University of Strathclyde

Carbon Management Implementation Plan 2019

Version 1.1
November 2019

i. Forward by the Principal & Vice-Chancellor

As greenhouse gas concentrations continue to increase there is growing International agreement that the consequences of resultant climate change impacts will be adverse, irreversible and require immediate action. It is clear that business as usual is not an option. Delivering change has never been more pertinent.

Cutting carbon emissions as part of the fight against climate change is a key priority for the University of Strathclyde. As a signatory of the Sustainable Development Accord, we have demonstrated our commitment to address the causes of climate change, and to be an exemplar for Higher Education.

The Carbon Management Implementation Plan 2019 is an update of the Carbon Management Programme which has been in operation since 2006. The plan forms part of our emerging Climate Change and Social Responsibility Plan which is currently being developed.

Name:	**Professor Sir Jim McDonald**
Position:	**Principal & Vice-Chancellor**
Date:	**November 2019**

1.0 Executive Summary

This Carbon Management Implementation Plan (CMIP) 2015 to 2020 is coming to an end and will be replaced in 2020 with an updated plan that sets out the University's continuing actions to reduce its climate impacts.

The successful implementation of our carbon management strategy has achieved, cumulatively as of 2018/19, cumulative CO_2E savings of 7,500 tonnes. Relative to the 2009/10 CO_2E baseline these savings represent approximately 25% of annual emissions output. The utility expenditure savings associated with this programme are £350,000 per annum.

The University is in the middle of a £1BN investment in its estate which involves the development of several new buildings and the refurbishment and upgrading of several existing assets. The University has taken the opportunity to invest a number of energy saving measures at scale within these developments associated with heat and power usage and control. In addition a range of solar arrays have been developed and there are plans for more systems to be deployed across the estate.

One of the major projects carried out during the recent period has been the installation of the University's Combined Heat and Power District Energy Scheme. This £20M investment in district heating at the University has been operational since October 2018 and was delivered on time and on budget. The new system is providing hot water across 18 University buildings with electricity generated from the Combined Heat and Power engine being distributed via the University's High Voltage ring. The system is returning emissions savings greater than 1,000TCO2e compared to grid electricity and financial savings of circa £1.8M. Importantly, the system has been sized so that it can be further extended to other buildings and developments as funding permits.

During 2019/2020, we will continue to commission the system in its first year of operation.

Figure 1 - The new 24MW boiler plant in the refurbished energy centre.

Figure 2 – the newly installed Combined Heat and Power 3.3MW engine in its acoustic enclosure

2.0 A Summary of Key Points

Looking back:

- The implementation of the existing CMP up to 2019 has reduced annual CO_2E emissions by **7,500** tonnes. This has enabled the University to be very close to meeting its strategic carbon target of a reduction of 25% of CO2e emissions by 2025, using a baseline of 2009/10. It is forecast that by 2020, this target will have been achieved and emissions will have reduced by 28%.

Our Current Position:

- The 2019 emissions baseline from scope 1 and 2 emissions sources is 2**2,694** tonnes CO_2E.
- The relative carbon emissions performance of the university is **65.2 kgCO_2e per m^2 GIA**.

Looking Forward:

- At the end of its target period in August 2020, the University aims to achieve an absolute emissions level of **21,623 tonnes CO_2E** by the **end of the 2019/2020** academic year. This equates to a **28%** reduction from the 2009/10 baseline.
- The University aims to achieve a **relative carbon performance of 64.7 kgCO_2e per m^2 GIA by the end of the 2019/20** academic year.
- In future, all new buildings will be designed and constructed so that they are carbon neutral for energy.
- The University will continue to operate its Combined Heat and Power District Energy Network and seek to optimise its performance.

- The next phase of work will be to deliver a net zero emissions position that aligns with governmental targets and milestones.

3.0 Key Successes and Performance Summary

- Water intensity has reduced by 48% from (15 to 8m3/FTE) since our 2009 baseline year.
- Grid electricity intensity has reduced by 44% (119 to 67 kwh/m2) since our 2009 baseline year.
- GHG intensity has reduced by 28% (90 to 65 kg/m2) since our 2009 baseline year.

3.1 SALIX Energy Investment Fund

Background

In July 2008 the University of Strathclyde committed to an external loan agreement with Salix Finance. The purpose of the loan was to provide interest free capital to accelerate investment in energy efficiency improvements and greenhouse gas (GHG) mitigation projects across the campus.

The university manages one of the largest SALIX funds (£1.55M) in the UK public sector.

In 2017/18 SALIX provided a £400,000 'top-up' to the university SALIX Fund, as illustrated in Table 1. This was supported by match funding from the Faculties of Science and Engineering who worked collaboratively with Estates Services to upgrade campus HPC facilities and data centre performance utilizing SALIX funding.

