UNIVERSITY OF LEEDS

Carbon Management Plan

June 2011

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1. EXECUTIVE SUMMARY

Foreword from the Vice-Chancellor

We must act now to reduce carbon emissions if we are to combat climate change. It is an issue everyone should be concerned about if we wish to continue living and working in a way that is sustainable and which enables us to pass on a planet fit for future generations. The University of Leeds understands the challenges posed by climate change and is committed to reducing its own emissions.

We already strive to integrate sustainable development into all our activities and operations and it was included in our revised strategy map in 2009 as a key strategic enabler to achieve our vision. This means the plan to 'provide a sustainable environment with first class facilities' is at the very heart of the University's activities.

I fully endorse the introduction of this ambitious Carbon Management Plan (CMP), which further demonstrates our commitment to the issue of reducing carbon emissions. The aims of the CMP are threefold: to make a significant contribution to government and the Higher Education Funding Council for England's (HEFCE) carbon reduction targets; to help the University deliver its core business in a more sustainable way; and to save money.

Through the CMP, we aim to reduce carbon emissions from buildings, vehicles, waste and water by 35% by 2020, compared against the 2005/06 baseline. This is no small task, but it is achievable with the support of all our staff and students. A number of projects are proposed, and finding funding for these will be challenging. However, the greatest challenge is for us to embed sustainability into our thinking and behaviour, and work together to make this plan a success.

Professor Michael Arthur
Vice-Chancellor

About the University of Leeds

The University of Leeds is recognised internationally for the excellence of its teaching and research. As one of the largest universities in the UK, Leeds is able to offer a wide range of academic courses, and 35 Schools are rated internationally or nationally as being excellent. Leeds currently has over 33,000 students from 142 countries, and over 7,600 members of staff. The University is a member of the Russell Group of research-intensive universities and earns over £100M each year in research related income.

Background

Between 2006 and 2011, the University has invested in excess of £200M in a substantial Capital Programme to provide new teaching, research and residential facilities. In parallel, an extensive backlog maintenance programme (BLM) has been undertaken to improve the quality of existing assets. As part of the programme of upgrading the building stock, a number of energy intensive buildings have been constructed, whilst at the same time disposals have concentrated on peripheral low-use properties.

As part of the University's commitment to reducing its carbon footprint, the University's first Carbon Management Plan was produced in 2005/06 as part of the first wave of Carbon Trust sponsored work in the higher education (HE) sector.

The 2011 CMP aims to reduce carbon emissions from buildings, owned vehicles, and waste and water by 35% by 2020, compared against the 2005/06 carbon emissions baseline.

National context

The Climate Change Bill (2008) established the Government's ambitious carbon emission reduction target of 80% of the 1990 baseline figure by 2050. In addition, in 2010 HEFCE set a target for the HE sector of a reduction in Scope 1 and 2 carbon emissions[1] of 43%[2] per cent by 2020/21, and 80 percent by 2050, against a 2005/06 baseline.

Current situation

In 2005/06 the University's total energy bill for residential and non-residential properties was £10.8M; this has reduced to £10.3M in 2008/09. Similarly total carbon emissions have reduced from 69,529 tonnes to 69,171 tonnes of carbon in the same period.

Since 1996 the University has obtained the majority of its electricity, heat, and chilled water, from a combined heat and power plant (CHP) operated by a third party supplier, Dalkia. This plant is known as the Generating Station Complex (GSC). CHP is recognised as a lower carbon source of energy than traditional grid sourced supplies. The current contract to operate the GSC expires in 2015, and new operational arrangements for post 2015 are now under discussion. As an early adopter of CHP, the University is unable to make further substantial reductions in carbon emissions from its primary source of carbon consumption. The efficiency of the CHP plant is borne out by lower emissions per m^2 of Gross Internal Area (GIA) of building space when compared to peers. There are, however, plans for further substantial investment to improve efficiency and resulting carbon emissions within the complex, once the current arrangements expire.

Much of the campus lies in a conservation area, and 44% of all academic space is in listed building which limits the introduction of some potential interventions, such as external fabric measures, including brise soleil, double glazing, and over cladding. In addition, space constraints limit the potential for extensive use of biomass as a renewable heating source.

Within some buildings there are third parties who lease space where energy is factored into their rents, and the University has no direct control over the use of energy in these areas.

[1] Scope 1&2 emissions are from owned transport, boilers and the generation of purchased electricity

[2] More recently and following consultation, HEFCE have now reduced the sector target to 34%

One example is the Worsley building, where 18% of floor space is leased by the Leeds Teaching Hospital Trust for use as a Dental Hospital, and this building accounts for circa 10% of the University's total energy costs.

Estate Strategy

In January 2010 the University Council approved a revised Estate Strategy for the period 2009/10 to 2019/20. The Estate Strategy and the associated Strategic Development Framework provide a long term strategy for developing and managing the estate in a sustainable way in relation to the University's academic and business needs. The Estate Strategy has been developed in support of the revised strategy map and has focused specifically on the key objectives of providing an exceptional student experience and first-class facilities in a sustainable environment.

Whilst the Estate Strategy identifies the University's needs going forward, our ability to invest will clearly be dependent on the level of HEFCE funding and the University's own ability to fund ongoing development. The new Capital Programme which is currently being developed will focus on maximising the use of current space to ensure optimum use of existing assets. Where there is an agreed need for additional space, this will be provided by refurbishing surplus space wherever possible. Only where buildings are at the end of their economic life, or if additional space is not available, will the construction of new buildings be considered. There will also be an increased focus on carbon management and energy saving, given the introduction of the Climate Change Bill and HEFCE targets. In addition, the continuing rise in energy prices will have an impact on future investment in the estate unless reductions in consumption are secured. The energy reduction programme will continue to focus on reducing energy costs by 5% in 2010/11, and a further 5% in 2011/12. The programme of disposal of surplus buildings will continue to assist with the funding of the Capital Programme and reducing carbon emissions.

Commitment

As a socially responsible organisation and a research-intensive University, Leeds intends to lead the way in reducing its impact upon the environment and wider society. The CMP defines desired outcomes, actions and targets to support the ambitious aims of the HEFCE policy document 'Carbon reduction target and strategy for higher education in England' (January 2010), which seeks to reduce the carbon emissions of the higher education sector by 43% by 2020/21 against a 2005/06 baseline for scope 1 and scope 2 carbon emissions. Increasing energy prices and the introduction of government schemes relating to purchasing carbon credits have also increased the need to reduce carbon emissions.

The University's carbon management programme has been designed to mirror the Carbon Trust's Higher Education Carbon Management (HECM) format, to enable comparison with other institutions who are participating in the Carbon Trust's carbon management programme. The plan establishes a baseline and targets for energy consumption reductions and hence carbon emissions reductions.

The plan will require significant investment by the University; ongoing rationalisation of the estate; efficient use of space and other resources, together with effective management of stakeholder behaviours relating to energy consumption. The CMP will constantly evolve and, by means of formal evaluation each year, will improve its effectiveness and ensure relevance as the University adapts to internal and external pressures.

Context and drivers for carbon management

There are a number of drivers for implementing an ambitious carbon reduction programme, including:

- Credibility - the University runs various sustainability related courses across a number of faculties and is involved in world-leading research in climate change and energy management. There is a need therefore to demonstrate to both students and the

wider community that the University supports the need for carbon reduction at institutional level.

- Reputation – the University's environmental management and performance is one of the considerations taken into account by students[3] when choosing where to study.
- Leadership – being an innovator in this field creates new opportunities for developing relationships with external organisations in industry, commerce and the public sector, leading to new opportunities for research funding.
- Legislation – as a means of demonstrating that the University is complying with current legislation and has the ability and the necessary expertise to adapt and respond to future requirements.
- Financial – the cost of utilities and carbon are forecast to rise significantly in the future, and prudent management of energy and its consumption could mitigate future cost pressures. Capital funding provided by HEFCE is also linked to carbon reduction plans[4].

Vision

The University's vision for environmental sustainability is:-

- To create a cultural change in the use of space and resources including energy.
- To minimise its impact upon the environment.
- To become a leader in carbon reduction and become a low carbon institution.
- To increase opportunities in the areas of sustainability and energy research.
- To reduce its exposure to energy related costs.

The adoption of the CMP supports a number of strategic enablers in the University's strategy map such as:

- Provide a sustainable environment with first class facilities.
- Manage risks, costs and resources and deliver our strategic priorities.

Embedding a low carbon culture, and alignment with corporate and strategic plans, are vital in ensuring that the University improves its environmental performance.

Objectives

The strategic objectives of the CMP are to:

- Ensure a University wide commitment to a low carbon future.
- Set high level targets for managing the University's carbon emissions.
- Develop policies and implement actions to support the agreed objectives.
- Set challenging but achievable carbon reduction targets over the medium and long term.
- Develop systems to ensure that accurate data and reporting tools are available.
- Measure the University's performance against milestones and report to all stakeholders.

To meet these objectives and targets the University of Leeds will:

- Allocate sufficient staff and staff time together with financial and other resources to enable the University's objectives to be realised.
- Develop, maintain and review an effective carbon management system.
- Comply with all relevant legislation.
- Ensure that energy efficiency is a key driver in all refurbishment projects whilst maintaining teaching and research functions as fundamental drivers.
- Invest in energy efficient measures where it is cost effective to do so.

[3] Forum for the Future and UCAS report 'Future Leaders' http://www.forumforthefuture.org/press-release/students-believe-change-needed

[4] 'Carbon reduction target and strategy for higher education in England', HEFCE January 2010 http://www.hefce.ac.uk/pubs/hefce/2010/10_01/

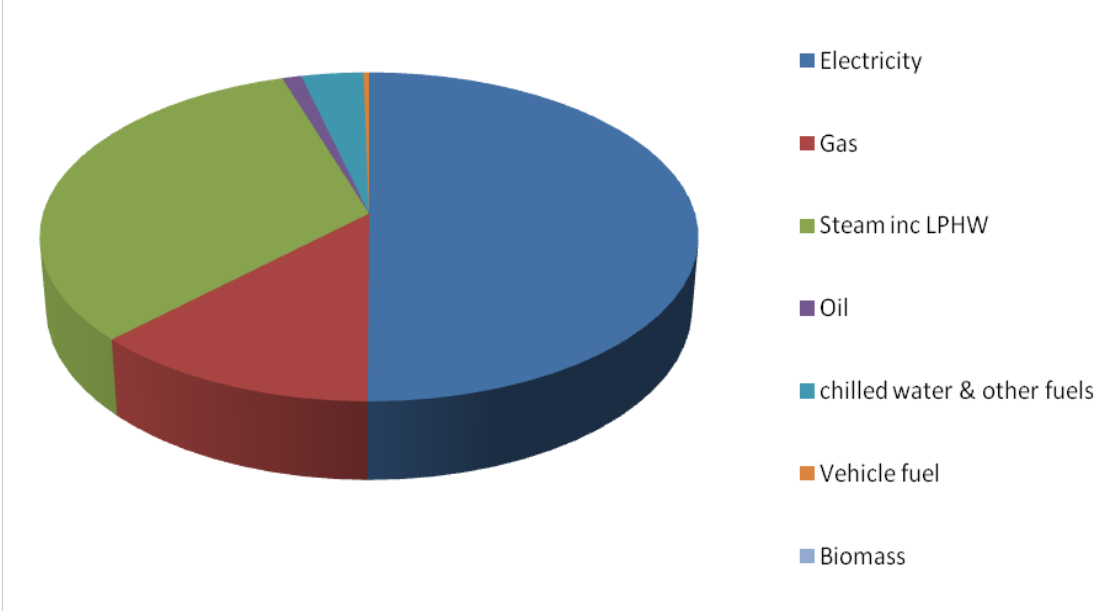
- Ensure that the principles of sustainability are understood and appreciated by staff and students alike.
- Ensure that major refurbishments are rated BREEAM 'very good' where practicable.
- Utilise external funding streams from different sources where appropriate.
- Ensure that business cases for new IT and other equipment consider the whole life cost of energy and associated carbon emissions.

The University supports the need for carbon reduction as a response to human induced climate change, and recognises that there are many potential benefits that will arise from curbing emissions. It recognises that as a leading research led University its activity can be energy intensive with a large science base that relies on laboratory space and complex equipment to undertake this work. This research activity is growing as the University strives to meet its strategic goals and improve the use of these expensive facilities.

Current Energy and Carbon Performance

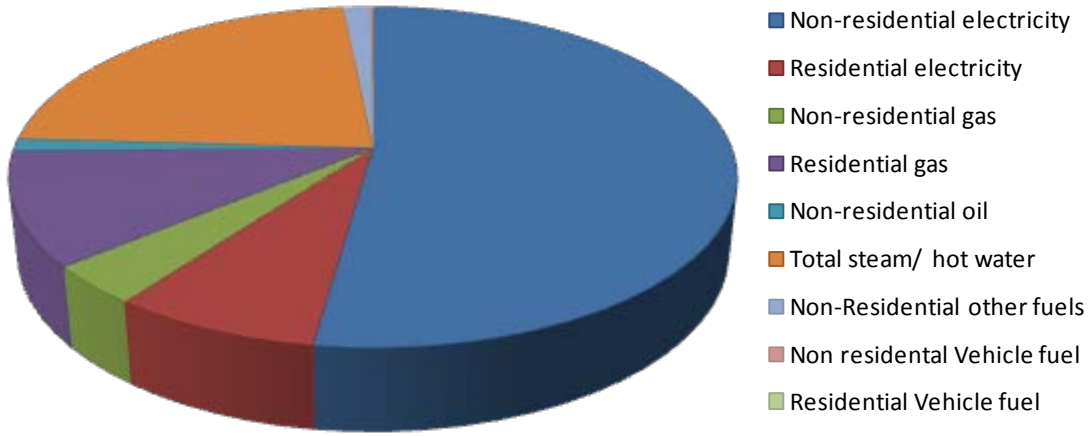
In 2009/10, the University's carbon footprint resulting from electricity, gas, steam and fuel used in its buildings and vehicles was 70,454 tonnes of carbon emissions with a financial cost of around £9.8M in energy bills. This represents a reduction of 358 tonnes of carbon against the 2005/06 baseline. The breakdown of the University's utility consumption by fuel is indicated below:

Breakdown of energy costs across utilities



Whilst electricity accounts for 50% of the University's utility costs, it contributes more significantly to our carbon footprint. The University benefits from low carbon heating as steam is raised as a by-product in the generation of electricity from the campus combined heat and power plant. The component elements of our carbon baseline are indicated below:

2005/06 carbon emissions (tonnes)



Transport

Whilst the CMP aims to deliver reductions in Scope 1 and 2 emissions, some elements of Scope 3 emissions are also managed, and by 2012/13 the University will also need to report on scope 3[5] emissions. At present the University is beginning to collate data for scope 3 emissions, including business car use and air travel and our targets and actions for scope 3 emission reductions will be included in a revised CMP.

In 2009 the University received an Environmental Association for Universities and Colleges (EAUC) Green Gown award for the success of its travel plan. One of the major successes has been UTravelActive which encourages and facilitates active travel, not only for University staff and students, but also for the wider community, including the Leeds Teaching Hospitals (NHS) Trust. Since the start of the project, student cycling has increased by 40%, and staff cycling by 50%; there has also been an increase in the trend for walking, which has increased by 5% for students and 15% for staff.

Targets

The University aims to reduce its Scope 1 and 2 carbon emissions by 35% by 2020/21, against the 2005/06 baseline, in support of HEFCE's target. As a first step, by 2012/13, the University aims to reduce its carbon emissions by 12% from the 2005/06 baseline in absolute terms.

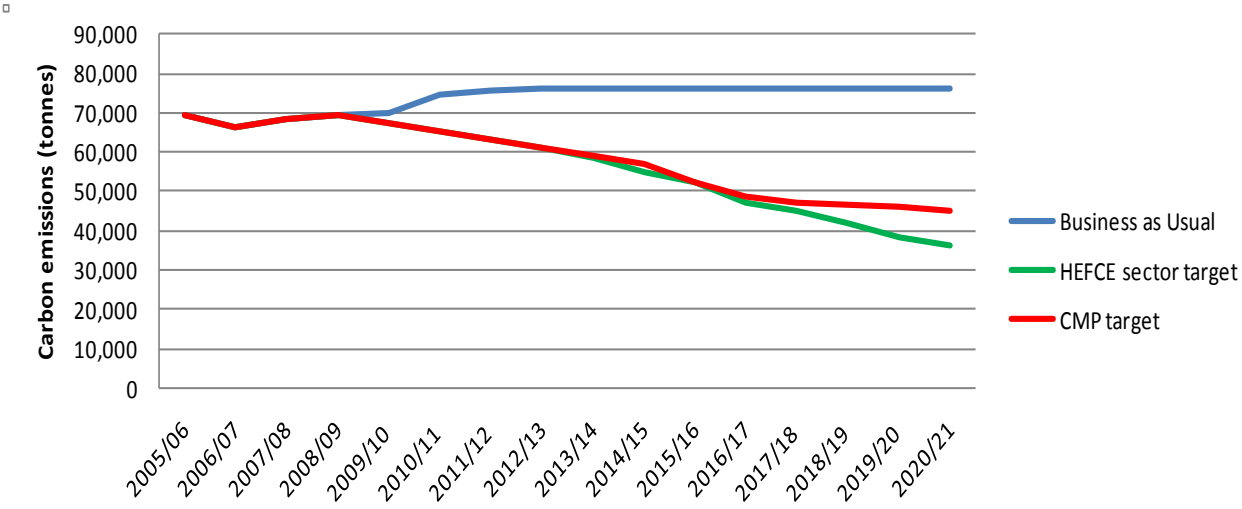
To support our target reductions a range of interventions is proposed across University buildings. Some initiatives will focus on control and management of systems, other initiatives improve efficiency and performance, whilst others will focus on how staff and students can support carbon reduction in their everyday activities.

