The Carbon Plan (Phase 1 2019 – 2023)

Executive Summary

De Montfort University's first Carbon Management Plan was adopted in 2011 and set a roadmap to a 43% reduction in carbon emissions by 2020 based on a 2005 baseline for emissions from energy use and its own vehicles.

The roadmap consisted of a series of energy saving projects to reduce carbon emissions, reduce energy costs and engage staff and students to raise awareness of climate change and encourage them to take positive action in their daily lives.

Through a combination of energy saving projects, the consolidation of the university's estate onto a single campus and the additional benefit of the decarbonisation of the electricity from the national grid the university's carbon emissions have reduced by 50% by 2018/19.

The Carbon Management Plan included a commitment to revisit and refresh the plan to identify further initiatives and projects which would continue to reduce energy use, cut costs and reduce carbon emissions.

This paper provides the details of that revision and proposes a revised Carbon Plan with newly identified initiatives and projects to deliver carbon reductions. Based on the existing size, situation and use profile of the campus the proposed projects and initiatives in the new draft Carbon Plan aim to:-

- reduce energy usage at DMU by over 5.5 million kWh per year;
- reduce costs by approximately £552,000 per year;
- reduce carbon emissions by around 1,639 tCO_2e per year;
- reduce carbon emissions to 60% below baseline year of 2005

This revised Carbon Plan provides the beginning of a road map towards a possible net zero emissions target for energy use. The projects and initiatives identified in Appendix A are to be implemented over the period 2019 to 2023 subject to appropriate funding. This will be phase 1 of the carbon plan.

After this period the Carbon Plan will be reviewed again in 2023 (Phase 2) and 2028 (Phase 3) in order to identify further projects to be implemented and additional funding will be sought to continue to reduce carbon emissions on campus.

Progress in reducing carbon emissions

As part of the original Carbon Management Plan the university adopted an overall carbon reduction target of 43% reduction in emissions by 2020 based on a 2005 baseline year. The university also adopted interim targets of a 12% reduction by 2012 and a 29% reduction by 2017.

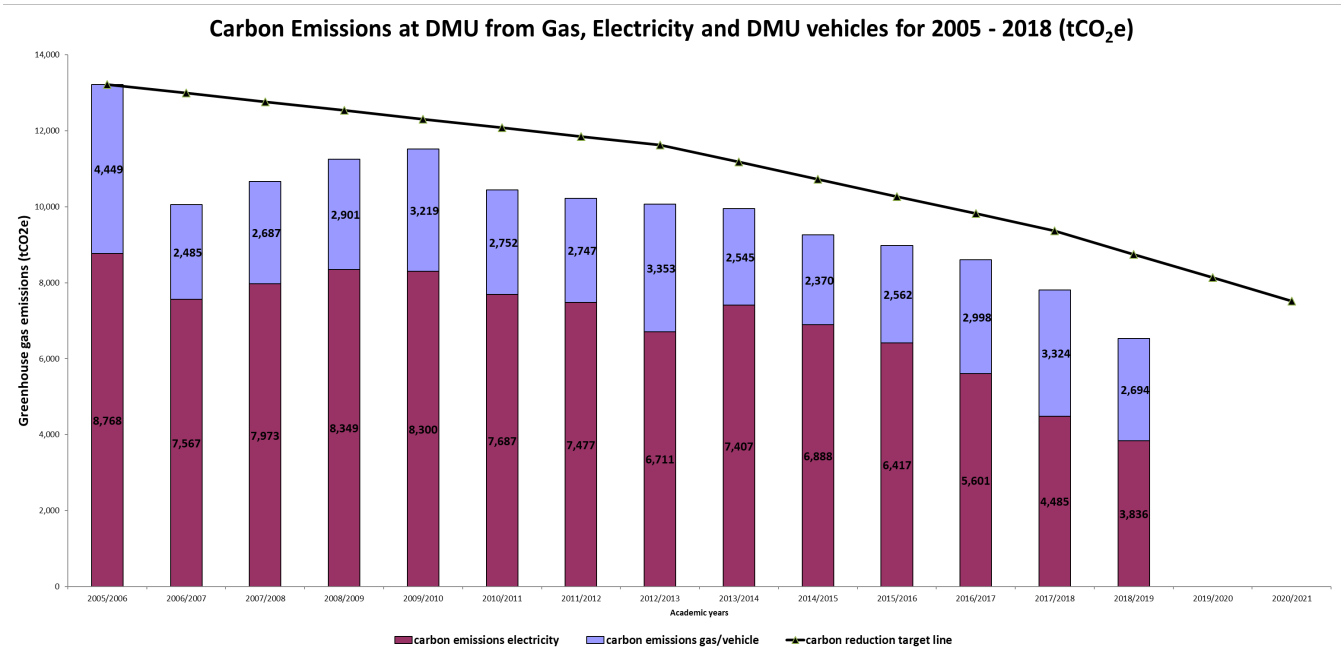

Figure 1: Carbon emissions from energy use and university owned vehicles at DMU from 2005 to 2018.

Carbon emissions for 2018/19 were calculated as 50% below the baseline year of 2005 surpassing the interim target for 2017 and the 2020 target.

Figure 1 shows the changes in carbon emissions since 2005 in relation to the carbon reduction targets which are represented as the black line. The current trend in carbon emissions at DMU is a downward trend and the university is close to meeting its 2020 headline target.

Trends in energy use at DMU

The headline figures shown in Figure 1 indicate excellent progress in reducing carbon emissions but is set against an ongoing rising trend in the consumption of energy on campus. Energy use on campus has increased due to a number of different factors including an increased size of the estate and student demand for buildings to be open longer and more frequently.

