Aston University
Carbon Management Plan

Date: September 2010
Author: Environment and Sustainability Team

Contents

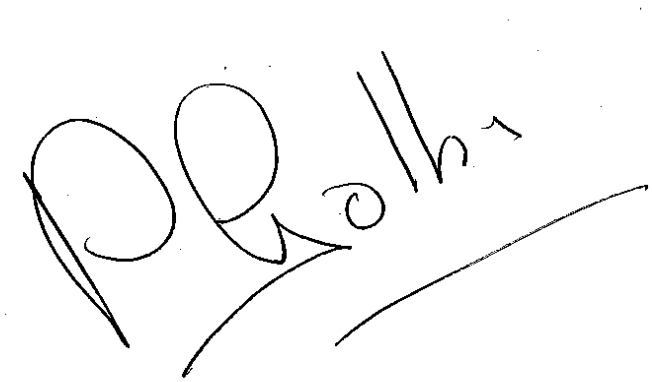
Endorsement by the Vice Chancellor, Professor Julia King and Pro Chancellor and Chair of Council, Dr Paul Golby.

The future of the environment is the responsibility of all of us, both collectively and individually. The products we buy, the journeys we make, the actions we take all impact on the world around us, and it is vital that we all make a real effort to reduce the damage we are doing to the environment.

The Government's Climate Change Act 2008 sets legally binding targets for the UK to reduce CO_2 emissions by least 34% by 2020 and by at least 80% by 2050 from 1990 levels.

Aston University has robust plans in place to meet the 2020 target at institutional level. The University has set itself a stretch target of 53% by 2020 (from 2005/6 base year) in line with our Aston 2020 University Strategy where sustainability forms one of our eight high level objectives.

Professor Julia King, Vice Chancellor



Dr Paul Golby, Pro Chancellor and Chair of Council

Executive Summary

Set out here is Aston University's Carbon Management Plan, the strategy to reduce the University's emissions over the period to 2020/21. This plan has been approved by the University's Vice-Chancellor and Chair of the governing body, Council.

The University's carbon footprint in 2005/6 for scopes 1 and 2 (covering the direct combustion of fuels on site, fuel use by owned fleet, electricity and heat purchased) was 16,965 tonnes CO_{2e}. The implementation of this plan will enable an absolute reduction in this footprint of 48% by 2020/21, compared to the 2005/6 base year, excluding residences. A stretch target of 53% has also been set with its delivery dependent upon resource availability. The University will work to establish a baseline for all scope 3 emissions sources (all other indirect emissions) by 2012 and set targets for reduction by 2013.

For scopes 1 and 2, the data shows that the University has already reduced its carbon emissions per FTE (staff and students) by 8% between 2005/6 and 2008/9.

This plan identifies a set of projects which, when implemented, will enable the University to reduce its emissions by approximately 1,837.9 tonnes of CO_{2e} pa with 1,554.6 tonnes of CO_{2e} already saved through projects implemented since 2005/6. Further, account has been taken of Aston University Estates Strategy 2009-19 which will deliver significant carbon reductions, estimated to be 1,172.5 tonnes of CO_{2e} pa by 2020/21. Also set out is the strategic fit and measures planned to engage stakeholders to ensure successful achievement of the carbon reduction target.

Achievement of this plan is estimated to result in financial savings of about £303,000 pa by 2020/21 at current energy costs. Implementation of the new projects identified is currently estimated to involve capital costs of about £130,000.

The delivery of this plan will be led by the Environment and Sustainability team and the plan will be under the scrutiny of the Sustainable Aston Working Group, which meets monthly. The Sustainable Aston Working Group will include a review of the plan as part of its existing annual review process at the start of each academic year. Progress will be reported to the University Council and key performance indicators will be published for carbon reduction.

Engagement across the University will be necessary if the carbon reduction target associated with this plan is to be met and implementation successful. Engagement is also important if the University is to achieve its role of successfully educating its students about the importance of these issues.

Climate change presents the global challenge of decoupling economic growth from growth in carbon emissions. This plan aims to decouple our future growth in staff & student numbers and turnover from growth in our carbon emissions.

1. Introduction

The purpose of this carbon management plan is to ensure that the University undertakes the necessary actions to measure, reduce and monitor its carbon emissions. It outlines how the changing campus will impact upon the carbon footprint and how activities to raise awareness will also produce changes in working practice and reduce emissions.

1.1 Context and drivers for carbon management

The Stern Review on the Economics of Climate Change states that, globally, as a result of the growing concentrations of greenhouse gases in the atmosphere, climate change threatens severe consequences including flooding, drought, population displacement and ecosystem destruction. The benefits of strong, early action far outweigh the costs. The UK Government has led the way by setting legally binding targets through the Committee on Climate Change for reductions in UK CO_2 emissions of 34% by 2020 and 80% by 2050 against a 1990 baseline. To achieve these targets various legislative drivers have been introduced, these are:

1. Future Funding

The Department for Education and Skills mandated HEFCE to promote sustainable development actively and to reflect it in the capital funding allocation for Universities. HEFCE has therefore committed the Higher Education sector to Government targets for scope 1 and scope 2 emissions and recommends that Universities aspire to achieve reductions beyond this. HEFCE also asked Universities to commit to making reductions in scope 3 emissions.

These requirements are being reviewed through HEFCE's second Capital Investment Framework which now requires that Universities have carbon management plans and that they can demonstrate an absolute or relative reduction in scope 1 and 2 carbon emissions in the period from either 1990 or 2005, to 2008. Also, Universities should be able to identify projects that will produce an absolute reduction in carbon emissions by 2020.

2. EU Energy Performance of Building Directive (EPBD)

This came into force on 4th January 2006 and sets out to 'promote the improvement of the energy performance of buildings within the EU through cost effective measures' and to 'promote the convergence of building standards towards those Member States which already have ambitious levels' implemented through specific measures and standards in the UK.

There is a set methodology for calculating the energy performance of buildings, the introduction of regular inspections of cooling, heating and boiler installations, a set of performance standards applicable to both new and existing buildings, and a certification scheme for both new and existing buildings, with larger public buildings (over 1000m2) required to show a display energy certificate (DEC) in a prominent position within the building. The DEC must be renewed annually.

3. Carbon Reduction Commitment (CRC)

Since April 2010 any organisation that consumed more than 6,000 Mega Watt hours of half hourly monitored electricity during 2008 has been legally obliged to participate in the CRC, the Government's new carbon trading scheme. However, due to the University's partnership with the Birmingham District Energy Company (BDEC) it is thought that the University will drop out of the scheme in 2013.

4. Climate Change Levy (CCL)
This is payable on all gas and electricity consumption, with supplies from low and zero carbon technologies being exempt (such as the electricity from the good quality Combined Heat and Power supplied from BDEC).

5. Building Regulations – Part L
This set out requirements for improved energy efficiency and the effective control of buildings and associated plant, applying to both new buildings and refurbishments.

6. Road Transport
The King Review reported in 2007 on the scale and options for vehicle and fuel technologies which, over the next 25 years, could help to 'decarbonise' road transport, particularly cars. It made policy recommendations to enable both short and long term carbon reduction in the vehicle fleet. It also emphasised the need to move from measurement of tail pipe emissions to life-cycle emissions and include the assessment of their overall sustainability.

7. Waste Management
There are currently numerous policy levers such as site waste management plans, the landfill tax escalator and the need to manage Waste Electrical & Electronic Equipment and batteries. These are designed to drive the management of waste up the "waste hierarchy". The waste hierarchy prioritises: Waste Reduction; followed by Reuse; Recovery (recycling, composting and energy from waste); then disposal in landfill as the least preferred option.

There are other significant non-legislative drivers for the University:

1. Sustainability policy and implementation
The University has adopted a sustainability policy and to meet this commitment, it is necessary to raise awareness and educate staff, students and visitors on these issues. The University has ensured that embedding sustainability into research and curriculum is being developed; measures to achieve this are included in this plan in section 6.3. These measures further ensure that the reputation of the University is maintained which contributes to the appeal for future recruitment of both students and staff.

2. Value for money
As the public sector finances tighten, it is important that efficient use of public funds is made and cost savings are made wherever possible. Many carbon reduction measures correspond to efficiency improvements, yielding cost savings.

3. Volatility of the energy markets and security of supply
Over recent years the energy market has become increasingly volatile due to risks to security of supply and the underlying trend is for the costs to rise. In order to manage this risk, it is necessary to ensure that all energy is used as efficiently and effectively as possible.

1.2 Current achievements

Aston University adopted its first carbon management plan in 2008/9. Targets were set to reduce emissions from energy use, staff and student travel, water and waste. This document provides an update to that plan.

To date many carbon reduction measures have been implemented across the University, including:

- **CHP:** The University utilises the heat and electricity provided by BDEC through a centralised provision of natural gas fuelled Combined Heat and Power (CHP) plant via a district heating system.

- **Awareness raising:** Aston signed up to the national 10:10 campaign, committing to reducing its carbon emissions from energy and transport by 10% during 2010. To achieve this staff are being encouraged to participate in the first Aston Go Green Awards and students to sign up to the Student Switch Off campaign in halls of residence.

- **Energy surveys:** These resulted in variable speed drives being fitted to pumps, fans, etc where feasible throughout the University's plant rooms.

- **Lighting refurbishments:** A rolling programme of lighting refurbishments has replaced old lighting with high efficiency, high frequency fittings and smart fittings where feasible. T12 fluorescent tubes have been replaced and T8 tubes replaced with T5 where possible, including use of retrofit conversion kits. Sensors to control the lighting have been installed in some areas. Further fans and lights have been linked to motion sensors as part of toilet refurbishments.

