

Cambridge City Council Carbon Management Plan



2021-2026

Contents

Introduction	page 3
Progress to Date	page 4
Measurement of Emissions	page 6
Aims	page 9
Carbon Reduction Projects	page 11
Approach to Achieving Net Zero Carbon Emissions Across the Council's Corporate Buildings	page 17
Appendix A: Completed Projects 2016-2021	page 21
Appendix B: Projects Planned for Implementation 2021/22	page 25
Appendix C: Future Projects Under Investigation	page 27
Appendix D: Bouygues Table	page 29



Introduction

The Council is committed to reducing the carbon emissions from its buildings and fleet and has previously implemented two Carbon Management Plans over the last ten years, which have helped to reduce its emissions by 28.9% from a 2014/15 baseline.

One of the six objectives of the Council's new Climate Change Strategy 2021-26 is "Reducing emissions from City Council buildings, land, vehicles and services". We have developed this Carbon Management Plan to help deliver this objective. The Plan sets out how the Council will continue to reduce carbon emissions from its buildings and fleet, which in 2019/20 was responsible for 1.1% of the city's emissions.

Over the next five years, the Council will continue to act to reduce the carbon emissions from the sources that it controls directly and has the greatest influence over. These include Council buildings and land (where the Council owns the building or land and pays the energy bills), Council fleet vehicles and business travel (travel by staff in their own vehicles for business purposes).

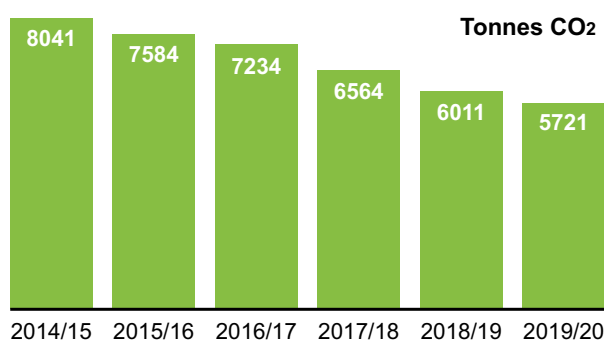
In the new Climate Change Strategy, we have set a target to reduce the Council's direct carbon emissions to net zero by 2030. This Plan identifies a prioritised list of carbon reduction projects for the next five years and sets out a broad approach to reduce the Council's emissions to net zero by 2030. This will primarily be achieved through moving from gas heating to low carbon heating in our buildings, and the commitment to purchase ultra-low emission vehicles (vans, trucks and refuse collection vehicles) when they are due for replacement (where viable).



Progress to Date

In March 2016, we set a target to reduce the Council's direct emissions by 15-20% between 2014/15 and 2020/21 in the Carbon Management Plan for 2016-2021. As shown by Figure 1, the Council's greenhouse gas emissions reduced **by 28.9% from 2014/15 to 2019/20**. Total gross emissions reduced by 2,320 tCO₂e, from 8,041 tCO₂e in 2014/15 to 5,721 tCO₂e in 2019/20. Over the past 6 years, the Council's carbon emissions have reduced by an average of 387 tCO₂e per year.

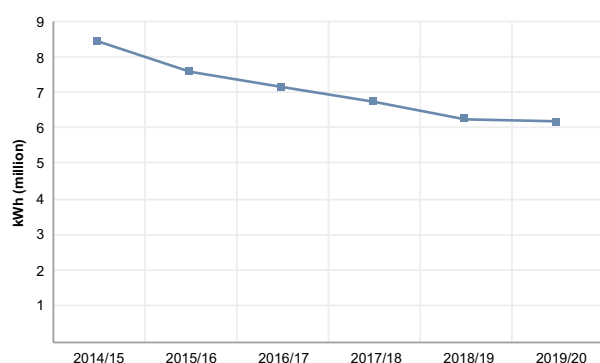
Figure 1. Cambridge City Council Greenhouse Gas Emissions (tCO₂)



The reduction in the Council's emissions from 2014/15 to 2019/20 is partly due to steps that the Council has taken, including rationalising its office accommodation, investing in energy efficiency and installing renewable energy measures in its corporate buildings, and reducing carbon emissions from its fleet vehicles.

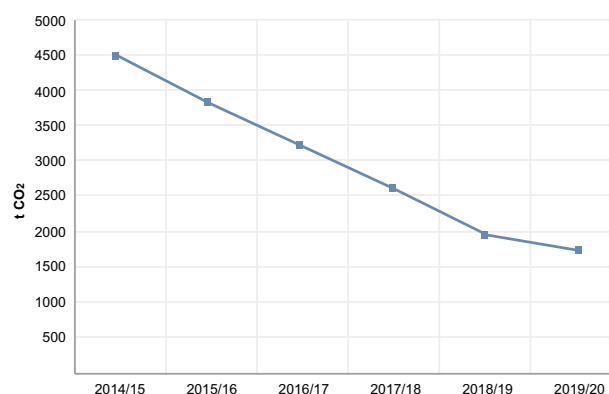
As a result, the Council's electricity usage has significantly reduced over the past 6 years, as shown in the chart below.

Figure 2. Total Electricity Consumption (Scopes 2 +3)



The reduction in the Council's emissions has also been partly due to the decarbonisation of the electricity supply at the national level in recent years, which meant that the electricity used by the Council has become steadily more low carbon, as shown in Figure 3.

Figure 3. Total Electricity Emissions (Scopes 2 + 3)



Last year (2020) was the greenest year on record for Britain's electricity system, with average carbon intensity (the measure of carbon dioxide emissions per unit of electricity consumed) reaching a new low (46 gCO₂/kWh on 24 May 2020). The year saw the highest ever share of wind power of the electricity mix (59.9% on 26 August) and solar power (34% on 30 May). This follows a trend that has seen the electricity system decarbonise by 66% in the last seven years and progress towards a national target of a carbon-free system by 2025¹.

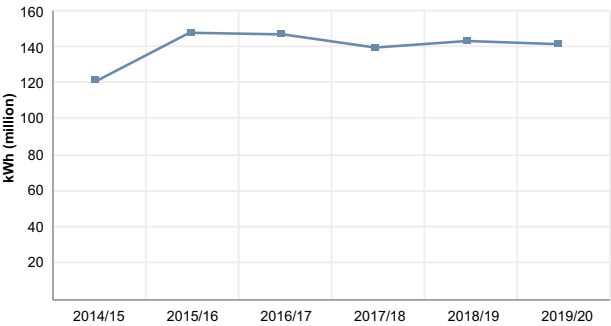
Since 2016 the Council has procured electricity for the Council's buildings on a green tariff which comes from 100% renewable sources, including solar, wind and hydro/wave. The Council will benefit from electricity matched to Renewable Energy Guarantees of Origin (REGOs). REGOs provide transparency on the proportion of energy coming from renewable sources and means that the Council can record the electricity purchased on this tariff as an emission reduction against its gross emissions in its annual Greenhouse Gas report (as net emissions).

¹ www.nationalgrid.com/stories/journey-to-net-zero-stories/2020-greenest-year-record-britain



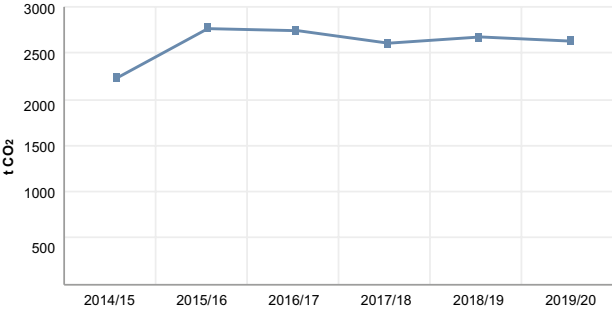
However, as shown by Figures 4 and 5, we have not reduced our gas consumption, or the carbon emissions associated with gas consumption, very significantly to date. This is despite the installation of projects that will reduce the gas consumption of buildings, such as more efficient boilers and insulation.

Figure 4. Total Gas Consumption (Scopes 1 + 3)



Achieving the carbon emissions reduction target for the Council's corporate buildings, fleet vehicles and business travel will require the Council's direct carbon emissions to reduce at a more rapid rate. For the reasons outlined above, reducing our gas usage from buildings (for heat) will be the major part of the challenge of reducing our emissions to net zero carbon.

