

LIVERPOOL HOPE UNIVERSITY



# Carbon Management Plan 2015-2016 to 2020-2021

## Progress Report to 2018-2019

I ♥ MY  
Campus



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## EXECUTIVE SUMMARY

In 2016, Liverpool Hope University drafted its second Carbon Management Plan (CMP) 2015-2016 to 2020-2021 to align its carbon reduction targets with those set in the University's Corporate Plan. This CMP Progress Report provides a summary of the University's carbon emissions and also the actions and projects implemented during the first three years of the CMP (to 2018-2019).

### Target:

To reduce emissions from gas, fuel used within University vehicles (fuel) and electricity annually by 2.5% between 2015-2016 and 2020-2021 (i.e. a total reduction of 12.5%) targeting a maximum of 4394 tonnes CO<sub>2</sub>e.

### Emissions:

Emissions (tonnes CO <sub>2</sub> e)	2015-2016	2016-2017	2017-2018	2018-2019	% change from 2015-2016
Gas (Scope 1,3)	2,111	2,282	2,340	2,076	-1.66
Fuel (Scope 1,3)	16.4	15.9	12.4	15.0	-8.54
Electricity (Scope 2,3)	2,895	2,542	1,974	1,794	-38.0
<b>TOTAL</b>	<b>5,022</b>	<b>4,840</b>	<b>4,326</b>	<b>3,885</b>	<b>-22.6</b>

At the end of 2018-2019, the University had reduced its emissions to 3885 tonnes CO<sub>2</sub>e, a reduction of 1137 tonnes (22.6%). The reduction goal set within the Corporate Plan has therefore been achieved before the deadline. The reduction in emissions have been predominately caused by lower electricity carbon conversion factors (i.e. the factor used to convert kWh to carbon emissions has reduced annually because of the reduced reliance on coal to generate electricity and the higher proportion of gas and renewable sources). However, a number of carbon reduction projects have also been implemented including the installation of Building Management Systems across the majority of the estate; a rolling programme of LED installation, replacing single with double glazing, roof repairs with increased insulation; and increased awareness and engagement activities.

The University's Scope 3 emissions (water and wastewater; waste and recycling; construction waste; business travel; commuting and procurement / supply chain) continue to be the main contributor to the University's carbon footprint.

To ensure that the University continues to further reduce its carbon emissions beyond the Corporate Plan targets, the University will continue to implement carbon reduction projects and embed carbon management into its day to day activities. A new Carbon Management Plan (with an expanded remit to include a reduction in consumption) will therefore be written for approval by Senior Management Team and University Council.

## 1) Introduction

The 2015-2016 Carbon Management Plan (CMP) details the University's carbon emissions, carbon reduction targets (for Scope 1, 2 and 3 emissions from gas, fuel used within University owned vehicles [fuel] and electricity) and identifies a number of carbon reduction projects including specific investment projects, raising awareness and engagement and feasibility studies which are required to ensure that the University realises its targets and effects cost savings over the period of the Plan (to 2020-2021). Although the CMP was not approved or ratified by the Senior Management Team or University Council; the carbon reduction targets and requirements to achieve the targets set out within the Plan are enshrined within the University's Corporate Plan and are therefore valid and a progress report is required.

This Progress Report 2018-2019 provides an update on the 2015-2016 CMP and provides a breakdown of annual carbon emissions; and it will assess the progress achieved and identify any 'gaps' / areas for improvement. The emissions are also referenced against the HEFCE carbon reduction baseline year of 2005-2006 <sup>1</sup>.

### a) Targets

To reduce carbon emissions from gas, fuel and electricity (Scope 1, 2 and 3) annually by 2.5% between 2015-2016 and 2020-2021 (an overall reduction of 12.5%), i.e. reducing emissions from 5022 tonnes CO<sub>2</sub>e to a maximum of 4394 tonnes CO<sub>2</sub>e.

This equates to a 25.9% reduction between the HEFCE baseline of 2005-2006 (5928 tonnes CO<sub>2</sub>e) and 2020-2021 (4394 tonnes CO<sub>2</sub>e).

### b) Liverpool Hope University

The University continues to evolve and expand to meet the requirements and needs of the changing student population with major refurbishments and new builds / acquisitions. The gross internal area of the University has increased by ~8,500 m<sup>2</sup> since 2015-2016 with the construction of the Health Sciences building (completed in January 2016), the expansion of the Sports Hall (completed in September 2016) and the acquisition of three new properties (285 Woolton Road, 3-7 Shaw Street and 3 Islington Square) during 2017-2018. 3-7 Shaw Street was refurbished and opened in September 2017 as the Arts Centre, but 285 Woolton Road and 3 Islington Square are currently mothballed (nb, the mothballed buildings emissions are still included in the University's carbon footprint as they are part of the University's estate).

Staff and student numbers have remained fairly static since 2015-2016 averaging 4353 student Full Time Equivalents and 672 staff Full Time Equivalents (data from HESA Estates Management Record Data).

### c) Governance

The University is committed to reducing its environmental impact, wherever practicable, and recognises that all students, staff, visitors and business partners have a responsibility to support the University achieve its goals. Their role is to manage materials and resources responsibly and to account for the impacts of their individual choices and actions.

The University Council, Office of the Vice Chancellor and the Rectorate Team are directly responsible for, and ultimately directly accountable, for reducing the University's carbon emissions and ensuring that the targets within the CMP are met.

