Guildford Borough Council

Net Zero Carbon Emissions Trajectory

Report

This report has been prepared in July 2022

APSE (Association for Public Service Excellence) is a not for profit local government body working with over 300 councils throughout the UK. Promoting excellence in public services, APSE is the foremost specialist in local authority front line services, hosting a network for front line service providers in areas such as waste and refuse collection, parks and environmental services, leisure, school meals, cleaning, housing and building maintenance.

APSE Energy is APSE's local authority energy collaboration. The vision for the collaboration is to form an "effective collaboration of a large number of local authorities to enable and facilitate the local municipalisation of energy services. By this we mean the public and community, as well as private, ownership and managerial control of local energy generation, supply networks and delivery of energy efficiency works. Local authorities working together in this way would have great influence and would be able to deliver economies of scale in green energy to promote economic growth and combat fuel poverty.

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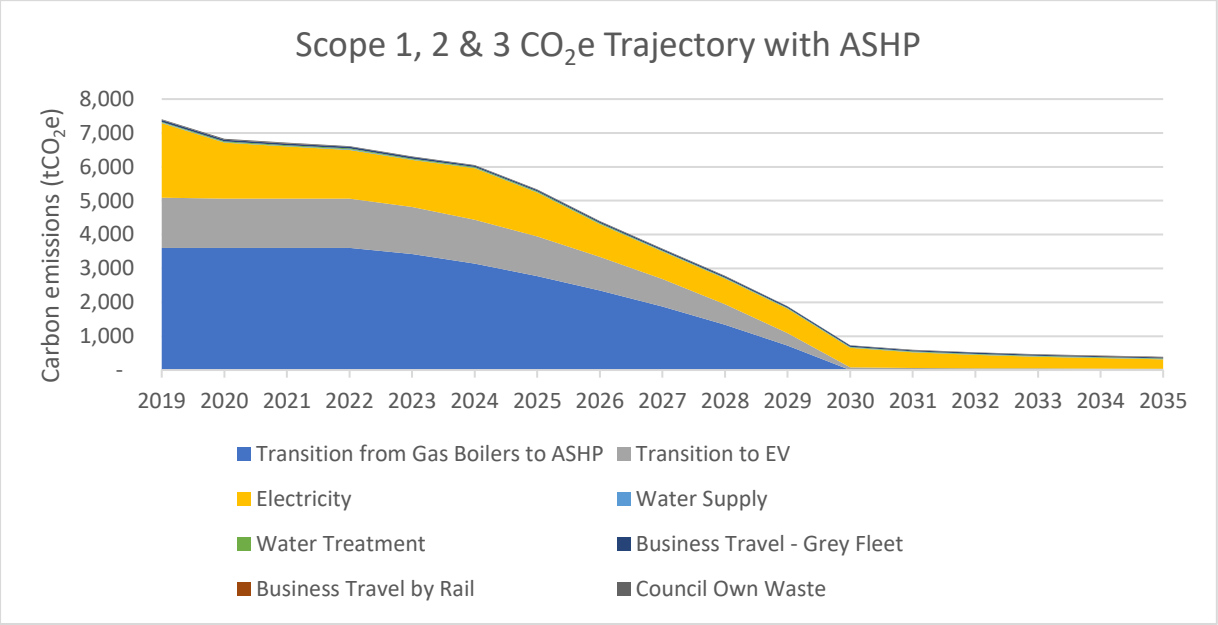
Executive Summary

The 2019/20 baseline carbon footprint from Scope 1, 2 & 3 emissions within Guildford Borough Council's operations are 8,613 tCO_2e. This value is calculated based on emissions factors published by BEIS for 2019.

It is estimated that a financial budget of £32.0million is required to reach net zero carbon (as currently calculated) in the building estate by installing air source heat pumps, being more energy efficient, generating power and developing a tree planting scheme. An additional £26.6million capital is required to upgrade the vehicle fleet to electric and the high cost is largely due to the 43no. refuse lorries. It is estimated that these initiatives will financially benefit the Council by £962,900 annually by 2030.

Chart showing projection of carbon emissions through the Councils Scope 1, 2 & 3 emissions



*Future CO_2 emissions and tariff rates have been taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions published by BEIS. These emissions factors include transmission and distribution losses, including significant losses due to power station inefficiency meaning that the emissions factors differ slightly to those calculated for the 2019 emissions.