- **ICT:** Energy efficient settings have been enforced across the University's computers and student PC labs now are set so that they power off if they have not been used for 30 minutes.

- **Refrigeration:** Savawatt devices have been introduced to reduce the power consumption of all fridges and freezers in catering, residences and research areas.

- **Insulation:** Many projects to insulate pipework have been undertaken including repair and replacement of existing insulation.

- **Windows:** Replacement of old metal frame windows with new double glazed units has commenced in the Main Building.

- **Air conditioning:** Procedures have been introduced in Estates stores so that portable heating and air conditioning units for comfort cooling cannot be introduced without being reviewed by the Estates Department. This allows alternative mitigation measures to be considered.

These achievements, amongst others, have been recognised by the People & Planet Green League, where the University came 5th out of over 130 universities in 2010.

1.3 Scopes of emissions

There are generally three scopes of emissions referred to according to the Greenhouse Gas Protocol Initiative, "A Corporate Accounting and Reporting Standard"[1] as:

[1] Produced by the World Resources Institute and World Business Council for Sustainable Development, available from http://www.ghgprotocol.org/files/ghg-protocol-revised.pdf

Scope 1: Direct emissions produced from sources that are owned or controlled by the University. This covers the combustion of fuels – such as natural gas, oil and fuel used by the vehicle fleet. Also covered are fugitive emissions such as refrigerants from air conditioning systems.

Scope 2: Indirect emissions caused through purchase of electricity and heat.

Scope 3: Covers all other indirect emissions which are a consequence of the activities of the University, but occur from sources it does not own or control. For example waste disposal, water supply, business travel, staff/student commuting and procurement of goods and services.

It is also important to note that as a University, Aston's teaching and research has a role to play in reducing emissions produced by a third party but influenced by the University's knowledge.

1.4 Target for emissions reduction

The strategic aim is to decouple growth in staff/student numbers or income from the University's carbon footprint, i.e. to grow the University without growing emissions.

Using the Climate Change Act targets as a benchmark and considering HEFCE's carbon reduction target and strategy, the University has chosen a target based on 2005/6 baseline, excluding its residences, of 48% by 2020/21 and an intermediate target of 32% by the end of academic year 2014/15[2]. A stretch target of 53% has also been set with its delivery dependent upon resource availability. From academic year 2009/10, the University residences are no longer under the University's direct financial control, so are they excluded from this plan. These carbon reduction targets are absolute and include all of the Scope 1 and 2 carbon emissions listed in the baseline section 2.3. This target has been approved the University's Vice-Chancellor and Chair of the University Council.

At present the University does not have robust data on carbon emissions arising from fugitive emissions or procurement. Work will be done to establish a baseline for all scope 3 emissions sources by 2012 and set targets for reduction by 2013.

[2] The target of a 48% reduction by 2020/21 compared to a 2005/6 baseline is considered by HEFCE to be the equivalent, for the HE sector, of a reduction of 34% by 2020 compared to a 1990/91 baseline, which is the current UK target.

2. Carbon emissions baseline (scopes 1 and 2) and projections

Sources of carbon emissions for scopes 1 and 2 were identified and data obtained to quantify them where possible; allowing the University to compile a baseline carbon footprint. The effect of the known estate changes was then included in projections of the likely future carbon emissions. Further, the effect of reducing emissions to meet the reduction target was then evaluated providing an estimate of the value at stake to the University if the target is to be achieved.

2.1 Sources of data

Appendix A summarises the sources of data and emissions factors used to produce the carbon footprint. The emissions factors are taken from 2009 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting. They are broken down by scope of emissions.

Fugitive emissions sources (such as refrigerants) have not been included in this data. Further work will be undertaken as described in section 6.2 to ensure that data is collected so that in future a more complete footprint can be compiled.

2.2 Assumptions

The University is planning to refurbish and in some cases replace its buildings over the period of this carbon management plan. Figure 1 summarises the assumptions made regarding estate changes (excluding residences), using information taken from the University's Estate Master Planning Study and Aston University Estate Strategy 2009-19:

Figure 1

Year	Buildings expected to close	Buildings expected to open	Total floor area (Net Internal Area m^2)	Estimated change in emissions* (tonnes CO_{2e} pa)
2010	-	Aston Brain Centre EBRI	88,499	**149.6 net increase**
2011-15	Chemical Engineering Building Gem Sports Hall South Wing	Woodcock Sports Centre extension.	76,971	**1,058.9 net decrease**
2016-20	North Wing Student Guild	BCU New Building New Students Guild	79,951	**1,172.5 net decrease**

*Based upon latest Display Energy Certificate consumption energy benchmarks.

The table shows that the changes planned in the Estates Strategy are anticipated to deliver net reductions on emissions over the period of this plan.

The University, as of academic year 2009/10, no longer has direct financial control over its residences. The emissions from residences are therefore included in the 2005/6 and 2008/9 baselines but excluded from the predicted emissions and targets through to 2020/21.

2.3 Baseline carbon footprint

The baseline carbon footprint for academic year 2005/6 was 16,964 tonnes of CO_2. This was dominated by emissions from purchased electricity, comprising 63% total emissions, as shown in Figure 2 below.

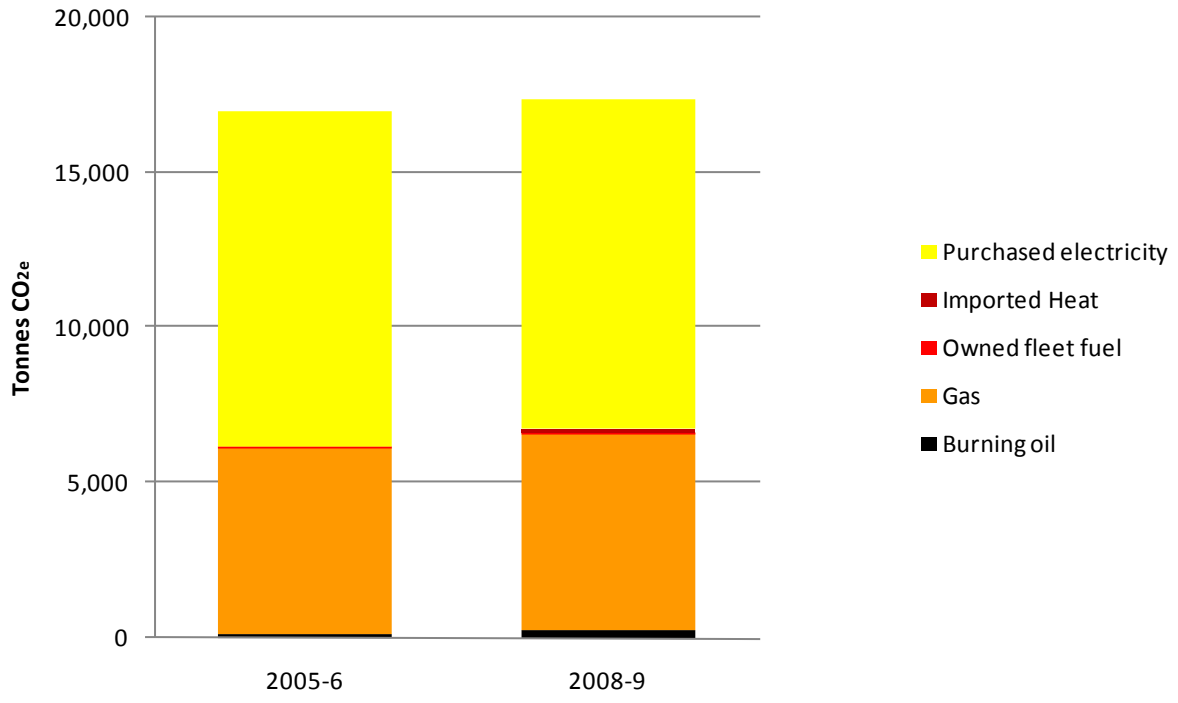
The carbon footprint in academic year 2008/9 was 17,355 tonnes CO_2. There was a small, absolute reduction (18 tonnes) in scope 2 emissions compared with 2005/6, but emissions were similarly dominated by electricity purchase.

