King's College London

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*Outlining progress during 2015/16 against our target to achieve a 43% reduction in Scope 1 & 2 carbon emissions by 2019/20 against a 2005/06 baseline.*

King’s College London Carbon Management Plan update 2014/15

## Introduction

King’s College London has committed to a target of a 43% reduction in Scope 1 & 2 carbon emissions by 2019/20 against a 2005/06 baseline. During 2014/15 KCL had achieved a reduction of 8% against baseline. This was assisted by the implementation of projects with calculated carbon savings of 688tCO2e, detailed in Appendix A. An example project case study is included in Appendix C.

To meet the 43% target, an additional 2,900 tCO2 will need to be saved from KCL’s emissions each year. Based on the current rate of reduction, we can achieve a 1kg reduction in CO2 per £1 invested. Extrapolation of this leads to an estimated £2,900,000 per annum investment to achieve our targets. Based on an average return on investment of 21% an investment of £2.9m per annum would yield £2,418,000 in energy savings per annum at today’s prices by 2019/20.

Existing pipeline projects with an annual carbon reduction total of 3,159tCO2 have been identified for completion in 2015/16, as detailed in Appendix B. The estimated cost of implementation is £2,803,395. A full list of 2014/15 projects can be found in Appendix A, pipeline projects for 2015/16 in Appendix B. Key risks facing the successful achievement of the carbon reduction target include lack of investment, growth of the estate, increase in student numbers and changing demands on building environments.

KCL tracks and reports Scope 3 emissions. Scope 3 emissions are baselined against 2008/09. By 2014/15, Scope 3 emissions had increased by 30% against the 2008/09 baseline to 38,073tCO2. This figure reflects increases in staff and student commuting and business travel.

## Current Carbon Emissions

The implementation of the carbon management plan in 2005/06 has led to annual savings of approximately £3.6m. Despite this achievement, KCL are not on target to reach the stated carbon reduction target of 43%. Figure 1 outlines our progress to date against carbon targets, using best available current data.

Figure 1: Carbon emission projections

Business as usual represents the predicted carbon emissions if nothing had been done to address carbon reduction. This can be seen to increase dramatically, based on actual and planned changes to staff and student headcount. The green line represents the Reduced Emissions Scenario (RES) and shows the path to achieve the 43% reduction in carbon emissions by 2019/20 against 2005/06 baseline. The blue bars from 2005/06 to 2014/15 show measured carbon emissions.

## Future carbon emissions

KCL is a research intensive institution. We have targets to increase staff and student numbers, whilst rationalising floor space and carbon emissions. Table 1 outlines our success in decoupling carbon emissions from other growth metrics.

Table 1: Normalisation factors

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2005/6** | **2014/15** | **Change** |
| tCO2 (scope 1&2) | 32,525 | 29,992 | -8% |
| Total Staff (FTE) | 6,234 | 7,330 | 18% |
| Students (FTE) | 19,289 | 26,509 | 37% |
| Turnover (£000) | 387,951 | 684,225 | 76% |
| Turnover £m (2005) | 387,951 | 556,590 | 43% |
| GIA (m2) | 407,093 | 384,900 | -5% |

The reduction in carbon emissions per total FTE of students and staff is mirrored by falling carbon emissions per £ income. Income into the College has grown over the years and is a good representation of the level of teaching & learning and research. Carbon emissions per £ of income have reduced by 36% after adjustment for inflation. This suggests that KCL has managed to decouple economic growth and increasing carbon emissions.

## Achieving KCL’s Carbon Reduction Targets

In order to move ahead of our targeted carbon emissions we must reduce CO2 by a further 20% against 2005/06 by the end of the 2016/17 academic year. Following the Project Register, summarised in Appendix C, we are on track to reduce the footprint by 10% during 2015/16. The challenge remains in identifying and mitigating the impact projects that will increase our carbon footprint, offsetting the effect of these works.