Figure 5. Total Gas Emissions (Scopes 1 + 2)



Measurement of Emissions

The Council has measured and published its greenhouse gas (GHG) report detailing the total gross greenhouse gas emissions from the Council's estate and operations, on an annual basis since 2014/15. We have used HM Government's Environmental Reporting Guidelines², a document designed to help all organisations with voluntary GHG emissions reporting, and advice from the then Department of Energy and Climate Change, to determine the relevant energy sources that the Council is responsible for and should include in its carbon emissions baseline calculated in 2014/15.

The quantities of energy consumed in Council buildings and the fuel consumed and miles travelled in Council fleet and staff vehicles are collated for the financial year. The relevant carbon emission factors³, provided annually by the Department for Business, Energy & Industrial Strategy, are then applied to each type of energy to calculate the carbon emissions. The Council's emissions are grouped under three different scopes as per the Greenhouse Gas Protocol (Corporate Standard)⁴ methodology and latest UK Government Guidelines:

- **Scope 1:** These are direct emissions and include emissions from activities owned or controlled by the Council that release emissions into the atmosphere. Included in Scope 1 are the emissions from the combustion of gas in boilers in buildings owned or controlled by the Council and emissions from the combustion of diesel and petrol in fleet vehicles owned or controlled by the Council.
- **Scope 2:** These include emissions released into the atmosphere associated with the Council's consumption of purchased electricity. These are indirect emissions that are a consequence of the Council's activities. Scope 2 includes electricity consumed in buildings owned or controlled by the Council. It also includes the limited streetlighting owned by the Council, and

"landlord lighting" provided in the communal areas of commercial properties, sheltered housing and other housing properties (external lighting and staircase lighting in flats).

- **Scope 3:** These are the emissions that are a consequence of the Council's actions, which occur at sources which the Council does not own or control and which are not classed as Scope 2 emissions. Included in Scope 3 emissions are business travel by means not owned or controlled by the Council (business mileage) and the emissions from outsourced services. The gas and electricity used at the sites managed by the Council's outsourced leisure contractor is therefore included in Scope 3. Also included in Scope 3 is the transmission and distribution losses (T&D losses) for the electricity used by the Council's buildings in both Scope 2 and 3. T&D losses is the power lost in the transmission of (high-voltage) electricity from power generators to distributors and in the distribution of (medium- and low-voltage) electricity from distributors to end-users.

According to the Greenhouse Gas Accounting Tool⁵ (which is being developed by Local Partnerships, working with the Local Government Association), sources considered 'out of scope' and not to be included in local authority greenhouse gas emissions calculations include:

- commercial property (where control is given to the tenants through the lease agreement or the tenants are responsible),
- authority housing (except for communal areas for which the Council is responsible)
- private housing (not under the authority's control or influence).

The Council's approach to calculating its carbon emissions is aligned with the above guidance. The table at Figure 6 details all the sources of the Council's energy included in the Council's reported greenhouse gas emissions under each scope.

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850130/Env-reporting-guidance_inc_SECR_31March.pdf

³ www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019

⁴ <https://ghgprotocol.org/corporate-standard>

⁵ www.local.gov.uk/greenhouse-gas-accounting-tool



Figure 6. Emission sources included in the Council's greenhouse gas emissions report, by scope.

Scope	Type of Emissions		Source of Emissions	Sources of Energy/ Fuel Consumption included
Scope 1	Direct Emissions	Emissions created within the city	Gas Consumption	Council buildings (not outsourced leisure sites managed by GLL)
				Communal areas in Council managed properties (sheltered housing and commercial properties)
			Fleet Fuel Use (Diesel, Petrol, Gas Oil)	Council fleet vehicles
				Waste fleet vehicles
				Diesel use by generators used by Cambridge Live at events
Scope 2	Indirect Emissions	Emissions created outside the city	Electricity Consumption	Council buildings (not outsourced leisure sites managed by GLL)
				Landlord/ communal lighting of areas in Council managed properties (sheltered housing, housing blocks and commercial properties)
				Streetlighting
Scope 3	Other Indirect/ Outsourced Emissions	Emissions created within the city, not in direct control of the Council	Business Travel	Staff mileage
				Councillors mileage
				Car Club use by staff
		Emissions created outside the city	Gas Consumption	Outsourced (GLL) Leisure Sites
			Electricity Consumption	Outsourced (GLL) Leisure Sites
			Transmission & Distribution Losses	Council buildings and communal areas in Council managed properties (not outsourced leisure sites)
				Outsourced (GLL) Leisure Sites



The table at Figure 7 details the total emissions reported for each scope for the past 6 years.

Figure 7. Greenhouse Gas Emissions by Scope – 2014-2020.

Scopes	GHG Emissions (tonnes CO ₂ e)					
	2014/15 (baseline year)	2015/16	2016/17	2017/18	2018/19	2019/20
Scope 1						
Gas Consumption	1,540	1,637	1,544	1,303	1,347	1,478
Owned Transport (fleet and waste vehicle fleet)	1,209	1,004	1,275	1,315	1,379	1,341
Total Scope 1	2,749	2,641	2,819	2,618	2,727	2,819
Scope 2						
Purchased Electricity	2,975	2,597	2,080	1,678	1,254	1,256
Total Scope 2	2,975	2,597	2,080	1,678	1,254	1,256
Scope 3						
Business Travel	52	57	59	62	61	64
Outsourced Activities Gas & Electricity	1,904	2,001	2,012	1,985	1,819	1,449
Transmission and distribution (T&D) losses	361	288	264	221	150	132
Total Scope 3	2,317	2,346	2,335	2,268	2,030	1,646
Total Gross Emissions	8,041	7,584	7,234	6,564	6,011	5,721



Aims

We know that we will need to reduce the Council's carbon emissions from our corporate buildings and fleet vehicles rapidly over the next 5 years if we are to reach net zero carbon by 2030. We have therefore targeted the carbon reduction projects, detailed in this plan, to address the largest sources of the Council's emissions to achieve the greatest savings, as quickly as possible.

The greatest source of the Council's emissions is from the consumption of gas to heat buildings, followed by electricity, as shown in Figure 8. Emissions from the Council's fleet are also significant as being the source of nearly a quarter of the Council's emissions.

Figure 8. 2019/20 Total Council Carbon Emissions (tCO₂)

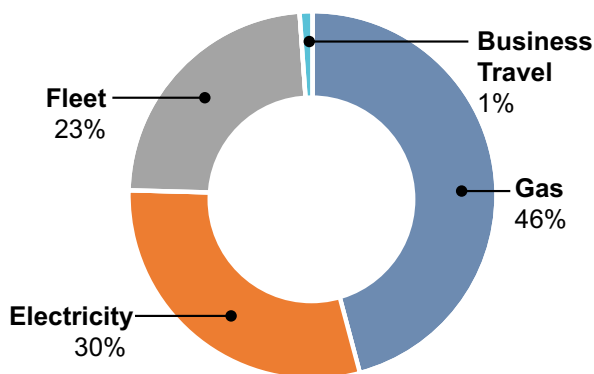


Figure 9 shows how the greening of the electricity grid, along with electricity saving measures the Council has installed, has rapidly reduced the emissions from the Council's use of electricity to below that of gas over 5 years since 2014/15.

We have also targeted carbon reduction projects at the areas of the Council's activity which contribute most to the Council's emissions. The largest consumers of gas and the largest source of the Council's emissions, are the 5 leisure centres and swimming pools, followed by sheltered housing and then the Council's administration buildings as shown in Figure 10.