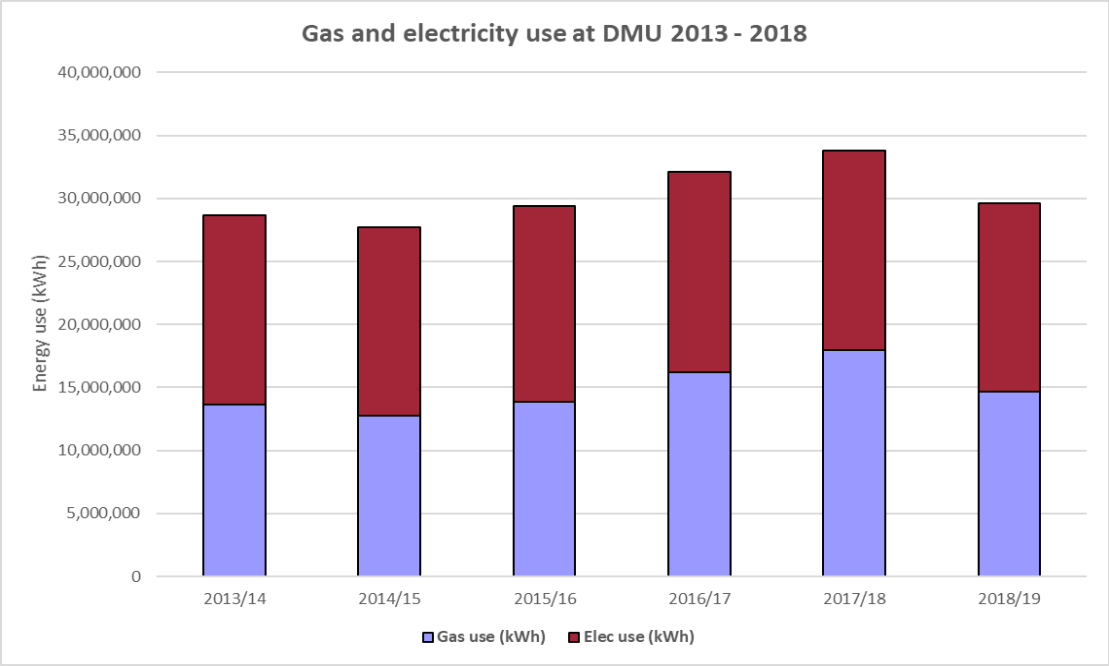

Figure 2: Energy use at DMU from 2013 to 2018

Figure 2 shows the rising trend in energy use at DMU. The figure shows annual increases in both electricity and gas usage at DMU for the past four years. The most recent year is the first reduction in energy use for four years.

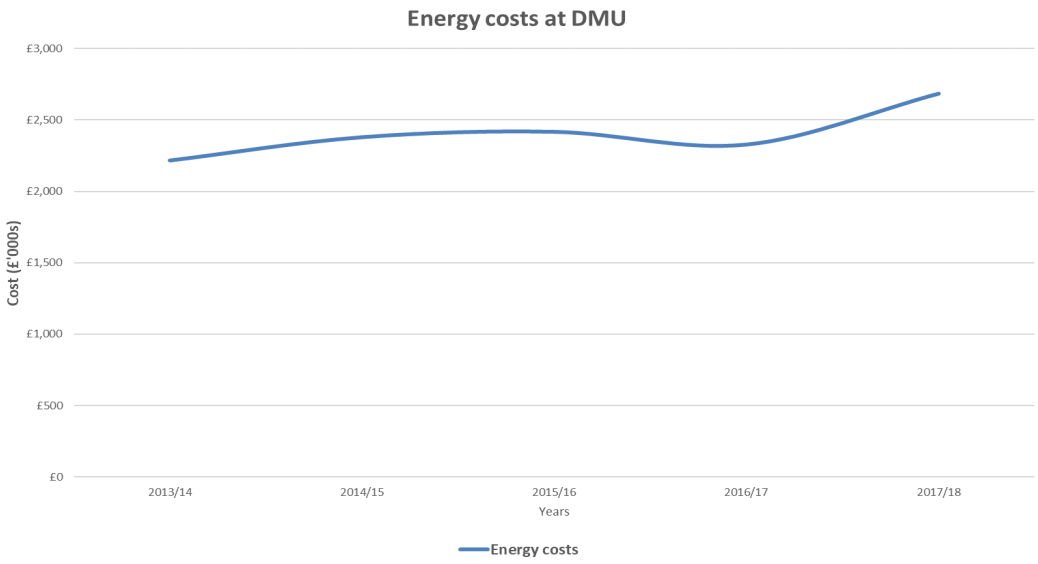

Figure 3: Energy costs at DMU from 2013 to 2017

The increasing use of energy on campus is not reflected in the headline carbon emission figures due to the decarbonisation of electricity from the national grid. Without the decarbonisation taking place DMU's carbon reduction figure would be significantly smaller or would be an increase in emissions.

Electricity from the national grid is drawn from a number of different generating sources which include carbon intensive sources such as coal fired power stations, oil fired power stations and gas fired power stations. Electricity is also drawn from low and zero carbon sources such as nuclear power stations, and renewable energy sources such as wind, solar, hydro and biomass.

As the amount of electricity which is supplied to the national grid from low and zero carbon sources increases and the electricity from carbon intensive sources decreases the overall carbon intensity of the electricity from the national grid reduces. Therefore the amount of carbon produced by using one unit of electricity from the national grid has decreased considerably over the past 10 years.

Whilst the rise in energy consumption is not reflected in the carbon emissions figure, the trend of increasing usage and associated cost remain a concern and the new carbon plan therefore includes measures to promote reductions in gas and electricity use.

The rising trend in energy use is also reflected in the energy costs for the university which are shown below in Figure 3. With year on year large scale cost increases forecast, this has a significant impact on university finances and operations.

The Need for Change – Climate Action

Drivers for Action

The university has committed to work towards the delivery of the United Nations Sustainable Development Goals (SDGs) which aim to promote prosperity while protecting the planet. The SDGs recognise that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection. The university has committed to the SDGs through its strategic plan and has been chosen as the Global Hub for SDG 16 (Peace, Prosperity and Strong Institutions). Action on climate change in particular is seen as impacting upon the majority of the SDGs, especially SDG7 Affordable and Clean Energy; SDG12 Responsible Production and Consumption; and SDG1 No hunger. Climate change also has its own dedicated SDG (SDG 13 Climate Action) emphasising its importance.

