

University of Abertay Dundee
Carbon Management Plan

CMP 2011 - 2016

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Foreword from Principal

Universities and colleges have a key role to play in the contribution to Scotland's long-term national targets. They have a wide remit and opportunity to effect change through their primary role as educators, skills trainers and researchers. Universities are owners and operators of large and complex estates which are often the focus of many local communities; as such, institutions can influence and lead on wider community and social initiatives.

This Plan illustrates a clear vision and target for Carbon Management in University of Abertay Dundee and represents the culmination of a significant effort by staff across the University to develop a framework that will allow us, as a University community, to make a significant reduction in our carbon footprint. The changes we seek to implement will not happen immediately. It will require the investment of time and resources and the commitment of the whole University community to achieve the challenging targets we have set for reduction of our carbon emissions. Through determined and persistent effort we will be able to ensure that we operate in a sustainable manner.

As an institution recognised for academic achievements in teaching and research in environmental sciences it is important that we commit ourselves to practices which are consistent with the knowledge we are developing and imparting to our students and the wider community. Each of us has a responsibility to play our part in delivering the objectives of this Plan; if we meet that challenge we will be contributing to a cleaner, healthier and more sustainable future.

I am delighted that we have the opportunity to work with the Carbon Trust in the implementation of this Plan and I am confident that we will reflect in due course on the successful achievement of these challenging but extremely commendable targets.

Professor Nicholas Terry

Principal and Vice Chancellor (Acting)

Foreword from the Carbon Trust in Scotland

Cutting carbon emissions as part of the fight against climate change should be a key priority for all public bodies - it's all about getting your own house in order and leading by example. The Scottish and UK governments have identified the public sector as key to delivering carbon reduction across Scotland and the UK, in line with Kyoto commitments and the world-leading Scottish and UK Climate Change legislation.

The Carbon Trust's Public Sector Carbon Management programme is designed in response to this. It assists organisations in saving money on energy and putting it to good use in other areas, whilst making a positive contribution to the environment by lowering their carbon emissions.

University of Abertay Dundee was selected to take part in this ambitious programme. University of Abertay Dundee partnered with the Carbon Trust in order to realise substantial carbon and cost savings. This Carbon Management Plan commits the organisation to a target of reducing CO_{2e} by 30% by 2016 and underpins potential financial savings to the organisation of around £0.75 million.

There are those that can and those that do. Public bodies can contribute significantly to reducing CO_{2e} emissions. The Carbon Trust is proud to support University of Abertay Dundee in the on-going implementation of its carbon management.

Paul Wedgwood

Manager, Carbon Trust in Scotland



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EXECUTIVE SUMMARY

The Carbon Management Plan for the University of Abertay Dundee sets out a five-year plan for the reduction of carbon emissions across the University's own activities. It has been produced in conjunction with the Carbon Trust in Scotland using the support of accredited consultants.

This Carbon Management Plan is aligned with the University's wider sustainability objectives and provides demonstrable commitment to fulfilling sustainability obligations placed upon it by external funding bodies such as the Scottish Funding Council (SFC). Overall responsibility for delivery of the Carbon Management Plan will lie with the Head of Estates and Campus. He will be supported on a day-to-day basis by the Project Manager and, more widely, by the Carbon Management Project Board, which includes representatives from across all departments. Progress towards the Plan's aims and objectives will be reviewed quarterly by the Carbon Management Team and reported to the appropriate sub-committees of Court and Senate.

Structure of the Plan

The Carbon Management Plan is split into three separate sections:

- **Background and Context:** This section sets out the aims and objectives of the Plan, the drivers behind the Plan, the University's governance structure in relation to carbon management, the original baseline carbon footprint for University of Abertay Dundee and reduction targets.
- **Progress Review:** This section provides an ongoing review of actual progress towards target carbon emissions.
- **Implementation Plan:** This section provides a list of planned carbon reduction projects, with details of project ownership, estimated reductions and progress.

Overall Target

University of Abertay Dundee's overall target for carbon reduction is to achieve:

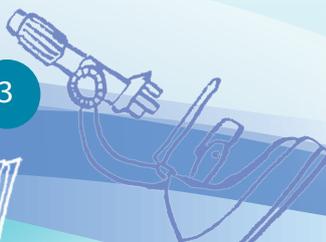
- at least a 30% reduction in overall carbon emissions by the end of calendar year 2016 (based on a baseline year of 2008); and
- an interim target of a 25% reduction in emissions by the end of calendar year 2013.

This equates to a reduction of around 1,200 tonnes CO_{2e} and a cost saving of around £775,000 over the period to the end of 2016.

These targets demonstrate the University's commitment to match the reputation of its environmental research work with the performance of the campus.



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1. BACKGROUND AND CONTEXT

1.1 Our Low Carbon Vision

In 10 years, the University of Abertay Dundee will be a visible leader in the local community on climate change and higher education sector for energy management, by saving money and carbon through effective implementation of carbon management.

1.2 Context and Drivers

Many policies driving the sustainable development and climate change agendas come from international agreements and national strategies, reflecting the cross-border and global nature of the issues. This section outlines the main directives and plans which drive climate change activity in the University and will be key for implementing emissions reductions.

Climate Change (Scotland) Act (2009) - The Climate Change (Scotland) Act 2009 outlines national greenhouse gas (GHG) emissions reduction targets; specifically at least an 80% reduction in emissions (relative to 1990 levels) by 2050 with an interim milestone target of at least 42% by 2020. The Scottish Government produced a Climate Change Delivery Plan in June 2009 to guide the national effort to meet the climate change targets and this will influence the University's policy priorities in this area.

Universities and Colleges Climate Commitment for Scotland (UCCCFs) - University of Abertay Dundee is a signatory to this commitment on behalf of Scotland's Universities and Colleges to address the challenges of climate change and reduce their carbon footprints. Signatories are committed to producing and publishing a five-year Climate Change Action Plan (CCAP) which will include measurable targets and timescales to achieve a significant reduction in emissions from all business operations and activities.

Community Influence - Universities and colleges have a key role to play in the contribution to long-term national targets. They have a wide remit and opportunity to effect change through their primary role as educators, skills trainers and researchers. Universities are owners and operators of large and complex estates which are often the focus of many local communities; as such, institutions can influence and lead on wider community and social initiatives.

Funding Obligations - As an organisation which receives significant public funding, there are certain obligations placed on the University by the funding body, the Scottish Funding Council (SFC). SFC requires that institutions demonstrate sustainability in their ongoing operations and in capital projects through conditions of grant.

Financial Savings - It is anticipated that the general trend of above inflation increases in energy costs will continue. There is an expectation that this Carbon Management Plan will mitigate increased costs and achieve measurable reductions.



1.3 *Revised Carbon Management Plan*

With the assistance of the Carbon Trust in Scotland, the University has undertaken a review of progress to date against the targets set out in the original Carbon Management Plan of 2008. This has included a review of ongoing efforts to reduce carbon emissions across University activities and the development of a revised target. In formulating the revised target the University has looked ahead to 2020 and considered in what areas it can most effectively contribute to the milestone reduction targets outlined in the Climate Change (Scotland) Act.

1.4 *Aims and Objectives*

University of Abertay Dundee's overall target for carbon reduction is to achieve:

- at least a 30% reduction in overall carbon emissions by the end of calendar year 2016 (based on a baseline year of 2008); and
- an interim target of a 25% reduction in emissions by the end of calendar year 2013.

In achieving these targets there are four strategic themes to be taken forward:

- Communicating progress towards the vision, and for the involvement of individuals and groups throughout the University;
- Changing existing policies or procedures, or creation of new policies to further incorporate sustainability and carbon management;
- Creation of new functions, responsibilities or posts to strategically deliver objectives; and
- Allocation of existing Salix funds to prioritised projects and seeking new external funds.

1.5 *Carbon Management Governance and Reporting*

The University has a firm commitment to make a positive contribution at local, national and international levels; minimising our impact on the environment and developing in a sustainable way are key aspects of achieving that commitment. The University has a strong reputation in research and teaching on environmental management; it is therefore essential that our operations do not detract from this.

This Carbon Management Plan, including our CO₂e savings targets, will be the subject of formal approvals by the University through both Court and Senate Committees. Following approval, various aspects of the Plan will be delegated to the appropriate schools and services across the University. However, the Estates Department and ACE will retain an oversight and co-ordination role in reporting back to the committees on progress. The committee reports will be the responsibility of the Head of Estates and will be reported through the relevant sub committees of Court and Senate.

The Plan envisages that sustainability will become an integral part of all aspects of our operations. Sustainability will become a core element of our teaching and learning provision across a wide range of programmes and courses within our portfolio. We will also look at ways in which we can reduce our carbon emissions in the academic schools. In delivering these objectives there are a number of key stakeholders to consider, as outlined in Table 1.