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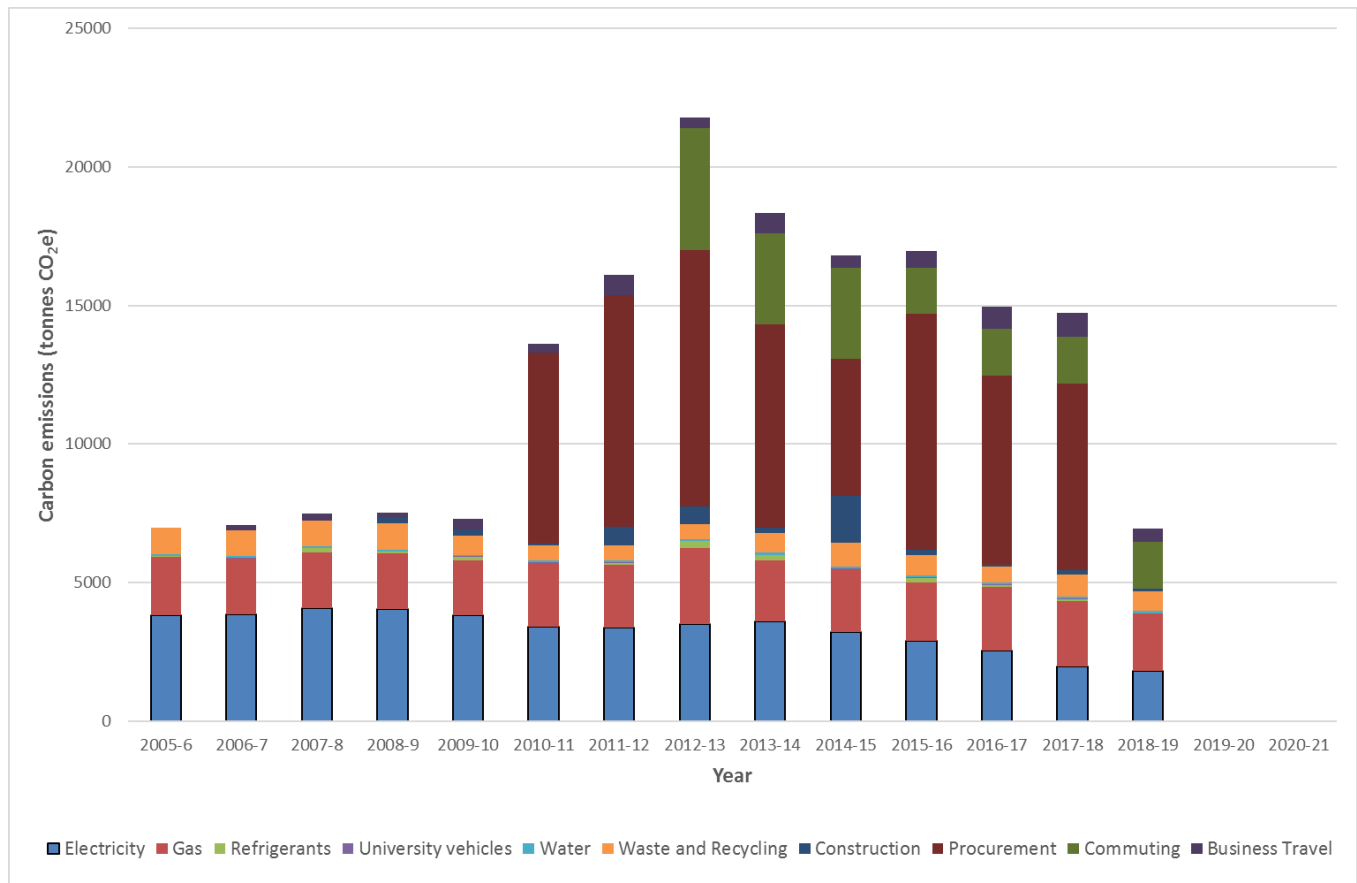
<sup>1</sup> The Higher Education Funding Council for England stated that Higher Education needs to play a part in meeting national targets for carbon reduction; and that it was uniquely placed to lead the way. The carbon reduction target and strategy for higher education in England (January 2010/01) statement of policy required all institutions to set their own reduction targets for 2020 against a 2005 (August 2005 to July 2006) baseline to achieve a sector wide target of a 29% reduction by 2017-2018 and a 43% reduction by 2020-2021. A 2005 baseline was chosen as it is used for reporting against UK targets and it was demonstrated that robust Scope 1 and 2 data are available for this year at an institutional level.

## 2) Carbon Emissions

The University collects consumption / usage / spend data from a variety of sources and calculates the associated carbon emissions<sup>2 3</sup> enabling the University to understand its carbon contribution, and to measure its progress towards its reduction targets as carbon reduction projects are implemented.

The University collects data from both sources owned and controlled by the University (Scope 1 and 2 emissions) and those which are not owned and controlled by the University (Scope 3 emissions), see Appendix 1 for more details. All data is presented in tonnes of CO<sub>2</sub>e; CO<sub>2</sub>e is the universal unit of measurement to indicate the global warming potential (GWP) of Greenhouse Gases (GHGs)<sup>4</sup>, expressed in terms of the GWP of one unit of carbon dioxide.

The University's carbon emissions are shown by emissions source in Figure 1 and a detailed breakdown can be found in Appendix 2. Please note that carbon emissions are not available for all emission sources since 2005-2006 either because the data was not collected and / or the carbon conversion factors / methodology was not available.



**Figure 1. Carbon emissions by source from 2005-2006 to 2018-2019**

The University's carbon footprint has been variable over time with the addition of new emissions sources. It must also be noted that the data shown is incomplete from 2015-2016 because of the limited construction waste and recycling data received from contractors and resources have not been available to calculate business travel claimed via payroll. Procurement / supply chain data has not been included for 2018-2019 as the data has not yet been released by the North West University Purchasing Consortium (NWUPC). Data has also not been included from student commuting to and from the University at the start and end of term nor from direct student travel for placements; though these is being explored.

<sup>2</sup> Carbon emissions are calculated using the Government's conversion factors for company reporting

<https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting#conversion-factors-2016>

<sup>3</sup> Carbon Conversion factors change on an annual basis and this can have a significant effect on the emissions from each emission source, for example, the electricity conversion factor changes dependent on the mix of fuels used to create the electricity such as coal and renewables

<sup>4</sup> There are seven main GHGs that contribute to climate change, as covered by the Kyoto Protocol: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>).

Scope 1 and 2 emissions (gas, fuel and electricity) account for ~30% of the University’s carbon footprint. Scope 3 emissions (water and waste water, waste and recycling, construction waste and recycling, procurement / supply chain, commuting and business travel), however, continue to be the biggest contributor to the University’s carbon footprint accounting for ~70% of our total emissions (nb, this is likely to be higher given the limited construction waste and business travel data).

Scope 1 and 2 emissions are the main focus of this progress report, despite having lower emissions than Scope 3, as HEFCE (at the time of writing the 2015-2016 CMP) and national carbon reduction targets are for Scope 1 and 2 emissions.