Connected to DMU's commitments to the SDGs is an emerging project relating to Education for the Sustainable Development Goals (ESDG). The focus of the ESDG work is on the three main areas of formal curriculum, informal curriculum (such as DMU Global trips) and the subliminal or hidden curriculum. The later area of work focuses on what students experience during their time on campus and has implications for energy saving and carbon reductions. Given the prominence of climate change within the SDGs, it is clear that awareness raising and education about climate change and carbon emissions will feature within this emerging body of work. As such the university should be seen to be leading on this issue by reducing carbon emissions from its activities and operations.

There is a growing momentum both nationally and internationally around campaigning on climate change in particular amongst young people. The campaigning has coalesced around the school strike for climate movement and the Extinction Rebellion movement which has called for a climate emergency to be declared.

There is no singular definition of what it means to call a climate emergency, however it is generally defined as organisations acknowledging the current climate situation as an emergency, and doing everything within their power to prevent the catastrophic consequences that could come from climate change. The United Nations have stated we have just 12 years left to limit devastating climate change effects arising from carbon emissions.

Many organisations have already declared a climate emergency including the UK Government. Other organisations including Leicester City Council, Leicestershire County Council, and other councils in London, Manchester and Edinburgh have all declared a climate emergency.

Following pressure from the student body several universities have also declared a climate emergency including Bristol, Newcastle, Exeter and Cambridge. Part of the declaration of these universities is to commit

to greater cuts in carbon emissions from their organisations and in the case of University of Bristol and Newcastle University includes a commitment to be carbon neutral by 2030 and 2040 respectively.

Review and Revision of the Carbon Management Plan

The Carbon Management Plan was adopted in 2011 and progress against the carbon reduction target has been reported annually to senior management and publicly on the DMU website.

The original Carbon Management Plan contained a commitment to revisit and review the Carbon Management Plan to identify further initiatives and projects which would continue to reduce energy use, cut costs and reduce carbon emissions.

Through a detailed evaluation process involving consultations with key stakeholders within the university and the engagement of external experts, a programme of energy saving projects and initiatives have been identified and costed.

This paper presents details of the projects and initiatives that were identified as part of the evaluation and consultation process. The projects identified include low carbon projects such as installing a combined heat and power unit; zero carbon projects such as installing more photovoltaic panels to generate electricity and energy efficiency projects to use less energy on campus.

The benefits of implementing the projects are highlighted in the paper and a full list of the projects is set out in Appendix A.

Opportunities identified in revised carbon plan

The university has already committed to invest over £2.7 million over the next five-years in infrastructure upgrades as part of its maintenance strategy. As an added benefit this will deliver annual carbon savings of 420 tonnes CO_2e.

Table 1 – funded and currently unfunded project value and savings included within the new Carbon Plan

Opportunity Type	Energy Saving kWh/yr	Cost Saving £/yr*	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs
Already approved	586,631	94,051	191	1,350,000	14
Backlog maintenance funded	329,141	41,849	114	469,140	11
Energy savings budget funded	3,078,729	257,829	855	795,574	3
Estates infrastructure funding phase 2	581,034	23,704	121	1,300,000	55
Halls refurbishment funding	161,809	49,718	103	337,050	7
ITMS projects	144,600	18,798	51	8,000	0.4
Funding unidentified	442,378	57,509	156	606,268	11
Recently completed	233,493	9,452	49	45,080	5
Totals	**5,557,815**	**552,910**	**1,639**	**4,911,112**	**9****

*At today's prices

** Payback based on total capital cost / by annual cost saving

Funding for projects to be delivered through the energy savings budget is being sought through the revision and amendment to the Energy Policy which includes an uplift of the energy savings budget to 10% of the annual university spend on utilities.

Energy saving projects have also been identified through the proposed refurbishment of the university's halls of residence. This investment of £337,050 will deliver an estimated saving of £49,718 per year in energy savings and a reduction in emissions of 103 tonnes carbon.

The Carbon Plan programme has identified a total of over 60 projects split between no-cost operational changes, low cost and higher cost measures. The projects provide a comprehensive building by building schedule of opportunities for lighting, heating, insulation and building management system control modifications.

The programme includes a number of projects which have already been approved and capital allocated as part of an on-going building maintenance/refurbishment programmes including new LED lighting, boiler renewals and upgrading of the Building Management System.

These projects will, as well as enhancing the quality and resilience of the campus, also result in both carbon and energy cost savings at DMU. Once implemented they will provide savings of approximately 1.3 million kWh of energy worth around £148,000 and deliver 421 tonnes of carbon savings per year.

The Carbon Plan also details a further programme of identified opportunities which do not currently have funding allocated. Funding for a range of renewable energy projects in the form of photovoltaic panels has yet to be identified. This investment is £844,000 to deliver anticipated energy savings of approximately 567,522 kWh per year, see table 1 above.

Table 2 reflects the potential payback periods, cost, energy and carbon savings for identified projects for which capital investment is required to enact the Carbon Plan 2019.

Table 2 – Savings, costs and benefits of identified potential projects requiring additional funding.

	Energy Saving (kWh/yr)	**Cost Saving (£/year)**	**Carbon saving (tCO_2e/yr)**	**Capital cost (£)**	**Payback Period (years)**
Measures with payback less than 1 year	2,646,975	212,231	720	168,879	0.8
Longer term measures equal or greater than 1 year and less than 3 years	167,896	20,564	57	28,055	1.44
Longer term measures equal or greater than 3 years and less than 5 years.	160,706	49,574	102	235,200	4.7
On-site renewable and low carbon electricity generation projects	256,672	33,367	90	491,068	14.7
Longer term measures equal or greater than 5 years.	2,325,567	237,173	669	3,987,910	16.8
Total	**5,557,815**	**552,910**	**1,639**	**4,911,112**	**9**

The overall investment for the Carbon Plan Phase 1 would be £5.1 million which is expected to deliver annual carbon savings of around 1,683 and an annual financial saving of approximately £569,000 (assuming the situation, size and use profile of the campus remains static).

