

#### **JANUARY 2019**

#### **Carbon Management Plan Annual Report**

#### For Information and Approval

#### 1. Background

In January 2010, the Board approved the University's first Carbon Management Plan (CMP). This included a challenging target to reduce the carbon footprint of the University by 30% (in absolute terms) by the end of the 2015/16 academic year and an aspirational reduction target of 40% by 2020/21, against a baseline year of 2005/6. In 2015 it was recognised, as a result of the growth in the estate, the 30% reduction target would not be met and the 40% target 2020/21 was endorsed by ULT and the Board. BU has now endorsed 50% reduction target by 2025/26 against a 2005/06 baseline.

The calculated 2005/06 carbon emissions included those associated with gas, electricity, and water use, fleet transport, BU buses (on designated routes), and waste sent to landfill. These emission sources are classified as Scope 1, 2 or 3, as defined in **Table 1**. Energy use (Scopes 1 & 2) accounted for 93% of the 2005/06 emissions, with transport accounting for 5% and the remainder 2%. This paper reports progress against the 2005/06 carbon emissions and also focuses on progress with reducing carbon emissions associated with energy use.

### Table 1 Carbon Scope

Scope	Direct/Indirect emissions	Source of emissions
Scope 1	Direct	Emissions associated with sources that are owned or controlled by BU. Examples include gas consumption and fleet vehicle fuel use.
Scope 2	Indirect	Emissions from the generation of purchased electricity
Scope 3	Indirect	Emissions from BU activities that occur from sources not owned or controlled by BU, such as procurement and water supply and disposal

The CMP was last reviewed and updated by the Sustainability Team in November 2016. This report highlights the progress within the period of 2017/18 and future identified plans.

### 2. Carbon Reduction Target and Current Projections

The challenging nature of the carbon target should not be under-estimated; an absolute reduction of 40% from a baseline of 8,275 tCO<sub>2</sub>e (tonnes of carbon dioxide equivalent) in 2005/06 to 4,965 tCO<sub>2</sub>e in 2020/21 in the context of an expected increase in the floor area of the Estate of 6% by 2020/21.

Table 2 shows the 2017/18 carbon emissions compared to the 2005/06 baseline and 40% emission reduction target:

### Table 2 - 2017/18 Carbon Update

2005/06 Carbon emissions (tCO <sub>2</sub> e)	2020/21 40% Reduction target emissions (tCO <sub>2</sub> e)	2017/18 Actual emissions (tCO <sub>2</sub> e)	Difference between 2017/18 and 2005/06 emissions (tCO <sub>2</sub> e)	Percentage reduction comparing emissions in 2017/18 to 2005/06 (%)	Difference between 2017/18 emissions and 2020/21 target (tCO <sub>2</sub> e)
8,275	4,965	5,274	-1,131	-36%	310

**Figure 1** shows the progress to date of carbon reduction projects implemented since 2010 in reducing carbon emissions. In 2017/18 emissions reduced by 16.1% from 2016/17 and from the 2005/6 baseline by 36.3%. This reduction is mainly due to the exit from Cranborne House, installation of energy conservation measures, staff and student engagement and a marked decline in recent years of the national grid electricity carbon factors, reflecting the de-carbonisation of the grid (See **Appendix 1** for annual DEFRA conversion factors for UK purchased electricity (including transmission and distribution) and natural gas). It should be noted the estate Gross Internal Area (GIA) increased by 7% over the same period (See Table 3).

During 2017/18 carbon emissions were estimated for the life of the current plan (2020/21) to provide some indication of whether the 40% carbon reduction target is achievable. Contained within the estimations are the identified projects within the CMP, the University's planned changes to the estate and the DEFRA carbon conversation factors (See Appendix 1). These estimations show a reduction of 41.4% by 2020/21 is possible.



**Figure 2** details the breakdown of emissions for 2017/18 in tonnes of  $CO_2$  and shows Buildings account for 92% of the total. Of this, the majority (3,546 tonnes) are from electricity.