The University's proposed carbon reduction profile is illustrated in the following graph, alongside an indication of what our profiles might be in a Business as Usual scenario without action to reduce our emissions.

[5] Scope 3 emissions are those indirect emissions that occur as a consequence of the activities of our organisation, but which are not owned or controlled by us. The staff and student commute is an example of Scope 3 emissions.

Carbon emissions at stake

Carbon emission at stake is the area between the lines. Total carbon at stake 248,430 tonnes.



As a method of monitoring this goal, the University has set itself interim targets, compared against HEFCE targets, of:

Year	Sector target	University of Leeds target reduction on 2005 /2006 emissions
2012/13	12%	12%
2016/17	29%	30%
2020/21	43%	35%

Energy cost savings

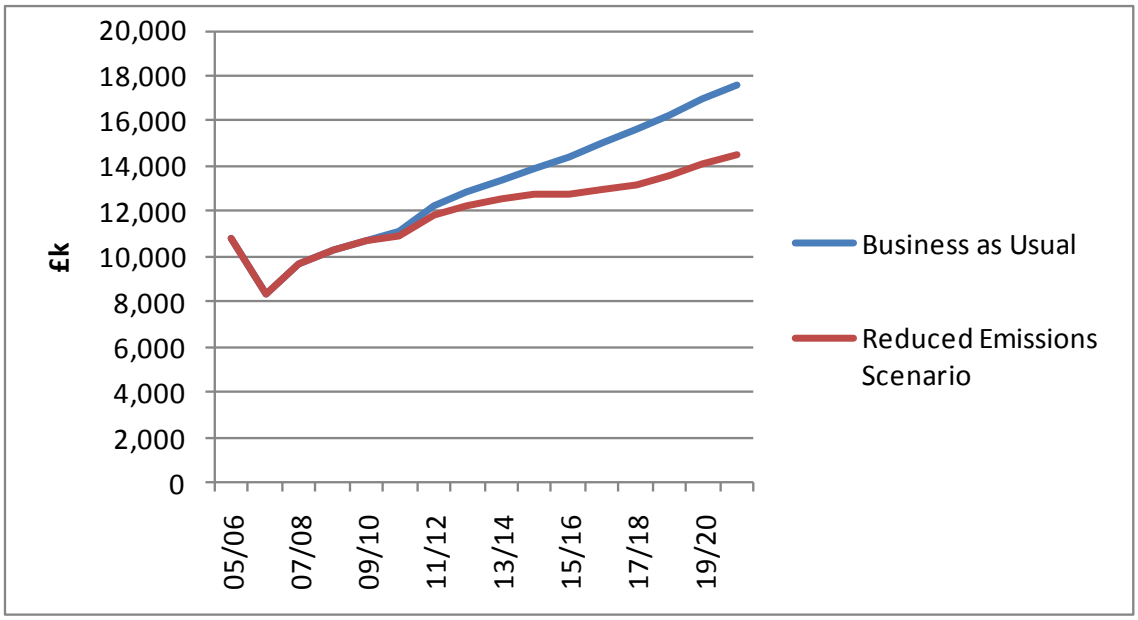
The 'Value at Stake' (VAS) calculation represents the potential savings in energy and carbon related costs that can be obtained through adopting the CMP, and is summarised in the chart below. The VAS for the University to the financial year 2020/21 has a headline value of £17.9M. This is the aggregated difference between the predicted energy spend for the Business as Usual scenario (BAU), and the energy spend in a Reduced Emissions Scenario (RES), following the implementation of a carbon management programme. It is based on a 35% reduction in total carbon emissions over the 10 year period, assuming that energy costs increase by 3.5% per year, that there is no growth in utility demand beyond 2012/13, and a constant £12 per tonne of carbon for CRC[6] has been applied.

However, this headline figure may have to be revised downwards, as the Carbon Trust tools assume that all carbon reductions equate to energy reduction. In some proposed interventions, emissions will be reduced through the use of low or zero carbon technologies, and the University will still have to fund utilities consumed.

[6] CRC refers to the Carbon Reduction Commitment which, from 2012, will operate as a tax on carbon emissions

Value at stake (VaS) is the difference between Business as Usual (BaU) and the Reduced Emissions Scenario (RES), i.e. the potential savings in energy costs if we achieve our targets. Total value at stake to 2020/21 is £17,855,000.

Value at Stake



Summary of main proposals in the Carbon Management Plan

- All buildings to have energy meters at source to monitor electricity, heat and water by 2012. By July 2011, the majority of buildings on campus will have energy meters at building entry level as a minimum, with Automatic Meter Readings (AMR) metering installed on all off campus buildings within the same time period.
- A behavioural change campaign with targets to save 840 tonnes of carbon and £92,000 from energy bills.
- A reduction in the space heating level to 21°C maximum in non-residential buildings and 21 to 23°C in residential accommodation where practical. The Carbon Trust suggests that a reduction of 1oC can generate energy savings of 10%.
- The set point for comfort cooling and air conditioning to be 24°C minimum in both residential and non-residential buildings where practical.
- Investment in updated systems and renewable technologies within the Generating Station Complex (GSC – the University's existing source of heating and partial electricity supply) saving 8,000 tonnes of carbon per annum.
- Improvements to the campus Building Management System (BMS) producing annual energy and carbon savings of £313,400 and 3000 tonnes of carbon respectively.
- Installation of variable speed drives on motors at a cost of £220,000 to provide energy savings of £49,230 and 485 tonnes of carbon per annum.
- Improvements in the use and control of fume cupboards at a cost of £1.43M aiming to provide annual savings of 1,946 tonnes of carbon and £239,000 in energy by 2020/21.
- The sale of surplus buildings releasing capital and providing annual carbon savings of 3,650 tonnes.

Assumptions

To help achieve the savings identified in the CMP and embed carbon management into the University's day to day operations, a programme of initiatives must be implemented in a systematic and managed manner, with clearly defined governance and ownership. Some projects will not lead directly to carbon emission reductions, but will assist in embedding carbon reduction into the collective consciousness. In the formulation of this plan, the

following assumptions have been made; these will be reviewed annually and revised as necessary taking into account the impact of the changes on the plan and its targets:

- The scope and make-up of the research undertaken by the University is anticipated to remain static.
- The number of staff and students remains relatively constant.
- The gross internal area of the University remains relatively static once the remaining major projects are completed in 2011/12.
- There are no changes to conversion factors for the main utilities, i.e. the amount of carbon emitted per unit of energy used remains stable over the next 10 years.
- The cost of carbon credits remains static.
- Energy costs increase at less than 3.5% per annum.

Funding of the CMP

To achieve the targets that the University has set, itself considerable investment will have to be made at a time when the HE sector is experiencing significant financial pressures. Interventions and their financial paybacks have been identified and prioritised but it is recognised that carbon reduction projects will, where possible, need to form a part of planned capital or major backlog maintenance projects to ensure that expenditure is optimised. In addition to doing carbon related work as a part of capital or BLM projects, other interventions, prioritised on the basis of financial payback, will be planned over the short (2011-2014), medium (2014-2017) and long (2017-2021) term.

The specific interventions described in this plan will form part of our integrated capital/BLM/Carbon plan which will in turn form the basis of the Estate Strategy update to be presented to the Council in 2011/12.

With potential large increases in carbon and utility costs over the next decade, the financial case for investment is strong, with many schemes showing financial payback in less than five years. The current plans assume that the cost of carbon credits remains static and that energy prices increase at less than 3.5% per annum. Clearly, changes in these costs will alter the attractiveness of particular interventions.

There are a number of external funding streams that may be available, many of which are managed by the Carbon Trust. Salix funding has been obtained by a number of universities, either in the form of grants, or as part of the Revolving Green Fund. At present, future funding of the Salix programmes is out for consultation, and whilst we have recently been successful in obtaining Salix funds for several small projects, historically, the University has not done as well as others due to current GSC utility prices paid being lower than grid prices, resulting in paybacks that fall outside Salix parameters. It may be however be appropriate for non-GSC supplied properties. The University will continue to work with outside agencies to identify other sources of funding.

Communications

The success of the CMP will be dependent upon the engagement and co-operation of stake holders across the University, and an effective communications strategy will be key to achieving our targets. Environmental Co-ordinators are already in place, and a member of the Sustainable Development Steering Group (SDSG) will take the role of Energy Champion to direct initiatives and maintain momentum. There will be a need to embed carbon management within the structures of Faculties and Services to ensure that local initiatives can be identified and managed in support of the University wide plan. Carbon management will also need to be embedded into the institution's core processes and will be a key consideration for the future when making investment decisions.

It is critical that the University as a whole embraces the need to use all resources efficiently and effectively, with reductions to energy consumption contributing to a reduction in carbon

emissions. Work is already underway in developing a behavioural change campaign which will be launched formally in 2011/12.

Monitoring and review

The SDSG will monitor implementation of the carbon management programme, and an annual review of progress against targets will be published. The University's target for reducing carbon emissions will also be reported through the Sustainable, Effective and Efficient Organisation (SEEO) strategic theme group reports.

2. INTRODUCTION

The University of Leeds is recognised internationally for the excellence of its teaching and research, and has had significant investment in high quality facilities and a first-rate infrastructure. As one of the largest universities in the UK, Leeds is able to offer a wide range of academic courses, and 35 Schools are rated internationally or nationally as being excellent for their research. Leeds currently has over 33,000 students from 140 countries, with over 7,600 members of staff. Consequently, the University has substantial energy demands.

The plan will require significant investment by the University; ongoing rationalisation of the estate; efficient use of space and other resources, together with effective management of stakeholder behaviours relating to energy consumption. The CMP will constantly evolve, and by means of an annual, formal evaluation of its success, will improve its effectiveness and ensure relevance as the University adapts to internal and external pressures.

3. BACKGROUND AND CONTEXT

Corporate Strategy
The University's refreshed Strategy Map was approved by the University Council in 2009.

Vision
The University's vision is to become one of the top 50 universities in the world by 2015.

Key themes
- Enhance the University's standing as an international university
- Deliver international excellence in all areas of research, with defined peaks of world-leading performance.
- Translate excellence in research and scholarship into learning opportunities
- Work with business, public and third–sector partners to create social and economic benefit.

Strategic enablers
- Proactively attract, support and develop high quality staff
- Secure a safe and healthy environment, promoting organisational well being
- Build and maintain world class performance engaging staff and students in the University's vision, strategy and values.
- To ensure that environmental sustainability is a key element in providing first class facilities
- Manage risk, costs and resources to deliver the strategic priorities

Estate Strategy
In January 2010 the University Council approved a revised Estate Strategy for the period 2009/10 to 2019/20. The Estate Strategy and the associated Strategic Development Framework provide a long term strategy for developing and managing the estate in a sustainable way in relation to the University's academic and business needs. The Estate Strategy has been developed in support of the revised Strategy Map and has focused specifically on the key objectives of providing an exceptional student experience and first-class facilities in a sustainable environment.

Whilst the Estate Strategy identifies the University's needs going forward, our ability to invest will clearly be dependent on the level of Higher Education Funding Council for England (HEFCE) funding and the University's own ability to fund ongoing development.

Capital Programme
The new Capital Programme currently being developed will focus on maximising the use of current space. Where there is an agreed need for additional space, this will be provided by refurbishing surplus space wherever possible. Only where buildings are at the end of their economic life, or if additional space is not available, will the construction of new buildings be considered.

There will also be an increased focus on carbon management and energy saving, given the introduction of the Climate Change Bill and HEFCE targets. In addition, the continuing rise in energy prices will have an impact on future investment in the estate unless reductions in consumption are secured. The energy reduction programme will continue to focus on reducing energy costs by 5% in 2010/11 and a further 5% in 2011/12. The programme of disposal of surplus buildings will continue to assist with the funding of the Capital Programme and reducing carbon emissions.

Current situation

In 2005/06, the University's total energy bill for residential and non-residential properties was £10.8M; this reduced to £9.8M in 2009/10. Carbon emissions have risen slightly from 69,529 tonnes to 70,454 tonnes of carbon in the same period, but this represents a relative reduction, given that the size of the estate has grown by 38,000 m^2 due to new building projects.

Since 1996 the University has obtained the majority of its electricity, heat, and chilled water, from a CHP operated by a third party supplier, Dalkia. This plant is known as the GSC. CHP is recognised as a lower carbon source of energy than traditional grid sourced supplies. The current contract to operate the GSC expires in 2015 and new operational arrangements will subsequently be required which are now under discussion. As an early adopter of CHP, the University is unable to make further substantial reductions in carbon emissions from its primary source of carbon consumption. The efficiency of the CHP plant is borne out by lower emissions per m^2 of Gross Internal Area (GIA) of building space when compared to peers. There are, however, plans for further substantial investment to improve efficiency and resulting carbon emissions within the complex, once the current arrangements expire.

Much of the campus lies in a conservation area and 44% of all academic space is in listed buildings. This limits the introduction of some potential interventions, such as external fabric measures, including brise soleil, double glazing, and over cladding. In addition, space constraints limit the potential for extensive use of biomass as a renewable heating source.

Within some buildings there are third parties who lease space where energy is factored into their rents, and the University has no direct control over the use of energy in these areas. One example is the Worsley building, where 18% of floor space is leased by the Leeds Teaching Hospital Trust for use as a Dental Hospital; this building accounts for circa 10% of the University's total energy costs.

Commitment

As a socially responsible organisation and a research-intensive University, Leeds intends to lead the way in reducing its impact upon the environment and wider society. The CMP defines desired outcomes, actions and targets to support the ambitious aims of the HEFCE policy document 'Carbon reduction target and strategy for higher education in England' (January 2010), which seeks to reduce the carbon emissions of the higher education sector by 43% by 2020/21 against a 2005/06 baseline for scope 1 and scope 2 carbon emissions, Table 3: Sources of Carbon Emissions, provides definitions of the various scopes. Increasing energy prices and the introduction of government schemes relating to purchasing carbon credits have also increased the need to reduce carbon emissions.

The University's CMP, which is outlined in this report, has been designed to mirror the Carbon Trust's HECM format, to enable comparison with other institutions who are participating in the Carbon Trust's carbon management programme. The plan establishes a baseline and targets for energy consumption reductions and hence carbon emissions reductions.

4. CARBON MANAGEMENT STRATEGY

Vision, objectives and targets

Within the University there are a number of drivers for implementing an ambitious carbon reduction programme, including:

- Credibility – the University runs various sustainability related courses across a number of faculties and therefore needs to be able to demonstrate to both students and the wider community that it supports the need for carbon reduction at institutional level.
- Reputation – the University's environmental management and performance is one of the considerations taken into account by students7 when choosing where to study.
- Leadership – being an innovator in this field creates new opportunities for developing relationships with external organisations in industry, commerce and the public sector, leading to new opportunities for research funding.
- Legislation – as a means of demonstrating that the University is complying with current legislation and has the ability and the necessary expertise to adapt and respond to future requirements. The University is covered by the mandatory cap and trade scheme started in April 2010.
- Financial – the cost of utilities and carbon are forecast to rise significantly in the future, and prudent management of energy and its consumption could mitigate future cost pressures. Capital funding provided by HEFCE is also linked to carbon reduction plans8.

The University's vision for the CMP is for it to act as an enabler to :

- create a cultural change in the use of space and resources including energy
- minimise its impact upon the environment
- become a leader in carbon reduction and become a low carbon institution
- increase opportunities in the areas of sustainability and energy research
- reduce its exposure to energy related costs.

The adoption of the CMP supports a number of strategic enablers in the University's Strategy Map such as:

- provide a sustainable environment with first class facilities
- manage risks, costs and resources and deliver our strategic priorities.

Embedding a low carbon culture, and alignment with corporate and strategic plans are vital in ensuring that the University improves its environmental performance.

The strategic objectives of the CMP are to:

- ensure a University wide commitment to a low-carbon future
- set high level targets for managing the University's carbon emissions
- develop policies and implement actions to support the agreed objectives
- set challenging but achievable carbon reduction targets over the medium and long term
- develop systems to ensure that accurate data and reporting tools are available
- measure the University's performance against milestones and report to all stakeholders.