Figure 10. Carbon emissions from gas consumption (tCO₂) 2019/20

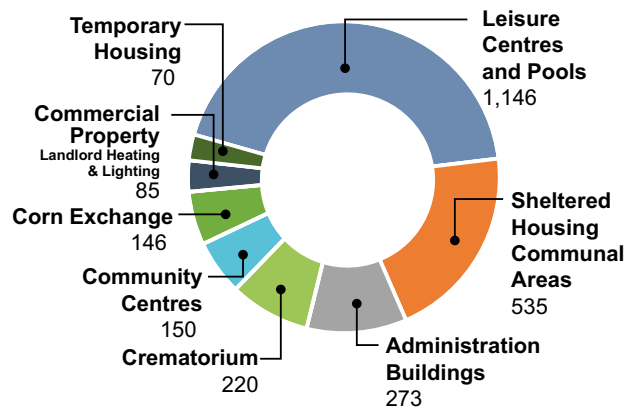


Figure 9. Total Carbon Emissions

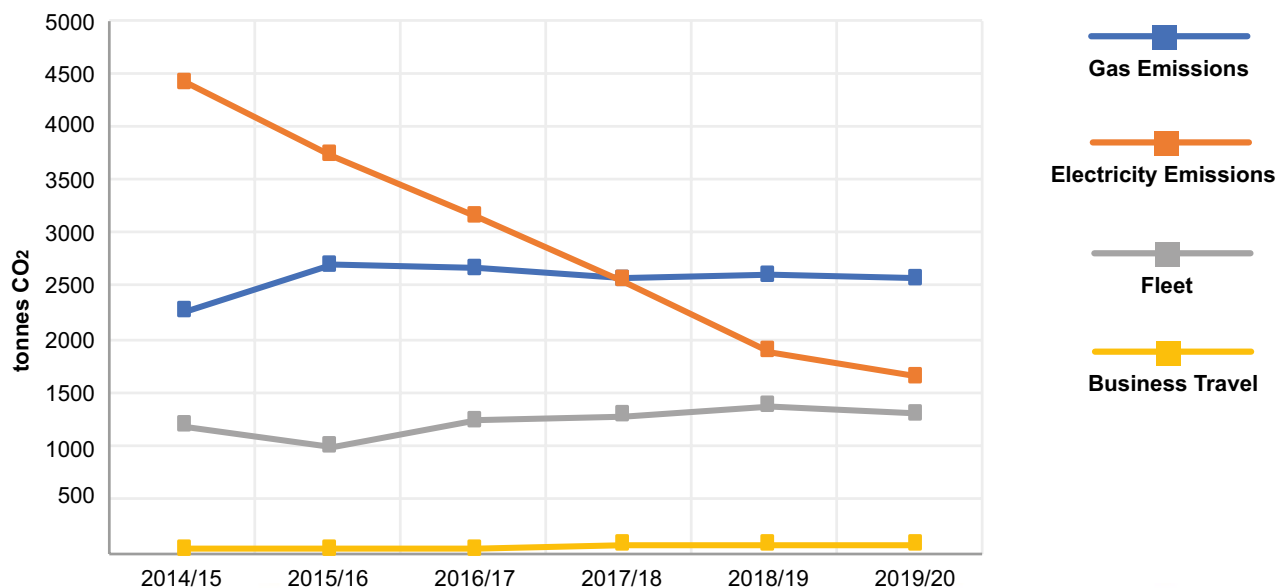
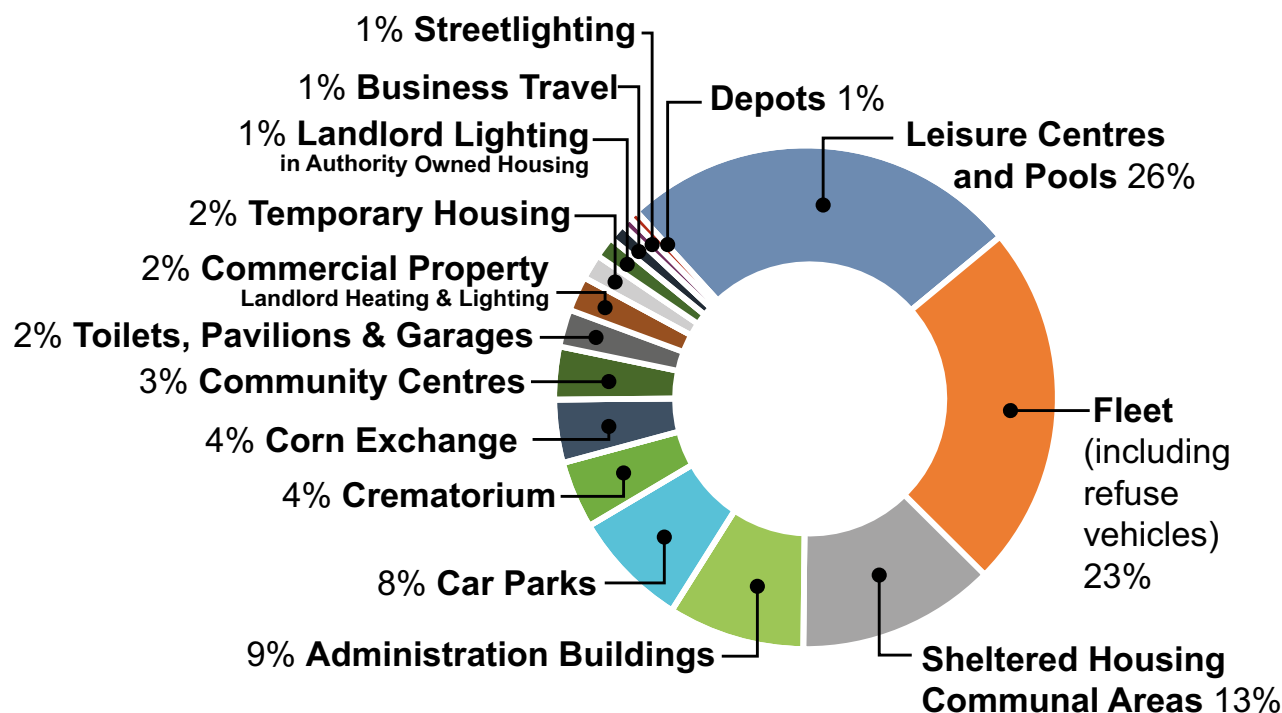


Figure 11 – Percentage of total City Council Scope 1, 2 and 3 emissions from different assets 2019/20

As shown in Figure 11, the largest source of all emissions in 2019/20 were the Council's 5 leisure facilities which includes 4 swimming pools, accounting for 26% of the Council's emissions.

The next largest source of emissions is the Council's vehicle fleet (23%), followed by sheltered housing communal areas (13%), administrative buildings (9%), and car parks (8%). We also have a listed 1930s Guildhall, and we operate the Corn Exchange concert venue, a listed Victorian building. These buildings are likely to be the most technically

challenging and expensive to retrofit to net zero standard.

It is therefore clear from the above charts that the priority areas of focus of the Council's carbon reduction activity should be the leisure centres and pools, sheltered housing communal areas, administration buildings and fleet vehicles. However, we will also develop and implement carbon reduction projects for other significant sources of emissions, including the Council's car parks, the Corn Exchange, crematorium and community centres.



Carbon Reduction Projects

Carbon reduction projects completed 2016-2021

The Council has produced two previous Carbon Management Plans, covering the periods from 2012-2016 and 2016-2021. Through these plans, the Council has implemented 66 carbon reduction projects on its own corporate buildings and vehicle fleet to date, including a range of different energy efficiency, fuel efficiency and renewable energy projects.



Switch it off campaign poster

These projects have been funded through a total of over £1.4m in contributions from the Council's dedicated Climate Change Fund since 2008/09, as well as further investment from planned maintenance and service budgets.

As described in more detail in Appendix A, the 66 Carbon Management Plan projects implemented to date have included:

- **Solar photovoltaic (PV)⁶ installations** at 11 buildings (Guildhall, Mandela House, Waterbeach Depot, Parkside Pool, Abbey Pool, Kings Hedges Learner Pool, Crematorium, Buchan Street Neighbourhood Centre, Brandon Court, Whitefriars, and New Street Hostel).



Solar photovoltaic array on the Guildhall roof

- A **solar thermal system⁷** at Abbey Pool, which heats water for the swimming pools, showers and other facilities.
- **LED⁸ lighting** at 10 buildings and sites (Guildhall, Mandela House, Grand Arcade car park, Grafton East car park, the Corn Exchange, Abbey astroturf pitches, Stanton House, School Court, Rawlyn Court and Whitefriars). Motion sensors were also installed at many of these sites.
- **Voltage optimisation** at 4 sites (the Guildhall, Mandela House, Abbey Pools and Grafton East car park).
- Comprehensive **energy efficiency works** at the Guildhall, including a Combined Heat and Power plant (CHP)⁹, new Building Energy Management System¹⁰ (BEMS), mechanical works to improve the efficiency of the heating and hot water system, roof insulation and secondary glazing.
- A range of different **energy efficiency improvements** at different swimming pools including pool covers; BEMS, Variable Speed Drives, heat pump, and refurbishment of an existing CHP.