## **Carbon metrics**

The following figures show carbon emissions (Scope 1 & 2) expressed as metrics using staff and student numbers (FTE), gross internal floor area ( $m^2$ ) and turnover (£) to demonstrate progress in tackling energy and carbon emissions against a back drop of an increasing University population, estate size and activity (as measured by University turnover) over the past ten years (See **Table 3**).

## Table 3 Carbon Metrics Data

Metric	Data Source	Dates when data used or provided	2005/06	2017/18	% change between 2005/06 and 2017/18
Student and Staff FTE	PRIME	January 2019	11,643	16,525	41.9%
University Space GIA (m <sup>2</sup> )	Estates (EMR)	January 2019	85,313	91,393	7.1%
Total Income £M	PRIME	January 2019	£81.2	£159.49	96.4%

**Figure 3** shows that in 2017/18 carbon emissions per FTE have decreased by 22.4% from 2016/17, demonstrating continued efficiency of running the University estate and operations. Emissions per FTE have more than halved since 2005/06, from 670 kgCO2 per FTE to 294 kg Co2 per FTE, despite the increase in University population by 4,882 over this period.



**Figure 4** shows that carbon emissions per gross internal area (GIA) in 2017/18 decreased from 2016/17 by 10%. Since 2005/06 there has been a decline in emissions per GIA of 41% (down from 91 kgCO2/GIA to 53 kg CO2/GIA), indicating a much lower energy intensive use of the estate. Since 2005 the estate has increased by  $6,080m^2$ , from  $85,313m^2$  in 2005/6 to  $91,393m^2$  in 2017/18, representing a 7.1% increase.



**Figure 5** shows carbon emissions per £ turnover declined by over two thirds between 2005/06 (0.096 to 0.03 kg CO2/£) and 2017/18, reflecting BU's increased income and activity (an increase of 96.4%) over this period.



# 3. Energy consumption

# 3.1 National Grid Electricity consumption

**Figure 6** shows that Grid Electricity consumption decreased by 9.7% in 2017/18 compared to 2016/17. Overall electricity consumption from the national grid has been reduced by 18.4% between 2005/06 and 2017/18 and is the first time since the 2005/06 baseline year BU have been below 10 million kWh for the consumption of grid electricity. The reasons for the decline in grid electricity are as described for the decline in carbon emissions together with the increase in on-campus electricity generation from photovoltaics and the Fusion building micro Combined Heat and Power (CHP) plant.



### 3.2 Natural Gas consumption

**Figure 8** shows natural gas consumption decreased by almost 17% in 2017/18 compared to 2016/17 consumption. This decrease was a combination of a warmer winter period and the exit from Cranborne House and 21 Lansdowne Road.

Gas consumption has overall declined by 21.6% between 2005/06 and 2017/18.



# 3.3 On-site Low and Zero Carbon (LZC) Technologies

**Figures 9 & 10** shows onsite renewable energy production has increased by 213% to 1,188,674 kWh from 2012/13 to 2016/17 following the continued installation of LZC technologies. Onsite electrical generation output increased by 35.7% from 2016/17 as a result of additional solar arrays on the Bus Hub and Poole House waste compound. Heat generation from the Biomass Boiler and Ground Source Heat Pumps (GSHP) declined by 24% between 2016/17 and 2017/18 due to operational problems. As a result LZC was about 7% of total energy use in 2017/18, a slight decrease from 7.3% in 2016/17.





**Figure 11** shows that the LZC technologies saved 406 tCo2e during 2017/18 down from the previous year of 555 tCo2e. This was due to the reduction in the grid electricity carbon factors and reduced outputs from the Biomass Boiler and GSHP's.



### 3.4 Total energy consumption

Figure 7 shows the total energy (grid & LZC sources) used across BU with the total consumed during 2017/18 was 17.17million kWh. This is a reduction of 13% from 2016/17 and 14.6% from the 2005/06 baseline year.