Following this projection, it expected that KCL will be required to investment a minimum of £11,500,000 over four years or £2,879,000 per annum at current costs to successfully address our carbon challenge. We have a rich project pipeline for 2015/16. A parallel focus must be maintained on surveying for additional projects. This could take the form of an energy performance contract (EPC). The ultimate challenge will be innovating to match the governance structure of an EPC with the deployment of internal resource.

## Appendix A: Carbon Reduction Projects Complete during 2014/15

The following table outlines carbon reduction projects completed during 2014/15.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project description | Date added | Project cost | Cost savings | Carbon reduction | Simple payback (years) |
| Wellcome project LED and controls | 19/03/2015 | £19,584 | £5,546  | 20.0 | 3.5 |
| Maughan Library lighting system to Building Management System interfacing | 31/03/2015 | £18,292 | £5,793  | 20.9 | 3.2 |
| Hodgkin corridor lighting | 19/03/2015 | £40,728 | £10,382  | 37.5 | 3.9 |
| Hodgkin building central staircase LED conversion | 19/03/2015 | £14,440 | £4,432  | 16.0 | 3.3 |
| Macadam -3 corridor lighting upgrade LED | 19/03/2015 | £2,559 | £1,275  | 4.6 | 2.0 |
| Research Freezer Controls on Guy's campus | 19/03/2015 | £16,756 | £8,996  | 32.5 | 1.9 |
| Harris Lecture Theatre LED conversion | 19/03/2015 | £8,062 | £1,723  | 6.2 | 4.7 |
| Anatomy lecture theatre (Hodgkin) | 19/03/2015 | £6,776 | £1,446  | 5.2 | 4.7 |
| King's building Safra lecture theatre CO2 sensors | 19/03/2015 | £3,310 | £1,042  | 3.8 | 3.2 |
| Britannia House circulation space LED conversion | 23/10/2014 | £33,603 | £9,446  | 34.1 | 3.6 |
| Britannia House offices and laboratory LED conversion | 23/10/2014 | £53,545 | £13,029  | 47.0 | 4.1 |
| FWB atrium lighting | 16/03/2015 | £94,433 | £7,726  | 27.9 | 12.2 |
| Drying cabinets replacement | 16/03/2015 | £77,845 | £17,285  | 62.4 | 4.5 |
| JBC lighting controls replacement | 16/03/2015 | £257,600 | £41,667  | 150.4 | 6.2 |
| Cold storage efficiency | 16/03/2015 | £38,300 | £15,600  | 67.0 | 2.5 |
| Wolfson Wing LED lighting | 16/03/2015 | £68,851 | £15,041  | 54.3 | 4.6 |
| SSO for Residences | 07/01/2015 | £7,580 | £27,480  | 99.2 | 0.3 |
| Total  |  | **£762,264** | **£187,909** | **689** |  |