Figure 2

		Tonnes CO2e		% of total	
		2005-6	**2008-9**	**2005-6**	**2008-9**
Scope 1: Direct emissions	Burning oil	114	270	0.67%	1.55%
	Gas	6,084	6,333	35.86%	36.49%
	Owned fleet fuel	7	10	0.04%	0.06%
	Total Scope 1	**6,204**	**6,613**	**36.57%**	**38.10%**
Scope 2: Electricity and indirect emissions	Imported Heat	-	141	-	0.81%
	Purchased electricity	10,760	10,602	63.43%	61.09%
	Total Scope 2	**10,760**	**10,742**	**63.43%**	**61.90%**
TOTAL		**16,964**	**17,355**	**100.00%**	**100.00%**

Figure 3 below illustrates the detailed composition of the baseline 2005/6 and the 2008/9 carbon footprint:

Figure 3



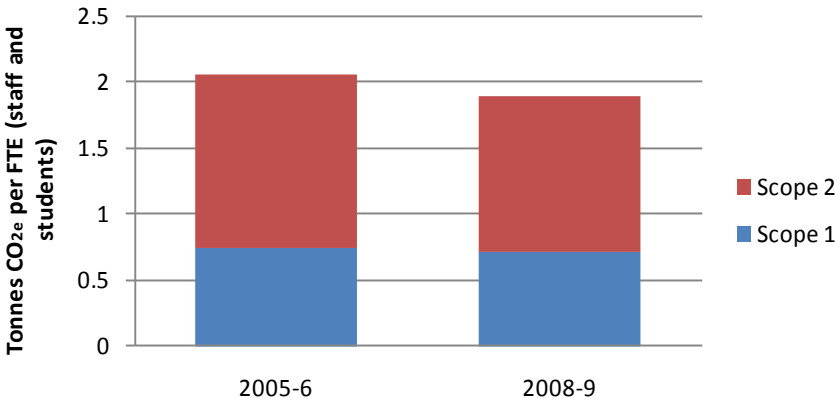
There has been a small increase (391 tonnes CO_{2e}) in scope 1 and 2 emissions between 2005/6 and 2008/9. Over this time period, combined full-time equivalent staff and student numbers have also increased as shown in Figure 4 below:

Figure 4

Year	Student FTE (from EMS D4 C1)	Staff FTE (from D5 C1)	Total
2005/6	7,152	1,112	8,264
2008/9	8,039	1,173	9,212

Over this period the University's total income also grew by 28%, from £76,812,000 to £97,972,000 (data taken from HESA). Figure 5 below illustrates the carbon footprint, by scope, per staff and student FTE. It shows that when the emissions are corrected for the growth in student numbers that they have in fact reduced by 8% (for scope 1 and 2 emissions) between 2005/6 and 2008/9.

Figure 5



The carbon footprint can further be broken down into contributions from Residential and Non-Residential sources as shown in Figure 6 below:

Figure 6

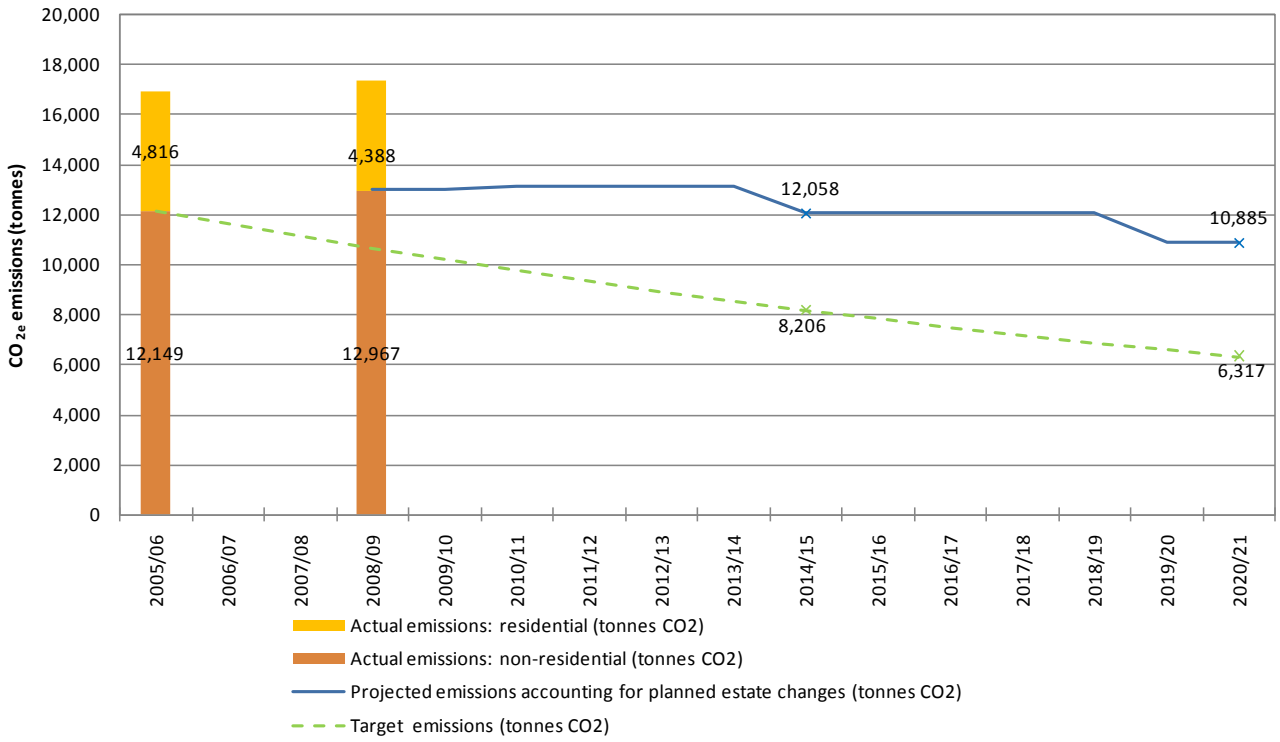
	Residential	Non-Residential	Total
Scope 1 & 2 (2008/9)	4,388	12,967	17,355

The residences comprised 25.3% of scope 1 & 2 emissions in 2008/9.

2.4 Emissions Projections

Figure 7 below illustrates the projected carbon emissions for scopes 1 and 2 to 2020:

Figure 7

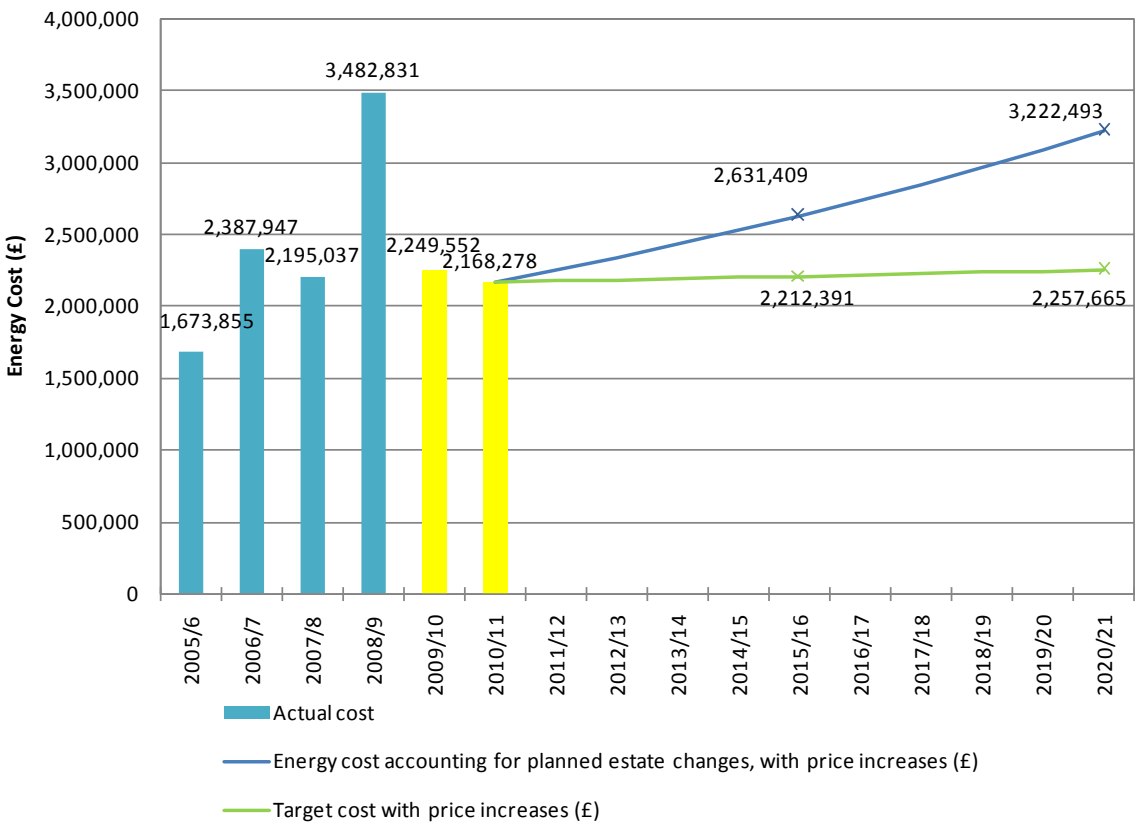


This shows that the University's emissions have increased from 2005/6 to 2008/9. A baseline, depicting the projected emissions which only accounts for the planned estate changes is then shown in which the emissions in 2020/21 would be lower than in 2005/6 at 10,437 tonnes CO_{2e} per annum. Finally, the trajectory that the target emissions (for achieving a 48% reduction by 2020/21 compared to a 2005/6 baseline) should aim to follow is shown. Achieving this would require a reduction of 8,143 tonnes CO_{2e} per annum compared to the 2005/6 baseline by 2020/21. Achieving the stretch target of 53% would require a reduction of a further 607 tonnes CO_{2e} to 5,710 CO_{2e} per annum.

2.5 Value at stake

Data provided in the Estates Management Statistics for total energy cost was used to provide the cost data for 2005/6 to 2008/9. Estimated consumption, unit prices and fixed charges known for 2009/10 and 2010/11 were used to provide the cost data estimates for this period. To produce the cost profile associated with the carbon footprint account was taken of the fixed charges and then an increase of 5% per annum was assumed from 2010/11 prices. The effect of these changes in the estimated energy costs over the period of the plan is summarised in Figure 8 below. This shows that by 2020/21 if no action is taken the cost, accounting for planned estate changes only, is estimated to be about £3.2 million per annum. If the target reductions in carbon emissions are achieved, then by 2020/21 this is estimated to correspond to a cost saving of approximately £965k per annum, almost stabilising energy costs.