[7] Forum for the Future and UCAS report 'Future Leaders' http://www.forumforthefuture.org/press-release/students-believe-change-needed

[8] 'Carbon reduction target and strategy for higher education in England', HEFCE January 2010 http://www.hefce.ac.uk/pubs/hefce/2010/10_01/

The University of Leeds aims to reduce its carbon emissions by 35% of the 2005/06 baseline by 2020/21 against a HEFCE sector target of 43%. As a method of monitoring progress, the University has set itself interim targets, compared against HEFCE targets, of:

Table 1 Carbon Management Plan targets

	Sector target	**University of Leeds target reduction on 2005 /2006 emissions**
2012/13	12%	12%
2016/17	29%	30%
2020/21	43%	35%

Our approach

To meet these objectives and targets the University of Leeds will:

- allocate sufficient staff and staff time together with financial and other resources develop, maintain and review an effective carbon management system.
- comply with all relevant legislation.
- ensure that energy efficiency is a key driver in all refurbishment projects whilst maintaining teaching and research functions as fundamental drivers.
- invest in energy efficient measures where it is cost effective to do so.
- ensure that the principles of sustainability are understood and appreciated by staff and students alike.
- ensure that major refurbishments are rated Building Research Establishment Environmental Assessment Method (BREEAM) 'very good' where practical.
- Use external funding streams from different sources where appropriate.
- ensure that business cases for new IT and other equipment consider the whole life cost of energy and associated carbon emissions.

Major projects

The following projects will be developed and implemented to meet the target of a 35% reduction in carbon emissions by 2020/21:

- major investment in renewable technologies within the GSC.
- upgrading of the existing building management system to provide greater and more effective control of the University infrastructure.
- review and install energy efficient systems to fume cupboards and improve operations to maximise energy efficiency.
- behavioural change campaign which will include the dissemination of the carbon management plan, its objectives and achievements.
- policies to ensure use of the most energy efficient equipment available for all areas of the University where practical.
- all individual buildings to have energy meters at source as a minimum to monitor electricity and heating by July 2011.
- reduction in heating levels to 21°C in academic and 21-23°C in residential buildings
- increase in minimum cooling temperatures to 24°C in buildings with a requirement for specific criteria to be met before cooling is provided.
- the installation of variable speed drives on all motors initially above 10kW; this will be rolled out to all motors above 5kW over the next four years. In addition the supply of variable speed drives will become a standard item associated with motors and pumps for all new buildings and refurbishments.
- rationalisation of the estate ensuring that space is used effectively and efficiently.

2010 Self-assessment of carbon management at Leeds

Using the Carbon Trust's Carbon Management Matrix, the University's self assessment of its carbon management in autumn 2010 is indicated in Table 2. The darker shading identifies the status of carbon management at the University of Leeds – our long term goal is to achieve the highest possible level (5) in all elements.

Whilst the matrix demonstrates that the University has made substantial progress in many areas, there is room for improvement, particularly in the formalisation and monitoring of policies. These improvements include:

- Policy – the University has a draft Sustainable Buildings Policy which will enable implementation and monitoring of carbon reduction measures in capital works. There are a number of other policies and plans such as an Energy Policy, Environmental Policy, and Transport Plan that will be aligned with the CMP in due course.
- Organisation – currently the Estates Engineering Services Team, which incorporates the Energy Team, has responsibility for energy reduction and the CMP. Within the wider University, environmental co-ordinators have been nominated by each faculty, school, and for some buildings. A campaign will be launched with the aim of recruiting a volunteer co-ordinator for each building. These staff will become involved in the carbon management strategy, thereby embedding sustainability and carbon management at all levels and will play a vital role in the success of the plan.
- Information and data – energy metering is currently being installed within all buildings. As a minimum, buildings will have a utility meter on each incoming service. This information will then feed into a monitoring and target system that will enable the Energy Team to assess whether or not actions are meeting targets, and to compensate for any shortfalls as appropriate.
- Communication and training – awareness of environmental issues is currently led by the SDSG, which includes representation from the University's Senior Management Team; and more general communication is via the University intranet and direct email communication with staff and students. In future, the Energy Team will develop a formal communications strategy to increase awareness of energy and carbon matters for staff, students and other stakeholders. The results of the behavioural change campaign will feed into this.
- Finance – the Energy Team have an annual budget of £400k for energy-saving projects and external funding has previously been secured for some initiatives. A future source of funding may be re-investment of savings from completed schemes. Energy saving and carbon reduction are drivers in capital, refurbishment and maintenance projects. There are two Energy Officers who have an energy and carbon remit within their roles.
- Monitoring and evaluation – the installation of metering will enable energy consumption to be monitored at building level, enabling the University to focus resources in the most efficient manner. More frequent reviews of energy and sustainability policies will be undertaken.

Table 2: Carbon Management matrix

	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, eg senior Sustainability / climate change responsibilities integrated into responsibilities of relevant people in different departments, eg Teaching, Finance, Estates	Carbon 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, eg 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, eg Teaching, Finance, Estates	Carbon emissions compiled for all main HEI sources for a baseline year (ie 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 (eg 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, eg Energy Manager, Sustainability/Environment Officer	Carbon emissions data compiled for some sources for a baseline year (eg buildings) and source data available for other sources (eg 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	Sustainability / Climate change as an aspiration in non-policy documents	Sustainability / climate change/carbon management is part-time responsibility of low ranking personnel	No carbon emissions data compiled for any sources but energy data compiled on a regular basis	Communication and training to specific groups in the HEI (eg 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	No sustainability / climate change policy or strategy and no mention of climate change in policy/strategy documents	No individual with responsibility for sustainability / climate change issues	No carbon emissions data compiled for any sources and energy data not compiled on a regular basis	No communication or training to staff/students on carbon or energy related matters	No internal financing or funding for carbon and/or energy efficiency related projects	No monitoring of carbon/energy policies/strategies, targets and action plans

5. CARBON EMISSIONS BASELINE AND PROJECTIONS

In accordance with HEFCE requirements, 2005/06 will be used as the base year for carbon emissions. Since this time the University has experienced a period of significant growth, and this has impacted on energy consumption. Continued growth from projects planned and currently under construction have been factored into the 'Business as Usual' (BaU) scenario used to estimate future financial implications of carbon reduction activity.

Energy supplier

In conjunction with the Leeds Teaching Hospital (NHS) Trust, the University obtains 75% of its energy from a third party supplier, (Dalkia), who lease and operate a CHP plant on behalf of the two organisations. The University has a 20-year contract with Dalkia that ends in 2015 for provision of electricity, steam, low pressure hot water and chilled water. As a generator, Dalkia obtains all European Union Emissions Trading Scheme (EUETS) credits; these are passed on, and the University is responsible for carbon emissions associated with the electricity supply – hence the use of the conversion factors quoted.

The remainder of energy consumed by the University is purchased through negotiated contracts for gas and electricity.

Scope

The current baseline comprises carbon emissions from Scope 1 and 2 sources only, with emissions as indicated in the table below

Table3: Sources of carbon emissions

Scope	Description	Example	Source
1	Direct emissions from sources owned or controlled by HEI	Direct fuel and energy use	Non-residential and Academic buildings Residential buildings The Students Union IT
		Transport fuel used in University's own vehicle fleet	Diesel Petrol LPG
2	Emissions from the generation of purchased electricity	Purchased electricity	Residential GSC
3	Emissions as a consequence of the activities of the HEI but from sources not owned or controlled by the HEI	Land-based business travel	
		Commuting	Staff and students
		Air travel	Business International students International student exchange
		Water	
		Waste	
		Procurement	Not measured at sector level

Scope 3 sources are currently excluded, but figures will be collated for future inclusion. Systems will need to be developed by the University to collect data on Scope 3 emissions from faculties and services.

Baseline

The University's monitoring and target system is in its infancy. Whilst information is available for off-campus academic and non-academic energy, the existing information for on-campus energy use on a building by building basis is limited. This is currently being resolved by means of an £800k investment in energy monitoring due for completion in July 2011. The baseline includes tenant consumption within buildings.

Table 4: Baseline figures in 2005-06 for carbon emissions

Fuel and service	Energy (kWh)	Carbon (tonnes)	Energy costs £s
Non-residential electricity	67,480,026	36,266	4,301,713
Residential electricity	10,241,612	5,504	1,103,513
Non-residential gas	14,193,388	2,629	452,000
Residential gas	40,407,232	7485	899,896
Non-residential oil	2,801,072	820	105,801
Residential oil	0	85	10,901
Non-residential steam and LTHW	74,549,902	15,655	3,514,045
Residential steam and LTHW	0	0	inc. above
Residential other fuels (chilled water and LPG)	0	0	0
Non-residential other fuels (chilled water and LPG)	4,572,046	964	377,205
Non–residential scope 1 Vehicle fuel	406,800	101	27,016
Residential scope 1 Vehicle fuel	75,576	19	6,686
Total	**215,016,228**	**69,529**	**10,798,776**

Carbon emissions baseline

Carbon emissions associated with electricity generation vary year on year due to fuel mix and grid efficiency losses. The following figures have been taken from 'HEFCE Carbon Management strategies and plans' January 2010 Appendix A'[9] September 2010 revision. Water and steam use conversion factors from the Stockholm Environment Institute quoted with the NHS England Carbon Emissions Carbon Footprinting Report[10] last updated September 2009. Baseline emissions have been established using data shown in Table 5.

Table 5: Emissions factors

Fuel	Unit	Academic Year				Source
Kg carbon per unit		**2005-06**	**2006-07**	**2007-08**	**2008-09**	
Electricity	kWh	0.53744	0.54073	0.54509	0.54522	Table A-2
Natural Gas	kWh	0.18523	0.18523	0.18523	0.18523	Table A-1
Gas oil	tonnes	3483.5	3483.5	3483.5	3483.5	Table A-1
LPG	litres	1.4920	1.4920	1.4920	1.4920	Table A-1
Diesel	litres	2.6720	2.6720	2.6720	2.6720	Table A-1
Petrol	litres	2.3220	2.3220	2.3220	2.3220	Table A-1
Steam	kWh	0.21	0.21	0.21	0.21	SEI factors [4]
Chilled water	kWh	0.21	0.21	0.21	0.21	SEI factors [4]

[9] http://www.hefce.ac.uk/pubs/hefce/2010/10_02/

[10] http://www.sd-commission.org.uk/publications.php?id=816

Projections

Since 2005/06, the University has undergone significant upgrading. A major capital programme has been undertaken, with substantial investment in developing the academic estate. Much of the focus has been on new buildings – stage@Leeds, Earth and Environment, The Edge sports facility, Charles Thackrah and The Marjorie and Arnold Ziff Building have all been completed in the past three years. At present, three new academic buildings (Liberty, Energy Research and CEU) are under construction for completion in 2011, and these buildings will further increase the size and energy consumption of the estate.

Major refurbishment schemes have also been undertaken for Biological Sciences, Engineering, Chemistry and the Institute of Communications Studies. Some remodelling of the estate has also taken place and the overall area has reduced by 6%, largely through disposal of the Bretton Hall campus in 2007. However, the majority of the disposed properties were low intensity use buildings, or had already been mothballed. Activities undertaken in the new buildings are often research intensive, with extensive use of equipment, which results in greater energy use, and consequently a larger carbon footprint. The University also delivered its first High Performance Computing (HPC) installation in 2010 which has a considerable carbon footprint, and this is scheduled to increase in intensity of use in a phased manner over subsequent years.

Redevelopment has also taken place in the non-academic estate, including the new 460-bed Storm Jameson student residences on campus, together with the construction of a large nursery, both of which replaced smaller facilities.

In tandem with capital developments, the University intends to upgrade the condition of its estate, with the aim of 95% of buildings being Royal Institution of Chartered Surveyors (RICS) condition A or B by 2015, if spending continues at planned levels.

The first biomass boilers were installed in 2007 at Bodington Sports Pavilion and Devonshire Hall. However, it is not envisaged that biomass technology will be adopted throughout the estate due to the confined nature of the campus, and increased operational costs, although biofuels are under consideration for use in the GSC after 2015.

Relatively stable activity levels are currently predicted in research and teaching, and student and staff numbers, in the short and medium-term. The academic estate is therefore likely to remain at current space levels for the foreseeable future.

Energy and carbon projections

Following calculation of the University's carbon emissions baseline, the difference between future costs and emissions in a Business as Usual scenario (ie continuing as now), and future costs and emissions in a Reduced Emissions Scenario , have been calculated. The 'Value at Stake' is essentially the financial and carbon savings the University would forego by failing to take any action to reduce emissions.

Business as Usual (BAU)

The BAU scenario is based upon the University taking no action to curb existing energy consumption and carbon emissions. It has been assumed that consumption will increase until 2013/14 due to capital investment, and then will remain static, with any potential increases being managed.

Reduced Emissions Scenario (RES)

By implementing the CMP, together with its agreed actions, a 35% reduction in carbon emissions is targeted for 2020/21. This is the RES.

Value at Stake (VAS)

The VAS calculation represents the potential savings in energy and carbon-related costs that can be obtained through adopting the CMP, and is summarised in Table 8 and Graph 3. The Value at Stake for the University to the financial year 2020/21 has a headline value of £17.9M. This is the aggregated difference between the predicted energy spend for the Business as Usual scenario, and the energy spend in a Reduced Emissions Scenario, following the implementation of a carbon management programme. It is based on a 35% reduction in total carbon emissions over the 10 year period, assuming that energy costs increase by 3.5% per year, that there is no growth in utility demand beyond 2012/13 and a constant £12 per tonne of carbon for CRC has been applied.

However, this headline figure may have to be revised downwards, as the Carbon Trust tools assume that all carbon reductions equate to energy reduction. In some proposed interventions, emissions will be reduced through the use of low or zero carbon technologies, and the University will still have to fund utilities consumed.

Financial Assumptions

Many commentators advise that energy costs and the price of carbon will increase substantially over the coming years. The CMP and VAS calculations do not attempt to forecast these rises specifically, although a 3.5% annual increase to future costs has been applied.

Table 6: Projected costs under a Business as Usual scenario (£,000s)

	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Electricity	5,405	4,408	5,012	5,100	5,278	5,463	5,654	5,852	6,057	6,269	6,488	6,716	6,951	7,194	7,446	7,706
Gas	1,352	1,304	961	1,061	1,098	1,137	1,177	1,218	1,260	1,304	1,350	1,397	1,446	1,497	1,549	1,603
Oil	117	118	11	7	7	8	8	8	9	9	9	9	10	10	11	11
Heating (steam & LPHW)	3,514	2,199	3,092	3,548	3,672	3,801	3,934	4,071	4,214	4,361	4,514	4,672	4,835	5,005	5,180	5,361
Other fuels (chilled water, & LPG)	377	312	510	514	532	551	570	590	611	632	654	677	701	726	751	777
Scope 1 Vehicles	33	37	44	40	41	42	44	45	47	49	50	52	54	56	58	60
Sub total	*10,799*	*8,377*	*9,628*	*10,270*	*10,629*	*11,001*	*11,386*	*11,785*	*12,197*	*12,624*	*13,066*	*13,523*	*13,996*	*14,486*	*14,993*	*15,518*
CRC costs	0	0	0	0	0	0	676	676	676	676	676	676	676	676	676	676
EUETS costs	0	0	0	0	121	128	138	424	487	586	702	827	962	1,107	1,261	1,372
Total	**10,799**	**8,377**	**9,628**	**10,270**	**10,750**	**11,129**	**12,200**	**12,885**	**13,360**	**13,886**	**14,444**	**15,027**	**15,635**	**16,270**	**16,930**	**17,566**

The data in the above table is based upon information available today for costs and rounded to the nearest £1,000. As it is inevitable that costs will increase over the period, a 3.5% inflation rate has been applied to current figures. Carbon is included using the latest available figures.