Stakeholder Group	Interest/Issues	Information Needs/Message	Method of Communication
Principal and Senior Management	<ul style="list-style-type: none"> Climate change declaration Efficient use of resources throughout the university Meet staff and students expectations External and internal reputation 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action 	<ul style="list-style-type: none"> Ian Simpson to provide briefings
Finance Director	<ul style="list-style-type: none"> Cost/Budgets 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action Programme will be governed to ensure effective use of scarce resources Potential for external funding eg. Salix 	<ul style="list-style-type: none"> Ian Simpson to provide implementation briefings (including financial payback for each project and case for external match funding from Salix)
Staff	<ul style="list-style-type: none"> Meet students expectations External and internal reputation 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action 	<ul style="list-style-type: none"> David Blackwood to organise newsletter on carbon management issues Presentation/workshop to interested staff linked to suitability initiative Green Space (web resource)
Academic Staff	<ul style="list-style-type: none"> Meet students expectations External and internal reputation Up to date relevant programmes Appropriately focussed research 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action 	<ul style="list-style-type: none"> David Blackwood to organise newsletter on carbon management issues Presentation/workshop to interested staff linked to suitability initiative Green Space (web resource)
Students	<ul style="list-style-type: none"> Resource to deliver Provide ownership Key or success Meet students expectations 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action 	<ul style="list-style-type: none"> People and planet society to organise briefing event Dissemination through their peers Their influence and enthusiasm Green Space (web resource)
Communication Team	<ul style="list-style-type: none"> Core part of delivery Help all levels understand project External and internal reputation 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action 	<ul style="list-style-type: none"> Vicki White to write News Articles on carbon management activities Green Space (web resource)
Wider public and stakeholders	<ul style="list-style-type: none"> Reputation 	<ul style="list-style-type: none"> Outline understanding of the CM programme Case for Action - costs will continue to rise if we don't take action 	<ul style="list-style-type: none"> Vicki White to write News Articles on carbon management activities PR



1.5.1 Governance Responsibilities

The key individuals involved in the delivery of the Carbon Management Plan are outlined in Table 2.

Table 2: Carbon Management Plan Delivery Team

Role in Carbon Management Programme	Name	Position
Project Sponsor	Nicholas Terry	Principal and Vice-Chancellor (Acting)
Project Leader	Ian Simpson	Director of Operations
Project Manager	Daniel Gilmour	Research Officer
Finance Champion	Wendy Grant	Head of Finance
Technical Support	Rab Smith	Estates Manager
Team Members	Alex Ingles	Information Manager, Information Services
	David Blackwood	Divisional Leader, Environment
	Vicki White	Communications Officer
	Jim Duncan	Lecturer, Environment
Green Team Representatives	David Bremner	
	Rona Whittet	
	Jonathan Teppett	
People & Planet Society Representatives	To be advised annually by Student Association President	

1.5.2 Programme Board

A Programme Board has been established which brings together representation from across the University community, including service providers and end users of services, a finance representative and students. The Board will be chaired by the Head of Estates and Campus Services.

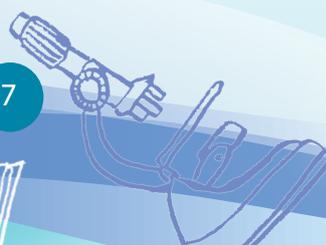
The responsibilities of the Programme Board are summarised as:

- ensuring that there is oversight of activity and ensuring that these activities are co-ordinated and complimentary;
- avoiding duplication of effort or negative impacts from one project or initiative on another;
- reviewing the programme risk register at meetings.

The chair of the Programme Board will report to the executive management of the University on progress against targets on a regular basis throughout the year at each meeting of the appropriate sub-committees of Court and Senate (approximately six times per year).

Table 3: Programme Board Membership

Name	Position
Prof. Nicholas Terry	Project Sponsor
Mr Ian Simpson	Project Leader
Mr Daniel Gilmour	Project Manager
Mrs Wendy Grant	Finance
Mrs Vicki White	Communications
Dr David Blackwood	Academic & Research Rep
Mrs Wendy Robb	Administration & Support Rep



1.5.3 Carbon Management Team

The University has decided that a small Carbon Management Team will be most effective in delivering the desired outcomes. Meetings of the team to review progress on individual projects will be chaired by the Project Manager who will report to the Director of Operations. It is envisaged that this team will meet monthly but frequency will vary depending on the agreed requirements. The Carbon Management Team is shown in Table 4.

Table 4: Carbon Management Team

Name	Position
Daniel Gilmour	Project Manager
Alex Ingles	Information Manager, Information Services
David Blackwood	Divisional Leader
Vicki White	Communications Officer
Jim Duncan	Lecturer, Environment
David Bremner	Green Team Representative
Rona Whittet	Green Team Representative
Jonathan Teppett	Green Team Representative
People & Planet Society Representatives	As advised by Student Association President

The role of the Carbon Management Team will be to review progress to date and to determine actions required for each forthcoming period.

As a small institution the University benefits from close personal contact and direct lines of communication between individuals and it is anticipated that much of the work of the Carbon Management Plan projects will be done on an ad hoc basis.

Individual staff members will be given responsibility for leading delivery of individual projects as agreed by the Carbon Management Team.

In the event of individuals either leaving the University or being unable to participate further in the work of the Carbon Management Team, then it will be the responsibility of the Project Leader and Project Manager to allocate alternative resource.

1.6 Monitoring and Reporting

In order to track the impact of the various initiatives within the Plan it will be necessary to continue to gather data to enable comparison with the baseline. Data gathering will remain the responsibility of the Project Manager with input from Estates staff who will continue to carry out their responsibilities for data input, etc. Further monitoring arrangements such as sub-metering will be considered to provide greater granularity in the data which will allow a more focused approach, targeting areas where the greatest impact can be achieved.

We will build upon the formal reporting of energy consumption which is already in place and will add other data that we are beginning to gather, such as volumes of segregated wastes, percentages of products from sustainable sources used in building projects, reduction of waste energy in IT equipment (measured by central IT management software) and travel choice data collected from staff and student surveys.



1.6.1 Reporting

The University's Communications Officer will co-ordinate efforts to get information disseminated to stakeholders. It is envisaged that a variety of communication tools will be used, from the creation of web pages on the University intranet, poster and awareness campaigns, through to events and training sessions.

The majority of the communication with internal stakeholders will be done by keeping the intranet pages up to date and providing regular news stories on the news section of the portal. External funding bodies such as the Funding Council will receive information as part of formal reporting procedures.

The contents of this Plan will be reviewed at minimum annually and updated in line with progress and details of individual projects. This update will be the responsibility of the Project Manager in the first instance, with support from the wider Carbon Management Team as requested.

1.7 Emissions Baseline and Projections

This section provides details of the University's carbon emissions baseline and projections through to 2015/16. There are two scenarios used in the projections:

- Business as Usual (BAU). This scenario assumes no additional actions are taken to reduce carbon emissions and shows the amount of carbon emitted by the University through to 2016;
- Reduced Emissions Scenario (RES). This scenario assumes that all actions outlined in this Carbon Management Plan are carried out to reduce carbon emissions.

1.8 Scope

The scope of the baseline estimates was established as being the following areas:

- Energy – metered electricity and gas consumption for which the University is responsible (including Halls of Residence);
- Waste – waste collected from within the University and landfilled. This figure is derived from the number of skips collected from the University. It assumes that the skips were full and an average density of material was 0.4 tonnes/m³
- Vehicle Fuel Use – in estimating these emissions, the total vehicle miles, the purpose of the vehicles and the likely distance travelled was considered. Most vehicles were used for regular short distance activities, with the exception of the principal and Urban Water Technology Centre vehicles which both typically undertake over 20,000 miles per annum;
- Water – metered consumption for which the University is responsible (including Halls of Residence);
- Business mileage – this is a recorded figure provided by the University's Travel Company accounting for all University business travel (field trips, conferences etc.)

The emissions categories outlined here are those of which the University can both influence and positively change.

Staff commuting and student travel are specifically excluded from the baseline on these grounds. However, the University is undertaking initiatives to reduce the environmental impact from these activities.

Staff travel to and from work is recognised as an issue within the University's Sustainable Travel Policy and one of the Policy's objectives is to reduce single occupancy car use. The University will continue to work with staff and transport stakeholders to encourage uptake of alternative forms of transport.

The University recognises that there is an emissions impact that results from student travel to and from the University. The emissions associated with travel to and from the institution is one area that the University sees as necessary in order to sustain the benefits to society brought about by excellence in teaching and research. By bringing students and researchers together in one place, with all of the engagement, facilities and infrastructure located in a single, compact location, there are considerable sustainability benefits attached to this experience. For this reason, the University has decided not to focus further on this particular carbon management aspect at this stage.

1.9 Baseline Footprint

The baseline year is 2008. Total carbon emissions amount to 4,222 tCO_{2e}.

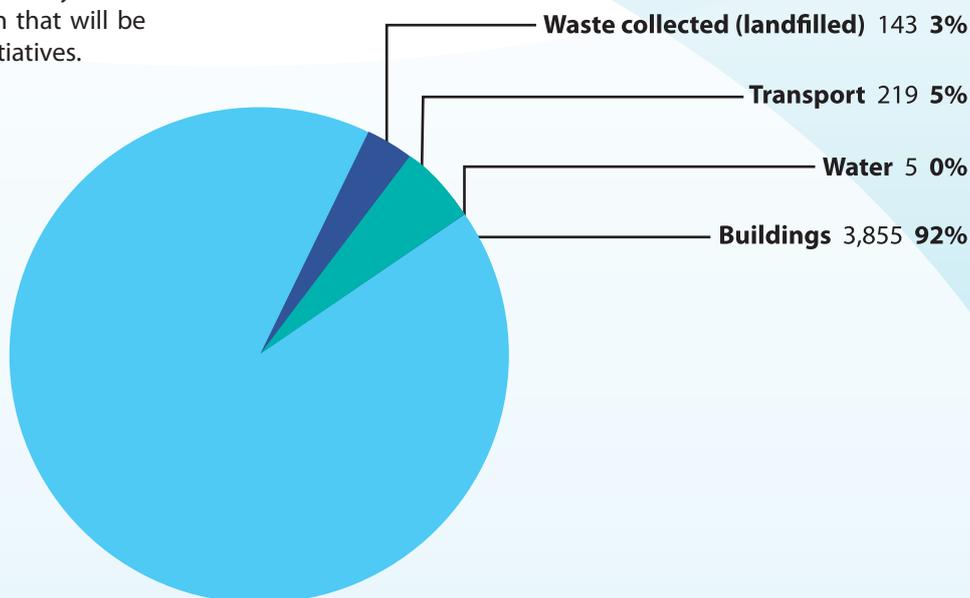
A breakdown of these emissions by category is provided here.