Figure 8



3. Scope 3 emissions

The effect of emissions from scope 3 sources, i.e. not from energy use on site or from owned fleet, is an important part of developing an understanding of the University's emissions sources. Typically scope 3 emissions will form a substantial proportion of an organisation's carbon footprint. Described below are the steps being undertaken by the University to quantify its scope 3 emissions and the activities which are reducing these emissions.

3.1 Sources of data

Appendix B summarises the sources of data and emissions factors used to produce the initial estimate of the scope 3 carbon footprint. The emissions factors are taken from 2009 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting.

There are sources of emissions which are not covered in this data. These are related to the procurement of goods and services. Further work will be undertaken as described in section 6.2 to ensure that data is collected so that in future a more complete footprint can be compiled.

3.2 Scope 3 carbon footprint

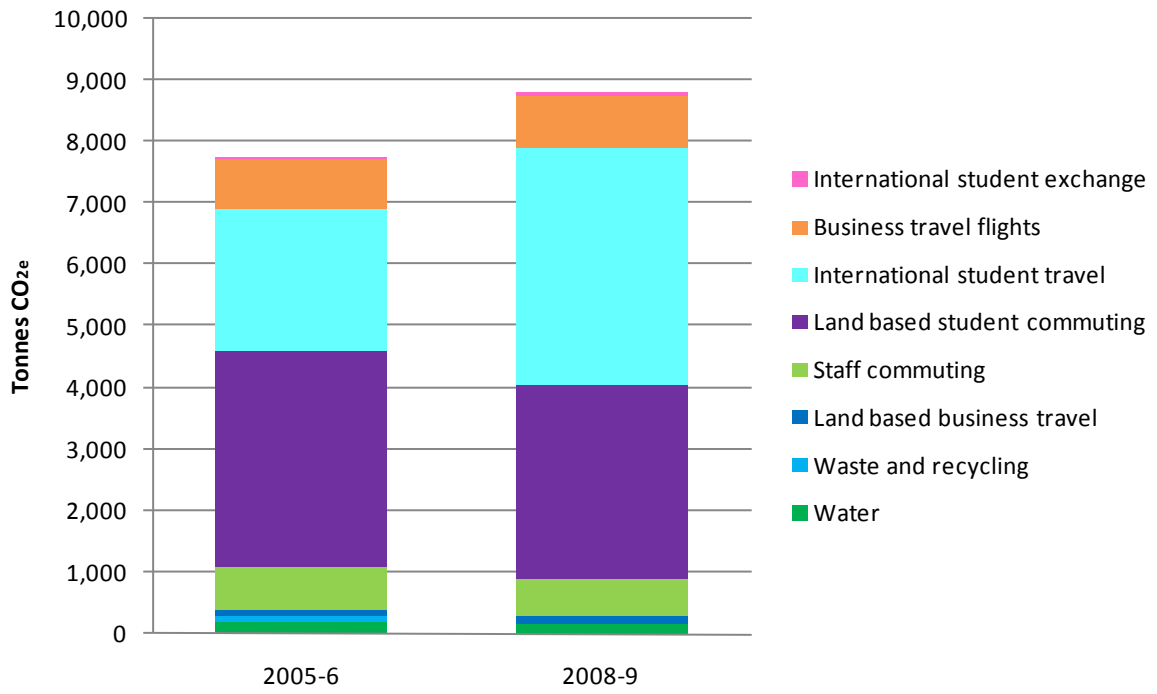
The initial estimate of the scope 3 carbon footprint for academic year 2005/6 was 7,737 tonnes of CO_2. The most significant sources of emissions were land based student commuting followed by international student travel. The estimated footprint in academic year 2008/9 was 8,769 tonnes CO_2. The increase between 2005/6 and 2008/9 is mainly due to the increase in emissions from international student travel.

Figure 9

	tonnes CO2e		**% of total**	
	2005/6	**2008/9**	**2005/6**	**2008/9**
Water	179	165	2.3%	1.9%
Waste and recycling	113	-32	1.5%	-0.4%
Land based business travel	109	128	1.4%	1.5%
Staff commuting	694	597	9.0%	6.8%
Land based student commuting	3,489	3,170	45.1%	36.1%
International student travel	2,315	3,858	29.9%	44.0%
Business travel flights	820	820	10.6%	9.3%
International student exchange	18	64	0.2%	0.7%
Total scope 3	**7,737**	**8,769**	**100.0%**	**100.0%**

Figure 10 below illustrates the detailed composition of the baseline 2005/6 and the 2008/9 carbon footprint:

Figure 10



3.3 Scope 3 reduction measures

A range of measures aimed at reducing the impact of the University's scope 3 emissions have been planned and are described below. Further measures, covering additional areas such as procurement will be developed and their savings quantified as this plan progresses.

Sustainable Transport

The University has committed to sustainable transport, through both its Travel Plan and updated Transport Action Plan. It also has set up an Aston Bicycle Users Group which has been championing cycling for many years. Travel survey results have shown that more staff and students are cycling, walking and using public transport. The University will continue to promote this, running events throughout the year such as regular bike sales to raise awareness and offering deals and discounts to staff and students. Staff can benefit from the Cycle to Work scheme and discounted public transport tickets. The savings from these measures have been estimated as 195.7 tonnes CO_{2e} assuming that there is a 5% reduction in land transport through modal shift.

As some travel is inevitable in the operation of the University, further investigation into the feasibility of setting up of an offsetting fund, managed by the University to proportionately reduce the estate's emissions will be undertaken.

Waste and Recycling

One of the upcoming targets is to achieve zero waste to landfill by 2012. This is estimated to save 27.1 tonnes CO_{2e}. Recycling facilities are now available for paper, glass, cans, cardboard, plastic bottles, batteries, textiles and mobile phones. An in-vessel composter is used to treat food and green waste. Other waste minimisation techniques adopted include the "Mug for life" which has reduced the need for paper cups and Conference Aston have installed an on-site plant to bottle their own water.

Water

As refurbishments are undertaken and also for new buildings the University will ensure that water efficient devices are included.

4. Carbon reduction projects

A range of carbon reduction projects have been identified and their effect on the carbon footprint has been quantified. Further areas for investigation which are likely to lead to carbon reduction projects are also detailed.

This implementation plan is based on the carbon hierarchy:

- Reduce energy demand
- Improve energy efficiency
- On-site or near site renewables
- Offsetting and green tariffs.

The savings assume:

- Electricity supplied at 4.790p/kWh excluding VAT and CCL. There is an additional fixed standing charge which is not assumed to be reduced;
- Heat supplied at 2.980p/kWh excluding VAT and CCL. There is an additional fixed standing charge which is not assumed to be reduced; and
- Gas supplied at 1.773 p/kWh excluding VAT and CCL.

4.1 Projects

Figure 11 below summarises the carbon reduction projects identified. Further details are provided in Appendix C.

Figure 11

Ref.	Project	Cost (£)		Annual savings		Payback period (years)	Implementation year
		Capital	Revenue	Financial (£)	CO_{2e} (tonnes)		
1	No or low cost energy saving projects (less than £2,000)	7,000	-	35,853	341.0	0.2	By 2014/15
2	Salix eligible carbon reduction projects (implemented)	70,691	-	80,666	419.0	0.9	2009/10
3	Fridge controls and lighting upgrades (implemented)	60,494	-	18,328	209.6	3.3	2009/10
4	Salix eligible carbon reduction projects	41,900	-	15,466	140.0	2.7	2010/11 onwards
5	Other capital investment energy saving projects	81,000	-	20,223	211.6	4.0	2010/11 onwards
6	Awareness measures	*	10,000	21,000	648.0	-	2009/10 onwards
7	Space utilisation measures	**	-	30,813	257.3	-	2020/21
8	Sustainable ICT measures	**	-	**	240.0		2020/21
10	Savings from BDEC CHP (implemented)	- ***	487,744 ***	81,000 ***	926.0	-	2009/10
Total		**1,99,004**	**497,744**	**303,349**	**3,392.5**	**-**	**-**

* Costs for improving Automatic Meter Reading should be included but not yet available.