6 Solar electricity panels, also known as photovoltaics (PV), capture the sun's energy and convert it into electricity for use.

7 Solar water heating (also known as solar thermal), is the process of capturing energy from the sun via the use of solar panels, to heat water for use.

8 A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs.

9 Combined heat and power (CHP) is a highly efficient process that captures and utilises the heat that is a by-product of the electricity generation process. By generating heat and power simultaneously, CHP can reduce carbon emissions by up to 30% compared to the separate means of conventional generation via a boiler and power station. At the Guildhall, gas is used by the CHP to generate electricity and the resultant heat is also used in the building.

10 Building Energy Management Systems (BEMS) are integrated, computerised systems for monitoring and controlling energy-related building services plant and equipment such as heating, ventilation and air conditioning (HVAC) systems.





Mandela House

- **Upgrading boilers** at Mandela House, Abbey Pools, Cherry Hinton Village Centre, the Meadows Community Centre and Ross Street Community Centre to condensing boilers.
- Replacing existing fleet vehicles with more **fuel-efficient Euro 6 vehicles** at the end of their life span and introducing 12 **electric vans** to the Council's fleet which are used by Streets & Open Spaces and Estates & Facilities teams. The Greater Cambridge Shared Waste service also purchased one of the first electric refuse lorries in the country.
- Using **software solutions to reduce fleet mileage** and associated fuel consumption and carbon emissions. The Greater Cambridge Shared Waste Service has used software to implement more efficient waste collection routes, the Council's Streets and Open Spaces teams have used software to schedule tasks in sequence and reduce vehicle routes, and the Environmental Health team has used a database to facilitate more mobile working and reduce travel to and from offices.
- Taking steps to reduce carbon emissions from **business travel** by Council staff, including improving the condition of 22 existing pool bikes, purchasing 4 electric pool bikes and installing electric vehicle charge points at Waterbeach depot for use by staff.

Carbon reduction projects to be delivered or investigated 2021-26

We have identified a range of carbon reduction projects for the next 5 years and have targeted

them at the main areas of activity which contribute most to the Council's emissions, as highlighted by the charts in section 3. These are the leisure sites, the Council's vehicle fleet, sheltered housing communal areas and administrative buildings.

Several projects, detailed below, and listed at Appendix B, have been developed, funding secured and are planned to be implemented during 2021/22. Further projects to target the key assets as identified in section 3 are under investigation for possible installation during the Carbon Management Plan period. Possible projects that have been identified to date are detailed in Appendix C.

The Council will determine the technical and financial viability of such projects and seek to identify ways in which they could be brought forward, and funding secured in order to deliver them.

There may be further opportunities for the Council to bid for external funding (Government and other sources) to finance some of the necessary carbon reduction projects. Additional projects will continue to be investigated and developed over the next 5 years and beyond.

Any further rationalisation of the Council's office estate as part of the Office Accommodation Strategy would also contribute to future reductions in carbon emissions. It is likely to require bold thinking about our office estate to enable the Council to get to net zero. The recent changes for staff to work more flexibly and from home have demonstrated that further rationalisation should be achievable. Not only should this reduce emissions from buildings due to reduced space, it should also result in reductions in transport emissions in the city due to reduced commuting. However, these potential reductions could be counterbalanced by any additional assets or services that the Council chooses to provide in future. The Council will also need to give careful consideration to potential future uses of any buildings it decides to vacate.

Leisure Centres and Pools

Bouygues Energies & Services (the Council's Energy Performance contractor) have developed a project to significantly reduce gas



usage and increase the supply of renewable electricity at Parkside and Abbey Pools, the Council's two largest swimming pools. Leisure sites are responsible for more than a quarter of the Council's total emissions, the largest source of emissions, with Parkside Pool the greatest emitter of emissions.

Investment has been made in energy saving measures at the pools over the years, as detailed at Appendix A. Large scale investment in new heating technologies is now required in order to decarbonise the pools.

The Council made two successful applications to the Government's Public Sector Decarbonisation Scheme (PSDS) in December 2020 totaling **£1.7m** to fund energy saving measures at the two leisure sites. The Council will deliver the projects through Bouygues via the REFIT 3 Energy Performance Contract,¹¹ which means the estimated energy savings are guaranteed.

The measures that are planned for Parkside Pool include:

- 2 air source heat pumps¹² (ASHP) (subject to planning permission), additional solar PV, an LED lighting upgrade, BEMS and pipework insulation. The ASHPs will work with the existing CHP unit to provide heat to the air plant and domestic hot water services at the pool. Improved controls will further reduce energy consumption.
- The current, aged boilers in the main plantroom will be replaced with new, smaller condensing gas boilers which will be much more energy efficient. These will serve as backup boilers for the ASHP to be used when demand is high. It is not possible to install a large enough ASHP, in the space available, to provide 100% of the building's required heating load. The replacement will be funded by a capital bid (subject to approval).

Currently there is a CHP unit and boiler plant on site which supplies heat (and electricity) to the building. The ASHPs have been designed to supply 100% of the site's domestic hot water requirements and most of the remaining

boiler heating load. This will allow the CHP to continue to offer low carbon heating and electricity (currently generated at a lower carbon factor than from the grid, which can be used on site to power the ASHP which requires electricity to run) until the end of its serviceable lifetime when it can be replaced by a renewable heating solution (such as connection to a GSHP district heating network) to fully decarbonise the building's remaining heat demand (subject to funding being available and any necessary permissions).

All the measures listed above for Parkside Pool will reduce the gas consumption of Parkside Pool by 42.6%, reducing emissions by approximately 368.3 tonnes of CO₂, which will reduce the Council's total carbon emissions by approximately 6.4%. Subject to planning permission for the ASHPs being granted, the project at Parkside Pool is planned to be completed by September 2021.

The following measures will be installed at Abbey Pool:

- A ground source heat pump (GSHP), BEMS and pipework insulation, which will reduce the centre's gas consumption by 45.1%, reduce carbon emissions by approximately 107 tonnes of CO₂ and reduce the Council's total carbon emissions by approximately 1.9%.
- Currently there is a condensing gas boiler plant on site which supplies heat to the building. The GSHP will satisfy a large proportion of the sites heating demand. Once the boilers have reached the end of their serviceable lifetime then a renewable solution can be identified to satisfy the remainder of the sites load. If the PSDS application for Abbey is successful, the project will be completed by June 2021.

There are several projects planned to expand the leisure facilities at Abbey, Cherry Hinton and Jesus Green after October 2023. These additional facilities will be supplied with low carbon and renewable energy from ASHPs and solar PV to reduce the energy consumption of the new buildings and the impact on the Council's carbon emissions.

¹¹ <https://localpartnerships.org.uk/our-expertise/re-fit/>

¹² Heat pumps are a form of electric heating where energy is extracted from the air (ASHP) or the ground (GSHP) in order to provide space or water heating at a high efficiency. Installing a heat pump significantly reduces the requirement for gas for heating (which generates high levels of carbon emissions) as they use electricity, which will progressively be decarbonised at a national level through renewable energy supplying the national grid.



The potential for a new, green energy centre to supply energy to Parkside Pool and Queen Anne Terrace car park and Kelsey Kerridge Sports Centre from low carbon and renewable energy will be investigated, including additional solar PV and ASHP.

Fleet Vehicles

The Council has carried out a review of our fleet vehicles and committed to progressively replacing its vehicle fleet (approximately 100 vans and trucks) with electric models. The Council will procure Ultra Low Emission Vehicles (ULEV) when replacing vans and trucks in the Council's fleet (where there is a suitable ULEV alternative and the infrastructure allows). This commitment could lead to a fully electric van and truck fleet by 2028 and would significantly reduce emissions from the Council's fleet, which is currently the second largest source of our emissions at 23% (See Figure 11).