Table 5: Carbon Baseline 2008 by Emission Category

Category	Total Carbon Emissions (tCO _{2e})	% Contribution to Total
Buildings of which	3,855	91%
Electricity	2,651	(63%)
Fossil Fuel	1,204	(29%)
Transport of which	219	5%
Fleet Fuel	215	(5%)
Business Travel	4	(0)
Waste - Landfill	143	3%
Water	5	0%
TOTAL	4,222	100%

Figure 1: Carbon Baseline 2008 (figures quoted in tCO_{2e})

Energy consumption across the University's buildings (including Halls of Residence) clearly dominates the overall carbon baseline. Therefore, it is predominantly measures relating to this energy consumption that will be targeted in ongoing project level initiatives.



1.10 Projected Emissions and Value at Stake

Projected CO_{2e} emissions for the Business as Usual (BAU) scenario have been calculated. The BAU scenario assumes that the University does nothing to reduce increasing trends in energy use (nor the impact of planned development works) and incorporates only existing measures already underway, i.e. no additional carbon reduction actions are carried out. Conversely, the Reduced Emissions Scenario (RES) assumes that all actions identified in this Carbon Management Plan are carried out. The Value at Stake (VAS) is the difference between the two scenarios.

Carbon emissions are predicted in the BAU scenario to rise from 3,855 tCO_{2e} in 2011 to 3,988 tCO_{2e} in 2016 tCO_{2e}. Implementing all the actions in this Carbon Management Plan through the RES over the same period will reduce the carbon emissions to around 2,700 tCO_{2e}. The accumulated carbon savings of the Carbon Management Plan are shown in Table 6. By implementing the Carbon Management Plan, the University will save an aggregate total of around 6,000 tCO_{2e} through to the end of 2016.

Table 6: Projected Carbon Value at Stake

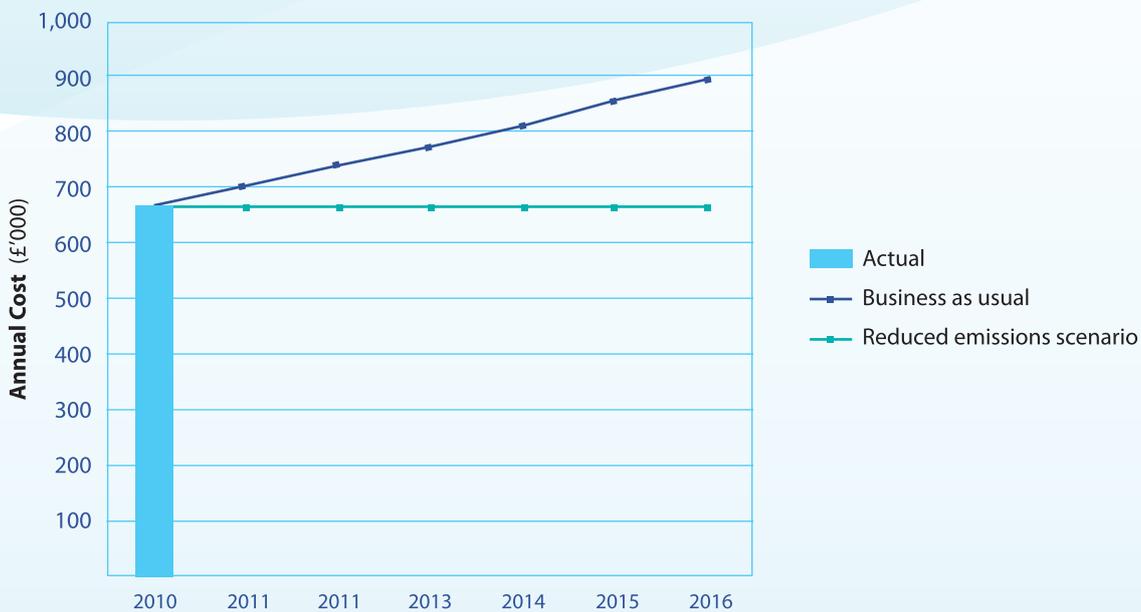
	UOM	2011	2012	2013	2014	2015	2016
BAU Emissions	tCO _{2e}	3,855	3,881	3,908	2,934	3,961	3,988
Reduced Emissions Scenario	tCO _{2e}	3,532	3,107	2,603	2,654	2,681	2,717
Value at Stake	tCO _{2e}	323	774	1,305	1,280	1,280	1,271
Cumulative Value at Stake	tCO _{2e}	323	1,098	2,402	3,682	4,982	6,233

Notes for Table 6

1. In the BAU Scenario an annual growth in emissions of 0.7% per annum is assumed in the case of buildings, transport and procurement emissions
2. In the BAU Scenario a net zero change in waste and water emissions is assumed

In addition to the carbon savings, there are also associated financial savings. Figure 2 shows the two scenarios – the BAU and the RES – in terms of the financial costs to the University and is discussed in more detail in Section 3.

Figure 2: Projected Financial Value at Stake



2. PROGRESS REVIEW

This progress report includes information on actual CO_{2e} emissions for the University of Abertay Dundee through to end of 2009.

Table 7: Carbon Emissions within University of Abertay Dundee (all figures in tCO_{2e})

Category	Calendar Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Buildings Energy	3,855	3,466								
Transport	219	219								
Waste (Landfilled)	143	114								
Water	5	4								
TOTAL	4,222	3,803								
Target Emissions	4,222	4,011	3,800	3,588	3,377	3,166	3,096	3,026	2,955	
Variance	0	-208								
% Change from baseline	NA	-9.9								
%Annual Change	NA	-9.9								
%Annual Change (by category)										
Buildings Energy	-	-10.1								
Transport	-	0.0								
Waste (Landfilled)	-	-20.0								
Water	-	-12.5								

Figure 3: University of Abertay Dundee Carbon Emissions



Commentary

Buildings Energy – Work to date has focussed primarily on widespread improvements to building insulation and thermal performance with a view to reducing heating demand across the buildings estate. Improvements have also been made to the building management system in the main University buildings to enhance the means by which staff can both monitor and control energy usage across the site.

A number of lighting upgrade projects have also taken place across the Estate, as well as a partial replacement of older style CRT monitors with more energy efficient flat screen alternatives.

Ongoing feasibility work is being undertaken to assess the next raft of potential projects, which includes the provision of low/zero carbon generation technologies and conversion of electric heating systems to lower carbon intensity gas-fed systems.

Transport – Given the small size of the University's vehicle fleet, ongoing monitoring of fuel use continues. In line with the University's Sustainable Travel Policy, use of such vehicles is minimised wherever possible, particularly in relation to short distance journeys in the vicinity of the main campus buildings. All staff are encouraged to travel via sustainable means when attending conferences, workshops etc.

Waste – Waste minimisation initiatives continue across campus. Extension of recycling facilities and associated awareness raising among staff and students should assist in further reducing the volume of waste generated and the associated fraction being sent to landfill.

Water – While only a tiny fraction of the University's overall carbon footprint, water consumption remains a significant area of activity. Overall metered supply is monitored on a monthly basis and there are a number of projects identified that target reductions in overall consumption.

Date of next progress report: September 2011



3. IMPLEMENTATION PLAN

3.1 Existing Projects

These projects have been either fully or part-implemented.

Table 8: University of Abertay Dundee Existing Projects

Project				Estimated Annual Savings		Cost	Payback Period	Completion Date/Status
Reference	Title	Area	Person Responsible	tCO _{2e}	Financial (£)	Capex (£)	Years	
UOA001	Roof insulation and heating	Buildings	Ian Simpson	9	724	2,000	2.8	Implemented
UOA002	Daylight controls and PIR	Buildings	Ian Simpson	9	1,469	5,000	3.4	Implemented
UOA003	Installation of BMS with front end controls	Buildings	Ian Simpson	194	10,500	35,000	3.3	Implemented
UOA004	Installation of energy efficient luminaries	Buildings	Ian Simpson	59	9,631	15,000	1.6	Q4, 2011
UOA005	'Better OFF' Campaign	Buildings	Ian Simpson	31	5,060	2,000	0.4	Q4, 2011
UOA006	Centralised Management Software	Buildings	Ian Simpson	143	12,000	27,000	2.3	Q1, 2011
UOA007	PIR lighting controls	Buildings	Ian Simpson	31	5,060	5,000	1.0	Implemented
UOA008	Upgrade loft insulation	Buildings	Ian Simpson	11	885	4,000	4.5	Implemented
UOA009	CTR to TFR monitor replacement	Buildings	Ian Simpson	83	13,549	30,000	2.2	Q4, 2011
UOA010	CTR to TFR monitor replacement	Buildings	Ian Simpson	78	12,732	25,000	2.0	Q4, 2011
UOA013	Printer & Fax Rationalisation	Buildings	Ian Simpson	9	1,469	1,000	0.7	Q3, 2011
UOA014	Waste Management improvements	Waste	Ian Simpson	11	0	1,000	NA	Q3, 2012
UOA016	Home working	Buildings	Ian Simpson	5	816	0	NA	Q1, 2012
UOA017	Draught proofing	Buildings	Ian Simpson	31	2,580	25,000	9.7	Q1, 2012
UOA018	Re cladding main campus	Buildings	Ian Simpson	55	4,438	30,000	6.8	Q2, 2012
UOA023	Space reduction - Bread demolition	Buildings	Ian Simpson	3	500	0	0.0	Implemented
UOA024	Gable alteration insulation	Buildings	Ian Simpson	22	1,775	12,000	6.8	Implemented
UOA030	BMS zone valves	Buildings	Ian Simpson	0	0	0	NA	Implemented
UOA034	Roof space insulation (Old College)	Buildings	Ian Simpson	44	3,541	3,000	0.9	Implemented
TOTAL				828	£86,729	222,000		

Note: All capex figures refer to estimated cost of saving measure rather than total capex for given project.