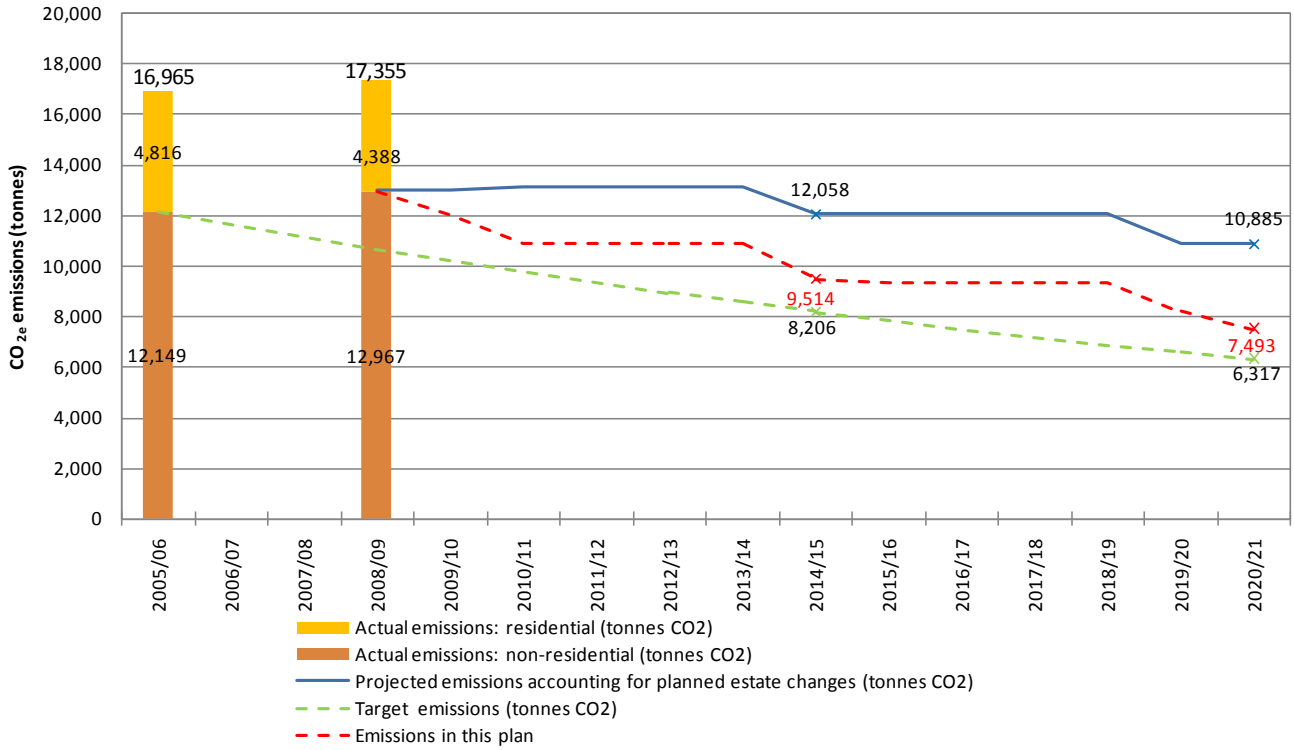
** Details to be confirmed.

*** Funded via a 25 year contract through annual management charge. Revenue cost is for 2009/10 and financial savings are the 5% saving in unit price below market rate.

4.2 Effect on the carbon footprint

The effect of the projects outlined in section 4.1 on the projected carbon footprint from section 2.4 has been calculated. This is shown in Figure 12 below:

Figure 12



The above figure shows that through the projects already quantified, the University should be able to deliver 80% of its target to reduce emissions by 48% by 2020 (72% of its stretch target of 53%). Initial estimates have been made for savings from the following and these will require more detailed review on an ongoing basis to ensure their continued accuracy:

- Awareness raising and behaviour change
- Sustainable ICT measures
- Space utilisation

The carbon reductions also correspond to estimated cost savings of £303,349 per annum by 2020 and will reduce exposure to energy market volatility. However, as the University is not able to control the emissions associated with the purchase of grid electricity there remains a risk that these may rise in future, which would potentially affect the achievement of this plan.

4.3 Areas for further investigation

There is potentially scope for significant carbon reduction through implementation of renewable opportunities. This will require further detailed feasibility studies to ensure the best approach is taken as there will be significant capital investment required for implementation. Potential opportunities (which may together save over 1,000 tonnes CO_{2e} pa) are:

- Options for installing 1MW of Wind turbine capacity.

- Vision Sciences Building: local generation of electricity and possibly hot water (basic biomass CHP system) at the Vision Sciences Building.

- Conference Centre / Aston Business School: local generation of electricity and possibly hot water (basic biomass CHP system) at the Aston Business School Building.

- Opportunities for installation of air source heat pumps.

In the light of these additional areas for investigation, and that new carbon reduction projects are likely to be initiated by 2020, the University's 2020 target appears achievable.

5. Plan financing

An essential part of the success of the carbon management plan is the provision of sufficient financing to allow the carbon reduction projects to succeed in their implementation. Here the Salix fund is explained together with the approach that will be used to fund projects that do not fall within its criteria and deliver other resource requirements.

As well as quantified benefits there are additional benefits which cannot be measured in terms of reduced emissions or cost savings. These are:

- enhanced reputation;
- improved building comfort for staff and students; and
- stabilisation and reduction in energy costs.

5.1 Salix funding

The University has a revolving fund of £270,000 from Salix/HEFCE Revolving Green Fund which will be used on energy saving projects across campus.

5.2 Funding non-Salix projects

The University has established procedures in place to fund capital investment projects. The University will ensure that appropriate business cases are developed and submitted for approval so that this route can be used to fund the projects requiring capital investment not covered by Salix funding.

5.3 Other resource requirements

The University will ensure that it achieves the target carbon reduction through ensuring successful delivery of projects. A necessary part of this is also ensuring that there is sufficient staff time available to implement the projects. The additional needs are:

- recruitment of a dedicated Energy Manager;

- staff time from Environment and Sustainability team to help coordinate delivery of the plan.

6. Embedding carbon reduction

The University will ensure that the carbon reduction target is achieved by embedding carbon reduction across policy, procedures and endeavouring to reflect a low carbon culture in all activities. To this end, current practice has been reviewed and the areas for action are presented below.

6.1 Strategy

This carbon management plan is supported by existing University policies and strategies. The University's strategic aim is to decouple growth in staff/student numbers or income from the carbon footprint, i.e. to grow the University without growing emissions. This plan will sit alongside the overarching Sustainability Policy, as well as the Environment Policy. In addition there are existing strategies covering waste management, sustainable transport and sustainable procurement. These will be updated, where required, in light of this plan.

This Carbon Management Plan makes a commitment to meet and exceed Climate Change Act targets for carbon reduction. This policy is backed by the University's Estates Strategy which sets a trajectory for sustained reductions in carbon emissions that exceed the Climate Change Act carbon reduction targets of 34% by 2020 and 80% by 2050.

6.2 Delivery

Leading the implementation and dissemination of the Carbon Management Plan will be the responsibility of the Environment and Sustainability Team. Many of the projects outlined in section 4 will be the responsibility of the Estates department, although all aspects of the University must ultimately be involved for the plan to be successful. The Environment and Sustainability Team will be responsible for coordinating data collection and management for the plan.

The Sustainable Aston Working Group is an interdisciplinary group of academics, student representatives and support staff, nominated by their departments. This is an evolving plan and will also be under the scrutiny of the Sustainable Aston Working Group, which meets monthly. The plan will be reviewed annually by the Sustainable Aston Working Group as part of its existing annual review process at the start of each academic year.

Progress with the plan will be reported to the Governing Body and key performance indicators will be published, including new ones covering carbon reduction. The review will cover the cost and all benefits:

- CO_2 savings and achievement against the target reductions;
- financial savings;
- less quantifiable benefits, such as raising awareness and other achievements.

The review will assess the current level of progress for each carbon reduction project against its planned level of achievement. A register of progress will be maintained for the projects ensuring that problems can be addressed in a timely manner. In addition, any further measures to deal with unforeseen events or to mitigate any significant risks to the plan will also be addressed in the review to ensure that the plan remains on track to achieve its target emissions reduction. The results of the review will be reported by the Pro Vice Chancellor representing the Sustainable Aston Working Group to the University's Executive and from there to Council, as required.

A Sustainable Procurement Strategy will be developed and included in this plan through the activities of the Sustainable Procurement Working Group. Similarly, fugitive emissions sources will be quantified by estates staff and included in the plan.

6.3 Stakeholder engagement

The University already has in place a wide range of measures developed to communicate with, engage and ultimately change the behaviour of its stakeholders to more sustainable practices. The main areas for action so far are:

- sustainability teaching;
- sustainability research;
- Eco Campus;
- Aston Go Green awards;
- Student Switch off.

Behavioural change requires many and varied approaches and to be continually refreshed. It is anticipated that over the period of this plan new approaches will be developed to engage with, for example, harder to reach groups and high energy users. Also the need to customise advice to different stakeholders, reflecting their concerns, is recognised.

It is already planned that new training, on the need to reduce carbon emissions and the practical actions that can be taken, will be developed so that it can be incorporated into staff and student induction processes.

In more detail the areas for continuing action are:

1. Sustainability in teaching

Teaching and learning are crucial to inspire and educate the next generation of decision makers, business leaders and citizens, and equip them with the skills and knowledge to deal with the challenges of climate change. Research and innovation helps us to understand the many facets of climate change and will be central to developing ideas and technologies to mitigate and adapt to a changing climate.

A survey has shown that there are a range of relevant modules on offer within all Schools, and from this a Directory of Sustainability Related Modules has been compiled. A strategy for embedding relevant aspects of sustainability into all of Aston’s taught programmes is currently under consideration. It is hoped that in 2011 the University will be ready to launch both Undergraduate and Postgraduate programs focused on sustainability and social responsibility.

Aston has signed the People & Planet Green Education Declaration, which recognises the key role of the education sector in addressing the challenge of climate change and making the transition to a low carbon economy and society.

2. Sustainability Research

There are some well established and internationally recognised areas of sustainability research at Aston, with the most prestigious being the Aston Bio-Energy Research Group (BERG). Elsewhere within the School of Engineering and Applied Science, under the umbrella of the Sustainable Environment Research Group, there are a wide range of activities, covering such diverse fields as

water resource management, remote sensing and GIS, biodiversity and business, renewable energy and sustainable procurement.

Individuals are working on aspects of sustainability within both the Aston Business School and the School of Languages and Social Sciences. In the former, the Operations and Information Management and the Finance, Accounting and Law Research Groups in particular both publish in the field, as does the Centre for Research in Social and Political Sciences (CRSPS) in the latter.