## Appendix B: Pipeline carbon reduction projects

The following table outlines projects that have been identified and quantified for potential tendering during 2015/16. Beyond these projects, there are over 250 proposed projects that await quantification. A key focus of 2015/16 will be to build on this project register by way of site surveys and audits. This will strengthen the project pipeline, ensuring that we can meet our commitments to reduce carbon emission.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Project description | Date added | Status | Cost | Cost savings | Carbon savings | Simple payback (years) |
| Strand Campus Philosophy Boiler Controls | 31/03/2015 | RGF4 | £5,876 | £4,148 | 15.0 | 1.4 |
| Maughan Library - LG63 Lighting | 31/03/2015 | RGF4 | £2,968 | £683 | 2.5 | 4.3 |
| Strand Main - Lagging HWS/CT/VT pipework in the Strand Building | 31/03/2015 | PO raised | £10,195 | £34,012 | 122.8 | 0.3 |
| Energy Performance Contract Phase 2 and 3 | 20/03/2015 | PAR2 | £2,000,000 | £422,765 | 1594.8 | 4.7 |
| Residences (SSA & GDS) Replacement of Bedroom Fridges With communal Fridges | 07/01/2015 | PO raised | £119,932 | £104,112 | 375.8 | 1.2 |
| Lighting replacement in SSA gym & Office area | 07/01/2015 | RGF4 | £30,800 | £4,135 | 14.9 | 7.4 |
| NHH Terminal Heating Pumps & Water Heating Pumps | 17/07/2015 | PAR2 Light | £48,399 | £3,201 | 11.6 | 15.1 |
| SGDP Basement and IOPPN Lighting | 21/08/2015 | RGF4 | £42,006 | £9,679 | 34.9 | 4.3 |
| SSA heating project | 03/11/2015 | pipeline | £211,454 | £29,744 | 107.4 | 7.1 |
| GDSA heating project | 03/11/2015 | pipeline | £473,756 | £98,383 | 355.1 | 4.8 |
| GDSA lighting project | 03/11/2015 | pipeline | £218,148 | £16,708 | 60.3 | 13.1 |
| SSA lighting project | 26/08/2015 | pipeline | £125,281 | £13,035 | 47.1 | 9.6 |
| Hodgkin BSU lighting | 28/09/2015 | RGF4 | £16,451 | £5,266 | 19.0 | 3.1 |
| JCMB lighting replacement | 27/10/2015 | RGF4 | £47,000 | £9,628 | 34.8 | 4.9 |
| waterless condenser | 16/11/2015 | ongoing | £4,000 | £1,600 | 0.0 | 2.5 |
| Calorifier changes in SSA | 18/11/2015 | pipeline | £380,155 | £90,936 | 328.3 | 4.2 |
| Total |  |  | **£3,736,421** | **£848,035** | **3,124** |  |

## Appendix C: KCL Sustainable Laboratories Case Study – Savawatt Installation

*Martin Farley, Sustainable Laboratories Project Coordinator, Oct. 2015*

Continuing on the commitment to reduce carbon dioxide emissions by 43% from 2005-06 levels by 2020, Kings College London has targeted its cold storage in research spaces as a method of achieving this goal. Research spaces can consume ~5 times more energy per square metre than academic spaces, and part of this is largely due to the substantial quantity of fridges and freezers that fill laboratories. Envision Concepts has developed a patented, Salix approved device called a Savacontrol which can match motor needs to energy output in any equipment with a compressor (ie fridges and freezers, though for this project we did not include ULT freezers), and in doing so achieve energy savings. They are easily installed at the plug-level and can endure for 10+ years. Previously Kings College London had already organised an installation of such devices where appropriate (buildings with higher voltages, above ~230 volts) with some success. Fridges with the devices attached showed ~14% reductions in energy consumption. This year the goal was to complete a wide-spread installation to target particularly areas in the Guys Hospital and Denmark Hill campus.

 *Savawatt Products Installed*

The project was a success as a large installation tallying approximately £38,000 was organised and managed by the Sustainability department with an estimated 2.4 year payback period. 584 refrigerators, -20C° freezers, and walk-in cold rooms had devices fitted (mostly fridges and freezers) throughout research spaces, as well as one sports facility. To improve payback, areas with particularly high voltages were targeted (for e.g. some areas surveyed were found to be running at 246 volts!). The project was not without its barriers. Of particular difficulty was managing the installation during the opening of the new Wohl Institute as many of the fridges/freezers initially surveyed were moved to this new space. The Wohl Institute was not appropriate though for Savawatt installation as it did not have a voltage high enough to give a good payback. There were no reported break downs or equipment failures associated with the installation, although it did highlight issues with one cold-room these were pre-existing. To avoid researchers removing the devices, they were closely consulted about the installation. To avoid waste of a Savawatt device, they were fitted where possible with stickers with contact information to the sustainability department to ensure that if the fridge was replaced, a suitable replacement could be fitted.

Currently, this remains an easy and tested method to achieve energy savings in research and cooking spaces where fridges and freezers are common. With an estimated ~£15,000 saved annually in energy and a 10+ lifespan of Savawatt devices, we hope to incur significant energy savings.