Table 3 – Showing the types of interventions identified within the Carbon Plan.

Opportunity Type	**Energy Saving kWh/yr**	**Cost Saving £/yr**	**Carbon Saving tCO_2e/yr**	**Capital Cost £**	**Payback Period yrs**
Already Approved	586,631	94,051	191	1,350,000	14.4
IT	628,217	81,668	221	114,700	1.4
Lighting	615,414	80,062	283	701,802	8.8
Renewable Energy	256,672	33,367	90	491,068	14.7
Boiler replacement	263,398	6,769	49	750,000	110
Improved controls	2,772,112	193,933	709	1,178,879	6.1
Recently completed	233,493	9,452	49	45,080	5
Other	201,877	63,059	96	324,663	5
Totals	**5,557,815**	**552,910**	**1,639**	**4,911,112**	**9**

Renewable energy

The use of renewable / low carbon energy generated by the university provides at least three benefits:

1. The energy generated has a low carbon content and contributes towards the carbon reduction targets.

2. As 60% of the cost of electricity from DMU's energy suppliers is made up of non-energy related costs (taxes, subsidy support, administration costs, etc.) there are significant revenue savings to be made by the university generating its own electricity.
3. Renewable energy systems such as solar panels make a highly visual statement that demonstrates the university's commitment to tackle climate change, taking responsibility to meet its own energy needs and contributing to the SDGs.

The renewable energy / low carbon projects proposed as part of the Carbon Plan are:

1. The installation of PV arrays on the roofs of the Queen Elizabeth II Leisure Centre, Bede Island, John Whitehead and Bede House as well as additional arrays on Gateway House.

These projects on their own will reduce the university's carbon emission by approximately 90 tonnes per year and produce an energy cost saving of around £33,367 per year at 2018 rates.

The costs detailed for the installation of the panels do not include any additional costs for roof strengthening.

The projects identified in the 2019 plan have the potential to reduce emissions at DMU by 1,639 tCO_2e per year. This would see the university's carbon emissions fall from the current 6,530 tCO_2e to an estimated 5,269 tCO_2e by2023, which is a reduction of 19% on current levels. The calculations include an assumption of a slight annual increase in energy consumption.

However if the decarbonisation of electricity from the national grid continues as predicted the university's emissions could be as low as 4,396 tCO_2e which is a 32% reduction on current emission levels and a reduction of 67% compared to the baseline year of 2005.

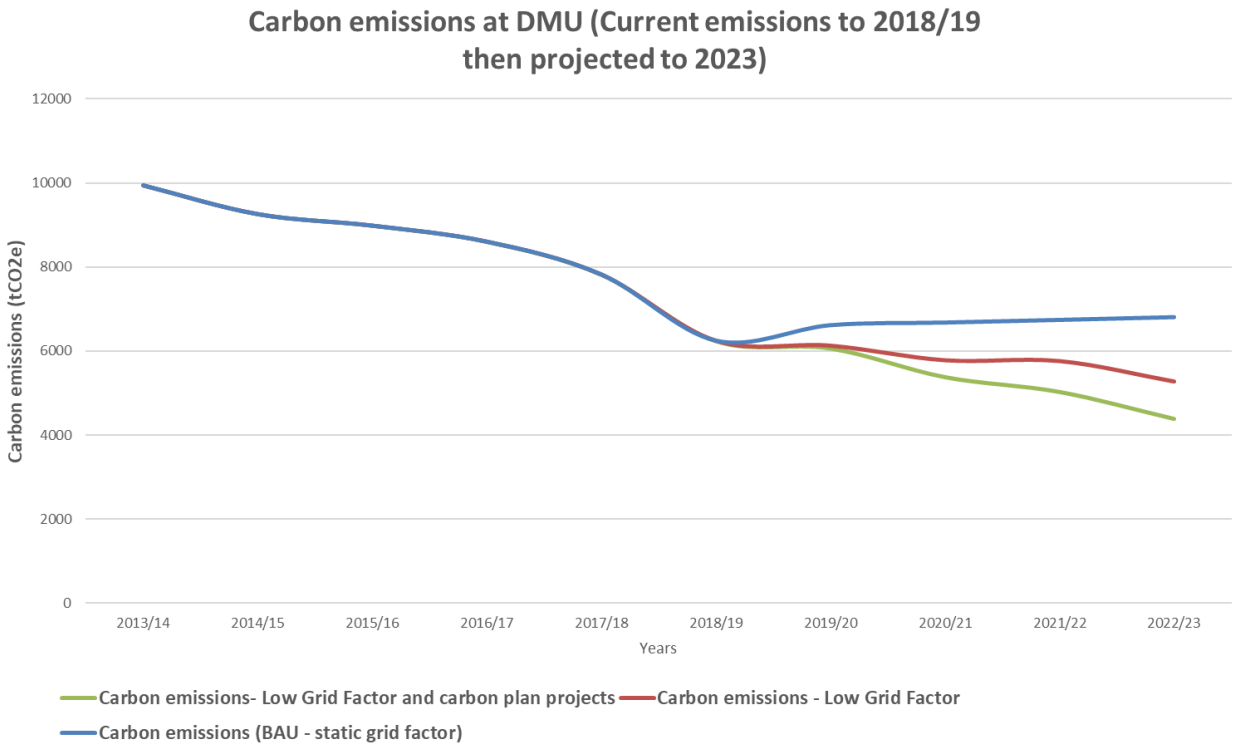

Figure 4: Carbon emissions at DMU, actual until 2018 and then projected to 2023

Long term target

The need for urgency on climate change has been highlighted by governments, climate activists and student representatives. To reflect the urgency of this action it is recommended that the university adopts long term targets for carbon reduction which will provide the context for future iterations of the Carbon Plan and future developments on campus.