Aston University is also the home of the Centre for Sustainability and Innovation, a multidisciplinary initiative which brings together researchers from all the Schools across the University to stimulate and develop research that focuses on the vital and current issues of innovation and sustainability. The aim of this Centre is to identify and promote relevant ideas for future collaborative research.

3. Eco Campus

Aston University has signed up to take part in Eco Campus, an environmental management system specifically designed for Universities and equivalent to ISO14001. The scheme is a 3 year program designed to help improve environmental performance.

The system is based on 4 tiers - bronze, silver, gold and platinum. Aston received its Bronze award in March 2010, and plans to achieve the Platinum award by November 2011.

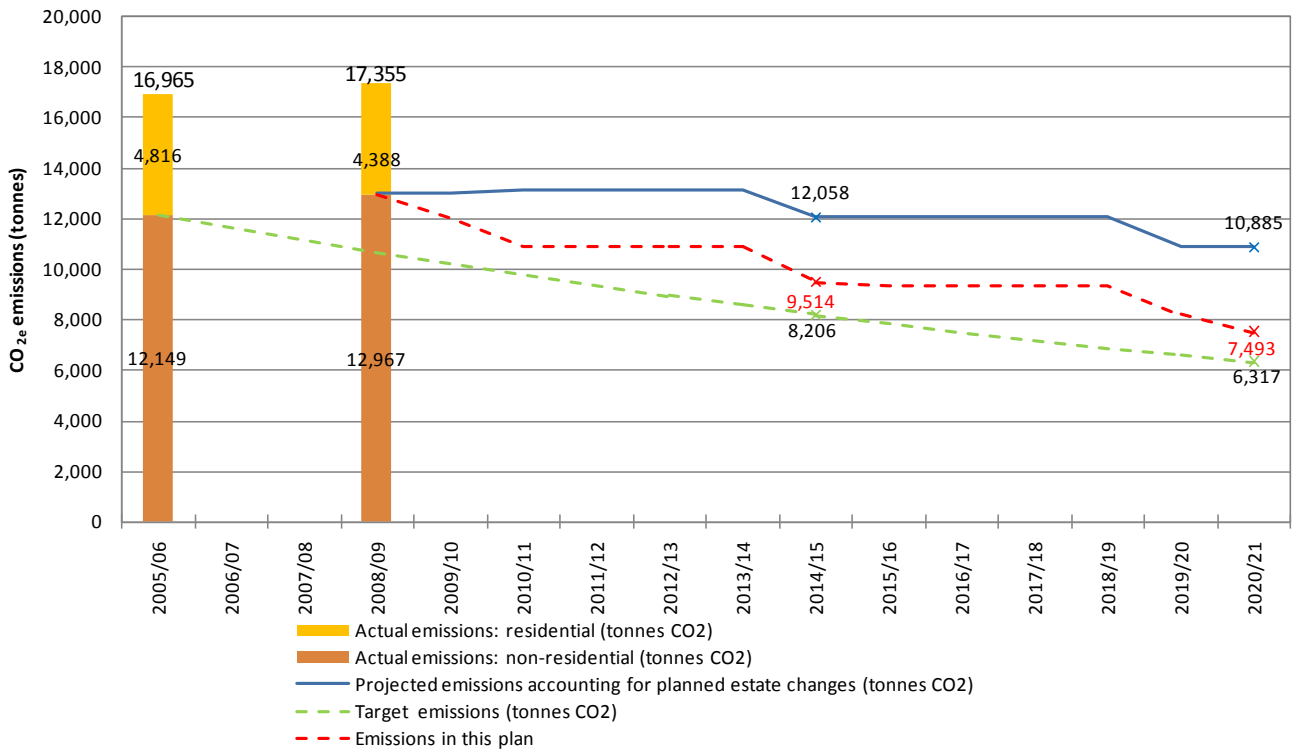
4. Go Green Awards

The Aston Go Green Awards encourage staff in each department to take part in a competition based on a workbook offering guidance for reducing energy use, improving waste management, sustainable procurement, etc. It comprises a list of 49 criteria with each delivering a practical action that will help reduce its impact on the environment. Most schools and departments are participating. A series of workshops covering energy, travel, waste and recycling, and procurement were held to support the awards.

Conclusions

This plan has outlined the proposed measures to achieve the University's target of an absolute reduction of 48% (excluding residences, as they are no longer under the University's direct financial control) by 2020/21 compared to 2005/6 baseline for scopes 1 and 2. A further stretch target of 53% has also been set with its delivery dependent upon resource availability. The plan has shown that, through the projects already quantified, the University should be able to deliver 80% of its target to reduce emissions by 48% by 2020 (72% of its stretch target of 53%). It has also identified further areas to address the remaining emissions reduction. These are shown in figure 13. This will enable the University to decouple growth in staff, students and turnover from its carbon emissions.

Figure 13



Appendix A – Data and Emissions Factors for Scopes 1 and 2

Appendix A summarises the sources of data and emissions factors used to produce the carbon footprint. The emissions factors are taken from 2009 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting. They are broken down by scope of emissions:

Scope	Source	Data 2005-6	Data 2008-9	Emissions factor
Scope 1	**Oil (kWh)**	460,528	1,093,181	0.24674 kg CO_{2e} per kWh (Gross CV)
	Gas (kWh)	33,071,415	34,426,029	0.18396 kg CO_{2e} per kWh (Gross CV)
	Owned fleet (miles): Diesel van up to 3.5 tonnes Medium diesel car 1.7 to 2.0 litre Small petrol car up to 1.4 litre engine	 9,138 5,803 3,078	 10,946 16,954 991	 0.4401 kg CO_{2e} per mile 0.3048 kg CO_{2e} per mile 0.2929 kg CO_{2e} per mile
Scope 2	**Electricity (kWh)**	19,759,495	19,481,793	0.53729 kg CO_{2e} per kWh (2005 grid rolling average electricity consumed, used for 2005/6) 0.54418 kg CO_{2e} per kWh (2007 grid rolling average electricity consumed, used for 2008/9)
	Imported heat	-	811,800	0.1734 kgCO_{2e} per kWh

Appendix B – Data and Emissions Factors for Scope 3

Appendix B summarises the sources of data and emissions factors used to produce the initial estimate of the scope 3 carbon footprint. The emissions factors are taken from 2009 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting:

Source	Data 2005-6	Data 2008-9	Emissions factor
Water (m^3)	184,556	170,416	Supply 0.276 kg CO_{2e} per m^3 plus Treatment 0.693 kg CO_{2e} per m^3
Waste:			
Recycled	80	83	-713 tonnes CO_{2e} per tonne
Landfill	2,100	335	81 tonnes CO_{2e} per tonne
Business travel:			
Car Hire (km)	72,586	62,605	0.20487 kg CO_{2e} per km
Car mileage (km)	408,818	511,361	0.20487 kg CO_{2e} per km
Rail (km)	110,572	110,572	0.06113 kg CO_{2e} per km
Domestic flights (km)	72,772	72,772	0.17283 kg CO_{2e} per km
Short haul flights (km)	1,750,462	1,750,462	0.09924 kg CO_{2e} per km
Long haul flights (km)	5,588,707	5,588,707	0.11331 kg CO_{2e} per km
Staff commuting (km):			
Car Driver	2,729,780	1,888,993	0.20487 kg CO_{2e} per km
Car Passenger	84,554	102,490	0.102435 kg CO_{2e} per km
Train	1,390,971	2,257,629	0.06113 kg CO_{2e} per km
Public Bus	354,473	492,608	0.11153 kg CO_{2e} per km
Bicycle	60,482	82,475	0 kg CO_{2e} per km
Walk	10,668	25,726	0 kg CO_{2e} per km
Metro	22,301	6,3254	0.08398 kg CO_{2e} per km
Motorbike/Scooter	-	12,401	0.11856 kg CO_{2e} per km
Student commuting (journeys home):			
Home students	176 miles x7,010 students x 4	176 miles x7,384 students x 4	0.32970 kg CO_{2e} per mile
EU students	600km x 434 students x 4	600km x 629 students x 4	0.09924 kg CO_{2e} per km
International students	4,000 x 1,473 students x 2	4,000 x 2,479 students x 2	0.11331 kg CO_{2e} per km
Student daily commuting (km):			
Car Driver	4,346,471	2,475,921	0.20487 kg CO_{2e} per km
Car Passenger	191,680	414,916	0.102435 kg CO_{2e} per km
Train	6,265,724	6,329,386	0.06113 kg CO_{2e} per km
Public Bus	4,662,484	4,315,893	0.11153 kg CO_{2e} per km
Bicycle	341,098	430,704	0 kg CO_{2e} per km
Walk	372,181	661,770	0 kg CO_{2e} per km

Metro Motorbike/Scooter Taxi	520,235 77435 -	422,294 41,905 11,804	0.08398 kg CO_{2e} per km 0.11856 kg CO_{2e} per km 0.15965 kg CO_{2e} per km
International student exchange: (assuming 1 return flight per student) Short haul flights (km) Long haul flights (km)	 30,230 131,540	 116,646 465,100	 0.09924 kg CO_{2e} per km 0.11331 kg CO_{2e} per km

Appendix C – opportunities for carbon reduction

ICT

The University's long term strategy is to replace individual printers with large volume shared machines. There are also opportunities in terms of server virtualisation and automatic PC switch off. Details of specific, costed projects can be found in the Energy saving opportunities table below.