Table 1 – SALIX Fund

2008 SALIX FUND	***MAIN FUND***	***CLIENT FUND***	***TOTAL***
Salix Contribution	*£300,000*		
Scottish Government Contribution	*£300,000*		
University of Strathclyde Contribution	-	*£150,000*	
TOTALS	**£600,000**	**£150,000**	**£750,000**
2017 SALIX FUND Top Up			
Salix Contribution	*£400,000*	-	
Strathclyde Contribution (ARCHIE-WeSt)	-	£100,000	
Strathclyde (Faculty of Engineering)	-	£150,000	
Strathclyde (Faculty of Science)	-	£150,000	
TOTALS	**£400,000**	**£400,000**	**£800,000**
SALIX FUND 2017	**£1,000,000**	**£550,000**	**£1,550,000**

SALIX Performance:

A summary of SALIX Fund outcomes is set out in Table 2.

Table 2 – SALIX Performance Outcomes

Projects	Project Spend	Utility Cost Savings	Estimated Lifetime Savings (SALIX)	Annual CO_2 Savings (TCO_2)	Simple Payback (yrs)
31	£3.4M	£710 k	£9.3 M	2,800	3.8

3.2 Energy Efficiency Project Examples carried out During the Period

Royal College Level 1 Fans

The Royal College mechanically ventilated supply air is supplied by three large fans, costing £50,000 per annum in electricity costs. Replacing these fans with energy efficient controllable EC equivalents is saving £20,000 per annum.

The new system has been commissioned and is now operational.

Project Value	Utility Cost Savings p.a.	CO_2 Savings p.a. (TCO_2)	Simple Payback (yrs)
£135k	£20k	42	6.6

Ross Priory Lochside Cottage Heating

The Lochside Cottage at Ross Priory has suffered from underinvestment and currently costs £4,000 annually in electricity. By replacing the electric storage heaters with an air source heat pump and insulating the property this will save Ross Priory £2,000 per annum.

Morris and Spottiswood have been appointed to do the work and pending planning permission will look to complete the works by the end of March 2020.

Project Value	Utility Cost Savings p.a.	CO_2 Savings p.a. (TCO_2)	Simple Payback (yrs)
£23k	£2k	4	7

Secondary Heating System Upgrades

A significant barrier to the integration of next generation heat supplies within existing HE building stock is the high operating temperature and poor level of dynamic control embedded in existing heating systems. In instances where new heat technologies have been installed within the sector (e.g. combined heat and power, heat pumps, biomass) a consistent failure in operation is the poor integration between new primary heating technologies and existing secondary heating systems in buildings. The result across the sector has been high system operating temperature, poor heating control, and the disabling of potential efficiencies from newly installed technologies. This problem is endemic to low carbon heating projects retrofitted within existing HE (and other) estates.

This project has been completed as part of the District Heating system installation works and has improved the efficiency of heat distribution within existing university buildings which are connected to the campus District Heating (DH) network. This is achieved by upgrading fixed volume heating systems (secondary systems) to variable volume control. This will better align the control of our existing secondary heating systems to the control of the new DH primary district heating system.

Upgrades in 10 buildings include the replacement of fixed volume pumps/motors with variable speed pumps/motors and the replacement of heat by-pass circuits (three port valves) with 2 port pressure independent control valves. The project will enable our heating systems to more efficiently utilize heat with lower operating temperatures.

Significant benefits of this project include:

- An ability to distribute heat efficiently across a wide range of daily and seasonal demand variations.
- A primary flow/return temperature of 90/60°C and a differential temperature of 30°C at the energy centre. This is in line with the UK Heat Network Code of Practice 2015 (best practice).

- The increased temperature differential at the energy centre, and reduced primary heat flow rates, enables a reserve in heat capacity at our energy centre of 4MW. This can be utilised for future heat network expansion.
- A reduction in primary and secondary flow rates enables significant electrical energy savings from pump motors.
- Improved monitoring of building heat demand, heat flow rate, flow temperature, and return temperatures.

This project helps enable the university to bring its existing building stock up to the best practice performance standards set out on the UK Heat Networks Code of Practice (2015). Specifically, the university can now achieve the demanding low flow/return temperatures required to enable the effective integration of next generation low carbon heat technologies e.g. heat pumps. A key output is the learned knowledge of the specification needed in integrating primary and secondary control works when initiating heat generation and district heating projects.

Project Value	Utility Cost Savings p.a.	CO_2 Savings p.a. (TCO_2)	Simple Payback (yrs)
£497k	£100k	293	4.9