It is recommended that the university adopts a **target of being carbon neutral for energy and own vehicle carbon emissions by 2032.**

This updated version of the Carbon Plan 2019 provides an initial step on this journey to a carbon neutral campus. It is recommended that the Carbon Plan is revisited every 4 – 5 years to identify further projects and initiatives that will continue to reduce energy use on campus, identify opportunities for renewable energy and continue to engage staff and students to raise awareness. It is proposed that the Carbon Plan is reviewed in 2023 to produce Phase 2 of the plan and again in 2028 to produce Phase 3 of the plan with further projects being identified and funding requested.

Funding

The Carbon Plan has identified a range of projects which will be implemented between 2019 and 2023 which already have capital funding of over £2.7 million allocated. The plan has also identified further projects which have yet to have funding identified.

There are a number of external funding sources available including SALIX loans, which is a Government loan scheme offering unsecured, interest free loans to the public sector. The university has previously made use of SALIX loans for small scale lighting upgrades. The cost of the loan is repaid from the savings achieved through the energy saving projects and is therefore cost neutral to the university.

Business as usual - Energy Price Rises

Due to the volatility of energy markets during the recent past, it is very difficult to predict the price of fuel and utilities in a year's time, let alone in five years' time. Combining electricity and gas price fluctuations at DMU the overall estate has seen an approximate 53% increase in energy costs between 2005/6 and 2016/17 from £1.5 million to £2.3 million.

The Department for Environment and Climate Change (DECC) publish an annual set of figures[1] which provide projections of cost and demand for energy until 2035. The projections are based on assumptions of future economic growth, fossil fuel prices, electricity generation costs, UK population and other key variables regularly updated.

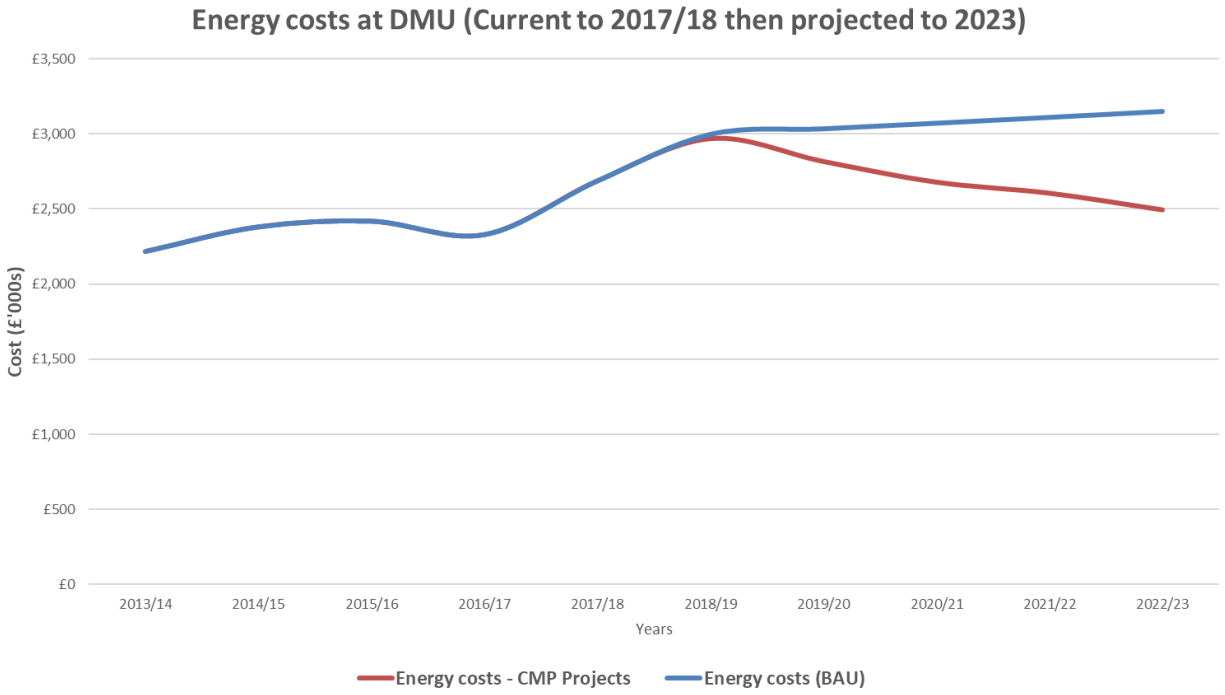

Figure 5: Energy costs at DMU, actual until 2017, then projected to 2023

The projections provide a number of different scenarios but from using the 'reference scenario', which is based on a central (medium) estimate of economic growth and fossil fuel prices the projections estimate that:-

- electricity costs are estimated to rise by 50% between 2015 and 2025[2]

[1] DECC Energy & Emissions Projections https://www.gov.uk/government/collections/energy-and-emissions-projections

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/477625/Annex-m-price-growth-assumptions.xls

- gas costs are estimated to rise by 30% between 2015 and 2025

Using the medium price assumption produced by DECC, energy costs at DMU could rise from approximately £2,000,000 in 2015/16 to £3,200,000 in 2025/26 for the same amount of energy used.

The carbon reduction interventions set out in the Carbon Plan 2019 will help to mitigate the impact of these energy cost rises on the university. Once fully implemented the interventions set out in the Carbon Plan have the potential to reduce energy costs by over £600,000 at 2018 energy prices.

Electricity Grid Carbon Intensity

The university's carbon footprint is dependent upon the amount of energy it uses on campus and the carbon intensity factor of the electricity provided via the National Grid. The university has been able to report a decrease in its carbon emissions even though its energy consumption has been rising for the past 6 years, as a result of the changes to the electricity grid carbon factor.

The current carbon grid factor for electricity is 255gms CO_2e per kWh. The Government estimates that this will reduce down to 55gms CO_2e per kWh in 2035 as a result of the reduction in electricity from coal fired powered stations and the continuing increase in electricity from renewable sources such as wind and solar.

The decrease in the grid carbon factor, if met, will help to reduce the university's carbon footprint. The estimated reductions have been factored into the carbon calculations for the Carbon Plan as shown below.

The reduction highlighted here in electricity grid carbon intensity would mean that for the current electricity use only 792 tonnes of CO_2e would be emitted compared to the current 4485 tCO_2e.