Graph 1: Costs under a Business as Usual scenario

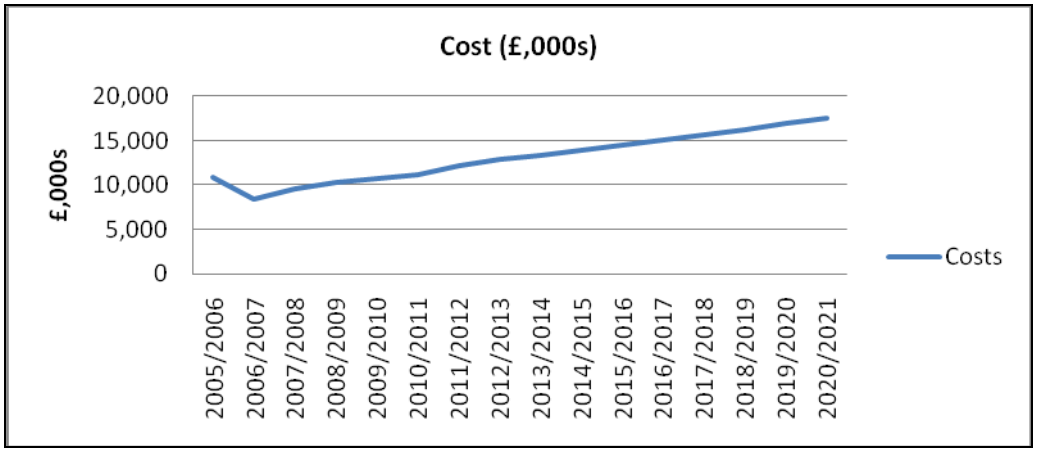


Table 7: Projected carbon emissions under a BAUscenario (tonnes)

	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Electricity	41,771	41,450	41,749	42,107	42,526	46,057	47,035	47,481	47,481	47,481	47,481	47,481	47,481	47,481	47,481	47,481
Gas	10,114	9,640	9,030	8805	8,819	8,912	8,948	8,948	8,948	8,948	8,948	8,948	8,948	8,948	8,948	8,948
(Gas) Oil	905	932	142	37	37	37	37	37	37	37	37	37	37	37	37	37
Heating (steam & LPHW)	15,655	13,301	16,009	16,802	17,047	17,990	18,285	18,333	18,333	18,333	18,333	18,333	18,333	18,333	18,333	18,333
Other fuels (chilled water & LPG)	964	757	1,089	1,286	1,328	1,398	1,427	1,427	1,427	1,427	1,427	1,427	1,427	1,427	1,427	1,427
Vehicles	120	146	138	134	134	134	134	134	134	134	134	134	134	134	134	134
Totals	**69,529**	**66,226**	**68,158**	**69,171**	**69,892**	**74,529**	**75,866**	**76,361**	**76,361**	**76,361**	**76,361**	**76,361**	**76,361**	**76,361**	**76,361**	**76,361**

Graph 2: Emissions under a BAU scenario

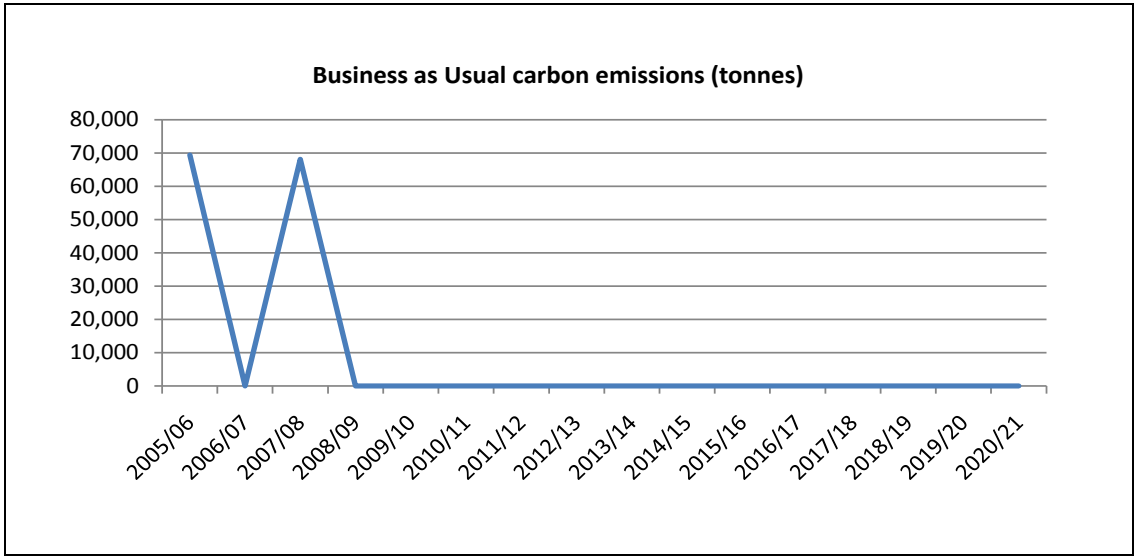


Table 8: Cash values (£,000s) of Business as Usual (BAU); Reduced Emissions Scenario (RES); and Value at Stake (VAS)

Costs £,000s	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
BaU	10,799	8,377	9,628	10,270	10,750	11,129	12,200	12,885	13,360	13,886	14,444	15,027	15,635	16,270	16,930	17,566
RES	10,799	8,377	9,628	10,270	10,708	10,893	11,846	12,297	12,530	12,806	12,810	12,982	13,132	13,597	14,083	14,543
VaS	**0**	**0**	**0**	**0**	**42**	**236**	**354**	**588**	**830**	**1,080**	**1,634**	**2,045**	**2,503**	**2,673**	**2,847**	**3,023**

Graph 3: Value at Stake (VAS)
Value at stake is the area between the lines.
Total value at stake is £17,855,000.

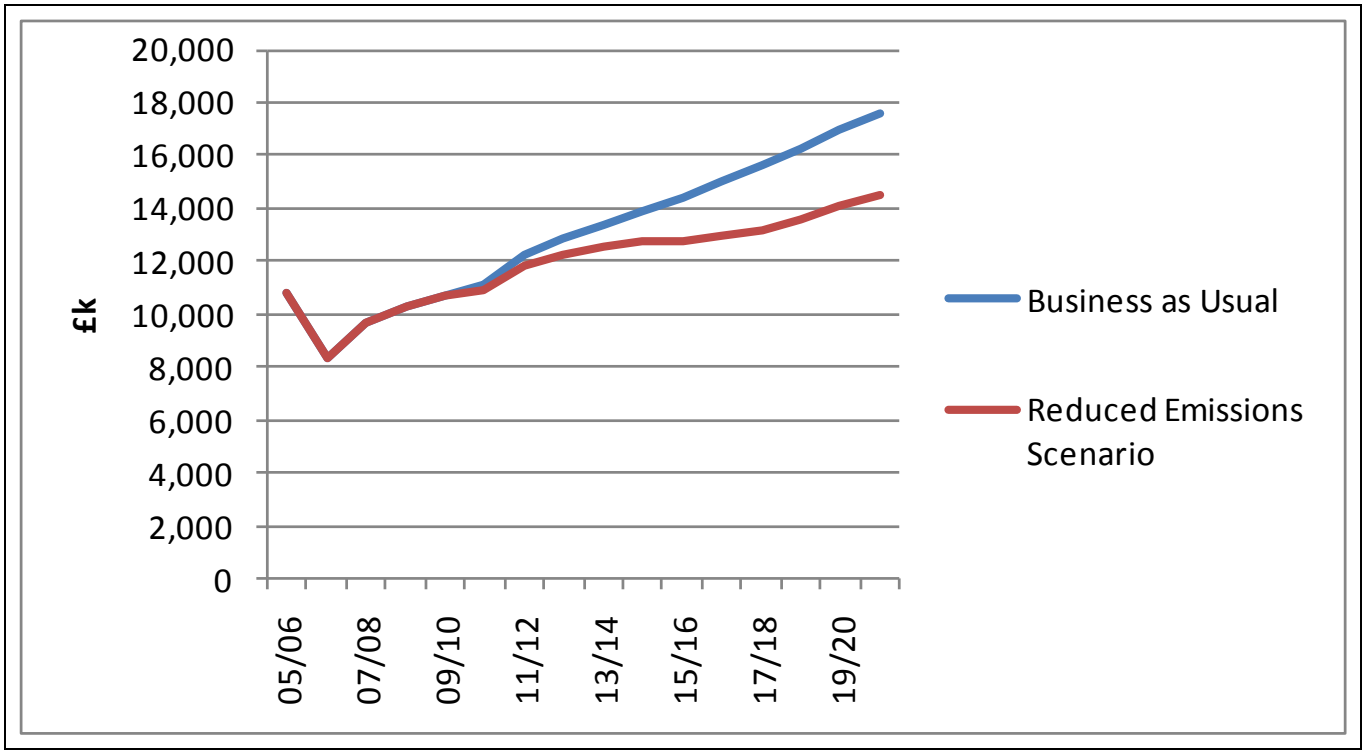


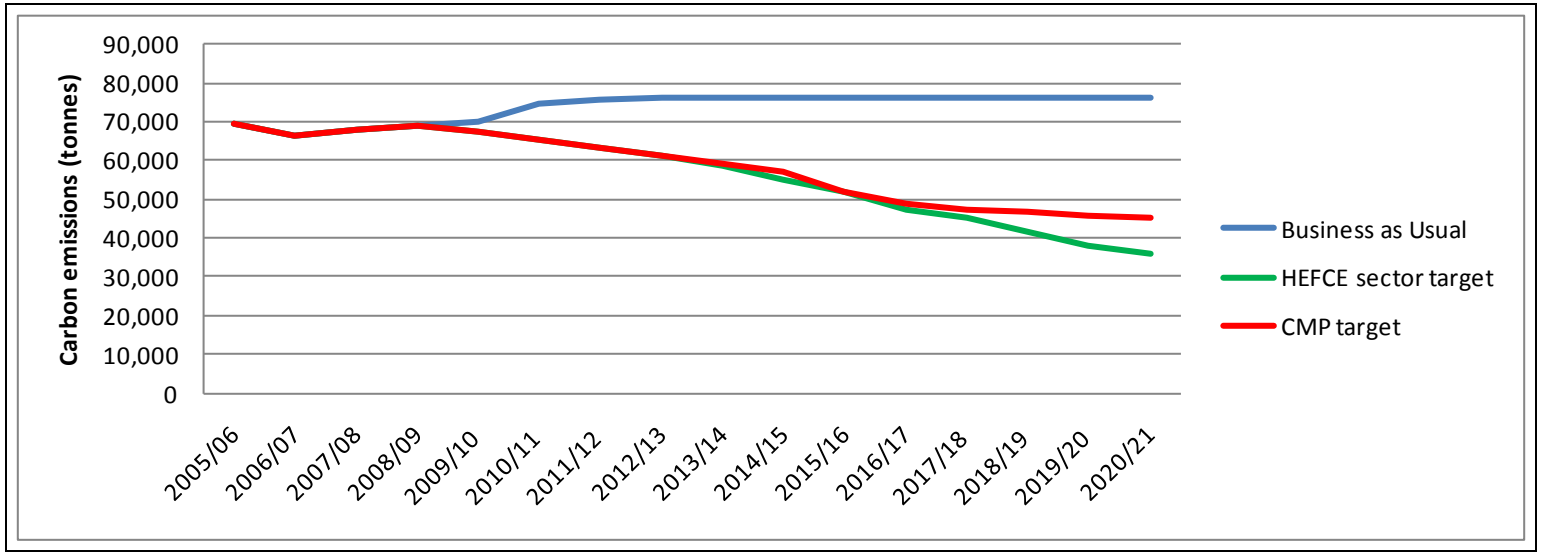
Table 9: Carbon emissions at stake

Carbon tonnes	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
BaU	69,529	66,226	68,158	69,171	69,892	74,529	75,866	76,361	76,361	76,361	76,361	76,361	76,361	76,361	76,361	76,361
RES	69,529	66,226	68,158	69,171	67,443	65,357	63,271	61,185	59,099	57,014	52,147	48,670	47,280	46,584	45,889	45,194
Carbon at stake	**0**	**0**	**0**	**0**	**2,449**	**9,172**	**12,595**	**15,176**	**17,262**	**19,374**	**24,214**	**27,691**	**29,081**	**29,777**	**30,472**	**31,167**

Graph 4: Carbon emissions at stake

Carbon emission at stake is the area between the lines.

Total carbon at stake 248,430 tonnes



6. PAST ACTIONS AND ACHIEVEMENTS

Energy

Since 1996 the University has purchased the majority of its electricity, heating (in the form of steam and low pressure hot water) and chilled water from a CHP system. The current contract to operate the facility expires in July 2015. Substantial investments are planned from that time to improve the energy efficiency of the existing CHP plant; to replace worn out assets; and to introduce an element of renewable fuel. Voltage reduction exercises have also been delivered as part of the CHP management of power.

Between 2005/06 and 2008/09 a slight reduction in carbon emissions of 272 tonnes was recorded, this reduction being recorded at a time when new buildings such as Brenner, Charles Thackrah, stage@Leeds and the Marjorie and Arnold Ziff Building became operational.

In the past two years, the University has been installing meters within all buildings to enable more accurate analysis of the energy being used. These are now being configured onto a new monitoring and targeting system that is gradually being built up with all available data from the various existing systems on site. The work will be complete in 2011. A project is being rolled out to install automatic metering in all off-campus buildings for gas and electricity. This information will then be captured on the University's energy management software, and will be used to underpin CRC energy efficiency submissions.

Display Energy Certificates (DECs) have been produced for 56 buildings on site (this will increase to 87 by September 2011 to cover buildings over 500m^2). Air conditioning energy inspection surveys (TM44 surveys) are being undertaken on the multitude of air conditioning systems on site as part of the University's maintenance regime. 1087 Energy Performance Certificates (EPC) have been produced for all residential accommodation.

Since 2007 all new buildings have targeted BREEAM 'Very Good' as a minimum, and the new Swimming Pool complex was awarded an 'Excellent' rating in 2010.

Set points for heating and air-conditioning are in line with set standards during normal occupancy hours, with setbacks for out-of-hours periods. In June 2009 a new Energy Policy was introduced setting new targets for heating (21-23°C) and increasing the set point for cooling (24°C). A programme to reconfigure chiller controls was undertaken, and to date, all systems have been modified; however, further interventions are required to ensure that the occupants cannot alter these set points.

Since 2007 £1.2M has been dedicated to energy efficiency and carbon management projects. Projects undertaken have included the replacement of external light fittings with energy efficient LED floodlighting; installation of presence detectors in cellular offices and corridors; and replacement of inefficient boilers.

A number of photovoltaic panels have been installed at the Nursery, Engineering Block, EC Stoner Building and Fenton Street, with the latest installation in the Earth and Environment Building capable of generating a peak of 13kW.

Within student residences, a number of interventions have already been undertaken, including energy efficient boilers, and additional heating and heating controls to prevent overheating of rooms in times of low occupancy. There is an active behavioural awareness campaign that targets new students with a Green Guide, and Student Environmental Representatives are in place in residences. Residential and Commercial Services (RCS) ensure that all electrical equipment procured since 2005 is minimum A-rated. Following

energy audits undertaken by an external consultant during the Summer of 2010, Residential Services will formulate a strategy for reducing carbon emissions in student residences. In domestic-style student residences, improvements include insulation; more efficient boilers and controls; improved lighting and controls; and secondary or double glazing installation.

As part of a joint National Union of Students/Department for Environment Food and Rural Affairs (NUS/DEFRA) University Hall Behaviour Project, Leeds has been involved with five other universities in implementing a student and energy use behaviour project.

Information Communication Technology

The University is committed to reducing the carbon footprint associated with IT. A sustainable IT group has been instigated, and energy consumption is factored into new equipment purchases.

Within the University computer clusters, software is already in operation that powers down monitors when they have not been used for thirty minutes.

As part of a project completed in 2010 to install a HPC facility in the Engineering Building, in-rack cooling using chilled water doors was installed, following the analysis of whole life costs.

In past years, the main computer server rooms have had their cooling set points raised to reduce chiller consumption. Some virtualisation of IT servers has been undertaken, and this has reduced the number of servers across campus. This work is ongoing and will be extended to faculty-managed servers in due course. Pilot studies have been undertaken to install thin client technology in areas such as the Library. A further pilot has been undertaken on computer and power management which, if successful, will be rolled out across the University.

Staff and student awareness

In order to deliver the aims of the CMP, the support and assistance of all members of the University community will be required. The University has a network of environment co-ordinators in faculties, schools and buildings who together with the Student Green representatives assist in identifying opportunities for improvement.

Recycling

In 2003 the University removed all wastepaper bins, replacing them with centralised recycling points for paper, card, plastics, metal and compostable food waste. Since 2004 the University has increased its waste recycling from 16% to over 90%. The University's efforts were recognised with a Green Gown Award for waste management in 2006. The University also operates an active furniture reuse scheme where unwanted furniture is offered free of charge to any other area of the University.

Travel

Whilst the CMP aims to deliver reductions in Scope 1 and 2 emissions, some elements of Scope 3 emissions are also managed, and progress is indicated below.

The University has had a travel plan since 2003. Based on 2005 levels there has been a reduction in single occupancy car use from 33% to 27% (staff); there has however been a slight increase in student use (5% to 6%) of cars. For the same period, there has been an increase in numbers walking to University from 12% to 15% (staff); and 61% to 67% (students). Improvements have also been seen in numbers of staff cycling (6% to 9%) and students (5% to 7%).

There has been a slight reduction in public transport over the same period, with rising costs, congestion and quality of service likely contributors.

For the period up to autumn 2011, based on the 2008 survey data, the following targets have been adopted for the Travel Plan:

Staff:

- Increase the proportion walking to the University to 15% (2008 – 13%).
- Increase the proportion cycling to the University to 10% (2008 – 8%).
- Reduce the proportion of single occupancy car drivers travelling to the University to 20% (2008 – 23%).
- Increase the proportion of car sharing to 17% (2008 – 15%)
- Increase/maintain the proportion of public transport users

Baseline data will be collected for different modes and types of business travel, and a programme to reduce this where possible will be developed.

Students:

- Increase the proportion walking to the University to 66% (2008 – 64%).
- Increase the proportion cycling to the University to 8% (2008 – 5%).
- Reduce the proportion of single occupancy car drivers travelling to the University to 4% (2008 – 5%).

At present the University is beginning to collate data for scope 3 emissions, including business car use and air travel.

7. CARBON MANAGEMENT PLAN IMPLEMENTATION

Actions and emissions reduction opportunities

To help achieve the savings identified in the CMP and embed carbon management into the University's day to day operations, a programme of initiatives must be implemented in a systematic and managed manner, with clearly defined governance and ownership. Some projects will not lead directly to carbon emission reductions, but will assist in embedding carbon reduction into the collective consciousness. In the formulation of this plan, the following assumptions have been made; these will be reviewed annually and revised as necessary taking into account the impact of the changes on the plan and its targets.