3.3 Planned Projects

These projects are planned, but funding is not yet confirmed.

Table 10: University of Abertay Dundee Planned Projects

Project				Estimated Annual Savings		Cost	Payback Period	Completion Date/Status
Reference	Title	Area	Person Responsible	tCO _{2e}	Financial (£)	Capex (£)	Years	
UOA019	Photovoltaics - Lyon Street Residences	Buildings	Ian Simpson	2	320	19,800	61.8	Q2, 2012
UOA020	District Heating - Residences	Buildings	Ian Simpson	54	11,115	13,333	1.2	Q2, 2012
UOA021	Photovoltaics - Hillside residences	Buildings	Ian Simpson	7	1,139	70,400	61.8	Q2, 2012
UOA022	Power Perfector - voltage optimisation	Buildings	Ian Simpson	150	16,806	104,820	6.2	Q2, 2012
UOA025	Reducing water storage capacity	Buildings	Ian Simpson	0	0	0	NA	Q1, 2012
UOA026	Bike boost	Buildings	Ian Simpson	0	0	0	NA	Q3, 2013
UOA027	Cycle Racks	Buildings	Ian Simpson	0	0	0	NA	Q3, 2013
UOA028	Lamp Replacement LED	Buildings	Ian Simpson	5	821	500	0.6	Q1, 2012
UOA029	Baxter Building Improvements	Buildings	Ian Simpson	6	3,115	14,500	4.7	Q1, 2013
UOA031	Quadra seal heat reflection	Buildings	Ian Simpson	1	100	306	3.1	Q1, 2012
TOTAL				225	33,416	223,659		

Note: All capex figures refer to estimated cost of saving measure rather than total capex for given project.



3.4 Identified Projects

These projects have been identified, but savings have yet to be quantified in full/or funding is not confirmed.

Table 11: University of Abertay Dundee Identified Projects

Project				Estimated Annual Savings		Cost	Payback Period	Completion Date/Status
Reference	Title	Area	Person Responsible	tCO _{2e}	Financial (£)	Capex (£)	Years	
UOA011	Rainwater Harvesting	Buildings	Ian Simpson	2	0	15,000	NA	TBC
UOA012	Replacement Mains Water Coolers	Buildings	Ian Simpson	0	0	5,000	NA	TBC
UOA015	Transportation Scheme	Buildings	Ian Simpson	5	2,260	15,000	6.6	TBC
UOA032	Secondary glazing Old College	Buildings	Ian Simpson	56	4,473	30,000	6.7	TBC
UOA033	Replacement of metal frame windows (North Block)	Buildings	Ian Simpson	130	10,438	120,000	11.5	TBC
UOA035	Lagging domestic hot water pipes	Buildings	Ian Simpson	11	854	3,000	3.5	TBC
UOA036	Victoria Chambers	Buildings	Ian Simpson	54	13,350	16,667	1.3	TBC
TOTAL				258	31,375	204,667		



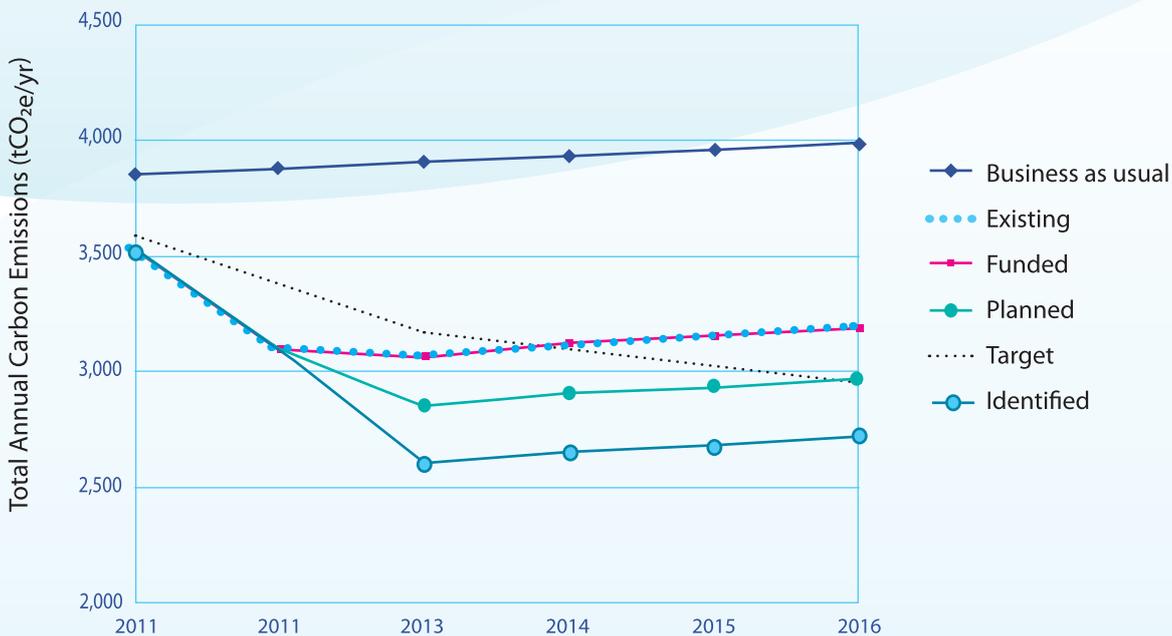
3.5 Projection of Progress Towards Target

The projected means of achieving the target reduction via the different projects outlined above is summarised here.

Table 12: Projected Annual Carbon Savings (tCO_{2e}/yr)

Year			1	2	3	4	5
	UOM	2011	2012	2013	2014	2015	2016
Business As Usual	tCO _{2e}	3,855	3,881	3,908	3,934	3,961	3,988
Reduced Emission Scenario	tCO _{2e}	3,532	3,107	2,603	2,654	2,681	2,717
Existing Projects	tCO _{2e}		3,108	3,080	3,137	3,164	3,200
Funded Projects	tCO _{2e}		3,108	3,080	3,137	3,164	3,200
Planned Projects	tCO _{2e}		3,107	2,860	2,911	2,938	2,974
Identified Projects	tCO _{2e}		3,107	2,603	2,654	2,681	2,717
Target Reduction	tCO _{2e}		3,588	3,377	3,166	3,096	3,026

Figure 4: Projected Annual Carbon Savings (tCO_{2e}/yr)



Achievement of the target can be seen as deliverable via all existing, funded and planned projects; as such not all identified projects need to be implemented in order to meet the reduction target. However, efforts will continue in these areas in the hope of achieving further carbon reductions.

3.5.1 Projection Methodology

In projecting future emissions the impact of each individual project is counted on a full annual basis, regardless of the implementation date. For example, if a boiler replacement project is completed in August of a given year (say 2012) then the projected carbon savings are allocated to the following year (2013 in this case). This avoids over-estimation of part year savings and allows for post-implementation work to verify that the measure is working effectively.

3.6 Financing

This section details the costs and benefits associated with implementing the Carbon Management Plan.

Table 13 details the costs to the University associated with buildings energy consumption, fuel and business travel and waste disposal costs. The University's budget for energy in buildings and fuel was £485,907 in the base year of 2008 (of which energy in buildings accounted for £313,078). By 2010, this had reached £670,000 (of which energy in buildings accounted for £535,000). The Carbon Management Plan aims to reduce carbon emissions by 30% by 2016. Achievement of this target would result in projected annual cost savings of £230,000 for the University. Table 13 also demonstrates that the aggregated savings to the University of year-on-year savings is in the region of £775,000 through to 2016. Clearly the financial benefits to the University from implementing the Carbon Management Plan are hugely significant and could be more so if energy costs continue to increase.

Table 13: University of Abertay Dundee Projected Financial Value at Stake

	2010	2011	2012	2013	2014	2015	2016
Business As Usual	£669,000	£702,000	£702,000	£775,000	£815,000	£854,000	£896,000
Reduced Emission Scenario	£669,000	£668,000	£668,000	£668,000	£668,000	£667,000	£665,000
Existing Projects		£34,000	£70,000	£107,000	£147,000	£188,000	£231,000
Funded Projects		£34,000	£104,000	£211,000	£358,000	£546,000	£777,000

There are a number of sources of funding that can be considered for funding the Carbon Management Plan including:

- The Salix fund: This is a source of interest free funding available to the University when seeking to invest in low carbon or energy efficient technologies;
- Capital Funding: The University has a capital fund for major asset development.

The combination of funding sources outlined here will provide a means of delivery of the planned carbon reductions. However, the Carbon Management Plan will be subject to annual assessment to ensure that sufficient funding is made available in order to maintain implemented savings.

Table 14 provides a summary of the predicted carbon reductions and the financial savings.



Table 14: Summary of Projected Cost and Carbon Savings

Total Projected Annual Cost Savings							
	UOM	2011	2012	2013	2014	2015	2016
Annual Savings	£('000)	34	70	107	147	188	231
Total Projected Annual Carbon Savings							
Value at Stake	tCO _{2e}	323	774	1,305	1,280	1,280	1,271

3.6.1 Financial costs and sources of funding

The current estimated additional cost of delivering this Carbon Management Plan from 2011 to the end of calendar year 2016 is summarised in Table 15.