From these figures it is clear that the decarbonisation of the grid can help considerably in achieving a carbon neutral campus by 2035.

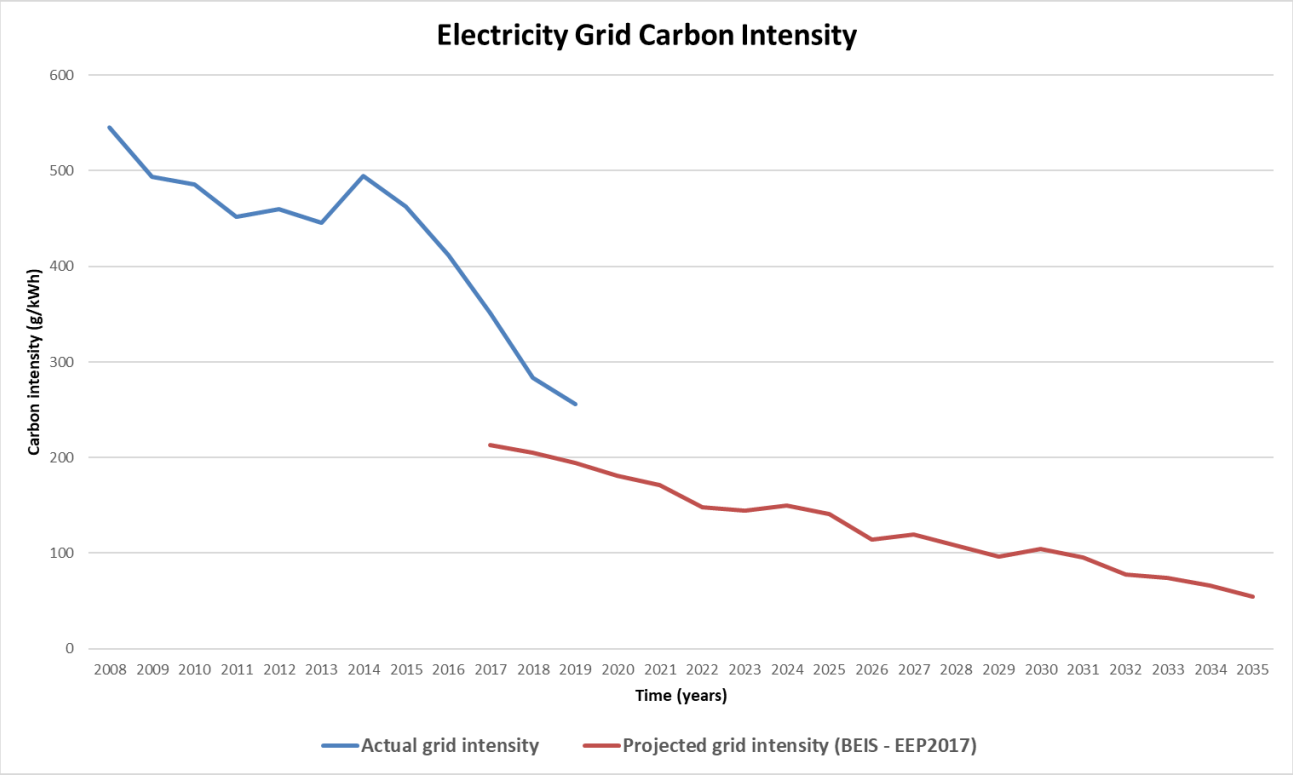

Figure 6: Changes in the carbon intensity of a unit of electricity supplied via the national grid. Actual to 2018 then projected to 2035

Governance and reporting

To meet the challenges of achieving the Carbon Plan proposals requires the commitment of the whole university community. Ownership of the Carbon Plan will lie with the Executive Board, whose role it will be to ensure that the university achieves the targets set out in each five-year plan, approve funding requirements and ensure that the importance of the plan is understood by the whole university community.

Progress on reducing carbon emissions has been reported since 2012 as part of the annual Sustainability Report.

Going forward this will continue and an additional report will be made each year to the Operational Leadership Group and Executive Board that will set out:

- The current level of emissions, targets and any necessary reviews.
- The interventions undertaken and spend against the allocated budget.
- A list of costed projects to be undertaken in the next financial year for budget approval.

A small working group will be formed, which will be chaired by the Deputy Director of Estates and Facilities to oversee implementation of the Carbon Plan. The group will meet at least three times a year to assess progress on the implementation of projects identified in the Carbon Plan 2019.

Staff and student engagement
Staff and student engagement is a key element to reducing energy and carbon emissions. The university has already committed to running student and staff behaviour change projects until 2020, as part of a suite of sustainability targets, which will include information about carbon emissions and actions that staff and students can take to reduce these. Further communications will also be provided through the emerging ESDG project.

Student Switch Off
The university participates in the Student Switch Off project which is an energy saving competition between halls of residence, run by the National Union of Students. Students are encouraged to save energy to win prizes throughout the year. Energy consumption in the halls is monitored and the hall which saves the most energy wins and end of year party. The university has run SSO since 2010 and includes DMU managed halls and halls managed by UNITE.

Green Impact
Green Impact is a behaviour change project for staff and students which is run by the NUS. The programme encourages staff teams, with support from student volunteers, to undertake a series of environmental activities including actions on energy and carbon reduction.

Depending on the number of activities completed teams are awarded bronze, silver or gold awards. Students are trained as environmental auditors to ensure that the environmental activities have been completed to the required level. DMU took part in Green Impact from 2009 until 2016 but will be re-joining the scheme during the period that the Carbon Plan 2019.

Future Projects
There are further projects which have been identified which currently are not within the plan. These include the inclusion of a water source heat pump project. Funding these elements would increase investment costs but deliver further substantial savings and place DMU at the forefront of institutions working on carbon reduction. These projects merit further investigation and will be included in future iterations of the Carbon Plan if investigations demonstrate their viability.

Other sources of carbon emissions
The university takes a comprehensive approach to measuring and reporting its carbon emissions. As well as carbon emissions from its energy use and own vehicles (known as scope 1 and 2 sources), the university also, measures and reports emissions from waste activities, staff and student commuting, water use and treatment, international student and UK based student travel to DMU, business travel, and emissions from supply chain activity, collectively known as scope 3 emissions.