- the scope and make up of the research undertaken by the University is anticipated to remain static
- the number of staff and students remains relatively constant
- the gross internal area of the University remains relatively static once the remaining major projects are completed in 2011/12
- changes to the conversion factors for the main utilities does not increase the amount of carbon emitted per unit of energy consumed
- the amount of energy consumed by the University remains stable over the next 10 years.outside of the new building projects

Metering

Metering in itself does not reduce energy consumption but it encourages both behavioural change and physical measures to reduce energy consumption. Over the last two years, the University has undertaken a rolling programme to meter all buildings at building level as a minimum, which will be completed by July 2011. For all new buildings and refurbishments, metering is done at a finer level, to enable more detailed assessment of intervention measures. The information that is collected from these meters will be available via the web for staff and for use as an educational tool. Automatic Meter Reader (AMR) metering is being installed in the majority of residential buildings, which are not supplied by the GSC, further enhancing the accuracy and availability of data.

Backlog maintenance and building refurbishment

Over the next ten years the University will be undertaking building refurbishments, and backlog maintenance will focus on major mechanical and electrical systems. Refurbishments will enable improved thermal performance and energy efficiency consistent with building regulations, and will target a BREEAM 'Very Good' rating. Intervention measures to reduce carbon will be subject to a maximum payback period to ensure that value for money is maintained. The CMP envisages 2,000 tonnes of reductions through major refurbishment schemes. Funding for this work is embedded within the existing Capital Programme and backlog maintenance budgets.

Fume cupboards

With in excess of 700 units a programme of fume cupboard and fume hood improvements will be introduced outside more general refurbishment schemes. This will include Passive Infra Red PIR sash control and time controls to significantly reduce the unnecessary dumping of laboratory conditioned air making heating and cooling savings. To assist the air handling unit and extract fan in efficiently controlling the variable air volumes and provide electrical savings variable speed motor controllers, air flow monitors and controllers will be fitted. The systems shall then be re-commissioned and further user energy efficiency training with the users undertaken. This measure aims to provide annual savings of 1,946 tonnes of carbon and £239,000 in energy by 2020/21 at a cost of £1.43M.

Rationalise and consolidate the estate

Over time, there will be rationalisation of the estate to improve space efficiency, and to minimise vacant areas, which will enable buildings to be decommissioned or sold. The cost of mothballing/disposing of buildings will be cost neutral. The CMP proposes a target reduction of 1,000 tonnes of reductions from this source. It is anticipated that there will be other significant benefits from the co-location of highly serviced space such as laboratories, and increased sharing of research equipment; work is currently taking place through the White Rose Consortium to scope the shared use of facilities within and between universities.

Renewable energy

Options have been considered through the Capital Programme for the wider use of wind and biomass sources of energy, but these have not been viable, particularly when factoring in the benefits derived from existing on-site CHP. A number of Photovoltaic (PV) arrays have been installed in recent years, and it is clear that the cost of installation is reducing, whilst the energy yields are increasing. It is envisaged that in the medium/long term, more widespread deployment of PV technology will be cost effective, and there are a number of large roofs across campus that would be suitable for such installations. It has been assumed that the cost of installation will be reduced by half due to widespread adoption of this technology, and 3300m^2 of PV arrays could potentially be installed. Other renewable energy sources such as air and ground source heat pumps are reducing in price, and their paybacks are becoming more attractive and will be explored further.

Investigations will also take place to understand the viability of a large scale wind turbine(s) on University-owned land away from campus, though this has not been included in the CMP at this stage.

Building fabric improvements

Building fabric improvements will include roof insulation; external and internal insulation measures; draught proofing; and window replacements. The University sits within a conservation area which covers much of the main campus, and in addition, 44% of academic buildings are listed. Therefore it is challenging to obtain planning permission for changes to the external facade of the buildings. Building fabric improvements often do not provide the payback period of other interventions, and will usually be carried out only as part of more general major refurbishment works, which will also minimise disruption to staff and students. There are a series of stand-alone roof insulation measures, such as two of the Clothworkers' buildings, and the Sports Hall, which are planned for 2010/11, as well as buildings such as the Edward Boyle Library and the IT Services Building.

Mechanical services improvements

Improvements to heating, cooling and ventilation systems will be carried out as part of major refurbishments, usually in conjunction with fabric improvements, to maximise benefits, whilst minimising disruption to occupants. Where buildings systems need replacing or upgrading, the opportunity will be taken to introduce more energy efficient systems with improved controls and monitoring.

Where improvements to existing systems will provide a payback before the system requires replacement, individual implementations will be introduced. Examples of this would be re-commissioning exercises, improved fume cupboard controls and introduction of variable speed drives.

Lighting improvements

A programme of lighting improvements may be introduced outside more general refurbishment schemes. This will include items such as installing lighting controls in circulation areas which have no 'owner' and as such tend to operate 24/7; and installation of

lighting controls in single occupancy offices where lighting is left on when unoccupied for a large proportion of the day.

Information Communication Technology improvements

There are a number of measures that ISS plan to investigate and implement over the life of the carbon management plan.

IT procurements are already required to identify and purchase, where possible, the most energy efficient servers, desktops and laptops. This needs to be maintained. Consideration will also be given to the whole-life carbon footprint of any purchases including the manufacture and transport of any purchases and the environmental cost of the manufacturing and disposal of equipment.

Over the last five years the number of servers in use have been minimised through:

- continuing to consolidate services on the minimum required pieces of hardware
- increasing the use of virtualisation technologies
- increasing the use of appliances where appropriate.

By July 2011 all IT functions will have reviewed what additional reductions can be achieved and will have produced plans to implement these reductions.

The University will move towards the use of print-on-demand, pull-printing services. This will be implemented on ISS managed cluster Multi-Function Devices (MFDs) by end December 2010. Pilots in three faculties will be undertaken in early 2011 with a migration process for moving to MFDs and pull-printing by end June 2011. Rollout across the rest of the University will be linked to printer replacement cycles.

Plans will be put in place to rationalise the number of printers and photocopiers on campus by making more use of centralised multifunction devices (MFDs).

IT facilities and services will be developed that will enable students and staff to reduce their personal carbon footprint, eg improved remote and mobile access services to encourage more home working resulting in fewer trips into the University by car or public transport. The costs of enhancing current services, such as buying additional software licenses, will need to be compared to possible carbon reductions.

ISS will investigate the potential for greater efficiencies within data centres (machine rooms) and present proposals by mid 2011.

The return on investment of replacing older clients PCs with more energy efficient models ahead of their normal replacement cycle will be determined and where attractive will be implemented. ISS will report on ISS managed cluster PCs to the Sustainable IT Steering Group.

The power consumption of desktop computers will be reduced by:

- enabling features to allow users to save power by manually ‘hibernating’ computers (ISS managed computers by end December 2010, all others by July 2011)
- force ISS managed cluster computers into power saving modes by end December 2010
- continue investigations with the aim of rolling out automatic power saving on ISS managed PCs, with a suitable opt out mechanism, starting in June 2011, followed by other computers
- collaborate with the University’s behaviour change programme to embed good practice in members of the University on powering off their computers.

Generating Station Complex (GSC)

From 2015 a major programme of works is planned to replace or modify the existing combined heating and power system within the GSC that supplies the main campus with the majority of its electricity, heating and chilled water requirements. Gas Engines that are life expired will be replaced, and improved efficiency and better controls will reduce energy consumption. One or more of the existing boilers in the GSC will be modified to run on either gas or bio-diesel, (to reduce carbon emissions by transferring to non fossil fuel). The University together with LTHT will investigate the viability of extending the district heating and chilled water systems to supply new buildings, and those undergoing major refurbishments, during the planning period.

Building Management System (BMS)

A ten-year plan will be implemented to improve and where necessary replace existing BMS systems and controls that are life expired, and at the same time additional controls will be introduced. These works will assist in reducing energy consumption, by monitoring and controlling local environments within buildings. To assist in the closer control of systems, modifications will be undertaken to the heating systems, by increasing the number of zones on a floor, and segregating floors.

In conjunction with the installation of an improved controls infrastructure, it is proposed that a dedicated Controls Engineer is employed to continually monitor the BMS, to ensure that energy use is minimised through correct deployment of control strategy and identification of problems.

Variable speed drives and motors

As a research-intensive University, Leeds consumes a substantial amount of energy from its process equipment. A large amount of this is associated with motors driving fume cupboards, air conditioning, and general pumps and fans. Whilst some of these motors already have variable speed drives, many do not, and where variable speed drives are fitted, they may not be commissioned to maximise energy savings. Over the next few years work will be undertaken to install new variable speed drives; replace motors with higher efficiency models; and recommission existing variable speed drives where possible.

Behavioural change campaign

The success of the CMP depends upon winning the hearts and minds of those with the power to make the majority of the energy savings – the building users. The University will build upon the success of the implementation measures that are already in place, which are widely recognised and rewarded externally. Internally, however, there is still insufficient communication and awareness. The skills and talents of students and staff must be harnessed to assist in reducing energy consumption, leading to reduced carbon emissions.

The behavioural change campaign will start in summer 2011. A brief is being prepared for going out to tender for a company with suitable expertise to run a communication campaign aimed at carbon reduction. The campaign will aim to create awareness of the CMP, the need to reduce energy, and identify ways to do this. There will also be individual projects tackling specific buildings (high energy users) or behaviour (eg use of fume cupboards) running parallel to the main campaign. A separate project called ‘Green Impact’ encourages ‘bottom up’ behaviour change amongst staff volunteers and their schools. Although covering all areas of sustainability, there is a significant focus on carbon reduction. Staff involvement in both the campaign and Green Impact are recognised in an annual awards ceremony in June.

Carbon Management Programme – planned projects

Tables 10 to 12 define the potential projects that the University may implement over the next 10 years broken down into short term (2011-2014), medium term (2014-2017), and long term projects (2017-2021).

Table 10: Carbon Management Programme planned short term projects (2011-14)
Target: 12% reduction, 8,463 tonnes

See Appendix A for further details.

Ref	Project	Lead	Funding stream	Cost (£s)	Total annual energy saving (£s)	Annual saving carbon (tonnes)	Cost per tonne of carbon	Simple payback (years)	% of target	Date	Carbon saving by 2020/21 tonnes
S01.	Installation of energy efficient AHU filters in Worsley building	Maintenance	Maintenance	£17,700	£46,312	476	£37	<1	1.96%	31 July 2010	5,236
S02.	Sports Hall district heating and heating system improvements BLM project	Maintenance	Maintenance	£27,245	£3,760	150	£182	7	0.62%	31 July 2010	1,650
S03	Installation of roof insulation to Parkinson	Capital Projects	Capital Projects	£339,126	£16,566	6	£61,659	20	0.02%	31 July 2011	55
S04	Installation of secondary glazing to Parkinson	Capital Projects	Capital Projects	£232,231	£8,248	4	£58,058	28	0.02%	31 July 2011	40
S05	Energy and Environmental Policy review and implementation	Engineering	Energy	£ 0	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S06a	Installation of AMR energy meters - Residential (legislative)	Engineering	Energy	£100,000	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S06b	Installation of AMR energy meters Academic (legislative)	Engineering	Energy	£25,000	£ 0	0	£ 0	0	0.00%	31 Dec 2010	0
S07	Installation of energy meters in Worsley	Engineering	Energy	£102,000	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S08a.	Improvement controls to fume cupboards in Astbury Phase 1	Engineering	Energy	£100,000	£20,088	116	£862	5	0.48%	31 July 2011	1,160
S09.	Installation of variable speed drives phase 1	Engineering	Energy	£251,600	£45,655	364	£691	6	1.50%	31 July 2011	3,640
S10.	Installation of PIR control to EC Stoner level 10 AC units	Energy	Energy	£4,050	£109	1	£4,050	37	0.00%	31 July 2011	10
S11.	Controls Engineer	Engineering	Engineering	£0	£23,867	140	£0	0	0.58%	31 July 2011	1,400
S12.	On campus cooling adjustment to 24 deg C	Energy	Energy	£50,000	£14,985	152	£329	3	0.63%	31 July 2011	1,520
S13.	Requirement for all projects proposals and equipment purchase requests to have a carbon and energy impact analysis	Central procurement	None	£ 0	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S14.	Rationalisation of estate - Clarence Dock	Central	RCS	£0	£127,637	1,098	£0	0	4.52%	31 July 2011	10,980
S15.	Automatic power down of IT equipment	ISS	ISS	£90,000	£11,152	99	£909	8	0.41%	31 July 2011	990
S16.	Refectory BLM roofing works including addition of insulation	Maintenance	BLM	£0	£7,848	34	£0	0	0.14%	31 July 2011	340

Ref	Project	Lead	Funding stream	Cost (£s)	Total annual energy saving (£s)	Annual saving carbon (tonnes)	Cost per tonne of carbon	Simple payback (years)	% of target	Date	Carbon saving by 2020/21 tonnes
S17.	Sports Hall 1 BLM roofing works including addition of insulation	Maintenance	BLM	£0	£1,551	9	£0	0	0.04%	31 July 2011	90
S18.	Auditorium BLM roofing works including addition of insulation	Maintenance	BLM	£0	£1,886	11	£0	0	0.05%	31 July 2011	110
S19.	17 Springfield Mount BLM roofing works including addition of insulation	Maintenance	BLM	£0	£644	5	£0	0	0.02%	31 July 2011	50
S20.	Clothworkers Central and South BLM roofing works including addition of insulation	Maintenance	BLM	£0	£2,476	5	£0	0	0.02%	31 July 2011	50
S21.	Food Sciences energy survey	Energy	Energy	£12,808.00	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S22.	Development of web based M&T system	Energy	Energy	£20,000.00	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S23.	Fabric survey	Capital Projects	Energy	£2,500.00	£ 0	0	£ 0	0	0.00%	31 July 2011	0
S24.	RCS 37 - 41 Lyddon Terrace implementation measures	Design Office	RCS	£7,995	£1,653	14	£585	5	0.06%	31 July 2012	137
S25.	On campus heating adjustment to 21 deg C	Energy	Energy	£50,000	£30,950	136	£368	2	0.56%	31 July 2012	1,360
S26.	RCS 27 Clarendon Place implementation measures	Design Office	RCS	£6,227	£438	3	£1,703	14	0.01%	31 July 2012	34
S08b	Improvement controls to fume cupboards in Astbury Phase 2	Engineering	Energy	£135,200	£27,179	157	£861	5	0.65%	31 July 2012	1,570
S27.	Chilled water system extension	Energy	Energy	£54,200	£12,008	124	£437	5	0.51%	31 July 2012	1,116
S28.	RCS Montague Burton implementation measures	Design Office	RCS	£21,509	£7,989	69	£312	3	0.28%	31 July 2012	620
S29.	RCS Lupton implementation measures	Design Office	RCS	£22,100	£8,032	69	£312	3	0.28%	31 July 2012	620
S30.	RCS Oxley Flats implementation measures	Design Office	RCS	£5,850	£2,117	18	£333	3	0.07%	31 July 2012	158
S31.	RCS North Hill House implementation measures	Design Office	RCS	£1,820	£509	4	£411	4	0.02%	31 July 2012	40
S32	RCS Oxley Flats implementation measures	Design Office	RCS	£5,850	£2,117	18	£333	3	0.07%	31 July 2012	158
S33.	Behavioural change campaign	Sustainability	Energy	£100,000	£102,754	840	£119	1	3.46%	31 July 2012	7,560
S34.	Improvement controls to fume cupboards in Garstang	Engineering	Energy	£375,900	£75,539	436	£862	5	1.79%	31 July 2012	4,360

Ref	Project	Lead	Funding stream	Cost (£s)	Total annual energy saving (£s)	Annual saving carbon (tonnes)	Cost per tonne of carbon	Simple payback (years)	% of target	Date	Carbon saving by 2020/21 tonnes
S35a	Replacement of BMS and system reconfiguration phase 1a	Engineering	Engineering	£1,097,653	£137,950	62	£17,704	8	0.26%	31 July 2012	558
S36.	Institute of Communication Studies (Clothworkers Central) energy reduction measures	Engineering	BLM	£137,027.57	£19,853	125	£1,095	7	0.51%	31 July 2012	1,001
S37.	Improvement controls to fume cupboards in Manton	Engineering	Energy	£81,900	£16,458	95	£862	5	0.39%	31 July 2011	950
S38.	Improvement controls to fume cupboards in the Faculty of MAPS	Engineering	Energy	£85,680	£14,416	133	£644	6	0.55%	31 July 2013	1,064
S39.	Improvement controls to fume cupboards in School of Chemistry	Engineering	Energy	£362,355	£60,975	563	£644	6	2.32%	31 July 2013	5,630
S40.	Installation of PIR controls to existing lighting	Engineering	Energy	£35,500	£11,455	112	£317	3	0.46%	31 July 2013	896
S35b	Replacement of BMS and system reconfiguration phase 1b	Engineering	Engineering	£1,097,653	£137,950	62	£17,704	8	0.26%	31 July 2013	496
S41.	CEM BLM contract energy reduction measures	Capital Projects	BLM	£1,002,332	£145,224	915	£1,095	7	3.76%	31 July 2013	7,320
S45	Fabric measures insulation and windows	Energy	Energy	£200,000	£11,562	70	£2,857	17	0.29%	31 July 2013	560
S42.	Clothworkers South (Man Made fibres) BLM project energy reduction measures	Energy	Maintenance	£182,252	£26,401	166	£1,098	7	0.68%	31 July 2013	1,162
S43.	Installation of energy meters	Energy	Energy	£80,000	£0	0	£0	0	0.00%	31 July 2013	0
S44	Mechanical systems recommissioning	Maintenance	Energy	£300,000	£63,454	354	£847	5	1.46%	31 July 2013	3,540
		Sub-totals		***£6,773,263***	***£1,249,768***	***7,214***	***£939***	***5***	***29.68%***		***68,232***