### 3) Scope 1 and 2 emissions

#### a) Target

The 2015-2016 to 2020-2021 gas, fuel and electricity carbon emission reduction target is a key goal of the University’s Corporate Plan:

Annual reduction target: 2.5% from 2015-2016  
 i.e. at least 12.5% between 2015-2016 and 2020-2021  
 (reducing carbon emissions from 5022 to 4394 tonnes CO<sub>2</sub>e)

For HEFCE requirements this equates to a 25.9% by 2020-2021 from a 2005-2006 baseline (reducing emissions from 5928 to 4394 tonnes CO<sub>2</sub>e).

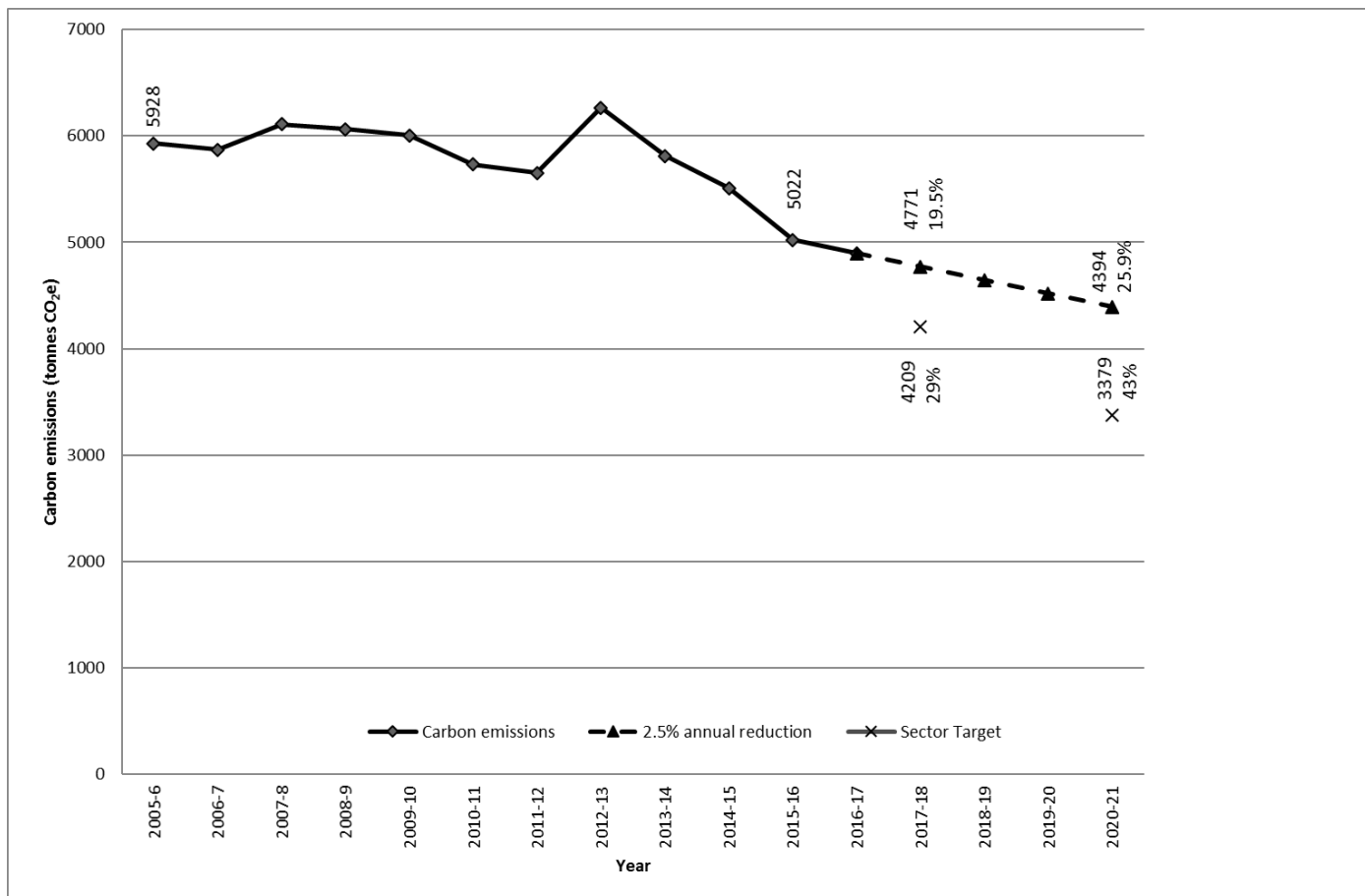


Figure 2. Gas, Fuel and Electricity carbon reduction targets to 2020-2021

b) Progress towards target

The gas, fuel and electricity carbon emissions, see Table 1, show a positive downwards trend and the University has reduced its emissions to 3,885 tonnes CO<sub>2</sub>e, a reduction of 22.6% from the 2015-2016 baseline (equivalent to a reduction of 34.5% from the 2005-2006 baseline). This means that the University has achieved its 12.5% carbon reduction target prior to the 2020-2021 deadline.

**Table 1. Gas, fuel and electricity carbon emissions (tonnes CO<sub>2</sub>e) from 2005-2006**

	2005-2006		2015-2016	2016-2017	2017-2018	2018-2019	% change from 2015-2016
<b>Gas (Scope 1, 3)</b>	2,079		2,111	2,282	2,340	2,076	-1.66
<b>Fuel (Scope 1, 3)</b>	16.5		16.4	15.9	12.4	15.0	-8.54
<b>Electricity (Scope 2, 3)</b>	3,832		2,895	2,542	1,974	1,794	-38.0
<b>TOTAL</b>	<b>5,928</b>		<b>5,022</b>	<b>4,840</b>	<b>4,326</b>	<b>3,885</b>	<b>-22.6</b>

These reductions, however, are predominately caused by continuing decrease in electricity carbon conversion factors (i.e. the factor used to convert kWh to carbon emissions). The conversion factor has reduced annually from 0.58878 kg CO<sub>2</sub>e in 2005-2006, to 0.5168 kg CO<sub>2</sub>e in 2015-2016 to 0.31598 kg CO<sub>2</sub>e in 2018-19 because of the higher proportion of gas and renewables used to generate the electricity, replacing coal. However, a number of carbon reduction projects have also been implemented (see Section 5 for more detail) including the installation of Building Management Systems (BMS) across the majority of the estate; a rolling programme of LED installation, replacing single with double glazing, roof repairs with increased insulation; and increased awareness and engagement activities.

The annual reduction in carbon conversion factors means that it is prudent to consider the change in consumption over time (Table 2).