Existing carbon reduction projects:

Initiative	Project status	Cost	Estimated reduction (kg CO2/year)	Estimated reduction (£/year)
3MW on-site CHP plant (projected reduction of 20% of energy emissions).	Completed Sept 2009		3,381,152	
Replace T8 lights with energy efficient T5 lighting in Library (Salix Revolving Green Fund).	Completed Oct 2009	18,480	58,800	5,199
Upgrade of 5 boilers around campus (Salix Revolving Green Fund).	Completed Oct 2009	29,786	199,500	18,870
Insulate / repair pipework around campus (Salix Revolving Green Fund).	Completed Oct 2009	7,915	41,500	6,726
Install variable speed drives in Library fans (Salix Revolving Green Fund).	Completed Jan 2010	14,510	119,200	10,543
Fridges controls installation	Completed Jun 2010	46,908	187,300	16,353
Lighting upgrade lecture room 370/2	Completed Jun 2010	13,586	22,330	1,975
Student Switch Off campaign	Ongoing	4,000	114,000	21,000
10:10 - behaviour change campaign	Projected	1,000	1,736,192	
TOTAL		**136,185**	**5,859,974**	**80,666**

Energy saving opportunities (following pages):

Salix Eligible Opportunities

Ref	Building	Description of opportunity (include details of significant resource requirements if applicable)	Electricity savings (kWh pa)	Gas savings (kWh pa)	Heat (district heating) (kWh pa)	CO2 savings (tonnes pa)	Financial savings (£ pa)	Capital cost (£)	Payback period (years)	Salix funding?
1	Main	Optimise the light density in the corridors. The light density in the corridors varies from 3 W/m2 to 13 W/m2. De-lamp or re-lamp to achieve the excellent 3 W/m2	9,690			5.3	464	2,000	4.3	Yes
2	Main	Optimise lighting densities in the offices, classrooms etc. Most areas had good lighting densities, from 6 to 10 W/m2. A few areas had lighting densities of 12 to 32 W/m2	6,660			3.6	319	1,200	3.8	Yes
3	Main	Twenty one fittings on the Atrium framework switched on but excellent natural lighting. Assumed to be rated at 75 W each. Remove or switch off using LUX level sensors etc.	6,300			3.4	302	400	1.3	Yes
4	Main	There are several areas where lighting levels appeared to be unnecessarily high, typically above 20 W/m2. Check all areas, associated with the laboratories, and de-lamp where possible.	20,500			11.2	982	5,800	5.9	Yes
5	Main	In the unoccupied laboratories there is evidence of lights being left switched on. It is estimated that 3.1 kW of lighting could have been switched off.	6,200			3.4	297	500	1.7	Yes
6	Main	Insulate the main body of the plate heat exchangers in the basement plant rooms. There are two plate heat exchangers in each plant room.			53,000	9.2	1,579	6,500	4.1	Yes
7	Main	Insulate large sections of pipe work and flanges in the Plant Room between A and C corner plant rooms.			97,000	16.8	2,891	2,850	1.0	Yes

8	Main	Insulate large OD flanges and valves in the Plant Rooms between A and C corner plant rooms.			64,000	11.1	1,907	2,400	1.3	Yes
9	Conference Centre / Aston Business School	Some of Atrium cafe lighting left on for aesthetics, there is excellent natural lighting, ~0.5 kW CFLs left on. Leave these lights switched off during daylight hours using sensor.	900			0.5	43	200	4.6	Yes
10	Conference Centre / Aston Business School	0.72 kW of corridor lighting (Conference room 3) left on but excellent natural lighting. Use a sensor to switch on when LUX levels below 50.	1,800			1.0	86	200	2.3	Yes
11	Conference Centre / Aston Business School	Toilet lights left on all the time, some toilets comprise of dichroic spots that can be replaced with LED spots. On failure replace with LEDs and PIR sensors. 10 dichroics fail each year.	7,000			3.8	335	1,250	3.7	Yes
12	Conference Centre / Aston Business School	Install an air curtain on the main entry doors to the reception area to prevent cold air entering the building. Fine tune the HVAC air feed and extraction to the area to prevent a negative pressure in this reception area.		20,000		3.7	355	1,200	3.4	Yes
13	Lakeside Residences	Consider installing variable speed controllers on to the four hot water pump sets in the basement plant room. Calculations indicate that they may be oversized.	29,700			16.2	1,423	5,400	3.8	Yes
14	ISA	Introduce a policy on switching monitors off. Most are left switched on all the time. Assign responsibilities to department heads / supervisors and lecturers to carry out this work. Prevent the procurement of computer monitors above a certain size, such as above 20".	31,200			17.0	1,494	2,000	1.3	Yes
15	ISA	Review the policy of not being able to switch off lecturers' and members of staff computers at the end of the day. Many are left switched on (PCs,	62,400			33.9	2,989	10,000	3.3	Yes

		monitors and printers). The amount of electricity large number of PCs, printers and monitors consume over 168 hour week and a 52 w eek year is considerable. The facility may already be available within the main computer system to carry out this task but a nominal cost has been applied to this recommendation.								
		TOTAL	**182,350**	**20,000**	**214,000**	**130.9**	**15,466**	**41,900**		

No or Low Cost Opportunities

Ref	Building	Description of opportunity (include details of significant resource requirements if applicable)	Electricity savings (kWh pa)	Gas savings (kWh pa)	Heat (district heating) (kWh pa)	CO2 savings (tonnes pa)	Financial savings (£ pa)	Capital cost (£)	Payback period (years)	Salix funding?
1	Main	Remove the two discharge fittings (pendant type) in the main reception / foyer area.	800			0.4	38	0	0.0	No
2	Main	Remove the seven decorative T8 fittings in the main reception / foyer area.	1,624			0.9	78	0	0.0	No
3	Main	The open fronted two chilled food cabinets were left switched on with no food in them. These cabinets are probably rated at 0.5 kW each. Switch off when not in use and look to install chilled cabinets with doors installed.	5,242			2.9	251	0	0.0	No
4	Main	Review the operating procedure for the tray wash. The tray wash was not in use but at its operating temperatures: 86 and 65˚C.	300			0.2	14	0	0.0	No
5	Main	Review set point temperatures for refrigerators. At previous sites using the -80˚C freezers it was believed that the actual set point could be a few degrees lower than -80˚C. Also there was a habit to set the temperature to as low as possible, which is not necessary.	9,000			4.9	431	0	0.0	No
6	Main	Apply a green dot policy (sticker to indicate that the item can safely be switched off) for all office equipment in the building. There is a considerable amount of PC monitors, printers, photocopiers, scanners projector equipment etc. Much of this equipment is left switched on all the	109,200			59.4	5,231	0	0.0	No

		time.								
7	Main	Review set point temperatures, clock settings and time controllers on the discrete air conditioning units. Several were seen during the survey, with the clock out by one hour, set temperature of 20˚C and set to manual control.	1,000			0.5	48	0	0.0	No
8	Main	Establish a minimum temperature set point for the air conditioning units when cooling the target areas. Many areas are air conditioned and it was noted that several of these areas have different set points varying from 21˚C to 29˚C. Ideally the set points should be 29˚C. Also reduce the time they are allowed to be switched on, 10:30 to 16:00	70,000			38.1	3,353	600	0.2	No
9	Main	A large number of incubators were seen during the survey, all of them were switched on. It is likely that they are left on at the target temperatures of ~37˚C for 24/7. Ensure that these incubators need to be left switched on all the time especially during University holiday periods. If not then switch some off.	2,100			1.1	101	100	1.0	No
10	Main	Apply the Green Dot policy (sticker to indicate that the item can safely be switched off) to the laboratory equipment to ensure small apparatus is not left switched on unnecessarily. Install 7 day timers additionally where appropriate.	28,000			15.2	1,341	1,000	0.7	No
11	Main	Old "BiQQ" fume cupboards are located in many of the laboratories. Some are used as storage and therefore ensure that their associate the extraction fans are switched off. Many of their doors are left open with the extraction fans left on full.	16,600			9.0	795	500	0.6	No

		However, when the doors are closed the fans are still on full. There is no control of the rate of extraction therefore electricity is being wasted by the extractor fans and the heat treated air from inside the rooms, comfort cooled or heated. Therefore switch fume cupboards off when not in use. Eventually replace them with modern energy efficient types.								
12	Gem Sports Centre	The lighting in the main sports hall is high bay discharge fittings. These lights are left switched on all the time. The fittings encourage this wasteful use as these lights need to cool down for ten minutes before being switched back on. Switch off when not required. If replaced then the pay back is likely to be between 9 and 12 years.	12,000			6.5	575	0	0.0	No
13	Gem Sports Centre	The lighting in the gym is high bay discharge fittings. These lights are left switched on all the time. The fittings encourage this wasteful use as these lights need to cool down for ten minutes before being switched back on. Switch off when not required. If replaced then the pay back is likely to be between 9 and 12 years.	1,100			0.6	53	0	0.0	No
14	Gem Sports Centre	Green dot policy (sticker to indicate that the item can safely be switched off) on equipment in this building; vending machines and office equipment. Additionally install 7 day timers to control appliances where possible.	4,200			2.3	201	200	1.0	No