Table 11: Carbon Management Programme planned medium term projects (2014-17)
Target: 25 % reduction; 17,631 tonnes

Ref	Project	Lead	Funding stream	Cost (£)	Total annual energy saving (£s)	Annual saving carbon (tonnes)	Cost per tonne carbon (£)	Simple payback (years)	% of target	Date	Carbon saving by 2020/21 tonnes
M01.	Improvement controls to fume cupboards in the Engineering Building (Houldsworth)	Engineering	Energy	£82,110	£13,822	128	£641	6	0.53%	31 July 2014	896
M02.	Improvement controls to fume cupboards in the Faculty of Environment	Engineering	Energy	£44,625	£7,505	69	£647	6	0.28%	31 July 2014	483
M03.	Improvement controls to fume cupboards in Worsley	Engineering	Energy	£42,840	£7,214	67	£639	6	0.28%	31 July 2014	469
M04.	Installation of variable speed motors	Engineering	Energy	£1,320,000	£302,750	2,665	£495	4	10.96%	31 July 2014	18,655
M05.	Rationalisation of Campus - sale of Fairburn House	Capital Projects	Capital Projects	£0	£306,133	183	£0	0	0.75%	31 July 2014	1,281
M06.	RCS North Lawn implementation measures	Design Office	RCS	£10,667	£1,685	14	£746	6	0.06%	31 July 2014	100
M07.	RCS Devonshire Coach House implementation measures	Design Office	RCS	£4,940	£548	5	£1,049	9	0.02%	31 July 2014	33
M08.	RCS Elmfield House implementation measures	Design Office	RCS	£13,910	£1,002	9	£1,636	14	0.03%	31 July 2014	60
M09a.	Replacement of BMS and system reconfiguration phase 2a	Engineering	Engineering	£1,000,211	£125,770	62	£16,132	8	0.26%	31 July 2014	434
M10.	RCS The Orchards implementation measures	Design Office	RCS	£19,240	£2,411	21	£928	8	0.09%	31 July 2015	124
M11.	RCS Lyddon Hall implementation measures	Design Office	RCS	£20,311	£1,533	13	£1,558	13	0.05%	31 July 2015	78
M12.	Rationalisation of Estate - sale of Boddington	Capital Projects	Capital Projects	£0	£30,960	2,580		0	10.61%	31 July 2015	15,480
M13.	ISS implementation measures	ISS/ Engineering	ISS	£0	£63,800	650	£0	0	2.67%	31 July 2015	3,900
M09b.	Replacement of BMS and system reconfiguration phase 2b	Engineering	Energy	£1,000,211	£125,770	62	£16,132	8	0.26%	31 July 2015	372
M14.	Houldsworth BLM project energy reduction measures	Engineering	BLM	£624,521	£72,387	456	£1,370	9	1.88%	31 July 2015	1,824
M15.	RCS Oxley Old Hall implementation measures	Design Office	RCS	£48,620	£6,927	61	£794	7	0.25%	31 July 2016	306
M16.	RCS 27 - 31 Cromer Terrace implementation measures	Design Office	RCS	£10,842	£758	6	£1,703	14	0.03%	31 July 2016	32
M17a.	Replacement of BMS and system reconfiguration phase 3a	Engineering	Energy	£933,084	£117,380	62	£15,050	8	0.26%	31 July 2016	310
M18.	Installation of 1 new biodiesel boiler at GSC	Engineering	Energy	£700,000	TBA	4,000	£175	TBA	16.46%	31 July 2017	16,000
M19.	Installation of 3no 3MW gas CHP engines at GSC	Engineering	Energy	£6,000,000	TBA	4,000	£1,500	TBA	16.46%	31 July 2017	16,000
M17b	Replacement of BMS and system reconfiguration phase 3b	Engineering	Energy	£933,084	£117,380	62	£15,050	8	0.26%	31 July 2017	248
M20.	RCS Sentinel Towers implementation measures	Design Office	RCS	£87,581	£13,647	104	£844	6	0.43%	31 July 2017	415

Ref	Project	Lead	Funding stream	Cost (£)	Total annual energy saving (£s)	Annual saving carbon (tonnes)	Cost per tonne carbon (£)	Simple payback (years)	% of target	Date	Carbon saving by 2020/21 tonnes
M21.	RCS Henry Price implementation measures	Design Office	RCS	£143,514	£13,648	68	£2,107	11	0.28%	31 July 2017	272
M22.	Fabric measures insulation and windows	Energy	Engineering	£250,000	£15,092	116	£2,155	17	0.48%	31 July 2017	464
		Sub-totals		***£13,340,310***	***£1,348,121***	***15,463***	***£81,353***	**9**	***63.62%***		***78,237***

Table 12: Carbon Management Programme planned long term projects (2017-21)
Target: 35% reduction, 24,683 tonnes

Ref	Project	Lead	Funding stream	Cost (£)	Total annual energy saving (£s)	Annual saving carbon (tonnes)	Cost per tonne carbon	Simple payback (years)	% of target	Date	Carbon saving by 2020/21 tonnes
L01.	Improvement controls to fume cupboards in Faculty of Medicine and Health	Engineering	Energy	£23,205	£3,904	36	£645	6	0.15%	31 July 2018	108
L02.	Improvement controls to fume cupboards in St James Hospital bldg 156	Engineering	Energy	£39,270	£6,632	63	£623	6	0.26%	31 July 2018	189
L03.	Improvement controls to fume cupboards in Faculty of Engineering	Engineering	Energy	£4,000	£2,716	26	£154	1	0.11%	31 July 2018	78
L04a.	Replacement of BMS and system reconfiguration phase 4a	Engineering	Engineering	£812,131	£102,501	82	£9,904	8	0.34%	31 July 2018	246
L05.	RCS North Hill Court implementation measures	Design Office	RCS	£17,914	£1,517	14	£411	12	0.06%	31 July 2018	41
L06.	RCS Spring Hill implementation measures	Design Office	RCS	£13,455	£1,063	9	£1,444	13	0.04%	31 July 2018	28
L07.	RCS Ellerslie Hall implementation measures	Design Office	RCS	£21,294	£1,731	14	£1,553	12	0.06%	31 July 2018	41
L08.	RCS Oxley Bar implementation measures	Design Office	RCS	£2,860	£179	2	£1,847	16	0.01%	31 July 2018	5
L09.	EC Stoner BLM Project Energy reduction measures	Engineering	BLM	£500,000	£49,055	345	£1,449	10	1.42%	31 July 2018	690
L10.	Improvement controls to fume cupboards in the Worsley Dental Hospital	Engineering	Energy	£10,710	£1,807	17	£630	6	0.07%	31 July 2019	34
L11.	Improvement controls to fume cupboards in the Faculty of PVAC	Engineering	Energy	£8,925	£1,503	14	£638	6	0.06%	31 July 2019	28
L12.	Improvement controls to fume cupboards in the LIGHT	Engineering	Energy	£14,280	£2,401	22	£649	6	0.09%	31 July 2019	44
L13.	Improvement controls to fume cupboards in Chapel Allerton Hospital	Engineering	Energy	£3,570	£606	6	£595	6	0.02%	31 July 2019	12
L14.	Installation of ground water cooling at Western campus	Engineering	Energy	£246,000	£12,780	90	£2,733	19	0.37%	31 July 2019	180
L15.	RCS Devonshire Old Hall implementation measures	Design Office	RCS	£164,450	£5,743	49	£3,359	29	0.20%	31 July 2019	98
L16.	Roger Stevens BLM Project Energy reduction measures	Engineering	BLM	£250,000	£29,570	185	£1,351	8	0.76%	31 July 2018	370
L04b	Replacement of BMS and system reconfiguration phase 4b	Engineering	Engineering	£812,131	£102,501	82	£9,904	8	0.34%	31 July 2018	82
L17.	Utilisation of Earth Sciences Borehole	Engineering	Energy	£239,000	£3,356	38	£6,289	71	0.16%	31 July 2020	38
L04c	Replacement of BMS and system reconfiguration phase 4c	Engineering	Engineering	£812,131	£102,501	82	£9,904	8	0.34%	31 July 2020	82
L18	Fabric measures insulation and windows	Energy	Engineering	£300,000	£24,020	110	£2,727	12	0.45%	31 July 2020	110
		Sub-totals		***£4,295,326***	***£456,087***	***1,285***	***£56,811***	**10**	***5.29%***		***2,503***

8. CARBON MANAGEMENT PLAN FINANCING

There are significant financial benefits to the University from implementing the CMP. Savings are based on reduced utility consumption, but the amount of savings realised is linked to utility prices over the plan period, which the University cannot influence. However, utility costs are likely to rise substantially as the economy recovers and the impact of environmental legislation for generators is passed on. This supports the case for investment to mitigate the impact of future energy price increases. Some aspects of the CMP will be funded from existing budgets, whilst others will require alternative funding.

In the past two years a dedicated budget amounting to £400k pa has been set aside for carbon management initiatives (the Energy Fund). This has been used to fund a variety of initiatives and schemes in academic buildings, including sub metering across campus; improved insulation measures; and better control measures. A number of building surveys and scoping studies, together with monitoring and targeting software developments, have also been funded. Over the past three years £1.2M has been spent on carbon/energy management activity. It is envisaged that current levels of funding will be maintained throughout the period covered by the CMP (i.e. to 2020/21).

Intervention paybacks

Due to uncertainty about energy tariffs and the phasing of individual interventions, it has been assumed that utility prices will remain flat at their current rates, despite widespread acceptance that utility costs will rise significantly over the planning period. Adopting this philosophy will mean that payback periods should improve in later years.

No account has been taken of the cost of purchasing carbon credits either through the EU emissions trading scheme or the CRC recycling mechanisms, as the complexity of this scheme is unresolved at the present time.

A key challenge for financing is the below-market price paid for utilities from the GSC. This makes some interventions look unattractive in terms of payback periods, and is particularly noticeable with thermal improvement measures.

As a consequence of differing commercial arrangements off campus, which relate to size of the property and supplier, the University pays a range of utility prices, and for the purposes of the CMP a blended rate has been adopted.

Utility	**GSC Sources**	**Non-GSC**
Electricity	4.927p/kWh	7.46p/kWh HH; 9.013p/kWh HH
Gas	-	2.172p/kWh
Heating (steam)	5.117p/kWh	-
Heating (LPHW)	2.501p/kWh	-
Chilled water	26.786p/kWh	-

Financing the gap

To finance the reduction in carbon emissions required by the CMP, it is clear that further capital will be required in addition to the £400k annual Energy Budget. Whilst planned backlog maintenance expenditure will contribute to carbon reduction initiatives, there will remain a shortfall. It is envisaged that proposed interventions with favourable payback periods will have to compete against other needs for capital funding. Major capital investment will be required in 2015 for improvements in the GSC following expiry of the current contract, and if funded, this will contribute 30% towards the total carbon savings envisaged by the plan. This funding requirement has been identified in the current, draft Capital Programme (which is dependent upon funding becoming available).

A combined and integrated Capital/BLM/Carbon plan is being developed following the publication of HEFCE capital funding, clarification of student tuition fees from 2012 and following the academic planning process (IPE 2011). This integrated plan will need to ensure that the projects identified in this CMP under short, medium and long term are factored in, as a component of Capital or BLM schemes or as separate projects. Approval of this integrated plan will form part of the University's financial forecasts for approval by Council and as part of our return to HEFCE.

There are a number of external funding streams that may be available, many of which are managed by the Carbon Trust. Salix funding has been obtained by a number of universities, either in the form of grants, or as part of the Revolving Green Fund. At present, future funding of the Salix programmes is out for consultation, but historically the University has not been successful in obtaining these funds due to current GSC utility prices paid being lower than grid prices, resulting in paybacks that fall outside Salix parameters. It may, however, be appropriate for non-GSC supplied properties. The University will continue to work with outside agencies to identify other sources of funding.

Benefits

In addition to benefits generated directly from reduced utility costs, lowering energy consumption may mitigate the impact of CRC legislation, and an increasing requirement to purchase carbon through the government's cap and trade scheme. The requirement to buy carbon credits related to consumption will increase in subsequent years, due to changes in European Union Emission Trading Scheme (EUETS) legislation, and changes in the recycle mechanism. This will directly impact on the overall utility budget. Whilst the impact of this has been taken into account in Value at Stake calculations, the benefits of reduced carbon costs have not been factored into individual payback calculations.

9. GOVERNANCE, OWNERSHIP AND MANAGEMENT

The CMP will be owned and managed through the University's existing structure and committees. This will provide the necessary leadership and management to keep the plan up-to-date, and ensure that targets are delivered.

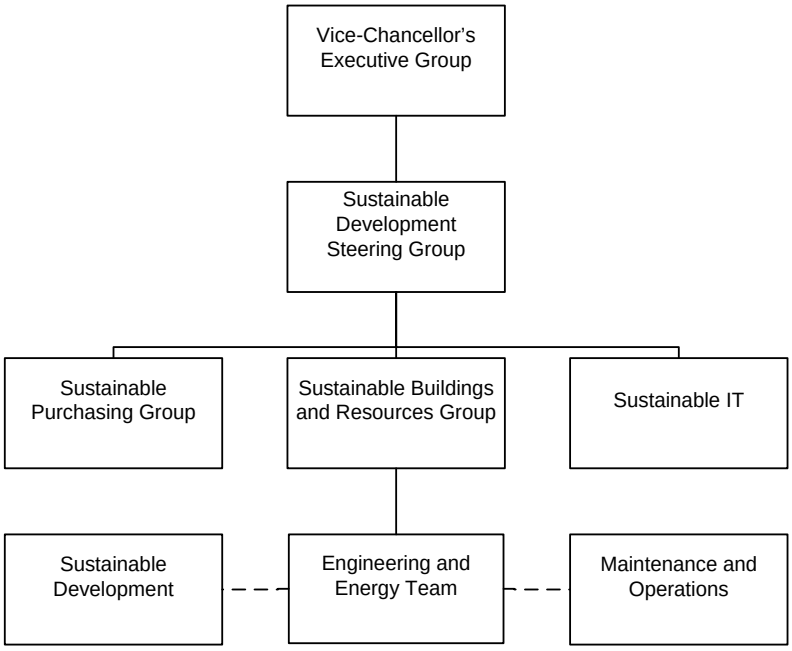
Stakeholder management

There are a number of key stakeholders across the University including but not limited to:

- Vice-Chancellor's Executive Group (VCEG)
- Finance
- Sustainable Development Steering Group (SDSG)
- Engineering Services (including Energy) Team
- Estates Maintenance and Operations
- Information Systems Services (ISS)
- Leeds University Union (LUU)
- Academic units
- Central Purchasing
- Capital Projects
- Design Office
- Residential Services
- Commercial Services
- Environmental Co-ordinators

Carbon management is integrated within the existing governance structure relating to sustainable development. At senior management level, the Director of Facilities Management has responsibility for utilities and carbon management activity, and sits on the VCEG.

A number of Working Groups report to the Sustainable Development Steering Group, which have specific roles to play in managing the University's programme for carbon reduction.



The Sustainable Development Steering Group (SDSG) currently comprises:

Dennis Hopper	Director of Facilities Management ***Project Sponsor***
Steve Gilley	Head of Estates ***Project Leader***
Jackie Berry	General Manager, Leeds University Union
Professor Jane Francis	Dean of the Faculty of Environment
Paul Gold	Student Representative 2010/11
Martin Holmes	Marketing Director
Professor Vivien Jones	Pro-Vice-Chancellor for Student Education
Phil MacDonald	Financial Controller
Professor Adrian McDonald	Yorkshire Water Professor of Environmental Management, School of Geography
James Dixon-Gough	Sustainability Officer
Professor Peter Roberts	School of Earth and Environment
Professor Steve Scott	Pro-Vice-Chancellor for Students and Staff
Philip Hobley	Information Systems Services (Sustainable IT)
Tim Brannon	Central Purchasing (Sustainable Purchasing)
Dr William Young	School of Earth and Environment (Academic Alignment)

Table 13 sets out the responsibilities of individual Group members and others associated with the Group's work, and indicates how liaison will be carried out with other stakeholders who are part of the carbon reduction programme, but are not members of the SDSG. The SDSG comprises key stakeholders and senior members of staff with responsibility for finance, teams of staff, special interest groups or functions. The main roles of the group are to:

- review and update the CMP on an annual basis
- monitor and report progress on the implementation of projects against the plan
- monitor and report the annual energy consumption and carbon emissions
- prepare and maintain an opportunities database
- communicate the plan and updates to internal and external stakeholders together with the wider University community
- increase programme awareness
- promote new initiatives
- engage with various other committees with an energy and/or environmental agenda.

Stakeholders

The CMP relies on the engagement of key stakeholders who will be affected by, or can influence, the success of the programme. These stakeholders are of critical importance to the success of the CMP and are shown in Table 14.