### 4. Financial matters

The cost of meeting our Carbon Reduction Commitment Energy Efficiency (CRCEE) obligations for 2017/18 was £82,836.00, a reduction from £103,268.80 in 2016/17. This reduction was a result of energy reductions and decreased carbon emissions from the energy used (due to the reduction in grid electricity emission factor). In 2017/18 additional allowances have been purchased to the value of £60,000 which will be used for 2018/19 requirements under the CRCEE. This means the total spend for allowances for the CRCEE in 2017/18 was £142,839. This is the final year of the CRCEE scheme and from 1<sup>st</sup> April 2019, UK government will increase the Climate Change Levy (CCL) rates on electricity and gas bills to generate carbon tax revenues.

### 3 Progress to Date

The 2014/15 Carbon Strategy Review by external consultants AECOM, to investigate the impact of the Estates Development Framework (EDF) on the 2020/21 40% reduction target, identified a number of key strategic themes to achieve the reduction target. Five potential work streams and the associated potential carbon savings were identified. The five work streams were; Building a more efficient estate, installing Energy conservation measures (ECM's), optimising IT services, upgrading the Talbot Campus HV network and improving the Soft Landing process (to optimise the energy performance of new buildings).

During 2017/18 work continued in all these key themes.

### i) Estate development

### Solar Photovoltaic (PV) Projects

BU has set an on-site electricity generation target of 500kW by 2020/21. In 2018/19, BU installed its largest PV array on Poole House which is expected to provide 130,000 kWh of electricity per annum and save 50 tonnes CO2e. Completion of this project is expected to be in January 2019.

### ii) Energy Conservation Measures (ECM)

Now into its 10<sup>th</sup> year the University continues to operate the HEFCE/Salix Revolving Green Fund (RGF) for energy efficiency projects. Investment of £741,644 to date has identified forecast savings of 1085 tonnes of carbon and £203,435 per annum. In 2018, RGF funded projects have included installation of LED lighting to various internal spaces including but not limited to: University Centre Yeovil, Sir Michael Cobham Library and the Executive Business Centre. RGF also part funded the boiler replacement in Talbot House and the BMS upgrades to PH. These projects are expected to save 200,000 kWh and 66 tonnes Co2e per annum. Also, as a combined project with the Maintenance Team we are currently standardising all external lighting on TC to LEDs.

## iii) IT Efficiencies

Feasibility study has commenced to look into improving the efficiency of the cooling systems to the University Data Centres (Studland & Jurassic).

# iv) Solar Photovoltaic (PV) Projects

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# v) Soft Landings

During 2017/18 a project was started to optimise the energy and water performance of the Student Centre. The twelve month project looked at all key systems of the building to see how it has been performing since opening in 2015 and explored potential improvements. Changes were made to the GSHP to enable correct operation and improved efficiency. Major BMS strategies changes were made to enhance the efficiency of the building and user comfort. These changes are being monitored to ensure that the building is operating as efficiently as possible whilst maintaining user comfort.

In 2018/19, a project has now started to optimise the performance of the Fusion Building.

# 4 Estate Development

The University continues to ensure the principles of sustainable development are incorporated into the design of the new Poole and Bournemouth Gateway buildings. Both buildings include a range of low and zero carbon technologies, rainwater harvesting and are designed to achieve EPC A's and BREEAM Excellent scores. The Sustainability Construction Policy includes commitments to help achieve the UN Sustainable Development Goals and sets out BU's requirements for all construction projects.

# 5 Staff and student engagement

In 2017/18 the main activities to raise awareness and engage with staff and students were:

- Student Switch Off Working in partnership with SUBU, BU Accommodation team and NUS to engage students in saving energy in halls. In 2017/18, 355 students signed up to the project and helped reduce electricity use by 8% (27 tonnes of CO2e).
- Green Impact In the third year of running this programme, eleven staff teams signed up for Green Impact and completed 440 'sustainability themed' actions. Four teams achieved a gold award, one achieved a silver award and six achieved a Bronze award.
- Green Rewards This scheme rewards staff for taking positive sustainable behaviours. 40% of BU employees signed up this year and achievements included; over 130,000 miles travelled sustainably to and from the University, 515kg of wasted disposable cups avoided, over 10,000 hours of exercise completed with almost 435 tonnes tCo2 emissions avoided across all behaviour themes. 387 tCo2e are under the scope 2 electricity consumption and form part of the CMP reductions which has already been accounted for and this highlights the importance of the staff engagement in helping achieve the CMP targets. The remaining savings are scope 3 (waste & transport) which are outside of the CMP scope and do not form part of the 40% reduction target.