It is estimated that there will be 733 tCO_2e from hard to reduce sources that will be unavoidable by 2030 that will need to be offset, and it is assumed that this can be offset through a 5MW solar farm and a tree planting scheme.

Guildford Borough Council Net Zero Carbon Emissions

1 Introduction

This report provides the findings of the carbon footprint calculations and trajectory towards net zero carbon for Guildford Borough Council which can be used as a benchmark to record current emissions and to track performance against future emissions. The carbon footprint has been undertaken in accordance with best practise guidance by the Greenhouse Gas Protocol and calculated using 2019 conversion factors for the carbon dioxide equivalent (CO_2e) published by the Department for Business, Energy & Industrial Strategy (BEIS).

The council has been recording its carbon emissions since 2008/09, which is the baseline year used as a reference point to track performance. The trajectory baseline year is nominated as the financial year of 2019/20, which is the reference point to base 'current' emissions on and used to forecast the pathway to net zero carbon.

The carbon footprint is categorised into scopes, which cover:

Scope 1 (direct) emissions are from activities owned or controlled by the Council. Examples of Scope 1 emissions include emissions from combustion in council owned or controlled boilers, furnaces and vehicles.

Scope 2 (indirect) emissions are associated with purchased electricity, heat, steam and cooling. These indirect emissions are a consequence of the Council's energy use, but occur at sources that the Council do not own or control. Examples include grid supplied electricity and heat provided through a heat network.

Scope 3 (other indirect) emissions are a consequence of the Council's actions that occur at sources the Council do not own or control and are not classed as Scope 2 emissions. Examples of Scope 3 emissions include business travel by means not owned or controlled by the Council (grey fleet), disposing of the Council's own waste and purchased goods in the supply chain, etc.

Note – we will use the term 'electric vehicles' throughout this report. However there are alternative fuels especially for heavier vehicles such as hydrogen and CNG for those who wish to invest in them. When using the term 'electric vehicles' we are also referring to alternatives which are likely to develop over the period to 2030.

2 Carbon Footprint

2.1 Carbon Reporting Boundaries

The organisational boundaries determine what emission are the responsibility of the Council or others. This can be based on who owns, operates, or exerts control over certain assets. The buildings categorised under Scope 1 & 2 within this reporting are those where energy is purchased or acquired and consumed by the Council. The vehicles categorised under Scope 1 are vehicles that the Council own, lease and operate purely for the Council's own operations.

Scope 3 emissions are classified under 15 different categories as detailed under Appendix C. As Scope 3 emissions are under the influence of the Council, but not under its direct control, it can be difficult to obtain the necessary data to calculate the associated carbon emissions from some Scope 3 sources. One of the larger contributors to carbon emissions is purchased goods and services.

Emissions from assets a company owns and leases to another entity, but does not operate, can either be included in Scope 3 or excluded from the inventory.

Based on the data available in 2020, the emissions involved in this reporting include:

Scope 1 - Direct Emissions
Natural gas used in buildings
Transport fuels (council owned vehicles)
Biomass
Other fuels
Scope 2 – Indirect Emissions
Electricity used in buildings
Scope 3 – Other Indirect Emissions
Gas – transmission emissions
Fuels – transmission emissions
Electricity – transmission
Biomass – transmission
Water Supply
Water Treatment
Business Travel by car
Business Travel by Train
Business Travel by Underground
Waste from Council operations
Recycling from Council operations

The emissions from the above sources represents a good data set for a Council, as it is not uncommon for councils to only have data available for electricity and gas.

There are sources that are missing from the reporting and the largest contributor is likely to be from purchased goods and services, which is generally very difficult to gather data and calculate emissions. This category includes all upstream (i.e. cradle-to-gate) emissions from the production of products purchased or acquired by the Council in the reporting year. Products include both goods (tangible products) and services (intangible products).

Cradle-to-gate emissions include all emissions that occur in the life cycle of purchased products, up to the point of receipt by the Council. Relevant purchases to the Council may include capital goods, such as office supplies, office furniture, computers, telephones, travel services, IT support, outsourced administrative functions, consulting services, janitorial, landscaping services, maintenance, repairs and operations.

The Council should set up procedures to record all emission sources related to its operations for future reporting.