Table 13: Responsibilities

Activity	Executive	Lead Officer	Core Team Member(s	Other(s)
Approval of the CMP	VCEG	Director of Facilities		
Development, delivery, monitoring and review of CMP	SDSG	Head of Estates	Head of Estates Head of Engineering Services Electrical Services Manager Head of Maintenance and Operations Sustainability Officer Technical Officers - Energy	
Financing of Carbon Management Activities	VCEG/ Director of Facilities	Head of Estates	Director of Finance Deputy Finance Director Head of Engineering Services Head of Maintenance and Operations	Procurement team Head of Residencies Head of Commercial Services Head of ISS
CHP operation and renewable energy	Director of Facilities	Head of Estates	Head of Engineering Technical Officers – Energy NHS Trust	Project Leader
Carbon Management in existing Buildings	Director of Facilities	Head of Estates	Head of Engineering Services Electrical Services Manager Head of Maintenance and Operations Project Sponsors Heads of Capital Projects and Design Office	Project Managers Environmental Coordinators
Carbon Management in new and refurbished Buildings	Director of Facilities	Head of Estates	Head of Engineering Services Electrical Services Manager Head of Maintenance and Operations Director of Finance Head of Procurement Heads of Capital Projects and Design Office	Project Managers Environmental Coordinators
Carbon Management in Transport	Project Sponsor (senior management)	Travel Plan Officer	Head of Procurement Head of Finance Student Union	
Carbon Management in Procurement	Project Sponsor	Head of Procurement	Head of Engineering Services Electrical Services Manager Head of Maintenance and Operations Head of ISS	Procurement team ISS project managers
Carbon Management Communication and Awareness	Director of Facilities	Sustainability Officer	Head of Capital Projects Sustainability Officer Communications Manager Electrical Services Manager Leeds University Union	Communications Officers Energy Technical Officers

Table 14: Stakeholders

Stakeholder	Area of interest
Director of Facilities Management	CMP sponsor
Senior management team (VCEG)	Costs and budgets Pressure to reduce revenue costs Competing/ conflicting priorities Reputation
Sustainable development group	Strategic support of the CMP and programme Promotion of sustainability issues across the University
Estates	Legislation compliance Design standards Refurbishments and new build projects Space utilisation Whole life costs of systems and materials Maintenance Energy consumption Waste Budget constraints
Procurement	Value for money Energy efficient equipment Transport miles Budget constraints
Catering	Energy consumption Transport miles Budget constraints
ISS	Changes in technology Systems usage Energy consumption
Residential Services	Costs and budgets Energy consumption Pressure to reduce costs
Commercial Services	Costs and budgets Energy consumption Pressure to reduce costs
Trade Unions	Employment security
Staff	Employment security
Academic community	Academic activities Energy consumption
Environmental co-ordinators	Suggestions Departmental liaison Dissemination of information
Students	Climate change Related courses Awareness View of University
Prospective staff and students	Recruitment Credibility of University
Corporate communications	University profile
Local community	Corporate image Sustainability issues Local resources (people, materials, products)
External stakeholders	Corporate image HEFCE and Government targets

Data collection and reporting

The data used to prepare the carbon baseline will need to be collected and updated on a regular basis throughout the year. These results will then be analysed against the baseline to monitor the effectiveness of the measures implemented to enable corrective actions to be implemented. The data will then be used in annual report on the CMP.

Table 15
Data collection for the carbon baseline

Area	Data	Frequency of collection	Responsibility
Buildings	Energy consumption Water consumption Chilled water consumption Steam consumption	Quarterly Quarterly Quarterly Quarterly	Energy officers
Waste	Waste collection	Monthly	Sustainability officer
Transport/ travel	Business travel Fleet vehicle mileage Staff commuting Student commuting	Annual	Sustainability officer

10. COMMUNICATIONS

Behavioural change campaign

To achieve its target of cutting carbon emissions by 35% by 2020, the University needs engagement from all staff and students. Raising awareness of the targets, and encouraging the whole community to save energy, are key aims of a communications campaign that will be launched to support the CMP.

Desired outcomes from the communications campaign are that staff and students:

- understand and appreciate the progress that has been made in cutting carbon emissions, and how much further there is to go
- understand that the University wants to behave (and be seen to behave) as a responsible and sustainable organisation
- are engaged and encouraged to support this goal by taking ownership of the sustainability agenda
- change behaviours to enable the University to achieve its aim of reducing carbon emissions
- work together to achieve common objectives, strengthening the sense of community and common purpose of the University.

Campaign structure

The behavioural change campaign will be launched in autumn 2011, with the first phase encouraging staff and students to share their examples of wasteful energy use at the University, and put forward ideas for efficiencies. The aim is to engage the community; to recognise that the sustainability of the University is everyone's responsibility; and to understand how the organisation as a whole can benefit if carbon emissions are reduced.

Future phases of the campaign will focus on behavioural changes that staff and students can make to save energy, which will include:

- turning off computers when they are not in use
- informing Estates if the heating in a building means the temperature is too high
- switching off lights wherever possible
- taking the stairs, rather than the lift
- altering the way that research equipment such as fume cupboards or specialist equipment is operated to ensure energy is not wasted.

Channels of communication

Channels that will be used to raise awareness will include:

- articles in the Reporter, and the students' newspaper
- messages and announcements in email all-staff briefings
- piloting of the Green Impact Workbook running in conjunction with the NUS
- posters and LCD screens
- social media including Twitter, Facebook and YouTube
- green giveaways
- renewing and refreshing the role of environmental co-ordinators and 'energy champions' in schools and services.

Other opportunities that will be explored include:

- establishing a series of lectures that showcase 'green' research
- holding a 'green' day every term, to be run jointly by the University and Leeds University Union

- competitions, for example, rewarding buildings that make particular progress in saving energy, or challenging students to produce a film which shows their ideas for making the University more sustainable
- tapping into wider 'green' initiatives, for example Earth Day or Earth Hour.

Campaign identity

For behavioural change to be successful it needs to imprint a memorable set of linked messages; be simple and widely applicable; speak to individuals; and be jargon free. It needs to provide a branding concept that has a number of applications across the wide range of media employed for communication at the University. Work will commence shortly with the Communications Team to deliver on aspirations.

Procurement

The University's purchasing policy states that staff involved in the procurement of goods and services should be aware of the impact they have on the environment. In particular, staff should, where possible, use environmental responsibility as a factor in their purchasing decisions.

Sustainable Procurement is already embedded as a work stream within the Sustainable Development Steering Group and work has been ongoing for some time.

Advice given to buyers about reducing the University's impact includes:

- identifying whether the purchase is really necessary (to reduce consumption and the carbon footprint)
- considering the "whole life" cost of equipment purchases
- trying to purchase products which may have a high recycled content
- where possible, purchasing goods and services which may be manufactured, used and disposed of in an environmentally responsible way
- using preferred suppliers who have already been assessed for their environmental policies
- supporting supplier and University recycling schemes
- where possible, recycling and re-using specific items (eg glassware)
- reducing the use of volatile organic compounds where possible
- reducing the use of materials containing heavy metals where possible
- minimising the use of virgin materials
- controlling discharge to air, land and water.

Further steps within purchasing processes are:

- during the tendering process, assess all potential suppliers on their environmental policies, e.g. BS7750, EMAS, ISO4001
- continually monitor major suppliers on their environmental policies and practices
- work with major suppliers to develop and share environmental policies, where appropriate
- where possible, offer environmentally friendly products as alternatives
- with the support of major suppliers and other internal partners, facilitate recycling arrangements
- minimise the supplier base to reduce the University's carbon foot print.

Policy

To assist in embedding carbon management within the University's overall strategic plan, the aims of the CMP need to be included within a number of University policies. These need to be actively managed and monitored on an annual basis and aligned with changes in the CMP eg the Energy Policy (latest version, July 2009).

Annual review of progress on carbon management

To ensure visibility of the CMP and its progress, an annual review will be published. The review will take place in January as this will ensure that a full set of energy data is compiled for the previous academic year. The first formal review will take place in January 2012. The review will be carried out by the Engineering Services Team and presented to the Sustainable Development Steering Group.

A document will be produced, for approval by SDSG, and will be made publicly available on the University website. The document will include:

- the annual target for:
  - total carbon emissions from buildings, fleet, waste and water
  - total utilities bill
- the actual total carbon emissions and costs for the year
- any unusual circumstances to be taken into account
- progress against planned projects
  - carbon savings
  - cost savings
  - capital expenditure
  - impact of changes in tariff for utilities
- an assessment of whether or not the projected BaU growth is still appropriate
- outcomes of the validation exercise for further carbon reduction opportunities to meet target
- mitigation measures for unplanned circumstances
- less quantifiable benefits, such as influencing the student body / local community
- actions for implementing any amendments required.

The table below shows a timescale for planned reviews. Expected emissions are based on the projects identified in the CMP being implemented against the Business as Usual scenario growth. Target emissions are an absolute figure based on a reduction from the 2005/06 baseline year.

Table 16: Timescale for planned reviews of progress on carbon management

Review Date	Academic Year being reviewed	Business as Usual emissions in plan (tcarbon)	Reduced Emissions Scenario in plan (tcarbon)
January 2012	2010/11	74,529	65,357
January 2013	2011/12	75,866	63,271
January 2014	2012/13	76,361	61,185
January 2015	2013/14	76,361	59,099

In order to validate predicted with actual emissions, the following points should be noted:

- projects will be implemented throughout the year, thus full annual savings may not be achieved until the following year
- other projects not currently captured in the CMP will achieve further carbon savings not yet included
- in addition to the annual review, there will be further incremental reviews undertaken quarterly throughout the year to check on progress being made with the implementation of projects, and carbon emission reductions being generated as a result.

The review will assess actual performance against anticipated expenditure and target emissions savings each year included in the CMP.

Appendix A summarises current projects identified in the CMP with anticipated annual costs and savings data. This information could be used as an initial basis upon which to assess actual against planned performance.

APPENDIX A: CARBON MANAGEMENT PLAN INTERVENTIONS

Information is included from surveys and investigations in tables 10, 11 and 12 that have enabled estimates to be prepared such that business cases can be submitted and funding approved. Given the number of measures proposed this is not an exhaustive list.

Project / Action no : S01		
Description	Installation of energy efficient Air Handling Unit (AHU) filters in Worsley building	
Quantified costs and benefits	Financial investment and operational costs	£17,700 None
	Emissions reduction	476 tonnes
	Financial savings	£46,312
	Payback period	<1 year
Resources	Funding source	Energy budget
	Management	Maintenance
Ownership and accountability	Lead	Head of Maintenance and Operations
	Supported by	Energy team
Ensuring success	To ensure the success of this measure the energy consumption needs to be measured before the implementation and after. It is envisaged that once this initial trial installation has been in operation for a year the financial and emissions savings will pay the additional filter costs as a rolling item. This measure will then be rolled out to other similar installations and again the savings will pay for the continued use of the high performance filters.	
Performance and success measure	The performance and success measure will be a visible reduction in the energy consumed by the filters, which will be measurable from meters installed on the control panels.	
Project start and completion dates	May 2010 June 2010	

Project / Action no : S03		
Description	Installation of roof insulation to the Parkinson building. As part of an overall refurbishment project at Parkinson the existing roof is being replaced. Although not currently required under Building Regulations the new roof will be installed with insulation to current 2006 Building Regulation Requirements. This will not only reduce carbon emissions but save energy from the reduction in heat losses through the roof.	
Quantified costs and benefits	Financial investment and operational costs	£339,126 None
	Emissions reduction pa	6 tonnes
	Financial savings pa	£16,566
	Payback period	20 years
Resources	Funding source	Backlog Maintenance
	Management	Capital Projects
Ownership and accountability	Lead	Capital Projects
	Supported by	Engineering Services
Ensuring success	To ensure the success of this measure the installation needs to be carefully monitored on site. The energy consumption within Parkinson needs to be monitored before the measure is in place as well as on completion.	
Performance and success measure	The performance and success measure will be a visible reduction in the energy consumed by the filters, which will be measurable from meters installed on the building supply.	
Project start and completion dates	May 2010 July 2011	

Project / Action no : S04		
Description	Installation of secondary glazing to the Parkinson building. As part of an overall refurbishment project at Parkinson secondary glazing is being installed. As the Parkinson building is listed, as are a number of buildings on the campus, replacement by double glazing units was not an option and secondary glazing has to be used that does not interfere with the visual impact of the facade. The emissions reduction of secondary glazing is not as great whilst the capital cost is greater than a double glazed system which means that the payback period is increased. This will not only reduce carbon emissions but save energy from the reduction in heat losses through the windows.	
Quantified costs and benefits	Financial investment and operational costs	£232,231 None
	Emissions reduction	4 tonnes
	Financial savings	£8,248
	Payback period	28 years
Resources	Funding source	Back Log Maintenance
	Management	Capital Projects
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	Capital Projects
Ensuring success	To ensure the success of this measure the installation needs to be carefully monitored on site to ensure that heat is not lost between the window and structure. The energy consumption within Parkinson needs to be monitored before the measure is in place as well as on completion.	
Performance and success measure	The performance and success measure will be a visible reduction in the energy consumed by the filters, which will be measurable from meters installed on the building supply.	
Project start and completion dates	May 2010 July 2011	

Project / Action no : S05		
Description	Energy Policy and Environmental Policy review and implementation. The existing policy needs to be reviewed and updated to reflect the agreed measures in the CMP.	
Quantified costs and benefits	Financial investment and operational costs	None None
	Emissions reduction	Indirect measure
	Financial savings	Indirect measure
	Payback period	Indirect measure
Resources	Funding source	Estates staff in post
	Management	Engineering Services
Ownership and accountability	Lead	Electrical Services Manager
	Supported by	Energy Technical Officers
Ensuring success	To ensure success parties that this affects need to be engaged and understand the need for the policy and its contents. This is related to improved communications as it will increase the capital cost of projects and equipment but in the long term will show a reduction in both direct energy costs and carbon emissions	
Performance and success measure	Success will be measured by the reduction in energy used by the Faculty with the new equipment or facility. Where this is a replacement system there should be a positive reduction in the energy consumed. Where this is a new installation supporting evidence should be provided that the requirements of the policy have been applied.	
Project start and completion dates	October 2010 December 2010	

Project / Action no : S06, S07 & S43		
Description	Installation of energy meters for AMR and building sub-metering As the final stage of the metering project energy meters need to be installed at the main incomer of each utility within each individual building on campus. The project will enable energy use to be tracked across campus and target areas that have unusually high energy consumption or usage patterns.	
Quantified costs and benefits	Financial investment and operational costs	£307,000 None
	Emissions reduction	Indirect measure
	Financial savings	Indirect measure
	Payback period	Indirect measure
Resources	Funding source	Estates Energy Fund?
	Management	Engineering Services
Ownership and accountability	Lead	Energy Officers
	Supported by	M&O Technical Officers
Ensuring success	To ensure success parties that this affects need to be engaged and understand this measure. This is related to improved communications as there will be disruption to utility supplies when the meters are installed. In the long term the meters will assist the University in measuring its energy consumption and carbon emissions and targeting resources to reduce.	
Performance and success measure	The performance and success measure will be the responses of the affected parties and whether or not the mitigation measures put in place to minimise disruption have been successful.	
Project start and completion dates	August 2010 July 2011	

Project / Action no : S08, S34, S37,S38 and S39		
Description	Fume cupboard improvements – Astbury, Garstang, Manton, MAPS and Chemistry	
Quantified costs and benefits	Financial investment and operational costs	£1,141,035
	Emissions reduction pa	1,500 tonnes
	Financial savings pa	£214,655
	Payback period	5 year
Resources	Funding source	Energy budget
	Management	Head of Engineering Services
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	M&O technical officers, Energy Officers
Ensuring success	University of Leeds is a research intensive facility that has in excess of 700 fume cupboards many of which have limited controls and operate 24 hours a day 365 days a year. Communication with users is vital to the success of this measure as its impact is two-fold. The control element will ensure that the fume cupboards only operate when necessary . The efficiency measure will ensure that the equipment is operating at minimum load therefore reducing electrical consumption and carbon emissions. Where appropriate fume cupboards will be rationalised and or new more efficient systems installed. Detailed analysis of individual installations is required with parameters agreed with the users and operational data updated accordingly.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion. The project aims to look at the campus as a whole so the works will be carried out in phases.	
Project start and completion dates	November 2010 July 2013	

Project / Action no : S09		
Description	Installation of variable speed drives – Phase 1 Installation of variable speed drives on existing suitable motor installations to ensure that the motor operation is matched to the load being supplied.	
Quantified costs and benefits	Financial investment and operational costs	£251,600 phase 1 including £100k for advance purchase of drives.
	Emissions reduction pa	364 tonnes
	Financial savings pa	£45,655
	Payback period	6 years
Resources	Funding source	Energy Budget
	Management	Engineering Services
Ownership and accountability	Lead	Electrical Services Manger
	Supported by	M&O technical officers,
Ensuring success	Communication with users is vital to the success of this measure as its impact is two-fold. The control element will ensure that the associated motors are functioning during normal operational periods. The efficiency measure will ensure that the equipment is operating at minimum load therefore reducing electrical consumption and carbon emissions. Detailed analysis of individual installations is required with parameters agreed with the users and operational data updated accordingly. The project aims to look at the campus as a whole so the works will be carried out in phases.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion.	
Project start and completion dates	First phase: August 2010 First phase: July 2011	