This expenditure will be reviewed regularly to ensure that the programme retains sufficient funding for delivery.

Table 15: University of Abertay Dundee Project Funding Summary

Existing Projects	£222,000
Funded Projects	£0
Planned Projects	£223,659
Identified Projects	£204,667
TOTAL	£650,326

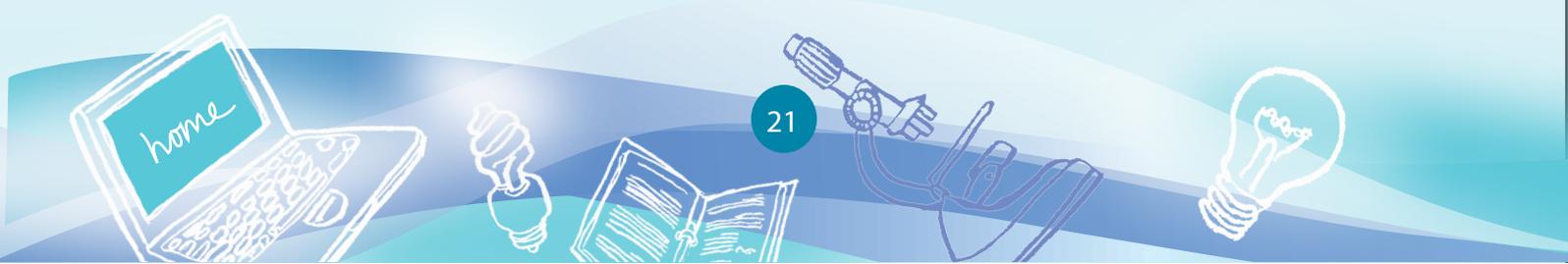


APPENDIX 1: PROJECT DETAILS

Project	Roof insulation and heating
Reference	UOA 001
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Improvements to roof insulation and heating systems within main campus building
Benefits	Financial savings: £724 Payback period: 2.8 years CO ₂ emissions reduction: 9 tonnes of CO ₂
Funding	Project cost - 2,000 Operational costs - NA Source of funding: Salix/Capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2010</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.015/kWh gas price</i>



Project	Daylight Controls and PIR
Reference	UOA002
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of daylight controls and PIR systems within main campus building
Benefits	Financial savings: £1,469 Payback period: 3.4 years CO ₂ emissions reduction: 9 tonnes of CO ₂
Funding	Project cost – 5,000 Operational costs – NA Source of funding: Salix/Capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2010</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	Installation of BMS with front end controls
Reference	UOA003
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of BMS system (including front end controls) within main campus building. System to enable remote monitoring of energy performance.
Benefits	Financial savings: £10,500 Payback period: 3.3 years CO ₂ emissions reduction: 194 tonnes of CO ₂
Funding	Project cost – 35,000 Operational costs – NA Source of funding: Salix/Capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2010</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



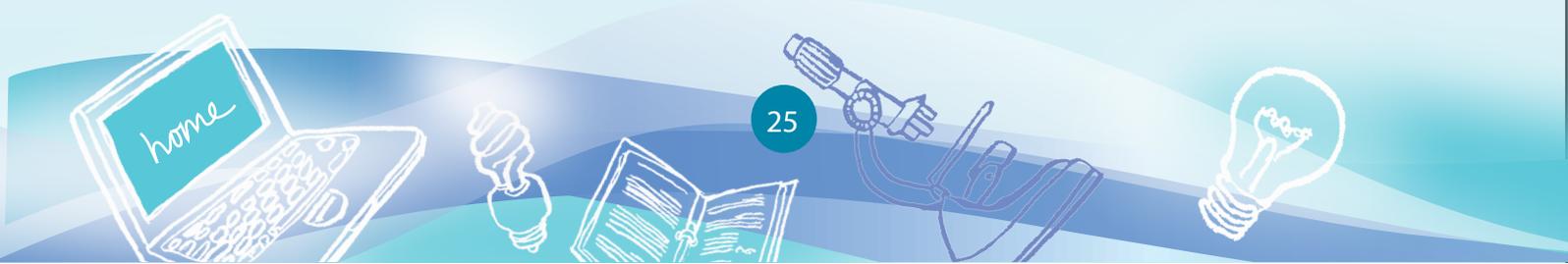
Project	Installation of energy efficient luminaries
Reference	UOA004
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Cross campus programme of replacement of existing luminaries with energy efficient equivalents
Benefits	Financial savings: £9,631 Payback period: 1.6 years CO ₂ emissions reduction: 59 tonnes of CO ₂
Funding	Project cost – 15,000 Operational costs – NA Source of funding: Salix/capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	Milestones/key dates • start date: Q1, 2010 • completion date: Q3, 2011
Notes	Key Assumptions 1. Cost savings calculated on basis of £0.089/kWh unit cost of electricity



Project	Energy awareness <BETTER OFF> campaign
Reference	UOA005
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Energy awareness campaign to be run across campus for both staff and students specifically targeting electrical energy consumption
Benefits	Financial savings: £5,060 Payback period: 0.4 years CO ₂ Emissions reduction: 31 tonnes of CO ₂
Funding	Project cost – 2,000 Operational costs – NA Source of funding: capital funding Funding Decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	Milestones/key dates • start date: Q1, 2010 • completion date: Q3, 2011
Notes	Key Assumptions 1. Cost savings calculated on basis of £0.089/kWh unit cost of electricity



Project	Centralised Management Software
Reference	UOA006
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of centralised management software to enable remote whole campus energy monitoring
Benefits	Financial savings: £12,000 Payback period: 2.3 years CO ₂ emissions reduction: 143 tonnes of CO ₂
Funding	Project cost – 27,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2010</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.015/kWh gas price</i> 2. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	PIR Lighting Controls
Reference	UOA007
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of PIR lighting controls
Benefits	Financial savings: £5,060 Payback period: 1.0 years CO ₂ emissions reduction: 31 tonnes of CO ₂
Funding	Project cost – 5,000 Operational costs – NA Source of funding: Salix Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2011</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	Upgrade loft insulation
Reference	UOA008
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Enhanced loft insulation within campus buildings
Benefits	Financial savings: £885 Payback period: 4.5 years CO ₂ emissions reduction: 11 tonnes of CO ₂
Funding	Project cost – 4,000 Operational costs – NA Source of funding: Salix Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of works to ensure effective delivery
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2010</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.015/kWh gas price</i>



Project	CRT to TFR monitor replacement (Phase 1)
Reference	UOA009
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of older CRT with more energy efficient TFR monitor
Benefits	Financial savings: £13,549 Payback period: 2.2 years CO ₂ emissions reduction: 83 tonnes of CO ₂
Funding	Project cost – 30,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	In-house resources sufficient to deliver project
Ensuring success	Procurement specification to include minimum energy standard for new monitors
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> • start date: Q1, 2010 • completion date: Q4, 2011
Notes	<i>Key Assumptions</i> 1. Cost savings calculated on basis of £0.089/kWh unit cost of electricity



Project	CRT to TFR monitor replacement (Phase 2)
Reference	UOA010
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of older CRT with more energy efficient TFR monitor
Benefits	Financial savings: £17,732 Payback period: 2.0 years CO ₂ emissions reduction: 78 tonnes of CO ₂
Funding	Project cost – 25,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	In-house resources sufficient to deliver project
Ensuring success	Procurement specification to include minimum energy standard for new monitors
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post purchase
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2011</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	Rainwater Harvester
Reference	UOA011
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of older CRT with more energy efficient TFR monitor
Benefits	Financial savings: £NK Payback period: NK years CO ₂ emissions reduction: 2 tonnes of CO ₂
Funding	Project cost – NK Operational costs – NA Source of funding: NK Funding decision: no funding
Resources	Third party contractors to be used as required
Ensuring success	Ensure robust initial design to make best use of system
Measuring success	Ongoing monitoring of water consumption across campus
Timing	Milestones/key dates • <i>start date: identified project</i> • <i>completion date: identified project</i>



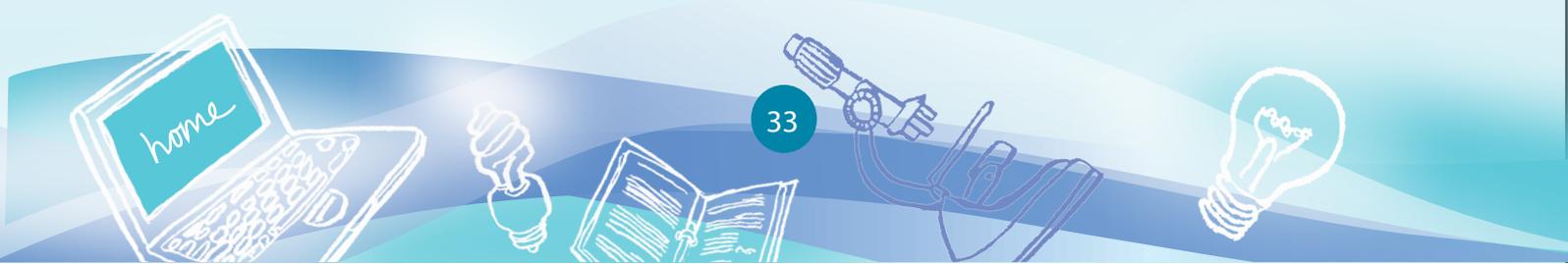
Project	Replacement mains water coolers
Reference	UOA012
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of existing mains fed water coolers
Benefits	Financial savings: £NK Payback period: NK years CO ₂ emissions reduction: NK tonnes of CO ₂
Funding	Project cost – 5,000 Operational costs – NA Source of funding: Capital funding Funding decision: no funding secured at present
Resources	Third party contractors to be used as required
Ensuring success	Ensure energy efficiency is one of the criteria used in selection of new coolers
Measuring success	Ongoing monitoring of water consumption across campus building
Timing	Milestones/key dates • <i>start date: identified project</i> • <i>completion date: identified project</i>