Charging one of the Council's electric vehicles

The Greater Cambridge Shared Waste Service will seek to replace all Refuse Collection Vehicles (RCVs) with low carbon alternatives (electric or hydrogen) at the point when they are due for replacement, and the whole fleet

should have moved to low carbon alternatives by 2028. The service has purchased one of the first electric Refuse Collection Vehicles (RCVs) in the country and is planning to purchase 5 further electric Refuse Collection Vehicles (RCV) for use across the service in 2021/22.

Progressively replacing existing fleet vehicles with electric vehicles (particularly electric RCVs) will require a higher initial capital investment compared to purchasing replacement diesel, but it is anticipated that the "whole life" costs for electric vehicles are likely to be comparable to diesel vehicles, due to lower running costs for electric vehicles.

Sheltered Housing

Stanton House sheltered housing scheme's 25 flats have shared gas boilers and a planned project will install new, energy efficient heating systems to the flats and the communal areas. Low carbon options are being considered such as ASHP, insulation and replacement windows.

Car Parks

The LED lighting in the lower (basement) levels of the Grand Arcade car park was installed around 10 years ago and is due for replacement soon, which will result in the installation of newer, more energy efficient lighting. A new motor and control panel will reduce energy consumption from the Air Handling Unit at Grand Arcade Annex car park.

The Park Street Car Park redevelopment is part of a wider scheme including a new car park and hotel. The re-provided car park will see a reduction in spaces from 390 to 225 and with improved cycle parking including provision for cargo and non-standard format bikes. The scheme is being constructed to BREEAM Excellent. Since the original planning consent, further improvements have been made through the removal of gas and design development of the facade to improve insulation and reduce embedded CO₂ in materials used, increasing the reduction of carbon emission over original planning scheme to 46.4% from 16.7%. Energy saving measures include: LED lighting, ASHPs for heating and hot water and all car parking spaces will have electric vehicle charging point infrastructure with 10% available for use on day one.



Crematorium

Various measures to reduce the crematorium's gas and electricity consumption are currently being considered including the possible installation of heating and ventilation improvements including installing a BEMS, and an LED lighting upgrade.

An upgrade of the ornamental lighting in the main chapel of the Crematorium to low energy LED lighting is planned.

Corn Exchange

Measures that are planned for the building include: the replacement of the current gas boilers, which requires immediate action to remain operational; a new air handling system and insulation to pipework; a BEMS to maximise the efficiency of mechanical plant and ventilation systems (including modification of the heating distribution system in the building), and LED lighting upgrade and insulation. The measures will save approximately 43 tonnes CO₂ and reduce the Council's total carbon emissions by approximately 0.8%.

Temporary Housing

It is planned to install external wall insulation to New Street Hostel and lighting improvements to replace communal lighting with low energy LED lighting and motion sensor controls to further reduce electricity consumption from the lighting.

Community Centres

A review of the existing community centres will include the potential for installing ASHP, additional solar PV, insulation, upgrades to the HVAC, lighting and the installation of BEMS.

New community centres are being built to BREEAM¹³ Excellent¹⁴ or Very Good¹⁵ standard to replace existing community centres. BREEAM is an international sustainability scheme that provides independent third-party certification of the assessment of the sustainability performance of individual buildings, communities and infrastructure projects.

Figure 12. Building standards for new community centres in development

Centre	BREEAM	Heating	Other
Mill Road	Excellent	ASHP	PV on flats above
Cromwell Road	Very Good	CHP (Gas)	
Campkin	Very Good	ASHP	PV on flats above
Akeman	Very Good	Gas Boiler	
Meadows	Excellent	ASHP	PV and Battery TBC

The current Meadows Centre and Buchan Street Neighbourhood Centre will be replaced with a single new community centre (Meadows) built to BREEAM Excellent standards which will mean that the community centre will be in the top 10% of sustainable buildings in the UK and so will be a more sustainable building compared to the previous centres, with a much lower carbon footprint. The heating will be provided by an ASHP.

An existing building is currently being used as a temporary community centre at Akeman Street which will be replaced by a purpose-built centre in 2021. Additional new community facilities planned at Mill Road, Campkin Road and Cromwell Road will add to the Council's current carbon emissions but are designed to be energy efficient with a significantly lower carbon footprint.

Pavilions & Toilets

A review of the pavilions that provide facilities for outdoor sport will include the potential for installing ASHP, solar PV, upgrading insulation and upgrades to the HVAC and lighting at all sites.

Landlord Lighting in Authority Owned Housing

Where not already upgraded, the Council's communal lights (up to 3000 in total including emergency lights) within blocks of flats on housing estates will be replaced with LED lamps and appropriate controls to further reduce electricity consumption.

¹³ The BREEAM rating benchmark levels enable a client or other stakeholder to compare an individual building's performance with other BREEAM rated buildings and the typical sustainability performance of new non-domestic buildings in the UK.

¹⁴ Top 10% of UK new non-domestic buildings (best practice)

¹⁵ Top 25% of UK new non-domestic buildings (advanced good practice)



Streetlighting

The housing estate street lighting project will involve the replacement of approximately 400 streetlights owned by the Council with low energy LED light fittings with dimmable capability, which will further reduce energy consumption. Approximately 400 of the Council's 650 lighting columns, which have not already been upgraded to LED lighting, will be replaced across the Council's estate saving approximately 97,925 kWh of electricity.

Waterbeach Depot (office accommodation)

The depot building, used by the Greater Cambridge Shared Waste service, uses electricity for both heating and lighting. It has an ASHP for heating and the lighting was upgraded to LED lighting in 2020, which will reduce electricity consumption by 8,363 kWh and save 2.6 tonnes of CO₂.

In 2019 a solar PV system was installed (jointly owned by South Cambridgeshire District Council and Cambridge City Council) which

reduces the amount of electricity required from the national grid. The councils are exploring ways to source as much renewable energy as possible to cover the site's current and forecast usage, which will include the charging of electric RCVs (refuse collection vehicle).

All sites

Building Manager Energy training: When Covid-19 restrictions are lifted, a training session will be delivered to all building managers to raise their awareness of where energy can be saved and to ensure heating is set correctly and not left on unnecessarily.

Monitoring and targeting (M&T): The Council created a new role in 2020 of Corporate Energy Manager to allow further capacity to deliver energy efficiency projects and to manage energy data. Part of this role will be to carry out monitoring and targeting of energy data and to identify further areas of potential energy and carbon reduction and to ensure projects deliver their objectives.



Approach to Achieving Net Zero Carbon Emissions Across the Council's Corporate Buildings

As part of the development of the new Carbon Management Plan, we commissioned Bouygues to produce a high-level study to identify the measures needed for the Council to reduce its direct emissions from corporate buildings to net zero carbon and what level of capital investment would be required.

The report focussed on the 29 corporate buildings which have the highest carbon emissions within the Council's estate of more than 200 buildings. Total carbon emissions from these 29 buildings in 2019/20 were 3,607 tonnes of CO₂. This represents 83.6% of total carbon emissions from the Council's corporate buildings, and 63% of the Council's total carbon emissions (including emissions from fleet vehicles and business mileage).



Abbey Pool

Potential carbon reduction projects

The Bouygues report identifies a range of potential carbon reduction projects across the Council's corporate buildings (summarised at Appendix D). The projects would primarily involve installing ASHPs and GSHPs where feasible, with additional LEDs, solar PV, BEMS and other measures at some sites. The focus on heat pumps would help switch energy consumption from gas (which generates

high levels of carbon emissions) to electricity (which will progressively be decarbonised at a national level through renewable energy).

While the study suggests that it would potentially be possible to reduce emissions from many of the buildings within the scope of the study to close to zero carbon, the study identifies three buildings that will be much more challenging to improve to a net zero standard: Guildhall, Corn Exchange and the Crematorium.

Guildhall

The Council has already installed a package of measures at the Guildhall including a BEMS, LED lighting throughout the building, solar PV, CHP, additional roof insulation, insulation of pipework, and secondary glazing. However, the Guildhall presents a significant challenge for decarbonisation due to its location, status and the fabric of the building.

The Guildhall has some significant spatial constraints which limit renewable heating options significantly. Other than Market Square, the Guildhall is surrounded by historically significant buildings with very little in the way of open space, which means that a GSHP would not be viable. There are spatial constraints surrounding the building and on the roof, which would prevent the Council from being able to install an ASHP. Finally, the grade II listing of the building and the fact that it sits within a conservation area means that a dedicated renewable heating solution for the Guildhall is considered not to be feasible.