Project / Action no : S10		
Description	Installation of PIR controls to EC Stoner Level 10 Air conditioning units	
Quantified costs and benefits	Financial investment and operational costs	£4,050 None
	Emissions reduction pa	1 tonne pa
	Financial savings pa	£109
	Payback period	37 years
Resources	Funding source	Energy fund?
	Management	Design Office
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	Design Office
Ensuring success	The University has a substantial number of areas where air conditioning operates throughout the day whether or not an area is occupied. Whilst it is simple to implement improved controls during refurbishment and new builds a plan is required to cover the existing systems. This is a pilot scheme to evaluate the impact that providing local automated control has on the areas, environment and users' perception. The PIR controls have been installed to cover 16 individual occupancy offices.	
Performance and success measure	Whilst at this level the carbon and energy savings are minor implemented throughout the University it should have a substantial impact. The success should be a reduction in the air conditioning of the space when it is unoccupied but without causing the users a perceptible change to their environment when they are using the area.	
Project start and completion dates	January 2010 July 2011	

Project / Action no : S11		
Description	Controls Officer	
Quantified costs and benefits	Financial investment and operational costs	Circa £50,000
	Emissions reduction	152 tonnes
	Financial savings	£14,985
	Payback period	3 years
Resources	Funding source	
	Management	Head of Engineering Services
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	M&O
Ensuring success	The use of a Controls Officer is viewed as critical not only to the carbon management plan but to the success of the BMS improvement elements of the plan. The University of Leeds has one of the largest Trend building management systems in Europe. At the present time the majority of works carried out on the system are reactive maintenance with ad hoc installation of new devices. The Controls Officer will undertake a programme of works to identify systems that are not properly controlled or reporting to the BMS as well as ensuring that new installations follow agreed procedures and protocols. The Controls Officer will also bring benefits to the BMS and variable speed drive measures.	
Performance and success measure	Occupants on buildings will benefit from improved thermal conditions, better environmental control. There will also be a benefit of reduced energy and carbon costs due to better control regimes being implemented and monitored.	
Project start and completion dates	July 2011 Ongoing	

Project / Action no : S13		
Description	Project proposals and equipment purchase: energy and carbon analysis	
Quantified costs and benefits	Financial investment and operational costs	Project specific
	Emissions reduction	Project specific
	Financial savings	Project specific
	Payback period	Project specific
Resources	Funding source	Project specific
	Management	Project specific
Ownership and accountability	Lead	Project Managers, Procurement, Finance
	Supported by	Head of Engineering Services
Ensuring success	This is a vital element of the success of the CMP. As part of all projects a carbon assessment of the impact shall be prepared. For new projects this will detail the additional energy load and carbon emission that the project will add to the baseline. This shall utilise whole life cycle cost analysis taking into account not just the initial capital cost but ongoing maintenance, carbon emissions and energy consumption. For refurbishments this will be an omit and add scenario which will require a detailed analysis of the existing installation and operation. The ideal solution will be that refurbishments will have a negative impact upon the baseline but given the research intensive nature of the University this is not always practicable. This information can then be added to the carbon baseline spreadsheet. Procurement have a part to play in that as part of their policy the most energy efficient solution is procured that satisfies the technical outputs of the project. Finance need to ensure that all business cases have a carbon analysis included. Project Managers from all disciplines have to ensure that an initial carbon and energy analysis is carried out as part of the initial proposals at stage B/C and that costs are included in the business case either as part of the total or as separate items.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion.	
Project start and completion dates	ASAP Ongoing	
Project / Action no : S15		

Description	Automatic power down of IT equipment This will not only reduce carbon emissions from the electricity consumed but, by reducing the heat generated from IT equipment, also from any cooling within the associated areas. The number and location of live IP addresses that are left on out of normal operational hours needs to be established by ISS. From this an analysis can be made as to which need to be left operational such as those associated with research functions. Arrangements then need to be made to communicate with staff and students that these measures are being implemented and a roll out programme agreed.	
Quantified costs and benefits	Financial investment and operational costs	£90,000 estimated None
	Emissions reduction	99 tonnes
	Financial savings	£11,152
	Payback period	8 years
Resources	Funding source	ISS
	Management	ISS
Ownership and accountability	Lead	ISS
	Supported by	To be agreed
Ensuring success	The energy consumption within buildings needs to be monitored before the measure is in place as well as on completion. Communication with staff and students on the rationale of automatic power down. It is recognised that as a research intensive facility that certain faculties will need to have some machines operating constantly. To cover this an opt out system will be introduced as opposed to an opt in where the faculty provide details of machines that cannot have automatic power down. This could with be a central system of machines or individual machines operating for the duration of the research.	
Performance and success measure	The performance and success measure will be a visible reduction in the energy consumed by the filters, which will be measurable from meters installed on the building supply. Whilst it is likely that this measure will cause complaints initially it is believed that the communication measures put in place initially and follow up communication to individual building occupants will assuage most of the criticism.	
Project start and completion dates	TBA ongoing	

Project / Action no : S16 - 20	
Description	Roof insulation works

Quantified costs and benefits	Financial investment and operational costs	No additional costs over and above backlog maintenance. None
	Emissions reduction	64 tonnes
	Financial savings	£14,405
	Payback period	Not applicable
Resources	Funding source	BLM
	Management	M&O
Ownership and accountability	Lead	Head of M&O
	Supported by	M&O technicians
Ensuring success	The success is dependant upon the insulation being installed correctly to ensure that there are no breaks within the insulation to create a cold bridge effect. This risk will be minimised by use of professional competent contractors and site supervision.	
Performance and success measure	A reduction in heating energy consumption should be reflected at building levels. It will be difficult to measure the actual savings from this particular level as it will overlap with other implementation measures and heat meters are not installed within all existing buildings at the incoming supply point.	
Project start and completion dates	August 2010 July 2011	

Project / Action no : S24, S28 – S32		
Description	Residential measures	
Quantified costs and benefits	Financial investment and operational costs	£71,351
	Emissions reduction	195 tonnes
	Financial savings	£22,855
	Payback period	3 years
Resources	Funding source	Residential Services
	Management	Design Office
Ownership and accountability	Lead	Head of Design
	Supported by	Design Officers
Ensuring success	The success is dependant upon the insulation being installed correctly to ensure that there are no breaks within the insulation to create a cold bridge effect. This risk will be minimised by use of professional competent contractors and site supervision.	
Performance and success measure	A reduction in heating energy consumption should be reflected at building levels. It will be difficult to measure the actual savings from this particular level as it will overlap with other implementation measures and heat meters are not installed within all existing buildings at the incoming supply point.	
Project start and completion dates	August 2010 July 2011	

Project / Action no : S33		
Description	Behavioural change campaign A behavioural awareness campaign will be undertaken to address the issue of carbon reduction and energy conservation with staff and students. This measure will tie in with the improved communications project. Although claims are made that a behavioural change campaign can save 10% of an organisation's energy, the calculations are based on a 2% saving on electricity only. Anecdotal feedback is that in an academic environment this is a difficult measure to implement successfully.	
Quantified costs and benefits	Financial investment and operational costs	£100,000 None
	Emissions reduction	840 tonnes
	Financial savings	£102,754
	Payback period	1 years
Resources	Funding source	Energy budget
	Management	Capital Projects
Ownership and accountability	Lead	Capital Projects
	Supported by	Sustainability Officer
Ensuring success	Communication is key to this measure as is ensuring that staff and students accept ownership for the energy that they have control over such as lighting heating and equipment. The support and involvement of the environmental champions is critical to the success.	
Performance and success measure	The performance and success of this measure is very hard to quantify as it is an ongoing measure that will overlap with all the other physical measures being put in place. One measure will be the involvement of the environmental champions. A second will be feedback from staff and students during the role out.	
Project start and completion dates	January 2011 Ongoing	

Project / Action no : S35, M09 & L04		
Description	Upgrading of University BMS system Currently 20% of the existing BMS system is obsolete and a further 30% is life expired. To improve the control, energy consumption and carbon emissions of the estate the existing BMS system needs to be upgraded. As a substantial amount of the existing control hardware is obsolete this needs to be replaced and future-proofed whilst at the same time new hardware and software provided to maximise the benefits of the remainder of the existing system. It is envisaged that this project will take five years from inception to completion.	
Quantified costs and benefits	Financial investment and operational costs	£6,632,121 total project cost reduced
	Emissions reduction	494 tonnes
	Financial savings	£834,943
	Payback period	8 years
Resources	Funding source	BLM/ Energy Budget/ Capital Programme
	Management	Engineering Services
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	Controls Officer
Ensuring success	To maximise the success of the measure which is very costly, the equipment procured needs to be the most efficient available, and future proofed such that new technology that can further enhance efficiencies can be retrofitted at minimum costs.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion. Additionally the control of the buildings will be improved which in turn should improve conditions within the buildings for occupants. However, as part of the analysis it needs to be ensured that double accounting does not take place with other measures.	
Project start and completion dates	August 2011 July 2020	

Project / Action no : S40		
Description	Installation of PIR lighting controls to existing lighting	
Quantified costs and benefits	Financial investment and operational costs	£35,500 including purchase of PIR's in 2008/09 budget.
	Emissions reduction	112 tonnes
	Financial savings	£11455
	Payback period	3 years
Resources	Funding source	Energy budget
	Management	Energy Officers
Ownership and accountability	Lead	Energy Officers
	Supported by	Electrical Technical Officers.
Ensuring success	The University has a substantial number of areas where individual offices, corridors and toilets are unoccupied but the lighting remains operational throughout the day Whilst it is simple to implement improved controls during refurbishment and new builds a plan is required to cover the existing systems. This is a pilot scheme to evaluate the impact that providing local automated control has on the areas environment and users perception.	
Performance and success measure	Whilst at this level the carbon and energy savings are minor implemented throughout the University it should have a substantial impact. With the current arrangement of lighting circuits it is very difficult to measure the actual reduction in energy use however the perception of wasted energy should be reduced. The success should be a reduction in the lighting within an area when it is unoccupied but without causing the users a perceptible change to their environment when they are using it.	
Project start and completion dates	January 2011 Ongoing	

Project / Action no : S44		
Description	Mechanical systems recommissioning	
Quantified costs and benefits	Financial investment and operational costs	£300,000
	Emissions reduction	354 tonnes
	Financial savings	£63,454
	Payback period	5 years
Resources	Funding source	BLM/ Energy budget
	Management	M&O
Ownership and accountability	Lead	Head of M&O
	Supported by	M&O technicians
Ensuring success	To ensure success the measure will need to be undertaken as part of a wider ranging review of existing mechanical systems. In addition to recommissioning additional control devices and BMS connections may be required which is reflected within the financial costs of the investment.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion. Additionally the control of the buildings will be improved which in turn should improve conditions within the buildings for occupants. As part of individual building measures heat meters will be installed at the incoming service point prior to the measure being implemented to capture the savings.	
Project start and completion dates	August 2011 July 2013	

Project / Action no : M04		
Description	Installation of variable speed drives – Phase 2 Installation of variable speed drives on existing suitable motor installations to ensure that the motor operation is matched to the load being supplied.	
Quantified costs and benefits	Financial investment and operational costs	£1,320,000 total project cost reduced
	Emissions reduction	2665 tonnes
	Financial savings	£302,750
	Payback period	4 years
Resources	Funding source	Energy budget
	Management	Engineering Services
Ownership and accountability	Lead	Electrical Services Manger
	Supported by	M&O technical officers,
Ensuring success	Communication with users is vital to the success of this measure as it is two-fold. The control element will ensure that the associated motors are functioning during normal operational periods. The efficiency measure will ensure that the equipment is operating at minimum load therefore reducing electrical consumption and carbon emissions. Detailed analysis of individual installations is required with parameters agreed with the users and operational data updated accordingly. The project aims to look at the campus as a whole so the works will be carried out in phases.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion.	
Project start and completion dates	Second phase: August 2011 Second phase: July 2014	

Project / Action no : M18		
Description	Installation of a biodiesel boiler within the GSC. Installation of new equipment to replace life expired equipment at the GSC. These works need to be undertaken once the existing lease arrangement ends in 2015. The benefits obtained from the replacement will not only be a reduction in energy consumption and hence carbon emissions but also a more secure supply and possibly depending upon the new contractual arrangement additional benefits under CRC/ EUETS.	
Quantified costs and benefits	Financial investment and operational costs	£700,000 University element of project cost
	Emissions reduction	4,000 tonnes
	Financial savings	To be confirmed
	Payback period	To be confirmed
Resources	Funding source	Capital Programme
	Management	Capital Projects
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	Electrical Services Manager
Ensuring success	To maximise the success of the measure which is by the far the most expensive measure being implemented the equipment procured needs to be the most efficient available and future proofed such that new technology that can further enhance efficiencies can be retrofitted at minimum costs.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion. Metering of all equipment at the GSC needs to be in place and monitored by the University's site wide system.	
Project start and completion dates	August 2015 July 2017	

Project / Action no : M19		
Description	Installation of 3 new 3MW gas CHP engines within the GSC. Installation of new equipment to replace life expired equipment at the GSC. These works need to be undertaken once the existing lease arrangement ends in 2015. The benefits obtained from the replacement will not only be a reduction in energy consumption and hence carbon emissions but also a more secure supply and possibly depending upon the new contractual arrangement additional benefits under CRC/ EUETS.	
Quantified costs and benefits	Financial investment and operational costs	£6,000,000 University element of project cost
	Emissions reduction	4,000 tonnes
	Financial savings	To be confirmed
	Payback period	To be confirmed
Resources	Funding source	Capital Programme
	Management	Capital Projects
Ownership and accountability	Lead	Head of Engineering Services
	Supported by	Electrical Services Manager
Ensuring success	To maximise the success of the measure which is by the far the most expensive measure being implemented the equipment procured needs to be the most efficient available and future proofed such that new technology that can further enhance efficiencies can be retrofitted at minimum costs.	
Performance and success measure	A direct measure of the outcome will be a reduction in the energy consumption and hence carbon emissions of the buildings upon completion. Metering of all equipment at the GSC needs to be in place and monitored by the University's site wide system.	
Project start and completion dates	August 2015 July 2017	

APPENDIX B: POSSIBLE FUTURE ACTIONS

The following are further potential actions for inclusion in the CMP, subject to review and analysis.

- Energy contra-charging – to give an incentive to building users to be more aware of the need to use energy wisely
- Dedicated Sustainability/energy website – develop and promote the University's environment pages to reflect their importance
- Green purchasing policy
- Business travel/teleconferencing
- Holistic whole life cycle costing to be adopted across the campus
- Thermal comfort – will be addressed as an essential element of an energy awareness programme. Natural ventilation strategies will be adopted, with comfort cooling and air conditioning only used when essential, and meeting set criteria
- 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 and condensers, repairing windows and replacing aging light fittings
- Hand driers – when specified, ensure that low energy models are used i.e. high velocity cool air
- Passive infra-red (PIR) controls – roll out of PIR controls to single occupant offices, toilets, stores, etc.
- Insulation
    - Pipework – particularly on steam network
    - Valves – jackets on valves in plant rooms. Valve jackets should be easy to fit and remove eg 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
- Lighting controls – install combined sensors for absence detection and daylight linking to switch off lights in areas that are vacated, or inhibit lights from coming on when there is sufficient natural light. Install constant lux systems on all new installations
- Standalone control – install local controls, such as thermostatic radiator valves for radiators; presence sensors; and time switches for lecture theatre extract fans
- Building Management System outstations – install BMS outstations for heating and ventilation systems currently under local control, with excessive operating hours
- Supply voltage – consider installing voltage optimisation on off campus sites
- Motors – replace with high efficiency types where appropriate
- Pumps – replace with high efficiency types where appropriate
- Systems commissioning/boiler and chiller optimisation – recommission systems for seasonal impact
- Compressor controls – optimisation/replacement of compressor controls to match loads.
- Replacement of Red Route lighting – use of high efficiency lighting and lighting controls including absence detection and daylight linking
- External lighting – cohesive approach to external lighting. Replacement with energy efficient light-emitting diode (LED) fittings and lighting controls
- Chilled water – use the existing chilled water distribution system to provide cooling for process and environmental requirements where practicable
- Boilers – replacement with high efficiency models and close control
- Light fittings replacement in non-churn areas – replace with very high efficiency systems ie LEDs
- Luminaire replacement in churn areas – establish a policy on light fittings and control types, reuse these fittings when churn occurs when less than 5-10 years old, and supplement

- Heating controls – improve wherever inadequate, but especially on single pipe systems
- Hot water – point of use heaters to be installed where appropriate with time clocks
- Radiator reflective foil – to be installed across estate
- Air conditioning units – highest efficiency available
- TM44 surveys – across campus 12kW surveys being undertaken by Cofely as part of ongoing maintenance agreement, with 250kW surveys being a separate item
- Energy audits – target top 10 energy intensive buildings for a full top down energy survey.
- Off campus data centres – cloud computing
- Photo Photovoltaics (PVs) on campus flat roofs – standalone input or building