Project	Printer & fax rationalisation
Reference	UOA013
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Review of existing assets and rationalisation of total number of units deployed across campus
Benefits	Financial savings: £1,469 Payback period: 0.7 years CO ₂ emissions reduction: 9 tonnes of CO ₂
Funding	Project cost – 1,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	In-house resources sufficient to deliver project
Ensuring success	Procurement specification to include minimum energy standard for new equipment
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	Milestones/key dates • <i>start date: Q1, 2011</i> • <i>completion date: Q1, 2012</i>
Notes	Key Assumptions 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



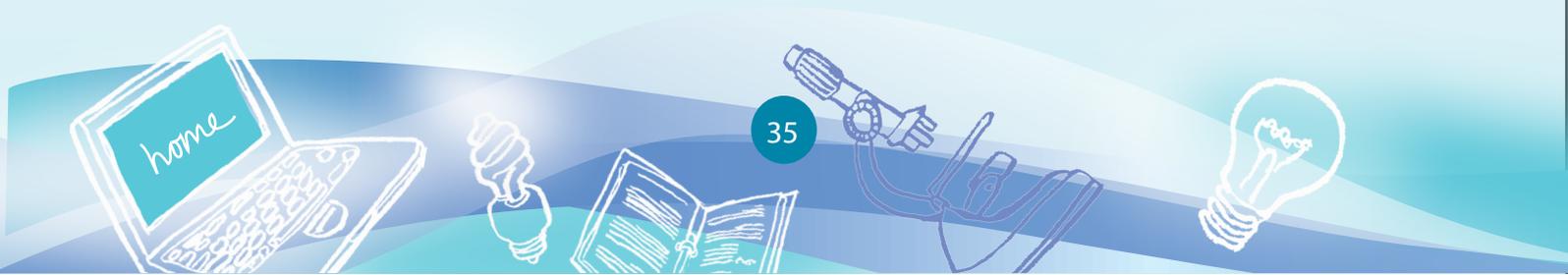
Project	Waste Management Improvements
Reference	UOA014
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Enhanced waste management working practises to reduce overall water consumption across campus
Benefits	Financial savings: £0 Payback period: NA years CO ₂ emissions reduction: 11 tonnes of CO ₂
Funding	Project cost – 1,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Measuring success	Ongoing monitoring of energy consumption within campus building pre and post installation
Timing	<i>Milestones/key dates</i> <ul style="list-style-type: none"> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2011</i>



Project	Transportation Scheme
Reference	UOA015
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Improvements in transport management to reduce fleet diesel consumption
Benefits	Financial savings: £2,260 Payback period: 6.6 years CO ₂ emissions reduction: 5 tonnes of CO ₂
Funding	Project cost – 15,000 Operational costs – NA Source of funding: TBC Funding decision: no funding secured at present
Resources	Third party contractors to be used as required
Ensuring success	Effective targeting of fuel consumption
Measuring success	Ongoing monitoring of fleet fuel consumption across campus
Timing	Milestones/key dates • <i>start date: identified project</i> • <i>completion date: identified project</i>
Notes	Key Assumptions 1. <i>Cost savings calculated on unit price of £1.35 per litre (diesel)</i>



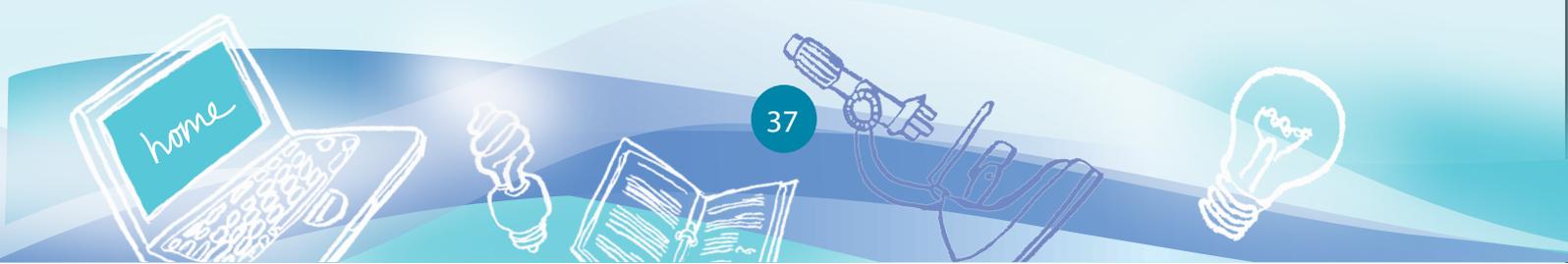
Project	Home working
Reference	UOA016
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Provision of IT services and system access to enhance capacity for home working
Benefits	Financial savings: £816 Payback period: NA years CO ₂ emissions reduction: 5 tonnes of CO ₂
Funding	Project cost – NA Operational costs – NA Source of funding: NA Funding decision: NA
Resources	Third party contractors to be employed as required
Ensuring success	Review of key IT services required by staff when working from home
Measuring success	Ongoing monitoring of energy consumption across campus
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2011</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	Draught proofing
Reference	UOA017
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Draught stripping of doors, windows and other major sources of air infiltration as identified across campus
Benefits	Financial savings: £2,580 Payback period: 9.7 years CO ₂ emissions reduction: 31 tonnes of CO ₂
Funding	Project cost – 25,000 Operational costs – NA Source of funding: Salix/capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain oversight of workmanship to ensure effective roll out of programme
Measuring success	Ongoing monitoring of fleet fuel consumption across campus
Timing	<i>Milestones/key dates</i> • start date: Q1, 2010 • completion date: Q4, 2011
Notes	<i>Key Assumptions</i> 1. Cost savings calculated on basis of £0.015/kWh gas price



Project	Re-cladding main campus building
Reference	UOA018
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Re-cladding of main campus building
Benefits	Financial savings: £4,438 Payback period: 6.8 years CO ₂ emissions reduction: 55 tonnes of CO ₂
Funding	Project cost – 30,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be employed as required
Ensuring success	Maintain oversight of workmanship to ensure effective roll out of programme
Measuring success	Ongoing monitoring of energy consumption across campus
Timing	Milestones/key dates • start date: Q1, 2010 • completion date: Q1, 2012
Notes	Key Assumptions 1. Cost savings calculated on basis of £0.015/kWh gas price



Project	Photovoltaics - Lyon Street Residences
Reference	UOA019
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of 4.5 kWp PV array
Benefits	Financial savings: £320 CO ₂ emissions reduction: 5 tonnes of CO ₂
Funding	Project cost – 19,800 Operational costs – NA Source of funding: Salix Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain oversight of workmanship to ensure effective installation. Ensure installation of output and export meters to facilitate performance monitoring
Measuring success	Ongoing monitoring of metered output from array
Timing	Milestones/key dates • start date: Q1, 2011 • completion date: Q4, 2012
Notes	Key Assumptions 1. Residence roof is not overshadowed and output from 1kWp array is 800 kWh per year 2. Cost of PV array assumed at £4,400/kWp 3. Cost savings calculated on basis of £0.089/kWh unit cost of electricity

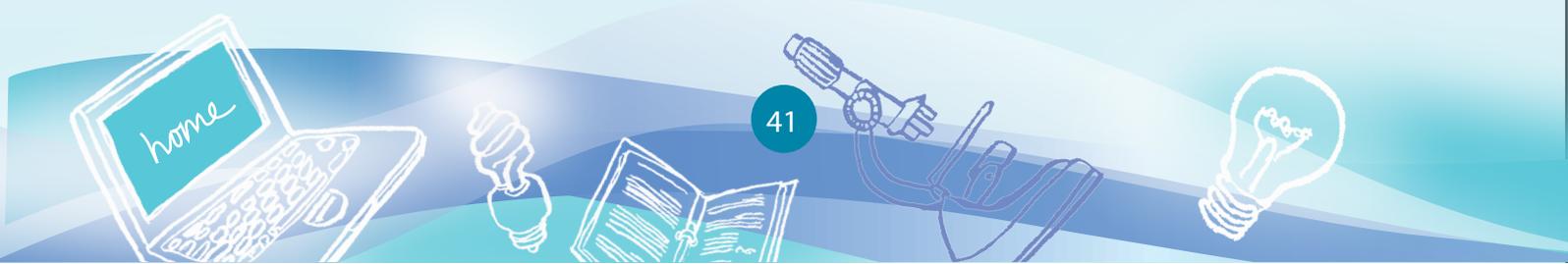


Project	Districts Heating - Residences
Reference	UOA020
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Central Gas fired boiler plant replacing local electric heating installations
Benefits	Financial savings: £11,115 Payback period: 1.2 years CO ₂ emissions reduction: 54 tonnes of CO ₂
Funding	Project cost – 13,333 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain oversight of workmanship to ensure effective installation. Ensure sufficient metering installed to facilitate ongoing consumption monitoring within residences
Measuring success	Ongoing monitoring of metered energy consumption within residences
Timing	Milestones/key dates • start date: Q1, 2011 • completion date: Q4, 2012
Notes	Key Assumptions 1. Present electrical heating energy consumption assumed to align with CIBSE typical benchmark for general accommodation 2. Assumed electricity consumption 150,000 kWh per year 3. Boiler operation assumed to be 4,500 hrs per year 4. Cost of boiler estimated at £400/kWh 5. Cost savings calculated on basis of £0.015/kWh gas price replacing existing electricity at unit cost of £0.089/kWh