**Table 2. Consumption of gas, fuel and electricity from 2005-2006**

	2005-2006		2015-2016	2016-2017	2017-2018	2018-2019	% change from 2015-2016
<b>Gas (kWh)</b>	11,238,638		10,099,845	10,762,493	11,166,535	9,990,682	-1.1
<b>Fuel (L)</b>	6,271		5,239	4,989	3,912	4,798	-8.4
<b>Electricity (kWh)</b>	6,508,424		5,601,117	5,703,299	5,595,258	5,678,523	+1.4

**Gas** consumption has reduced by 1.1% since 2015-2016 (and by 11.1% since 2005-2006). Consumption has decreased despite the increased footprint of the University estate (the new acquisitions increased the gas consumption by 119,447 kWh in 2017-2018 and 65,941 kWh during 2018-2019) therefore evidencing the success of the carbon reduction projects which have been completed, including: 1) Phase 1 and 2 of the BMS in the third quarter of 2017 and first quarter of 2019 – the controls are continuing to be optimised to ensure that the heating and hot water systems are operating as effectively and efficiently as possible; 2) approval of the Heating Policy in May 2017 and is being strictly enforced to limit heating to 21°C; 3) replacing roofs with increased insulation; 4) replacing single with double glazing; and 5) installing Thermostatic Radiator Valves throughout campus.

**Fuel** consumption has reduced by 8.4% since 2015-2016 (and by 23.5% since 2005-2006). Diesel during this period has decreased by 24.4% following the sale of a number of vehicles and a reduction in miles travelled to our Network Colleges. Petrol, however, has increased by 245% with the increase in fuel purchased for the gardening equipment.

**Electricity** consumption has increased by 1.4% since 2015-2016 (and by 12.8% since 2005-2006) despite a number of carbon reduction projects being implemented, including: 1) increased roof insulation at St Michaels halls of residence, 2) LED lighting with upgrades in controls; and 3) I ♥ MY Campus Challenge – a competition between halls of residence to reduce the consumption of electricity compared to the previous year (per student) and a staff challenge to improve the environmental sustainability of their teams. The new acquisitions increased the electricity consumption by 30,365 kWh in 2017–2018 and 112,733 kWh during 2018-2019; if these buildings had not been purchased the electricity consumption between 2015-2016 and 2018-2019 would have decreased by 0.2%; However, these buildings are part of the strategic plan of the University therefore additional carbon reduction projects need to be quantified and completed to ensure that consumption reduces.

Additional solar PV panels (13.5 kW estimated to produce ~11,600 kWh per annum) were installed during the construction of the Health Sciences building in 2015-2016; but they have not performed as expected as the panel system has developed a fault.

c) Refrigerant gases

The release of refrigerant gases from the University's air handling units (AHUs) is variable, see Table 3. Maintenance and servicing of the units is carried out at least six monthly by the University's mechanical maintenance contractors to ensure that the equipment is operating at its optimum. Other than specifying low emission refrigerants when upgrading / replacing AHUs there is limited scope to influence / reduce the release of these gases.

**Table 3. Refrigerant gas carbon emissions (tonnes CO<sub>2</sub>e) since 2005-2006**

	2005-2006	2015-2016	2016-2017	2017-2018	2018-2019
<b>Refrigerant gases</b>	40.2	158	85.6	86.9	7.6

**4) Scope 3 emissions**

Carbon emissions for Scope 3 emissions sources have been calculated from as long a period as possible, see Table 4. With the exception of water and wastewater, Scope 3 emissions should be considered with caution because either: a) the information used to calculate emissions is reliant on data supplied by third parties, b) a weak calculation methodology, or c) the carbon emissions are calculated using spend data. The University is working with its partners to ensure that the required data is collected, so the emissions presented are as complete and accurate as possible.

Scope 3 reduction targets have not yet been set, but a reduction in emissions is desired. As noted above, the Scope 3 data provided is incomplete, therefore percentage changes since 2015-2016 have not been included for discussion.

**Table 4. Scope 3 emissions (tonnes CO<sub>2</sub>e) from 2005-2006**

	2005-2006	2015-2016	2016-2017	2017-2018	2018-2019
<b>Water and Waste Water</b>	61	71	71	73	72
<b>Waste and Recycling</b>	933	744	561	790	704
<b>Construction Waste and Recycling</b>		185	80	168	No data available
<b>Procurement / Supply Chain</b>		8,527	6,829	6,730	No data available
<b>Commuting (staff and student)</b>		1,658	1693	1702	1683
<b>Business Travel</b>		608	785	855	496

a) Water and Waste Water

Water consumption and waste water disposal carbon emissions have increased since 2015-2016 by 1.4% (consumption / disposal has increased by 0.6% from 67,882 m<sup>3</sup> to 68,302 m<sup>3</sup>). The increase may be linked to the increase in the footprint of the estate, variability of residential students, or the method of data input (the usage is entered on the last day of the usage period i.e. not divided on a monthly basis, therefore variability may occur whether the invoices are received on a monthly or quarterly basis).

Although water is a costly resource, its carbon emissions are minimal compared to gas and electricity and therefore water has not been given a high priority and therefore water reduction projects such as waterless urinals, non-concussive taps etc. have not been prioritised.

b) Waste and Recycling

The waste and recycling data shown only relates to that arising from student accommodation and academic buildings; waste arising from the gardens, refurbishments and construction are included in the construction waste and recycling section.

The amount of waste produced (tonnage) and percentage of recycling has been variable throughout the CMP and is dependent on whether the contractor uses accurate or estimated weights for the bins which has a direct correlation

to the carbon emissions produced. The University collects paper, card, plastics and cans both individually in academic buildings and as mixed recycling in student halls and catering outlets, though all recycled materials are placed in the same external bin for collection by the contractor; therefore the calculated carbon emissions are dependent on the breakdown of materials provided.

c) Construction Waste and Recycling

Data provided by the University's construction partners has been very limited since 2015-2016; therefore it is not appropriate to provide comment on this data. The University recognises it must ensure that the waste and recycling data is provided by the contractors to enable our complete carbon footprint to be calculated.

d) Procurement / Supply Chain

Emissions from the University's supply chain is the largest contributor to the University's carbon footprint. The supply chains emissions are calculated using the annual spend in the different ProCHecodes, therefore the higher spend the higher the carbon emissions, regardless of whether the item purchased was environmentally sustainable. The only way therefore to reduce emissions is to spend less.

e) Commuting

The travel habits of staff and students are collected every two years and the carbon emissions are calculated based on survey responses (extrapolated as required), therefore a number of assumptions have to be made. The change in carbon emissions is because of the change in carbon conversion factors, rather than a change in the travel modes of our staff and students. Data has not been collected from student travel from their home address at the start and end of term, though this is something that may be considered in the future.

f) Business Travel

Business travel data is collected via fuel cards (for hire car fuel), expenses claimed via payroll, purchases made through Barclaycard and through the Travel Management Company. The data shown here is very limited and only includes the fuel card and Travel Management company data; resources have not been available to analyse payroll and Barclaycard data. Data has not been collected from student's direct travel to placements, though this is something that may be considered in the future.