2.2 Carbon Emissions

Appendix A is an Excel spreadsheet that shows a breakdown of the emissions by source. The Council has been calculating its carbon emissions inhouse from 2008/09 (the baseline year) and 2013/14 to 2015/16. APSE Energy have calculated the carbon emissions from 2016/17 to 2019/20. Appendix A shows a summary for the emission for all years and separate tabs showing a breakdown for each source in the most recent year (2019/20), as this is the benchmark year for the trajectory to be net zero carbon by the target year of 2030.

Emissions are calculated as carbon dioxide equivalent (CO_2e), which is a term used to combine the seven most threatening gases that have the highest Global Warming Potential. This includes carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride and nitrogen trifluoride.

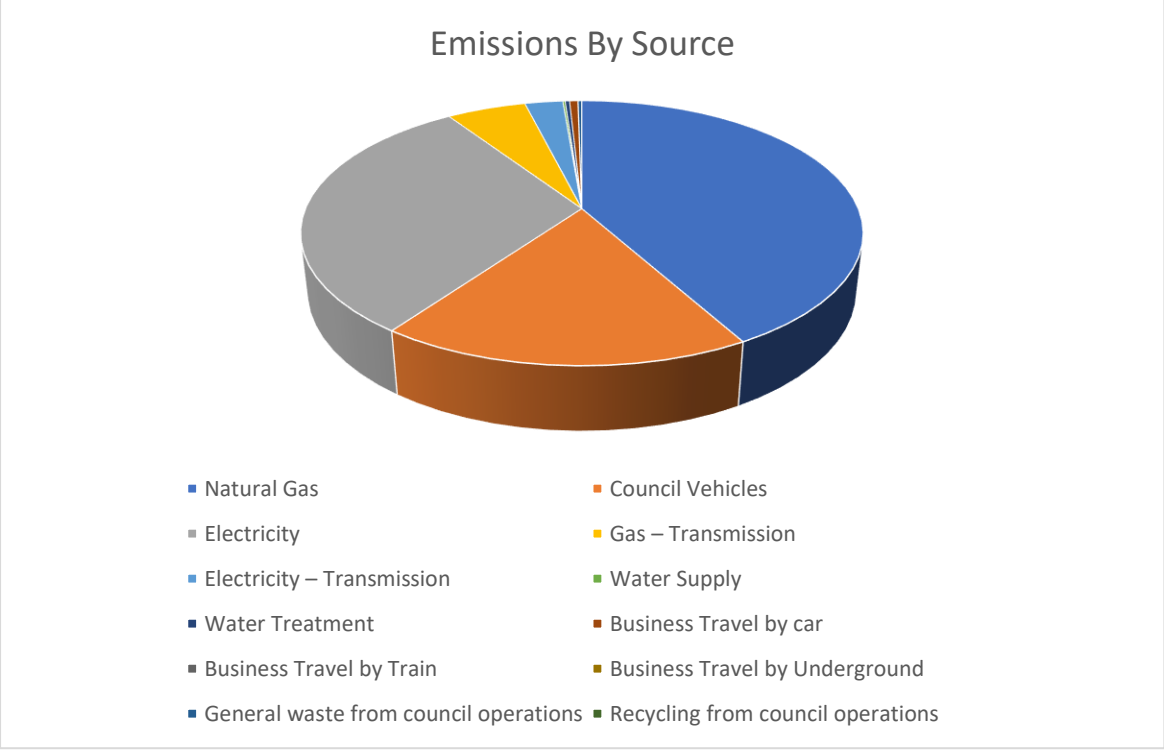
The carbon footprint has been calculated using the best data that was available to the Council during the reporting year and it is the Council's responsibility to confirm the accuracy.

2.3 Trajectory Baseline Emissions for 2019/20

Scope 1, 2 & 3 carbon emissions by source for 2019/20

Emissions Source	Scope	% Split	TonnesCO2e
Natural Gas	1	46.2%	3,607
Council Vehicles	1	19.9%	1,555
Electricity	2	33.9%	2,646
Gas – Transmission	3	6.0%	469
Electricity – Transmission	3	2.9%	225
Water Supply	3	0.2%	14
Water Treatment	3	0.3%	26
Business Travel by car	3	0.6%	49
Business Travel by Train	3	0.017%	1.3
Business Travel by Underground	3	0.002%	0.2
General waste from council operations	3	0.27%	21
Recycling from council operations	3	0.014%	1
Total		**100%**	**8,613**