Project	Photovoltaics - Hillside Residences
Reference	UOA021
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of 16 kWp PV array at Hillside Residences
Benefits	Financial savings: £1,139 CO ₂ emissions reduction: 7 tonnes of CO ₂
Funding	Project cost – 70,400 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain oversight of workmanship to ensure effective installation. Ensure installation of output and export meters to facilitate performance monitoring
Measuring success	Ongoing monitoring of metered output from array
Timing	<p>Milestones/key dates</p> <ul style="list-style-type: none"> • start date: Q1, 2011 • completion date: Q4, 2012
Notes	<p>Key Assumptions</p> <ol style="list-style-type: none"> 1. Residence roof is not overshadowed and output from 1 kWp array is 800 kWh per year 2. Cost of PV array assumed at £4,400/kWp 3. Cost savings calculated on basis of £0.089/kWh unit cost of electricity



Project	Power Perfector - voltage optimisation
Reference	UOA022
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of PowerPerfector for main campus, student centre and library buildings.
Benefits	Financial savings: £16,806 Payback period: 6.2 years CO ₂ emissions reduction: 150 tonnes of CO ₂
Funding	Project cost – 104,820 Operational costs – NA Source of funding: Salix/Capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain oversight of workmanship to ensure effective installation.
Measuring success	Ongoing monitoring of electricity consumption across relevant buildings. Monitoring of input voltage fed from Power Perfector to verify effective performance.
Timing	Milestones/key dates • <i>start date: Q1, 2011</i> • <i>completion date: Q4, 2012</i>
Notes	Key Assumptions 1. <i>Projected savings based on 2010 energy consumption figures for relevant buildings</i> 2. <i>Assumed installed system can deliver 7% saving</i> 3. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	Space reduction - Bread St demolition
Reference	UOA023
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Demolition of unheated building area
Benefits	Financial savings: £500 Payback period: NA years CO ₂ emissions reduction: 3 tonnes of CO ₂
Funding	Project cost – NA Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain working relationship with contractors
Measuring success	Ongoing monitoring of electricity consumption.
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q4, 2010</i>
Notes	<i>Key Assumptions</i> 1. <i>Cost savings calculated on basis of £0.089/kWh unit cost of electricity</i>



Project	Gable alteration insulation
Reference	UOA024
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Previously uninsulated gable wall to be insulated with combination of either 100mm of Kingspan or 300mm of Rockwool
Benefits	Financial savings: £1,775 Payback period: 6.8 years CO ₂ emissions reduction: 22 tonnes of CO ₂
Funding	Project cost – 12,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain working relationship with contractors
Measuring success	Ongoing monitoring of energy consumption
Timing	Milestones/key dates • start date: Q1, 2010 • completion date: Q4, 2010
Notes	Key Assumptions 1. Assumed gable wall area of 400 m ² 2. Assumed U value on uninsulated wall 0.6 Wm ⁻² K ⁻¹ ; assumed U value of insulated wall 0.35 Wm ⁻² K ⁻¹ 3. Thermal conductivity heat loss calculated based on 20 year average degree days for East of Scotland (2482) 4. Cost of insulation assumed at £30/m ² 5. Cost savings calculated on basis of £0.015/kWh gas price



Project	Reducing water capacity
Reference	UOA025
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Removal of a storage tank of 9 m ³ capacity. Doesn't affect consumption but increases circulation of water and should reduce the need for water treatment
Benefits	Financial savings: £ NK Payback period: NK years CO ₂ emissions reduction: NA tonnes of CO ₂
Funding	Project cost – NK Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to undertake work
Ensuring success	Maintain working relationship with contractors
Measuring success	Ongoing monitoring of energy consumption
Timing	<i>Milestones/key dates</i> <ul style="list-style-type: none"> • <i>start date: Q1, 2011</i> • <i>completion date: Q4, 2012</i>

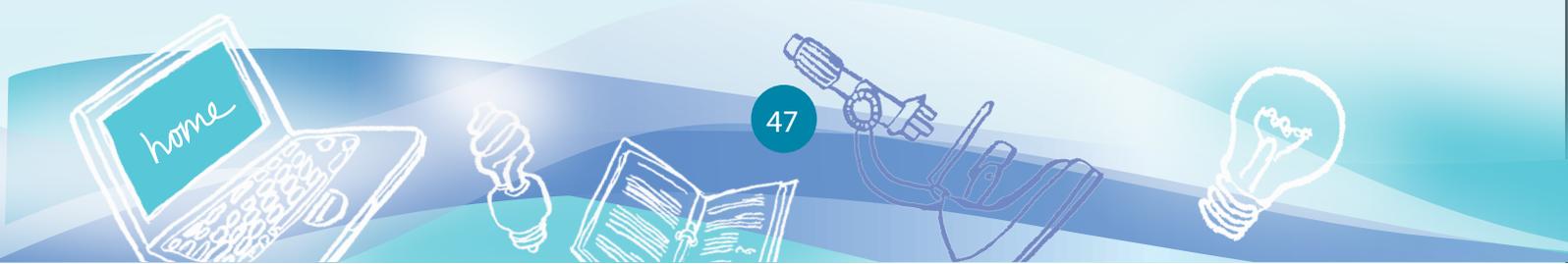


Project	Bike Boost
Reference	UOA026
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Initiatives to encourage extended use of bikes across campus
Benefits	Financial savings: £ NK Payback period: NK years CO ₂ emissions reduction: TBC tonnes of CO ₂
Funding	Project cost – TBC Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Timing	<i>Milestones/key dates</i> <ul style="list-style-type: none">• <i>start date: Q1, 2011</i>• <i>completion date: Q4, 2012</i>

Project	Cycle racks
Reference	UOA027
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Provision of up to 40 additional bike bays across campus
Benefits	Financial savings: £ TBC Payback period: TBC years CO ₂ emissions reduction: TBC tonnes of CO ₂
Funding	Project cost – TBC Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Timing	<i>Milestones/key dates</i> <ul style="list-style-type: none">• <i>start date: Q1, 2011</i>• <i>completion date: Q4, 2012</i>



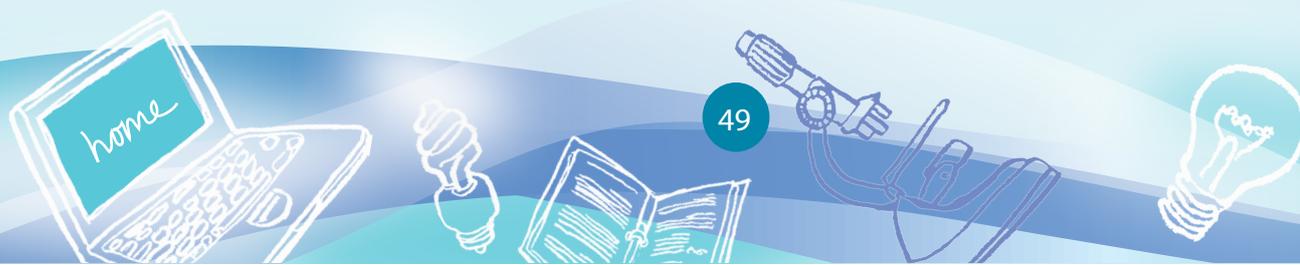
Project	Lamp replacement (LED)
Reference	UOA028
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of around 100 amps (ratings either 50 or 35 W) with 7 W fittings
Benefits	Financial savings: £821 Payback period: 0.6 years CO ₂ emissions reduction: 5 tonnes of CO ₂
Funding	Project cost – 500 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	No third party resources required
Ensuring success	Phase out of higher power rated lamps with lower energy equivalent
Measuring success	Ongoing monitoring of electricity consumption via remote monitoring system
Timing	Milestones/key dates • start date: Q1, 2011 • completion date: Q1, 2012
Notes	Key Assumptions 1. Assumed replacement of 50 lamps of 50 W rating; 50 lamps of 35 W rating 2. Assumed operating hours of 2,600 hours per year 3. Unit cost of replacement lamps assumed at £5/lamp 4. Cost savings calculated on basis of £0.089/kWh unit cost of electricity



Project	Baxter Building improvements
Reference	UOA029
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Alteration to heating system to allow local control
Benefits	Financial savings: £3,115 Payback period: 4.7 years CO ₂ emissions reduction: 6 tonnes of CO ₂
Funding	Project cost – 14,500 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to undertake work
Ensuring success	Maintain working relationship with contractors
Measuring success	Ongoing monitoring of heating energy consumption
Timing	<i>Milestones/key dates</i> • <i>start date: Q2, 2011</i> • <i>completion date: Q3, 2013</i>
Notes	<i>Key Assumptions</i> 1. <i>Assumed improved control system contributes to 7% energy saving</i> 2. <i>Savings calculated on 2009 gas consumption figure</i> 3. <i>Cost savings calculated on basis of £0.015/kWh gas price</i>



Project	BMS Zone Valves
Reference	UOA030
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of additional zone valves and BMS field wiring to temperature controls
Benefits	Financial savings: £TBC Payback period: TBC years CO ₂ emissions reduction: TBC tonnes of CO ₂
Funding	Project cost – TBC Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors to be used as required
Ensuring success	Maintain working relationship with contractors
Measuring success	Ongoing monitoring of heating energy consumption
Timing	<i>Milestones/key dates</i> • <i>start date: Q1, 2010</i> • <i>completion date: Q1, 2011</i>