The lack of robust data for Scope 3 emissions means direct comparisons and analysis over the years is extremely difficult. However, data collection is continuing to improve and works by external organisations (such as the EAUC and AUDE) are developing more robust methodology for the collection and analysis of Scope 3 emissions.

## 5) Carbon Management Plan Projects

The CMP detailed a number of carbon reduction projects that were scheduled to be implemented during the lifetime of the plan, see Appendix 3. The projects were prioritised on the basis of carbon reduction, cost and payback period and were phased to ensure that the 'quick wins' were implemented first. Not all of the projects have yet been carried out either because they were scheduled during the last two years of the CMP; alterations to the capital / maintenance programme, unforeseen practical or operational reasons, changing University priorities or available funding.

Appendix 4 provides a full list of completed projects and some of the most successful projects are discussed below.

### Sub-metering

The University has installed gas and electricity sub-metering in the majority of its buildings from October 2016 enabling half hourly meter reads to be taken at a building level. Using this data will enable: 1) the identification of high or unusual use of energy and highlights opportunities to make savings (such as usage outside of operational hours) and using the BMS settings to alter start-up and close down times, operating temperatures therefore ensuring that the plant is operating effectively and efficiently and making significant savings in gas consumption; 2) reporting on energy performance on a building by building basis; and 3) the ability to run energy saving competitions more effectively rewarding actual performance.

### Building Management System

The BMS allows for close energy efficient control and monitoring of the heating and hot water services, thereby ensuring occupant comfort levels, reducing consumption and therefore carbon emissions, lower running costs and



optimising plant performance. Phase 1 (~28% of total gas consumption) was installed during the third quarter of 2017 and Phase 2 (~45% of total gas consumption) was installed during the first quarter of 2019.

The BMS has proved invaluable enabling the remote access and control of the heating and hot water plant (removing the need for a physical presence to adjust the plant) to programme occupancy times and the heating season; and has also highlighted problems with the plant not operating optimally.

### **Building upgrades**

The University has a programme of utility saving projects within its maintenance schedule including replacing lighting with LEDs and automatic controls; replacing single glazing windows with double glazing (the majority of buildings are now complete) and where required replacing roofs and increasing the insulation.

### **Heating Policy**

The University's Heating Policy was approved in May 2017 by the Senior Management Team in which the University aims to provide a comfortable working and living environment whilst fixing winter set points at 21°C i.e. to reduce wasted energy by overheating buildings.

### **Awareness and Engagement**

Awareness and engagement activities have increased over the period of the CMP with a new website, presence on social media and attending events such as Fresher's Fayre, Health and Wellbeing Days and dedicated sustainability events. The University has run an energy saving competition between halls of residence to see which halls can reduce its electricity consumption between November and April compared to the previous year. During 2015-2016 the competition was run alongside the NUS, then was brought in house. This competition has not been hugely successful as it has been difficult to engage with both the student body and Student's Union. The University also runs a sustainability competition between staff teams (during 2015-2016 this was the NUS's Green Impact scheme, it was then brought in house and rebranded the I ♥ MY Campus Challenge), which has had less than 10 teams take part each year, with a very limited number of academic teams.

## **6) Summary**

The University has reduced its carbon emission from gas, fuel and electricity between 2015-2016 and 2018-2019 (gas decreased by 1.7%, fuel decreased by 8.5% and electricity decreased by 38%) through the implementation of carbon reduction projects and the reduction in the conversion factor used to convert usage to carbon emissions and has achieved its 2020-2021 target of 4394 tonnes CO<sub>2</sub>e ahead of the deadline.

Despite the emissions reduction target being met, the University cannot become complacent as consumption figures show that we are not on target to achieve the Corporate Plan key goal of a 25% reduction in utilities consumption between 2005-2006 and 2020-2021 (gas consumption has decreased by 11.1% and electricity by 12.8%). It is imperative that action is taken now to reduce utility consumption, not at least because of the cost savings that could be achieved by taking early action, and the associated reduction in carbon emissions. Failure to implement the projects could lead to unmanageable utility costs which may compromise University business and operations.

A new CMP to 2020-2021, with a broader remit to include utilities, is urgently required to detail the path the University is required to take if it is to meet the 25% reduction Corporate Plan Key Goal and must be ratified by both Senior Management Team and University Council. The new CMP will set out the projects, both technological and behavioural, whose implementation will be essential if the Key Goal is to be met. Immediate reductions are required, but in a manner which will not compromise business operations. Behaviour change can deliver significant savings, but it will also be necessary to upgrade inefficient equipment and invest in technologies to realise the reductions. Equally important is using our existing facilities in the most efficient manner without avoidable energy wastage. Immediate action to reduce consumption has multiple benefits –reducing utility costs and helping to protect us from future price increases; and reducing carbon emissions which will contribute to the net zero emissions targets set by Liverpool City Council (by 2030) and the UK (by 2050).

The opportunities and challenges faced to reduce the University's consumption and therefore carbon emissions are significant. Renewed senior management support and embedding environmental sustainability into all of the University's operations will be vital in ensuring that these reductions are met. Resources, both financial and personnel, must be made available if these goals and targets are going to be met.

## **7) The future**

The University will continue to expand and transform to ensure that it meets the needs of its future students and a new Corporate Plan and Estates Strategy are currently being drafted to shape this transformation and these will have a fundamental impact on the University's carbon emissions. It is essential that sustainability is at the heart of the Estates Strategy ensuring that all developments are achieved in the most utility and resource efficient manner possible; the Strategy will also allow future carbon management projects to be planned more prudently.