The location of the Guildhall and the proximity of a number of other major energy consumers (including the Corn Exchange, Grand Arcade shopping centre, University sites and many other nearby commercial properties) may provide an opportunity for the Council to explore the potential for a community district heating scheme with partners in future.



Corn Exchange

The Corn Exchange has similar challenges to the Guildhall in that the building is grade II listed and is located within a conservation area. The building is extremely thermally inefficient, with single-skin brick walls with no insulation, single glazing and issues relating to the roof. It also has an ineffective heat distribution system within the building and issues with the ventilation system. As a result, the building has a very high energy demand.

A GSHP would not be viable because there is not sufficient space around the building. Bouygues have advised that ASHPs would not currently be able to satisfy a meaningful proportion of the high heating demand in the building. As an interim solution, they have recommended replacing the existing obsolete boilers, which are at risk of failing, with more energy efficient gas boilers. This would reduce carbon emissions from the building by circa 40 tonnes per annum (17% of carbon emissions from the building in 2019/20). There are also opportunities to improve the efficiency of the building in its current state, including a new BEMS to maximise the efficiency of mechanical plant and ventilation systems, and the installation of LED lighting. These measures are listed in the 2021/22 table at Appendix B.

Bouygues have recommended that the Council develops a longer-term investment plan to address fundamental issues with the thermal efficiency of the building, including the walls, windows and roof. This work would also provide an opportunity to improve the heating distribution system in the building and replace the existing air handling system. Once these longer-term measures are taken, the heating demand from the building may be reduced to a point where an ASHP could meet a much greater proportion of the heating requirements.

Crematorium

The Crematorium poses a unique decarbonisation challenge, as a renewable solution to the cremators will be necessary to fully decarbonise the building. The current cremators are currently gas-powered and no viable low carbon alternative has been developed for cremators by manufacturers.



The Crematorium

There are opportunities in the short term for controls improvements and mechanical modifications to ensure the existing heat recovery unit operates efficiently. The proposed BEMS installation will be able to work in conjunction with the heat recovery unit to maximise the energy savings. Bouygues have also recommended installation of an ASHP to provide heating to the building in the absence of heat recovery.

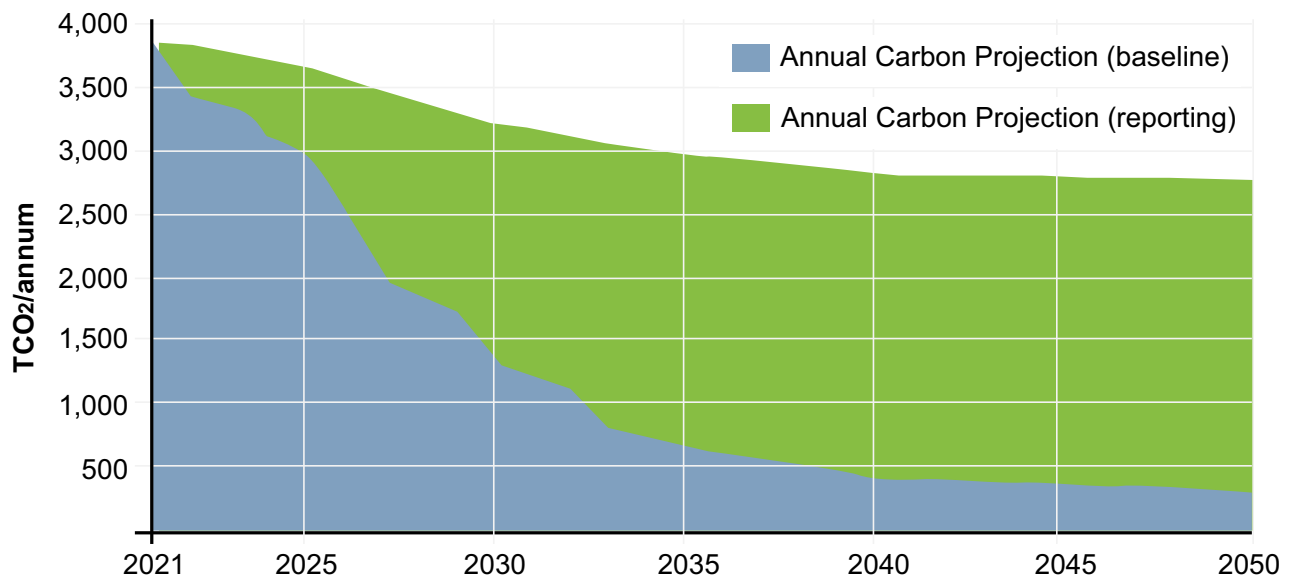
Estimated reduction in carbon emissions

As shown by Figure 13 on the next page, the findings of this study suggest that it is potentially possible for the Council to significantly reduce its carbon emissions from its buildings significantly closer to zero carbon by around 2030. The study identified potential carbon reduction measures which could reduce carbon emissions from the 29 buildings within the scope of the study by 69% by 2030 and 87% by 2050.

The study suggests that, while the majority of the Council's current carbon emissions can be removed, it will be challenging to reach absolute zero carbon emissions across all the buildings in the scope of the study. This is primarily because, as outlined above, the site, structure and listed status of the Guildhall and Corn Exchange mean that low-carbon heating solutions are not currently viable at these buildings, and there is likely to be residual gas consumption at the Crematorium from the gas-powered cremators until viable, low carbon alternatives become available in the market.



Figure 13 – Bouygues estimates of potential carbon emissions reduction from City Council corporate buildings (compared against current baseline position)



We will explore more innovative solutions with local partners for these hard-to-treat buildings, including exploring the potential for district heating schemes incorporating the Guildhall and Corn Exchange.

The study also suggests that, while over the next 10 years the national electricity grid will be decarbonised to a very significant extent through the replacement of fossil-fuels with renewable energy generation, it is unlikely that electricity generation will be fully decarbonised within this timeframe. It is likely therefore, that there will be some limited, residual carbon emissions associated with the electricity from the national grid used by the Council.

The Council has made considerable progress in reducing its carbon emissions by achieving a 28.9% reduction in 2019/20 from a 2014/15 baseline, and we will actively pursue all feasible opportunities to decarbonise our buildings over the next 10 years.

However, it is likely that the remaining carbon emissions identified through the study will need to be addressed through credible carbon offsetting or carbon sequestration measures in order for the Council to reach net zero carbon by 2030. The Bouygues study and other advice received by the Council identifies a range of potential carbon off-setting approaches, which

we will explore in more detail as part of the new Climate Change Strategy.

Estimated costs of carbon reduction projects

The Council has already invested in many of the simpler, more cost-effective solutions (e.g. insulation, LED lighting, solar PV) to reduce emissions from its buildings. The capital cost of the schemes to date listed in Appendix A were 'paid back' by the energy savings generated through the schemes, usually within a ten-year period. Projects that the Council will need to invest in to reduce its emissions in the future will have a much higher capital cost (potentially up to several million pounds per scheme for the larger and more complex schemes), and the net savings on energy costs will not always cover the capital costs of some of the works.

The study carried out by Bouygues found it would cost in the region of **£10.5m** over the next 10 years to implement the carbon reduction projects needed for the Council to achieve the total reduction in carbon emissions identified above for the 29 buildings within the scope of the study. Once the running costs and maintenance costs of these schemes are included, Bouygues estimate that the total cumulative additional costs of the carbon



reduction measures will broadly be around **£38.4m** between 2021 and 2050. This is because the ongoing maintenance costs and electricity costs to run the pumps are higher than the maintenance and running costs of gas boilers.

The Council's planned investment in electric vehicles is more likely to "pay back" over time. For example, the initial purchase cost of electric refuse lorries is currently significantly higher than for the diesel lorries, but modelling suggest that the whole life costs for electric refuse lorries are potentially no more than for diesel lorries.

The Council will put the plans and required budget in place to fund the most suitable projects that will enable us to significantly reduce the Council's carbon emissions. We will continue to bid for Government funding and other sources, when available, to fund developed projects.

As highlighted above, the Council has applied for **£1,706,547** from the Government's Public Sector Decarbonisation Scheme (PSDS) for a range of measures at Parkside and Abbey Pools, including GSHP and ASHP and additional solar PV installations, which will very significantly reduce the Council's carbon emissions.