Project	Quattroseal heat reflection
Reference	UOA031
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	"Quattroseal" heat reflection panels installed on external walls behind radiators (approx 50m ² of wall area)
Benefits	Financial savings: £100 Payback period: 3.1 years CO ₂ emissions reduction: 1 tonne of CO ₂
Funding	Project cost – 306 Operational costs – NA Source of funding: Salix/Capital funding Funding decision: funding to be confirmed
Resources	Third party contractors to be employed as required
Measuring success	Ongoing monitoring of heating energy consumption
Timing	Milestones/key dates • start date: Q2, 2011 • completion date: Q4, 2011
Notes	Key Assumptions 1. Manufacturer claims potential savings of 134 kWh per m ² of installed panel 2. Assume 50 m ² of panels installed 3. Coverage therefore requires 113.5 panels at a unit cost of £2.70 per panel 4. Cost savings calculated on basis of £0.015/kWh mains gas



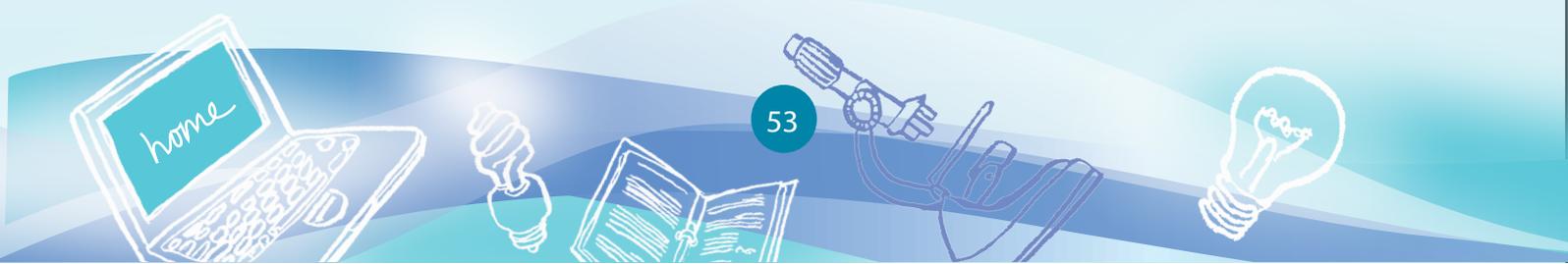
Project	Secondary Glazing (Old College)
Reference	UOA032
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of secondary glazing to supplement existing ca. 100m ² of single glazing - glass approx 6 mm thick and about 100 years old
Benefits	Financial savings: £4,473 Payback period: 6.7 years CO ₂ emissions reduction: 56 tonnes of CO ₂
Funding	Project cost – 30,000 Operational costs – NA Source of funding: Salix/Capital funding Funding decision: no funding secured at present
Resources	Third party contractors to be employed
Ensuring success	Ensure product specification includes consideration of energy efficiency rating of secondary glazing
Measuring success	Ongoing monitoring of heating energy consumption within Old College building area
Timing	<p>Milestones/key dates</p> <ul style="list-style-type: none"> • <i>start date: identified project</i> • <i>completion date: identified project</i>
Notes	<p>Key Assumptions</p> <ol style="list-style-type: none"> 1. Assume U-value of single glazing is 4.8 Wm⁻²K⁻¹; this is reduced to 2.4 Wm⁻²K⁻¹ by installation of secondary glazing 2. Thermal conductivity losses calculated on basis of 20 year average East of Scotland degree days (2,482) 3. Unit cost estimated at £300/m² 4. Area of glazing estimated at 100 m² 5. Energy cost savings based on unit price of £0.015/kWh gas



Project	Replacment of metal frame windows (North block)
Reference	UOA033
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of single glazed metal frame windows. Glazing area 400 m ² approx. 10 mm thickness dating from 1970s
Benefits	Financial savings: £10,438 Payback period: 11.5 years CO ₂ emissions reduction: 130 tonnes of CO ₂
Funding	Project cost – 120,000 Operational costs – NA Source of funding: Capital funding Funding decision: no funding in place at present
Resources	Third party contractors to be employed to carry out works
Ensuring Success	Maintain working relationship with contractor to ensure satisfactory workmanship. Ensure procurement specification for window units includes energy efficiency criterion
Measuring success	Ongoing monitoring of gas consumption
Timing	Milestones/key dates • <i>start date: identified project</i> • <i>completion date: identified project</i>
Notes	Key Assumptions 1. Assume U-value of single glazing is 3.5 Wm ⁻² K ⁻¹ ; this is reduced to 2.1 Wm ⁻² K ⁻¹ by installation of double glazing 2. Thermal conductivity losses calculated on basis of 20 year average East of Scotland degree days (2,482) 3. Unit cost estimated at £300/m ² 4. Area of glazing estimated at 400 m ² 5. Energy cost savings based on unit price of £0.015/kWh gas



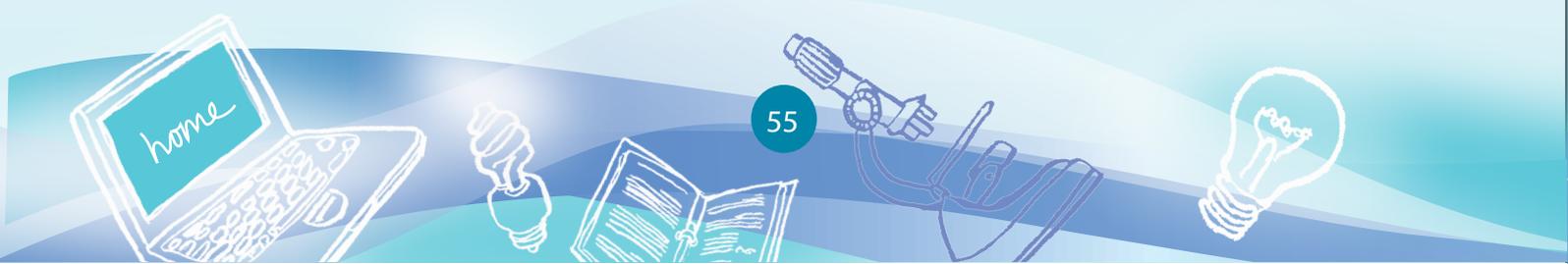
Project	Roof Space insulation (Old College)
Reference	UOA034
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Installation of 100 mm Kingspan insulation in roof space (previously uninsulated)
Benefits	Financial savings: £3,541 Payback period: 0.9 years CO ₂ emissions reduction: 44 tonnes of CO ₂
Funding	Project cost – 3,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding secured
Resources	Third party contractors used for installation
Ensuring success	Maintain oversight of works and relationship with contractor
Measuring success	Ongoing monitoring of gas energy consumption
Timing	Milestones/key dates • start date: Q1, 2010 • completion date: Q4, 2010
Notes	Key Assumptions 1. Assume U-value of uninsulated roof is $2.3 \text{ Wm}^{-2}\text{K}^{-1}$; this is reduced to $0.4 \text{ Wm}^{-2}\text{K}^{-1}$ by installation of insulation 2. Thermal conductivity losses calculated on basis of 20 year average East of Scotland degree days (2,482) 3. Unit cost estimated at £30/m ² 4. Area of glazing estimated at 100 m ² 5. Energy cost savings based on unit price of £0.015/kWh gas



Project	Lagging domestic hot water pipes
Reference	UOA035
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Apply approx 300 m of pipe lagging to 50 mm heating pipes, currently insulated with 10 mm wool type 1970s insulation
Benefits	Financial savings: £854 Payback period: 3.5 years CO ₂ emissions reduction: 11 tonnes of CO ₂
Funding	Project cost – 3,000 Operational costs – NA Source of funding: Capital funding Funding decision: funding not yet secured
Ensuring Success	Ensure good level of workmanship in application of lagging
Measuring success	Ongoing monitoring of gas consumption
Timing	Milestones/key dates • <i>start date: identified project</i> • <i>completion date: identified project</i>
Notes	Key Assumptions 1. <i>Estimated heat loss from pipe presently 30 Wm⁻¹; reduced to 8.2 Wm⁻¹ by application of lagging</i> 2. <i>Assume pipework length of 300 m is lagged</i> 3. <i>Cost of insulation estimated at £10 per metre</i> 4. <i>Energy cost savings based on unit price of £0.015/kWh gas</i>



Project	Victoria Chambers
Reference	UOA036
Owner (person)	Ian Simpson
Department	Estate and Campus Services
Description	Replacement of existing storage heaters and electric immersion hot water system with gas fired central boiler plant and plate heat exchangers for hot water supply
Benefits	Financial savings: £13,350 Payback period: 1.3 years CO ₂ emissions reduction: 54 tonnes of CO ₂
Funding	Project cost – 16,667 Operational costs – NA Source of funding: Capital funding Funding decision: funding not yet secured
Ensuring success	Ensure specification of works includes minimum energy efficiency performance criteria
Measuring success	Ongoing monitoring of electricity consumption pre and post installation
Timing	Milestones/key dates • <i>start date: identified project</i> • <i>completion date: identified project</i>
Notes	Key Assumptions 1. <i>Present electrical heating energy consumption assumed to align with CIBSE typical benchmark for general accommodation</i> 2. <i>Assumed electricity consumption 150,000 kWh per year</i> 3. <i>Boiler operation assumed to be 4,500 hrs per year</i> 4. <i>Cost of boiler estimated at £400/kWh</i> 5. <i>Cost savings calculated on basis of £0.015/kWh gas price replacing existing electricity at unit cost of £0.089/kWh</i>



University of Abertay Dundee
Carbon Management Plan

CMP 2011 - 2016

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