Following the achievement of the Corporate Plan target for reducing carbon emissions, thought must now be given to future carbon reduction targets. Carbon reduction has recently been gaining more prominence in the public eye following the school strikes; Extinction Rebellion action; and Climate Emergencies being declared by Government, various local Governments and Universities. The Government has recently amended its Climate Change Act target to achieve net zero emissions by 2050 following recommendations by the Climate Change Committee and the EAUC (The Alliance for Sustainability Leadership in Education) has called for all post-16 Higher Education Institutions to declare a Climate Emergency and to commit to a 2050 net zero emissions target. Sector targets, previously set by HEFCE, are no longer valid following the replacement of HEFCE with the Office for Students in April 2018. Government, however, introduced a voluntary target in the Clean Growth Strategy for the wider Public and Higher Education sectors in England to reduce Scope 1 and 2 emissions by 30% by 2020/21, compared to a 2009/10 baseline (April to March). These factors all need to be considered while the University sets its own ambitious, but achievable targets.

## Appendix 1. Data obtained to calculate the University's carbon footprint

Scope <sup>5</sup>	Emissions Source	Details	Source
1, 3	Gas	Gas consumed in residential and non-residential buildings	Invoices, supported by monthly meter readings. Accurate
1, 3	Fuel used within University owned vehicles	Fuel used within University owned vehicles	Litres of fuel from fuel card information. Accurate
2, 3	Electricity	Electricity consumed in residential and non-residential buildings	Invoices, supported by monthly meter readings. Accurate
1 <sup>6</sup>	Refrigerant gases	Fugitive emissions from leaks from air conditioning or refrigeration units	Reports from the University's Mechanical Maintenance Contractor of refrigerants added during service and maintenance. Accurate
3	Water	Water consumed and waste water disposed of <sup>7</sup> in residential and non-residential buildings	Invoices, supported by monthly meter readings. Consumption is recorded on the last date of usage and could account for three- or six-monthly usage; it is not reported monthly; therefore this could cause variations throughout the years. Accurate
3	Waste	Waste collected for disposal from residential and non-residential buildings	Monthly waste report from the waste and recycling contractor. It should be noted that the data is estimated using the average weight of bins <sup>8</sup> and an estimated breakdown of materials <sup>9</sup> . Estimated
3	Construction waste	Waste collected for disposal as a result of building projects	Data provided by building contractors from skips and site waste management plans for larger construction projects. Estimated
3	Business Travel	Travel undertaken by staff which is paid for by the University	Invoices from car hire supplier; Travel and subsistence forms; fuel cards; credit card purchases. Estimated
3	Staff and Student Commuting <sup>10</sup>	Travel undertaken by staff and students from their home address to their place of work/study	The data is extrapolated from the responses received from biennial travel surveys and is based on a number of assumptions. Estimated
3	Supply Chain	Materials purchased and delivered to the University. The emissions are calculated on a 'consumption based' approach by assigning carbon intensity to various spend profiles	Institutional procurement spend (by ProcHE code) is converted into carbon emissions using HESCET (Higher Education Supply-Chain Emission Tool) by the North West Universities Purchasing Consortium (NWUPC). Estimated

<sup>5</sup> These baseline carbon emissions also include Scope 3 emissions i.e. those associated with extraction, refining and transportation of the raw fuel sources to an organisation's site, prior to their use; electricity also includes the emissions associated with grid loss.

<sup>6</sup> Refrigerant gases have been excluded from the baseline carbon emissions and the carbon reduction targets because there is limited scope for implementing projects to reduce these emissions. The air conditioning units are serviced and maintained at least every six months by the University's Mechanical Maintenance Contractor. The data has been provided for completeness.

<sup>7</sup> Water Plus assume waste water is 100% of the water consumed

<sup>8</sup> Please note, the bin weights were accurate between 2010-2011 and 2012-2013

<sup>9</sup> Data provided between 2005-2006 to 2008-2009 were calculated using the 2009 conversion factors for material use and waste disposal

<sup>10</sup> Commuting data does not include carbon emissions as a result of home and international students travelling from their home to their term-time address. The collection of this data is currently being investigated.

**Appendix 2. Carbon emissions and consumption from University activities from 2005-2006**  
Carbon Footprint shown in tonnes (CO<sub>2</sub>e)

	Scope	2005-6	2006-7	2007-8	2008-9	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Electricity	Usage (kWh) generated	6,508,424	6,746,286	6,696,015	6,654,936	6,396,046	6,049,189	5,915,798	6,239,181	5,794,749	5,564,494	5,601,117	5,703,299	5,595,258	5,678,523
	Transmission and Distribution	3,081	3,149	3,322	3,286	3,104	2,735	2,721	2,779	2,864	2,572	2,308	2,005	1,584	1,451
	Well To Tank (generation)	294	246	258	260	250	234	215	238	250	212	209	187	135	123
	Well To Tank (T&D)	417	430	461	445	415	389	408	439	436	383	347	320	235	202
		3	34	36	35	33	33	32	37	38	32	31	30	20	17
Gas	Usage (kWh) generated	11,238,638	10,787,310	10,862,479	9,972,142	9,846,017	11,517,887	11,046,321	12,998,185	10,520,628	10,948,360	10,099,845	10,762,493	11,166,535	9,990,682
	Well to Tank	2,079	1,996	2,010	1,834	1,824	2,115	2,046	2,392	1,946	2,019	1,858	1,982	2,054	1,837
		Included in Scope 1 emissions			179		207	211	365	261	272	252	300	286	239
	Petrol (L)	0	0	1,077	1,660	1,561	1,506	296	15	196	390	312	392	673	1,075
Fuel	Petrol	0	0	2	4	4	3	1	0	0	1	1	1	1	2
	Well to Tank	Included in Scope 1 emissions				1	1	0	0	0	0	0	0	0	1
	Diesel (L)	6,271	5,943	7,555	7,407	6,462	5,704	5,038	4,825	4,909	5,124	4,926	4,597	3,239	3,722
	Well to Tank	16	16	20	20	17	15	13	13	13	13	13	12	9	10
		3	Included in Scope 1 emissions			3	3	2	3	3	3	3	3	2	2
CMP emissions		5,928	5,869	6,109	6,065	5,828	5,733	5,650	6,266	5,812	5,508	5,022	4,840	4,326	3,885
	% change from 2005-2006		-1.0%	3.1%	2.3%	-1.7%	-3.3%	-4.7%	5.7%	-1.9%	-7.1%	-15.3%	-18.4%	-27.0%	-34.5%
Refrigerants		40	9	143	64	115	0	72	245	184	0	158	86	87	8
Water and Waste Water	Usage (m3) Supply	63,083	63,586	58,358	58,258	54,711	58,843	67,453	55,659	75,734	67,224	67,882	67,316	69,277	68,302
	Treatment	17	18	16	16	16	20	23	19	26	23	23	23	24	23
		44	44	40	40	41	41	48	39	54	48	48	48	49	48
	TOTAL	933	937	929	957	689	528	539	544	544	715	871	744	561	790
Waste and Recycling	Materials							514	518	679	856	736	553	782	700
	Waste disposal						25	27	27	37	15	9	8	8	8
Construction Waste and Recycling	TOTAL				203	231	76	664	641	181	1,677	185	80	168	
	Materials							659	636	179	1,653	183	79	167	
	Waste disposal						5	5	5	2	24	2	1	2	
	TOTAL						6,890	8,364	9,244	7,356	4,958	8,527	6,829	6,730	
Supply Chain	staff														
	student								562	572	572	468	476	506	497
Travel									3,835	2,713	2,713	1,190	1,217	1,196	1,186
			180	235	185	381	328	738	375	707	436	608	785	855	496
TOTAL		6,962	7,057	7,472	7,530	7,302	13,616	16,098	21,771	18,321	16,805	16,974	14,945	14,731	6,851