Parkside Pools



APPENDIX A

Completed Projects 2016-2021

Project	Cost	Climate Change Fund contribution	Contribution from other sources	Estimated annual energy savings (kWh)	Estimated annual carbon savings (tCO ₂ e)	Estimated annual financial savings	Financial payback
2016-17							
CAR PARKS							
Grand Arcade Main Car Park: Replace existing lighting with LED.	£189,227	£189,227	-	304,937	165	£27,307	6.9
Grafton East Car Park: Replace existing lighting with LED.	£131,771	£131,771	-	212,125	116	£18,856	7.0
CREMATORIUM							
Crematorium: Upgrade loft insulation.	£1,478	£1,478	-	3,218	0.6	£100	14.8
ADMINISTRATION BUILDINGS							
North Area Housing Office: Fully programmable heating control system installed.	£786	-	£786	6,436	1.2	£200	3.9
COMMERCIAL PROPERTIES							
Barnwell House: Communal Lighting – LED upgrade in corridors and toilets (x4 1200/600 panels replaced)	£1,518	-	1,518	3,504	0.1	£420	3.6
FLEET VEHICLES							
Council fleet: 7 diesel vehicles replaced with electric vans procured and added to fleet (9 now on fleet in total). 2 more fuel efficient diesel vans added to fleet. Others not yet delivered due to type approval problems with Euro 6 compliant legislation	£420,000	-	£420,000	N/A	11.7	£4,332	96.9
2017-18							
LEISURE SITES							
Abbey Leisure Complex: Solar thermal upgrade and upgrade of the hot water calorifiers - to utilise more of the heat in the hot water system.	£48,700	£40,000	£8,700	114,938	21.2	£4,597	10.6



Project	Cost	Climate Change Fund contribution	Contribution from other sources	Estimated annual energy savings (kWh)	Estimated annual carbon savings (tCO ₂ e)	Estimated annual financial savings	Financial payback
Abbey Leisure Complex: Upgrade and replacement of air handling unit with a new air plant circulation system and heat recovery technology.	£78,377		£78,377	737,071	148.4	£25,208	3.1
SHELTERED HOUSING							
Ditton Court: Heating and hot water boilers fitted in each of the 27 flats replacing the communal system. Each have their own gas meter fitted for their individual gas consumption and the tenants are now responsible to pay for their gas usage directly. The Council are now only responsible for the gas consumption of 2 communal domestic boilers serving all the communal areas.	£56,400	-	£56,400	250,000	46.0	£10,000	5.6
School Court: Replacement of individual flat system (boilers) by a communal system with a more energy efficient boiler.	£397,943	-	£397,943	25,000	4.6	£1,000	397.9
2018-19							
LEISURE SITES							
Abbey Leisure Complex: Replacement of astroturf floodlights with energy efficient LED lighting, new control gear and timers.	£65,560	-	£65,560	42,672	15.0	£4,690	14.0
Abbey Leisure Complex: 30kW Solar PV Array	£47,374	£47,374	-	25,661	7.9	£4,293	11.0
Parkside Pool: 50kW Solar PV Array	£74,450	£74,450	-	47,314	14.5	£6,676	11.2
Kings Hedges Pool: 11kW Solar PV Array	£16,902	£16,902	-	7,762	2.4	£1,279	13.2
CREMATORIUM							
Crematorium: 11kW Solar PV Array	£17,983	£17,983	-	7,229	2.2	£1,209	14.9



Project	Cost	Climate Change Fund contribution	Contribution from other sources	Estimated annual energy savings (kWh)	Estimated annual carbon savings (tCO ₂ e)	Estimated annual financial savings	Financial payback
ADMINISTRATION BUILDINGS							
Mandela House: Replacement of existing lighting with low energy LED light fittings and combined motion/light sensors.	£150,000	£54,544	100,000	52,359	24.2	£5,000	30.0
Mandela House: Upgrade to condensing boiler and pipework and valve insulation.	£60,000	£9,000	£51,000	82,604	15.4	£2,500	24
Mandela House: 30kW Solar PV Array	£46,708	£46,708	-	28,571	8.8	£4,779	9.8
Guildhall: Secondary glazing installed	£29,337	-	£29,337	5,658	1.0	£170	172.6
Guildhall: Install 30kW solar photovoltaic system	£33,180	£33,180	-	24,450	7.5	£4,257	7.8
SHELTERED HOUSING							
Whitefriars Court: 20kW Solar PV Array	£31,295	£31,295	-	15,048	4.6	£2,630	11.9
FLEET VEHICLES							
Vehicle fleet: Replacement of fleet vehicles with electric vans and fuel-efficient vans and trucks. 19 panel vans were replaced in Estates & Facilities. 1 of these was electric. The other 18 Euro 4 vehicles were replaced with Euro 6 emissions compliant vehicles. 9 refuse trucks were replaced in Shared Waste Service (Euro 6). 2 caged tippers were replaced in Streets & Open Spaces.	£2,436,000	-	£2,436,000	N/A	30	TBC	TBC
2019-20							
ADMINISTRATION BUILDINGS							
Guildhall: Building automation. Implementation of several measures to increase the level of control over the heating systems, including installing a BEMS.	£37,785	£37,785	-	174,497	32.5	£5,196	7.3
Guildhall: Replacement of roofing and additional insulation	£100,502	-	£100,502	60,980	11.2	£1,765	57.0



Project	Cost	Climate Change Fund contribution	Contribution from other sources	Estimated annual energy savings (kWh)	Estimated annual carbon savings (tCO ₂ e)	Estimated annual financial savings	Financial payback
Guildhall: Replace more than 670 existing light fittings with low energy LED light fittings and automation.	£76,731	£76,731	-	76,528	29.4	£8,081	9.5
Guildhall: Mechanical works improve the energy efficiency of the heating and hot water systems.	£46,945	£46,945	-	89,659	16.5	£2,496	18.8
Guildhall: Insulation of pipework and valves in plant rooms.	£7,778	£7,778	-	24,597	4.5	£712	10.9
Guildhall: Installation of a CHP unit.	£64,779	£64,779	-	-23,944	14.7	£6,631	9.8
Mandela House Ground Floor: LED lighting upgrade	£29,505	-	-	15,339	5.8	£1,687	17.5
SHELTERED HOUSING							
Whitefriars Sheltered Housing: Replace communal lighting with LED equivalent	£13,753	-	-	13,602	5.2	£1,496	9.2
Rawlyn Court Sheltered Housing: Replace communal lighting with LED equivalent	£15,468	-	-	9,399	3.6	£1,033	15
FLEET VEHICLES							
Fleet Vehicles: 8 vehicles in Estates & Facilities were replaced with x7 Euro 6 emissions compliant vehicles (which are more fuel efficient) and x1 electric vehicle. x3 vehicles in Streets & Open Spaces were replaced and x1 truck and x1 van were replaced in Shared Waste.	£647,000	-	-				
2020/21							
LEISURE SITES							
Parkside Pool: Pool covers	£7,400	-	£14,800 (GLL)	200,000	36.8	£4,000	3.7
Parkside Pool: LED lighting replacement	£8,500	-	£8,500 (GLL)	18,000	5	£2,150	4



APPENDIX B

Projects Planned for Implementation during 2021/22

Project	Cost	Climate Change Fund contribution	Contribution from other sources	Estimated annual energy savings (kWh)	Estimated annual carbon savings (tCO ₂ e)	Estimated annual financial savings	Financial payback	% of 2019/20 emissions
2021/22								
LEISURE SITES								
Parkside Pool: Installation of 2 ASHP, additional solar PV, LED lighting, BEMS and pipework insulation.	£988,946	-	£988,946 PSDS application	1,739,437	336	£27,689	35.7	5.9%
Parkside Pool: Replacement boilers	£227,370	-	£227,370 Capital	175,674	32.3	£4,392	51.8	0.6%
Abbey Leisure Complex: Installation of a GSHP, BEMS and pipework insulation.	£717,601	-	£717,601 PSDS application	524,949	107	£4,619	155.4	1.9%
CORN EXCHANGE								
Corn Exchange: New heating boilers, HVAC and insulation of pipework, BEMS and LED lighting.	£186,570	-	£186,570 Capital	208,534	43	£7,074	26.4	0.8%
CREMATORIUM								
Crematorium: HVAC improvements, BEMS, LED lighting, insulation.	TBC	-	TBC	TBC	TBC	TBC	TBC	
STREETLIGHTING								
Streetlighting: Replacement of remaining HRA street lamp columns and lanterns with LED units. Estimated 63% reduction on the baseline.	£1,013,205	-	£1,013,205	97,925	27.2	TBC	TBC	0.5%