# 6 Forward Plans

Sustainability and carbon reductions are embedded in the phase 2 of the EDF which spans the period 2020 to 2025. Delivering at least BREEAM 'Excellent' buildings with an Energy Performance Certificate 'A' is vital for carbon reduction and achieving the 50% reduction target by 2025/26.

Overall the estate is expected to grow in size by 6% by 2020/21 (See **Figure 12**). Key to the carbon efficiency of the estate and the 40% reduction target is the disinvestment in inefficient buildings (Bournemouth and Royal London Houses).

The addition of PGB in 2018/19 and BGB in 2019/20 will add further increases to the CMP, so ensuring these are optimised to operate as efficiently as possible will be key to achieving the 40% target for 2020/21. Design for Poole Gateway Building Phase 2 will be carried out from 2018/19.



Low and zero carbon projects will continue to be implemented through the carbon reduction programme, focusing on ECM, IT and building optimisation projects. Additional smaller scale projects will be undertaken through the RGF programme, including continued LED lighting replacement to internal and external spaces.

Modifications to the Hot Water Services in Poole House to enable this to be generated from the biomass boiler and potentially adding Solar Thermal collectors which are eligible for the Renewable Heat Incentive (RHI) could provide additions/increases to the LZC generation onsite and provide additional income for BU.

Upgrading of the utility metering logging devices will enable BU to record and monitor energy consumption at a building level across the estate. This will provide detailed information as to where potential energy reduction can be achieved and using System Link software help identify areas of increased consumption faster enabling a rapid response to identify and correct the causes. This will help BU achieve its Carbon Management Reduction target, save on energy costs and improve energy efficiency.

The High Voltage infrastructure upgrade at the Talbot Campus will investigate opportunities for improved electrical and carbon savings, whilst increasing resilience to the electrical infrastructure.

During 2018/19 a new team structure of Energy Manager, Energy Officer and Sustainability and Energy Analyst shall work to identify further energy/ carbon efficiency projects across BU. The team will also continue the work to gain ISO50001 (Energy Management system) certification with the first Gap Analysis visit during October 2019 and certification early 2020.

### 7 Scope 3 carbon emissions

These indirect emissions are for water, waste, procurement and transport. Water (consumption & waste water) since 2005/6 is detailed in **Figure 13**. Further work is needed before publishing the other Scope 3 emissions, as there are concerns about the accuracy of the data.



Note: Wastewater volume to sewer calculated as 95% of water consumption figures

**Figure 13** shows that total water carbon emissions have decreased in 2017/18 compared to 2016/17 by 42.5%. This reduction in water consumption was mainly achieved by the exit from Cranborne House together with continued investment in low flow taps and sanitary ware and a water saving campaign targeted at students to report any water wastage through dripping taps and toilet cisterns.

Water and wastewater emissions have fallen by 54.8% between 2005/6 and 2017/18.

### 8 Conclusion

The carbon management implementation plan continues to be a live document and quantification of further significant and longer term projects as well as small scale projects continues to be a priority.

Key to the next 12 months will be delivery of the key themes relating to IT efficiencies and onsite power/ heat generation such as the operation of the new PV arrays on PH and PGB. Formulating the business cases for larger scale infrastructure projects, specifically the replacement of the existing Talbot Campus high voltage transformers and the IT Data Centres and comms rooms cooling systems.

Optimising the performance of existing buildings shall continue to ensure the estate is efficient whilst also providing a comfortable working environment.

Work undertaken to estimate the University's carbon emissions to 2020/21 shows that, whilst still challenging and with the planned carbon reduction projects, anticipated changes to the estate and the continued reduction in DEFRA  $CO_2$  electricity carbon factors (See **Appendix 1**), the 40% reduction target can be achieved.

Dave Archer Energy Manager January 2019

## Appendix 1:

DEFRA Carbon Emissions Conversation Factors for UK Purchased Electricity (including transmission and distribution) and natural gas from 2005/6 to 2018/19.