### Appendix 3. Scheduled projects between 2015-2016 and 2020-2021

Project	Building / Site	Project cost - estimated (£)	Carbon source	Carbon saving estimated (t CO <sub>2</sub> e)
<b>Scope 1 and 2</b>				
Building Management System (BMS) – with Central Control Facility	Hope Park	110,000	Electricity Gas	42 18
	Creative Campus	25,000	Electricity Gas	8 7
Continue programme of lighting replacement and installation of lighting control	All		Electricity	
Remove redundant calorifier and review hot water load	St Julies	15,000	Gas	16
Repair pipe and valve leaks in calorifier room	St Julies	8,472	Gas	
Replace 2no. central heating boilers	St Julies	40,000	Gas	22
Replace central heating controller and review	St Julies	7,500	Gas	10
Install Variable Speed Drives to main circulation pumps	St Julies	3,500	Electricity	2
Replace central heating controller and review	Trinity Building	5,000	Gas	7
Install condensing boiler (remove feed from main boilers)	Estates	2,000	Gas	3
Decentralise boilers	Angela and Austin Halls	130,000	Gas	68
Heating control modification of main boilers (once Angela and Austin have been decentralised)	Frances Mary Lescher		Gas	
Replace boilers	Hopkins Hall Cornerstone	45,000	Gas	37
Replace heating circulation pump with new pump with integrated VSDs	Cornerstone (basement)	8,000	Gas	2
Replace gas fired water heater	Cornerstone	7,500	Gas	7
Install point of source hot water	Green Lane Building		Gas	
Conversion of electric immersion heater to gas fired	Lecture Theatre Complex	6,000	Electricity	3
Install time switches to water heaters	Trinity Building	300	Gas	0.3
Review time clock controls to water heaters	St Michaels	0	Gas	
Investigate replacing local heating time clocks (integral to units) with a centralised charge controller - Fit time clocks to the cottage immersion heaters	Plas Caerdeon	4,000	Electricity	9
Install of tamperproof Thermostatic Radiator Valves	Hope Park Creative Campus Aigburth	31,352	Gas	19
Further investigate heating and hot water controls	All		Gas	
Insulate boilers, pipes, valves and flanges	Hope Park	7,139	Gas	18
	Creative Campus	3,200		
Insulate boilers, pipes, valves and flanges after removal of calorifier	St Julies	2,232	Gas	7

Insulate exposed pipework throughout building		10,935		
Insulate exposed pipework throughout building	Plas Caerdeon	1,200	Electricity	3
Improve roof insulation	Conference Centre	1,800	Gas	1
	Sheppard Worlock Library Lecture Theatre Complex		Gas	
	St Julies	6,750	Gas	18
	Plas Caerdeon cottages	1,770	Electricity	0.3
Insulate cellar insulation	EDEN			
Retrofit doors to open fridges	Frances Mary Lescher shop		Electricity	
Investigate AHU operating hours and link to BMS	All	24,000		14
Investigate replacement of University owned vehicles with more fuel efficient lease vehicles			Fuel used within University vehicles	
Investigate roof replacements	Green Lane Building, Frances Mary Lescher, EDEN, Lecture Theatre Complex	GLB – 102260 FML - 533676	Gas	GLB – 4 FML - 11
Programme roof repairs	HCA, Cornerstone		Gas	
Investigate replacement of single with double glazing	Frances Mary Lescher (part), Business School, EDEN (part), Hilda Constance Allen (part), Green Lane Building, Lecture Theatre Complex, Trinity Building, St Julies, Plas Caerdeon (part)	FML – 33712 Business School – 41470 EDEN – 44831 HCA - 239090	Gas	FML – 0.5 Business School – 2 EDEN – 2 HCA - 4
Continue programme of computer upgrades	All		Electricity	
Replace gas fired flat tops with induction	Frances Mary Lescher kitchens		gas	
Continue programme of awareness and engagement	All		All	
<b>Scope 3</b>				
Sub-metering of water on a building by building basis	All		Water	
Reduce water consumption - Water audits including leak detection - Automatic meter readings	All		Water	

- Installation of water saving devices - Internal communications				
Waste and Recycling bins - Installation of Dry Mixed Recycling bins	Wesley, Newman and Teresa Halls Catering Outlets	6,810	Waste	