Project	Cost	Climate Change Fund contribution	Contribution from other sources	Estimated annual energy savings (kWh)	Estimated annual carbon savings (tCO ₂ e)	Estimated annual financial savings	Financial payback	% of 2019/20 emissions
SHELTERED HOUSING								
Stanton House: Replacement of existing heating system (gas boilers supplying 4 properties) with separate communal and flat heating systems.	Estimated: £850,000.	-	Estimated: £850,000	TBC	TBC	TBC	TBC	TBC
LANDLORD LIGHTING IN AUTHORITY OWNED HOUSING								
Sackville Close: Replacement of communal lights with LED lamps and appropriate controls.	£56,000	-	TBC	TBC	TBC	TBC	TBC	
FLEET								
Shared Waste Service: Purchase of 5 further electric Refuse Collection Vehicles (RCV) for use across the service.	TBC	-	TBC	TBC	TBC	TBC	TBC	



APPENDIX C

Future projects under investigation and possible implementation during 2022-2026

Site

Project Detail

LEISURE SITES

Abbey Sports Complex: Expansion of facilities	New green energy provision to be investigated for possible additional facilities. Additional facilities may be built at Abbey Sports Complex as part of the OPE development in East Barnwell including: a new pavilion with multipurpose spaces to support new lawn bowls, floodlit tennis and MUGA. There is an ambition to also invest in an indoor sports hall space in the locality of the pool building in the overflow car park. The new buildings would provide roof space for additional PV and energy will be provided by ASHP.
Cherry Hinton Village Centre: Expansion of facilities.	New green energy provision to be investigated for possible additional facilities. New sports gym / multi-purpose rooms on the side or front of the site over two storey extension. New meeting room and office spaces. Extension to solar PV, ASHP, BEMS and improved HVAC. Due to commence after October 2023.
Jesus Green Lido: Refurbishment & New Buildings	New green energy provision to be investigated for the outdoor lido. Options to be investigated to determine if it is possible to renovate the pool's plant room and provide energy from low carbon sources such as hydroelectric power from the nearby weir or ASHP or GSHP to heat the pool from a low carbon source and solar PV to provide the electricity. Will also include the installation of pool covers and thermal lining of the pool tank to retain the heat and allow the pool to be used all year round. New building for plantroom. New building for entrance, pool changing, WCs and showers, reception & foyer, Café community rooms. Due to commence after October 2023.
Queen Anne Car Park Roof: Energy Centre to provide energy to leisure centres.	Possible new green energy centre to be investigated for the roof of Queen Anne Terrace Car Park (QAT) & Kelsey Kerridge Sports Centre. Additional ASHP to Kelsey Kerridge (KK) linked to ASHP and controls at Parkside Pools. Extension of roof space for PV on KK roof. Solar PV carport roof. Modular relocatable energy centre plantrooms. Supply of energy to Parkside Pools, QAT and KK centres. Estimated cost of over £2million.

COMMUNITY CENTRES:

Community Centres: Green Energy Schemes	Review of community centres to determine the potential for ASHP, additional solar PV, insulation and heating and ventilation (HVAC) system upgrades, LED lighting and BEMS controls. Estimated cost of up to £400,000.
---	--

PAVILIONS & TOILETS:

Pavilions & Toilets: Green Energy Provision	Review of the pavilions supporting outdoor sports for the potential for ASHP, solar PV, insulation, HVAC system upgrades and LED lighting replacements. Estimated cost is up to £150,000.
---	---

LANDLORD LIGHTING IN AUTHORITY OWNED HOUSING

Blocks of flats: Communal lighting replacements	Replacement of communal lights within blocks of flats on housing estates with LED lamps and appropriate controls.
---	---



Site Project Detail

TEMPORARY HOUSING:

New Street Hostel: Insulation and lighting improvements	Installation of external wall insulation.
	Lighting improvements to be reassessed and completed as part of planned works including: replacing communal lighting with LED equivalent at New Street hostel, installing PIR motion sensor controls to hallway lighting at New Street hostel, replacing kitchen lighting with LED equivalent at 116 Chesterton Road.

CAR PARKS:

Park Street Car Park: New building	Complete redevelopment of the Park Street Car park. The building is being constructed to BREEAM Excellent. Includes LED lighting, ASHP and all car parking spaces will have electric vehicle charging point infrastructure with 10% available for use on day 1. Expected to be complete by January 2023.
Grand Arcade Annex: Air Handling Unit replacement:	A new motor and control panel will reduce energy consumption from the AHU.
Grand Arcade: Basement lighting replacement	LED lighting upgrade in the lower (basement) levels of the Grand Arcade car park.

CREMATORIUM:

Crematorium	Upgrade of ornamental lighting in the main chapel to low energy LED lighting.
--------------------	---

FLEET:

Council vehicles	The remainder of the light commercial fleet will start to be replaced with EVs following the roll out of EV charging infrastructure in 2021/22.
-------------------------	---

ALL SITES:

	Building manager energy efficiency training. To be delivered when Covid restrictions have been lifted.
--	--



APPENDIX D

Bouygues table

Building	Potential measures recommended by Bouygues
Parkside Pool	• ASHPs (for heating and hot water) • Back up boiler • Fan replacements for air handling units (AHUs) • New BEMS • Additional solar PV array • GSHPs (once existing CHP reaches the end of its life)
Guildhall	• Explore with owners of surrounding major buildings and energy users the potential for a joint district heat network solution • Upgrade the existing BEMS (when the technology has advanced to a point where further efficiencies can be achieved through the system)
Abbey Pools	• GSHP (for heating and hot water) • New BEMS • Fan replacements for air handling units (AHUs)
Corn Exchange	• New BEMS • LED lighting upgrade • Replacement of air handling units (AHUs) • Modification to the heating distribution system • Explore with owners of surrounding major buildings and energy users the potential for a joint district heat network solution
Crematorium	• New BEMS • Improvements to the heat recovery unit • Identification of a renewable energy technology for the cremators • Installation of an ASHP in the absence of heat recovery
City Homes Office	• New BEMS • LED lighting upgrade • Solar PV • ASHP to provide heating
Stanton House	• LED lighting upgrade • Solar PV • ASHPs for each flat
Mandela House	• Replacement of a small number of LED fittings • Upgrade the existing BEMS (when the technology has advanced to a point where further efficiencies can be achieved through the system) • ASHP • Explore with owners of surrounding major buildings and energy users the potential for a joint district heat network solution



Ditton Court	• New BEMS • Solar PV • ASHP
Ditchburn Place	• New BEMS • LED lighting upgrade • Solar PV • ASHP
Elizabeth Way	• LED lighting upgrade • Cavity wall and loft insulation • Solar PV • ASHP
Mansel Court	• New BEMS • ASHP
New Street	• LED lighting upgrade • Cavity wall/ loft insulation • Additional solar PV array • ASHP
Rawlyn Court	• ASHP
Whitefriars	• ASHP
School Court	• Solar PV • New BEMS • LED lighting upgrade • ASHP
Orwell House	• LED lighting upgrade • New BEMS • Solar PV • ASHP • Explore with owners of surrounding major buildings and energy users the potential for a joint district heat network solution
Brandon Court	• New BEMS • LED lighting upgrade • ASHP • Explore with owners of surrounding major buildings and energy users the potential for a joint district heat network solution
Barnwell House	• New BEMS • ASHP • Solar PV
Brown's Field	• Solar PV • LED lighting upgrade • GSHP



Talbot House	• Solar PV • ASHP
116 Chesterton Road	• LED lighting upgrade • Cavity wall/ loft insulation • Solar PV • ASHP
Grand Arcade Car Park	• Fan replacements for air handling units (AHUs)
Jesus Green Outdoor Pool	• GSHP or ASHP (if required to heat the pool)