The university has adopted a carbon reduction target for its scope 3 emissions. Work will take place to identify projects to reduce emissions from these sources in due course and be brought forward for consideration as a separate report.

Summary and conclusions

This report identifies a range of projects that could be implemented to reduce energy use, costs and carbon emissions to meet our 2020 target and beyond. The projects and initiatives identified vary in their cost,

energy saving, carbon reduction and payback period. However all identified projects provide energy savings and carbon reduction.

This report identified a range of funding source for the carbon saving projects to be realised. These sources are shown below.

Table 4 – funded and currently unfunded project value and savings included within the new Carbon Plan (Phase 1)

Opportunity Type	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs
Already approved	586,631	94,051	191	1,350,000	14
Backlog maintenance funded	329,141	41,849	114	469,140	11
Energy savings budget	3,078,729	257,829	855	795,574	3
Estates infrastructure funding phase 2	581,034	23,704	121	1,300,000	55
Halls refurbishment funding	161,809	49,718	103	337,050	7
ITMS projects	144,600	18,798	51	8,000	0.4
Funding unidentified	442,378	57,509	156	606,268	11
Recently completed	233,493	9,452	49	45,080	5
Totals	**5,557,815**	**552,910**	**1,639**	**4,911,112**	**9**

Funding for many of projects has been identified e.g. Estates infrastructure phase 2 funding and backlog maintenance funding. Funding for projects to be delivered through the energy savings budget is being sought through the amendment to the Energy Policy which includes an uplift of the energy savings budget to 10% of the annual university spend on utilities.

Funding is sought for the projects which have funding unidentified. These projects are the installation of photovoltaic panels on various buildings across the campus. This is currently a capital cost £606,268. The additional investment identified will deliver an estimated annual savings of 442,378 kWh per year and a financial saving of £57,509 per year and provide a visible statement of the university's commitment to carbon reduction.

APPENDIX A – PROJECT LIST

Funding Approved										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
1	Clephan	LED lighting replacement	170,590	-	170,590	31,367	60.0	370,000	11.8	Approved
2	Queens	LED lighting replacement	137,691	-	137,691	27,090	48.4	350,000	12.9	Approved
3	Hawthorn	LED lighting replacement	137,691	-	137,691	27,090	48.4	300,000	11.1	Approved
4	The Watershed	Boiler Replacement	22,560	-	22,560	580	4.2	80,000	138.0	Approved
5	Queen Elizabeth II Leisure Centre.	Replacement of Pool Hall Ventilation unit	39,000	60,000	99,000	6,612	24.8	160,000	24.2	Approved
6	Portland	Installation of low loss transformer	7,884	-	7,884	1,025	2.8	60,000	58.5	Approved
7	Hugh Aston	Replacement of STW	11,216	-	11,216	288	2.1	30,000	104.1	Approved
		TOTAL	526,631	**60,000**	**586,631**	**94,051**	**191**	**£1,350,000**	**14.35**	

Backlog Maintenance Funded										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
8	All	Air conditioning upgrades Phase 1	155,250	-	155,250	20,183	54.6	207,000	10.3	Backlog Maintenance
9	All	Air conditioning upgrades Phase 2	144,750	-	144,750	18,818	50.9	193,000	10.3	Backlog Maintenance
10	John Whitehead building.	Split air conditioning control	7,200	-	7,200	936	2.5	5,000	5.3	Backlog Maintenance
11	Innovation	Replace ageing Hoval atmospheric boilers	9,006	-	9,006	231	1.7	50,000	216.0	Backlog Maintenance
12	Philip Tasker	Split air conditioning control	6,000	-	6,000	780	2.1	5,000	6.4	Backlog Maintenance
13	Estates Development	Split air conditioning control	4,500	-	4,500	585	1.6	5,000	8.5	Backlog Maintenance
14	Estates Development	LED lighting replacement	2,435	-	2,435	317	0.9	4,140	13.1	Backlog Maintenance
		TOTAL	**329,141**	**-**	**329,141**	**41,849**	**114**	**£469,140**	**11**	

Energy Savings Budget Funded										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
15	All	IT PC management software	430,000	-	430,000	55,900	151.2	50,000	0.9	Energy Saving
16	Queen Elizabeth II Leisure Centre.	LED lighting replacement	9,796	-	9,796	1,273	3.4	2,055	1.6	Energy Saving
17	Queen Elizabeth II Leisure Centre.	Pool / ventilation system temperature review.	35,100	-	35,100	902	6.5	1,000	1.1	Energy Saving
18	Bede Island fac of tech	TRV replacement	9,595	-	9,595	247	1.8	3,000	12.2	Energy Saving
19	Castle Hall	Set and lock electric heaters	3,750	-	3,750	488	1.3	0	0.0	Energy Saving
20	Castle Hall	Review use of electric boiler for basement heating.	20,000	23,000	-3,000	2,009	2.8	5,000	2.5	Energy Saving
21	Castle Hall	LED lighting replacement	1,155	-	1,155	150	0.4	1,260	8.4	Energy Saving
22	The Venue	Improve lighting manual control.	3,024	-	3,024	393	1.1	0	0.0	Energy Saving
23	Edith Murphy	LED lighting replacement	13,229	-	13,229	1,720	4.7	34,200	19.9	Energy Saving
24	Edith Murphy	TRV replacement	34,400	-	34,400	884	6.4	8,000	9.0	Energy Saving

Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
25	Trinity House	LED lighting replacement	1,722	-	1,722	224	0.6	1,800	8.0	Energy Saving
26	Hawthorn	TRV replacement	69,632	-	69,632	1,790	12.9	10,000	5.6	Energy Saving
27	Hugh Aston	LED lighting replacement	51,234	-	51,234	6,660	18.0	99,540	14.9	Energy Saving
28	Pace Building	LED lighting replacement	3,400	-	3,400	442	1.2	10,080	22.8	Energy Saving
29	John Whitehead building.	LED lighting replacement	53,617	-	53,617	6,970	18.8	56,700	8.1	Energy Saving
30	Portland	TRV replacement	21,628	-	21,628	556	4.0	7,500	13.5	Energy Saving
31	Portland	LED lighting replacement	3,302	-	3,302	429	1.2	3,600	8.4	Energy Saving
32	Clephan	TRV replacement	33,200	-	33,200	853	6.1	5,000	5.9	Energy Saving
33	Innovation	LED lighting replacement	27,549	-	27,549	3,581	9.7	26,460	7.4	Energy Saving
34	Philip Tasker	LED lighting replacement	11,350	-	11,350	1,476	4.0	12,060	8.2	Energy Saving
35	Estates services	LED lighting replacement	3,300	-	3,300	429	1.2	4,320	10.1	Energy Saving
36	Gateway House	LED lighting replacement	237,345	-	237,345	30,855	83.4	307,620	10.0	Energy Saving

Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
37	Gateway House	TRV replacement	20,000	3,600	23,600	982	5.0	20,000	20.4	Energy Saving
38	Campus Centre	Improved management of 'simply Fresh' Chillers and a/c	8,760	-	8,760	1,139	3.1	0	0.0	Energy Saving
39	All	IT building patch panel cooling.	126,000	-	126,000	16,380	44.3	20,000	1.2	Energy Saving
40	BMS	BMS adjustments and modifications	1,164,790	701,251	1,866,041	121,098	462.0	106,379	0.9	Energy Saving
		TOTAL	**2,396,878**	**681,851**	**3,078,729**	**257,829**	**855**	**£795,574**	**3.09**	

Estates Infrastructure Funding – Phase 2										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
41	Hawthorn	Boiler Replacement	240,000	-	240,000	6,168	44.4	600,000	97.3	Estates infrastructure Phase 2
42	Bede Island fac of tech	Boiler Replacement	14,393	-	14,393	370	2.7	100,000	270.4	Estates infrastructure Phase 2
43	All	Schneider Continuum BMS replacement	242,547	84,094	326,642	17,166	74.4	600,000	35.0	Estates infrastructure Phase 2
		TOTAL	**496,940**	**84,094**	**581,034**	**23,704**	**121**	**£1,300,000**	**55**	

Halls Refurbishment Funding										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
44	Bede Hall	Replace storage heaters in common areas with automatic controlled new units.	14,280	-	14,280	1,856	5.0	23,800	12.8	Halls Refurbishment
45	Bede Hall	LED lighting replacement	10,208	-	10,208	1,327	3.6	22,700	17.1	Halls Refurbishment
46	Bede Hall	Control of electric panel heaters	32,900	-	32,900	4,277	11.6	2,000	0.5	Halls Refurbishment
47	New Wharf Hall	Replace storage heaters in each flat with automatic controlled new units.	53,760	-	53,760	6,989	18.9	89,600	12.8	Halls Refurbishment
48	New Wharf Hall	Continue with replacement of individual room electric heater panels.	7,500	-	7,500	975	2.6	0	0.0	Halls Refurbishment
49	New Wharf Hall	Control of electric panel heaters	30,000	-	30,000	3,900	10.5	2,000	0.5	Halls Refurbishment
50	New Wharf Hall	Domestic hot water convert from electricity to gas	250,000	275,000	-25,000	25,433	37.0	120,000	4.7	Halls Refurbishment
51	New Wharf Hall	LED lighting replacement	38,161	-	38,161	4,961	13.4	£76,950	15.5	Halls Refurbishment
		TOTAL	**436,809**	**275,000**	**161,809**	**49,718**	**103**	**£337,050**	**6.78**	

ITMS Projects										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
52	All	Data Centre temperature control	37,500	-	37,500	4,875	13.2	3,000	0.6	ITMS
53	All	IT printer rationalisation	107,100	-	107,100	13,923	37.7	5,000	0.0	ITMS
		TOTAL	**144,600**	**-**	**144,600**	**18,798**	**51**	**£8,000**	**0.43**	

Other projects not currently funded										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
54	Library	LED lighting replacement	185,706	-	185,706	24,142	65.3	115,200	4.8	Other
55	Queen Elizabeth II Leisure Centre.	PV at QE2	98,400	-	98,400	12,792	34.6	169,000	13.2	Other
56	FoT	PV at LMBS Bede Island	38,800	-	38,800	5,044	13.6	78,000	15.5	Other
57	Gateway House	PV at Gateway House 2	22,000	-	22,000	2,860	7.7	48,100	16.8	Other
58	John Whitehead building.	PV at John Whitehead	19,872	-	19,872	2,583	7.0	39,968	15.5	Other
59	Bede House	PV at Bede House	77,600	-	77,600	10,088	27.3	156,000	15.5	Other
		TOTAL	**442,378**	**-**	**442,378**	**57,509**	**156**	**606,268**	**11**	

Recently completed carbon reduction projects										
Ref No.	Location	Opportunity Title	Primary Savings kWh	Secondary Savings kWh	Energy Saving kWh/yr	Cost Saving £/yr	Carbon Saving tCO_2e/yr	Capital Cost £	Payback Period yrs	Funding
60	Bede Island fac of tech	LED lighting replacement	2,591	-	2,591	337	0.9	8,280	24.6	Recently completed
61	Heritage House	Control split air conditioning	20,800	-	20,800	2,704	7.3	500	0.2	Recently completed
62	Heritage House	LED lighting replacement	2,502	-	2,502	325	0.9	6,300	19.4	Recently completed
63	Pace Building	Split air conditioning control	7,200	-	7,200	936	2.5	10,000	10.7	Recently completed
64	Clephan	Boiler Replacement	99,600	-	99,600	2,560	18.4	0	0.0	Recently completed
65	Hugh Aston	Summer isolation valve to reduce heating distribution losses.	100,800	-	100,800	2,591	18.6	20,000	7.7	Recently completed
		TOTAL	**233,493**		**233,493**	**9,452**	**49**	**£45,080**	**5**	