**Appendix 4. Completed projects between 2015-2016 and 2020-2021**

Project Name	Building / Site	Date	Estimated kWh saving	Utility
<b>2015-16</b>				
Increase efficiency of AHU	SWL Server room	Aug-15		
Replace MFD estates	All	Sep-15		
Replacement lighting with LED	Cornerstone stairwells	Sep-15		
Heating control modification	EDEN	Sep-15		
Energy Audits	All		N/A	All
Replacement dishwasher	FML	Jan-16	77,305	Electricity
Replacement dishwasher	FML	Jan-16	5,587	Gas
Replacement lighting with LED	Cornerstone Great Hall	Jan-16		Electricity
Replacement lighting with LED & PIR	Launderette	Mar-16		Electricity
Installation of Enhance 60p solar PV	Health Sciences		9,600.00	Electricity
Replacement lighting with LED	SWL mezzanine	Apr-16	19,742.00	Electricity
Replacement single with double glazing	FML - HR	May-16		Gas
Replacement boiler	Cloisters	May-16		Gas
Replacement lighting with LED	FML SF, TF & FF	May-16	2854	Electricity
TRVs - remaining blocks completed	St Julies	Jul-16	52,021	Gas
Lighting replacement with LED - GF left hand side (right side and middle)	SWL	Jul-16		Electricity
<b>2016-17</b>				
Replacement single glazed windows with double - GF	Business School (tower)	Jul-Aug 16		Gas
Installation of push taps	SWL, Cornerstone	Aug-16		Water, Gas
Refurbishment of bathrooms - push taps	GLB	Aug-16		Water, Gas
Heating and domestic hot water decentralisation	HCA/SWL	2016	90000	Gas
Decentralisation of estates central heating boiler from FML	Estates	2016	6000	Gas
Installation of sub-meters - gas and electricity		Sept 16 onwards	N/A	Gas and Electricity
Replacement lighting with LED	Cornerstone refectory			Electricity



Replacement lighting with LED	Cornerstone corridors			Electricity
Remediation of roof and increased insulation	Sports Hall			Gas
Patch roof repairs completed	Trinity			Gas
Replacement lighting with LED	Wesley communal areas			Electricity
Increase insulation of the roof void (from 100mm to 270mm)	St Michaels			Electricity
Installation of TRVs	Business School	Apr-17		Gas
Clear Policy Guideline - Heating and Cooling Policy	All	May-17		all
<b>2017-18</b>				
Single glazing replaced with double	Plas Caerdeon			Electricity
Single glazing replaced with double	HCA West Wing FF & SF	Aug-Sept 17		Gas
Single glazing replaced with double	HCA East Wing FF & SF facing the Health Sciences	Aug-Sept 17		Gas
Single glazing replaced with double	HCA WW FF & SF facing the Markland	Aug-Sept 17		Gas
Increase roof insulation	HCA WW	Aug-Sept 17		
Lighting replacement with LED	Finance Office FML	Aug-17	11,154	Electricity
Installation of push taps	Across campus	Aug-Sept 17		Gas and Water
BMS connected to central location (Estates)	Cornerstone	Aug-17		Electricity and Gas
Replacement lighting	SWL GF - left hand section	Aug-Sept 17	22,929	Electricity
Replacement lighting	SWL FF - left hand section	Aug-Sept 17	35,741	Electricity
Replacement lighting	SWL FF - staff section	Aug-Sept 17	12,113	Electricity
BMS connected to central location (Estates)	Capstone, GWB, EDEN (excl. Arbour room), Our Place, Health Sciences, Hopkins Hall, Hope Park Sports	Oct-17		Electricity and Gas
Hot water timings reduced from 24-7 to 6am - 11pm	Hopkins	Oct-17		Gas
Hot water timings reduced from 24-7 to 6am - 11pm	St Michaels	Oct-17		Electricity

Replacement lighting	HCA West Wing corridors and rooms	Oct-17		Electricity
Weather compensation equipment replaced	HCA West Wing	Dec-17		Gas
Installation of TRVs	Business School	Apr-17		Gas
Replacement lighting in flat corridors with LED	St Michaels and St Julies	Mar-18		Electricity
Replacement lighting - emergency lighting converted to LED	Wesley and Newman	Mar/Apr 18		Electricity
Replacement lighting - corridors	Wesley and Newman	June/July 18		Electricity
Refurbished GF bathrooms including waterless urinals	Business School			Electricity, Water
Roof replacement	FML - Theology	May-18		Gas
Roof repair (no increased insulation)	Cornerstone	May/June 18		
Dry Rot removal	Hermitage	Jun-18		
Refurbished GF bathrooms including waterless urinals	EDEN	June/July 18		Water
BMS software being re-written so heating and ventilation can operate separately.	EDEN	June/July 18		Gas
<b>2018-19</b>				
Improved roof insulation	St Michaels Block M & N	Sep-18		Electricity
Refurbishment of GF - including waterless urinals	Cornerstone	Oct-18	N/A (will increase consumption)	Water
Major refurbishment of newly acquired building - including heating and hot water on BMS	Arts Centre	Oct-18	N/A (will increase consumption)	
Replacement pitched roof with increased insulation	AJB	Nov-18		Gas
Installation of TRVs	FML 4th Floor	Aug-18		Gas
Replacement lights with LEDs	SWL GF	Jan-19		Electricity
Increased roof insulation to 300mm	St Julies	Dec-18		Gas
Space utilisation - move all teaching (evening and weekend) to FML/AJB, SWL or Hope Park Sports		Oct-18		Gas, Electricity
Installation of waterless urinals	EDEN toilets, Cornerstone, Business School	August onwards		Water
Isolation of pipes feeding the central core	HCA Central core			Gas
lighting problems fixed as on 24/7	FML Chapel	Dec-18		Electricity
Zumbobel lighting system removed and replaced with an open protocol system which can be controlled by the Security lodge or an app	EDEN	Feb-19		Electricity
Installation of BMS	Conference Centre, LTC lecture theatres/media, Business School, FML (includes GLB)	Jan / Feb 2019		Gas, Electricity

Replacement of single with double glazed windows	FML 058 and 059	Feb-19		Gas
Installed a thermostat in the main social space	Trinity	Jan-19		Gas
Occupancy sensors fitted to AHU & new controls	FML 4F and 202	Jan-19		Electricity
Roof replacement - remove leaks (no increased insulation)	FML/AJB English corridor	Nov-18		
Roof repairs to West Elevation following water ingress	SWL	Mar-19		Gas
Roof repairs to sections of Cornerstone Roof	Cornerstone	Ongoing		Gas
Installation of new flow and return pipework from main FML boiler house	Angela	Mar-19		Gas
Decentralised heating system with new boiler plant (from main FML boiler plant)	Austin	Mar-19		Gas
Installation of new heating controls and emergency lighting	Malachy Lodge	Mar-19		Gas
Replacement of single with double glazed windows	Austin Hall	Jul-19		Gas
Installation of TRVs on fourth floor	Austin Hall	Jul-19		Gas