15	Gem Sports Centre	Lights are all left switched on in the changing rooms and toilets even though the building was closed. Estimated power absorbed 0.7 kW by lights left switched on. Ensure a shut down procedure is developed.	1,400			0.8	67	600	8.9	No
16	Conference Centre / Aston Business School	Review the climate control systems for the large Study Room and Staff Room (unoccupied). Both areas were cooler than anticipated. Ensure target set point for cooling is no lower than 23˚C.	6,000			3.3	287	50	0.2	No
17	Conference Centre / Aston Business School	Meeting room 133- high light density, above 29 W/m2. De-lamp some of these fittings.	200			0.1	10	50	5.2	No
18	Conference Centre / Aston Business School	Meeting room 123- high light density, above 30 W/m2. De-lamp some of these fittings.	400			0.2	19	0	0.0	No
19	Conference Centre / Aston Business School	Review the air conditioning set points in the meeting rooms as several set point temperatures were noted at 16˚C, 18˚C, 20˚C, 21˚C etc. Ensure they are set at no lower than 23˚C and consider installing tamper proof controllers.	3,000			1.6	144	900	6.3	No
20	ISA	Restrict the number of printers and photocopiers allowed at the University. Ensure that they are low energy consuming type.	3,500			1.9	168	1,000	6.0	No
21	BMS Controls	Vision Sciences schedule for BOILERS consider switching them on at 07:30 Monday to Friday rather than 06:00, see Optic Clinic settings.	2,250	29,900		6.7	638	50	0.1	No

22	BMS Controls	Vision Sciences schedule for BOILERS consider switching them off at 16:30 Monday to Thursday and off at 16:00 Friday	1,500	11,500		2.9	276	50	0.2	No
23	BMS Controls	Vision Sciences schedule for BOILERS review time settings for Saturday - noon to 22:00 - if possible reduce to 16:00 or earlier	1,800	8,000		2.5	228	50	0.2	No
24	BMS Controls	Vision Sciences schedule for BOILERS review time settings for Holiday - On at 03:00 and off at 06:00 - if possible reduce this time for both pumps and burners.	700	18,000		3.7	353	100	0.3	No
25	BMS Controls	Vision Sciences schedule for Roof AHU consider switching off at 16:30 Monday to Thursday and off at 16:00 Friday	375			0.2	18	50	2.8	No
26	BMS Controls	Vision Sciences schedule for AHU consider switching off at 17:00 Monday to Thursday and off at 17:00 Friday	450			0.2	22	50	2.3	No
27	BMS Controls	Aston Business School for Academic areas on summer settings but schedule 24 hours a day and 7 days a week. Change these settings to match occupancy. See RESIDENTIAL settings where occupancy can be around the clock	5,540	220,000		43.5	4,166	100	0.0	No
28	BMS Controls	North Wing settings for most areas 04:00 to 22:00 Monday to Friday. Review occupancy levels and alter schedule to match, typically 07:00 to 17:00 Monday to Friday. See SOUTH WING settings	850		86,200	15.4	2,609	50	0.0	No

29	BMS Controls	North Wing schedule review time settings for Holiday - On at 03:00 and off at 06:00 - if possible reduce this time for both pumps and burners.	210		11,200	2.1	344	50	0.1	No
30	BMS Controls	North Wing ATRIUM schedule review time settings for Holiday - On at 03:00 and off at 06:00 - if possible reduce this time for both pumps and burners.	210		9,000	1.7	278	50	0.2	No
31	BMS Controls	South Wing schedule review time settings for Holiday - On at 03:00 and off at 06:00 - if possible reduce this time for both pumps and burners.	110			0.1	5	50	9.5	No
32	BMS Controls	South Wing AHU schedule review time settings for Holiday - On at 03:00 and off at 06:00 - if possible reduce this time for both pumps and burners.	110			0.1	5	50	9.5	No
33	BMS Controls	South Wing AHU schedule review time settings, on at 07:30 and off at 17:00, consider reducing the time this equipment is switched on 08:00 to 16:30.	150		22,500	4.0	678	50	0.1	No
34	BMS Controls	South Wing Floor 11 operating time 06:00 to 20:00, consider reducing this to 07:00 to 18:00 Monday to Thursday and to 17:00 on Friday. See South Wing Floor 8 schedule.	1,200		85,200	15.4	2,596	50	0.0	No
35	BMS Controls	South Wing Floor 11 operating time for the weekends is displayed Sat & Sun as 00:00 active. Consider disabling this setting.	2,160		116,250	21.3	3,568	50	0.0	No
36	BMS Controls	Review air conditioning controls for the South Wing, at present on 08:00 to 17:00 Monday to Friday. Consider setting on at 10:30 and off at 16:30 Monday to Friday. Set the target	45,000			24.5	2,156	50	0.0	No

		temperature to 24oC.								
37	BMS Controls	Review Lecture Theatre times in the Main Building. The schedules for the lecture theatres vary considerably. These schedules need to be set to match timetables and the frequency of the changes to these schedules must match the frequency that the timetables are altered.	3,000		40,700	8.7	1,357	600	0.4	No
		TOTAL	**341,281**	**287,400**	**371,050**	**3,029**	**32,502**	**6,500**		

Other Capital Investment Opportunities

Ref	Building	Description of opportunity (include details of significant resource requirements if applicable)	Electricity savings (kWh pa)	Gas savings (kWh pa)	Heat (district heating) (kWh pa)	CO2 savings (tonnes pa)	Financial savings (£ pa)	Capital cost (£)	Payback period (years)	Salix funding?
1	Main	Tighter control of the use of lighting. During the inspection 28 kW of lighting was left switched on in unoccupied areas, many of these areas were locked and inaccessible. The use of countdown timers, passive movement sensors etc.	21,000			11.4	1,006	8,000	8.0	No
2	Main	Many rooms were occupied with all lights switched on but there was excellent natural lighting. The use of LUX level switches and staff awareness training	12,000			6.5	575	5,000	8.7	No
3	Main	Apply draught proofing to the windows The metal frame single glazed windows are old and in many cases do not fit tightly to the frames they are fitted to. A low cost option for the windows is the installation of basic draught proofing. The methods considered should be using polymer form seals (for windows that are never used), rubber seals, silicone mastic sealants and window insulating films.			30,000	5.2	894	5,500	6.2	No

4	Main	Consider relocating the -80˚C freezers from occupied areas (such as laboratories) to a room fitted with suitable energy efficient environmental controls. This will reduce the air conditioning loads in the existing areas. There should be consideration given to forced draught ventilation to remove the 0.5 to 1 kW of hest energy each of these freezers emit. A forced draught fan will consume less than 20% of the electricity a compressor driven air conditioning system	16,800			9.1	805	9,000	11.2	No
5	Conference Centre / Aston Business School	Consider installing variable speed controllers on to the four hot water pump sets in the basement plant room. Calculations indicate that they may be oversized.	6,650			3.6	319	2,900	9.1	No
6	Conference Centre / Aston Business School	Review extraction control system in unoccupied rooms. These areas are climate controlled and extraction should be kept to a minimum. Certain rooms the extraction was noticeable which suggests higher than necessary number of air changes an hour	2,240			1.2	107	600	5.6	
7		Establish benchmark figures for each building and possibly department with occupancy level as the energy driver. The basis for this recommendation is that the overall electricity consumption for the site during the holiday period can take 1 MW from the CHP system and when the University is in full operation it will take 3 MW of electricity. The 1 MW electricity consumption needs to be justified, it is accepted that some power is being absorbed by the building works. However, the energy survey findings indicate many rooms and areas where equipment is left switched on and not being used. Places such as PC laboratories, offices, classrooms, life science laboratories, engineering and technology laboratories etc. Many of the HVAC systems are left switched on. Assign energy costs to department / faculty		756,000		139.1	13,404	15,000	1.1	

		budgets. Severely restrict areas that are left open and fully operational and lock off all other areas. For this recommendation a nominal target of 150 kW has been assigned for 120 hours a week and for 12 weeks a year.								
8	General	The air conditioning is used at various locations around the site. The use of these system should be kept at an absolute minimum. In Birmingham during 2009 for less than 30 days the ambient temperature went above 23˚C. The target set point should be 24˚C and the operating times should be from 10:30 to 16:00. This will dramatically reduce the use of air conditioning. This figure excludes the Main building and the South Wing	70,000			38.1	3,353	500	0.1	No
9	ISA	Free air cooling, adiabatic cooling, forced draught cooling for the server room in the main building	65,000			35.4	3,114	35,000	11.2	No
10	Vision Sciences Building	Feasibility study on the local generation of electricity and possibly hot water (basic CHP system) at the Vision Sciences Building. The system to use renewable fuel (biomass) eligible for Renewable Obligations Certificates (ROCs).	190,000			103.4	9,101	Tbc	Tbc	Tbc
11	Conferenc e Centre / Aston Business School	Feasibility study on the local generation of electricity and possibly hot water (basic CHP system) at the Aston Business School Building. The system to use renewable fuel (biomass) eligible for Renewable Obligations Certificates (ROCs). At present, one ROC is equivalent to £46 per MW.	650,000			353.6	31,135	Tbc	Tbc	Tbc
12	CHP Plant	A detailed review of using Biomass fuel in place of natural gas, or a blend of biomass with fuel oil to use as the fuel to fire the two CHP systems. The target should be to achieve eligibility for Renewable Obligations Certificates (ROCs). At present, two ROCs is equivalent to £92 per MW. The conversion costs could be very high, delivery of fuel could be an issue and maintenance costs will increase, possibly double. If it is assumed that the University consumes 21,840,000 kWh per annum of	Tbc	Tbc	Tbc	Tbc	Tbc	Tbc	Tbc	Tbc

		electricity generated by the CHP system. This is generated by natural gas. If it is possible to replace this natural gas with a biomass renewable fuel then the reduction in carbon dioxide and the financial benefits of receiving double ROCs are considerable.								
		Totals	**1,033,690**	**756,000**	**30,000**	**671.2**	**63,813**	**81,500**		