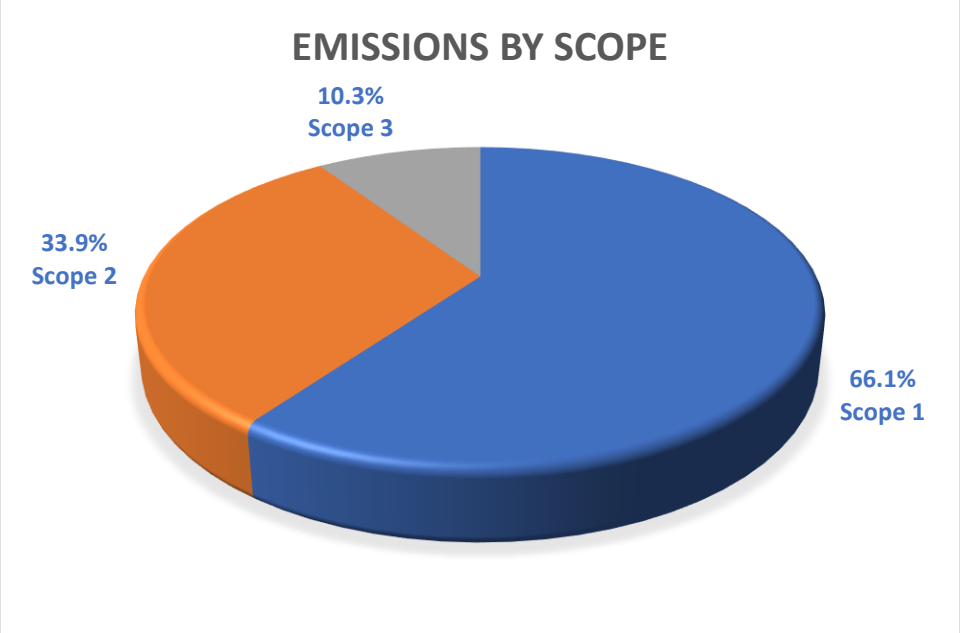
Carbon emissions by source for 2019/20



Carbon emissions by scope for 2019/20

Emissions Source	% Split	TonnesCO2e
Scope 1	66.1%	5,162
Scope 2	33.9%	2,646
Scope 3	10.3%	806
Total	**100%**	**8,613**

Carbon emissions by scope for 2019/20

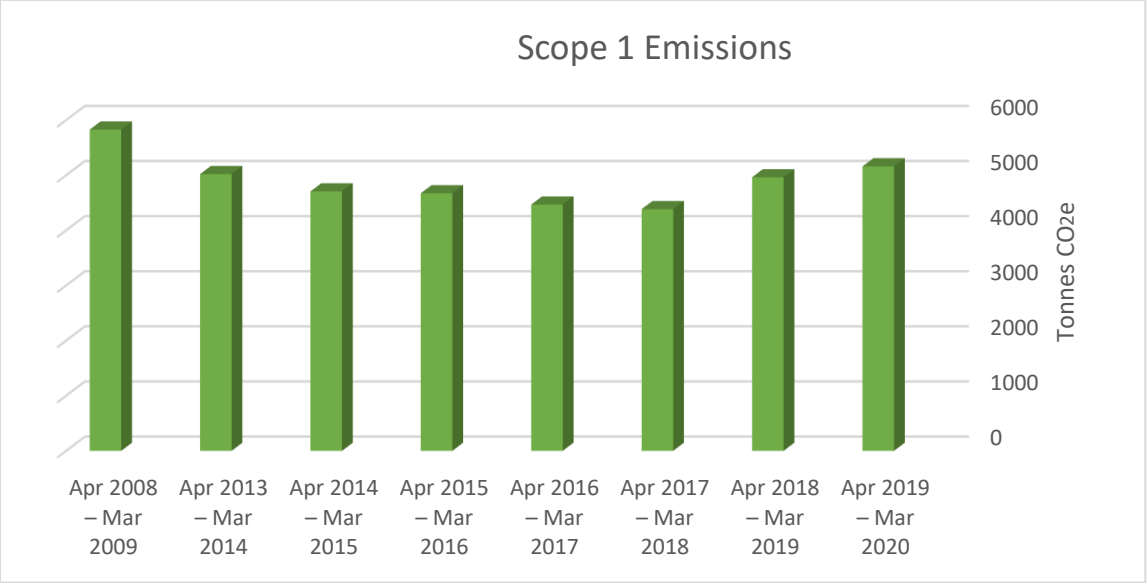


2.4 Carbon Emissions Performance

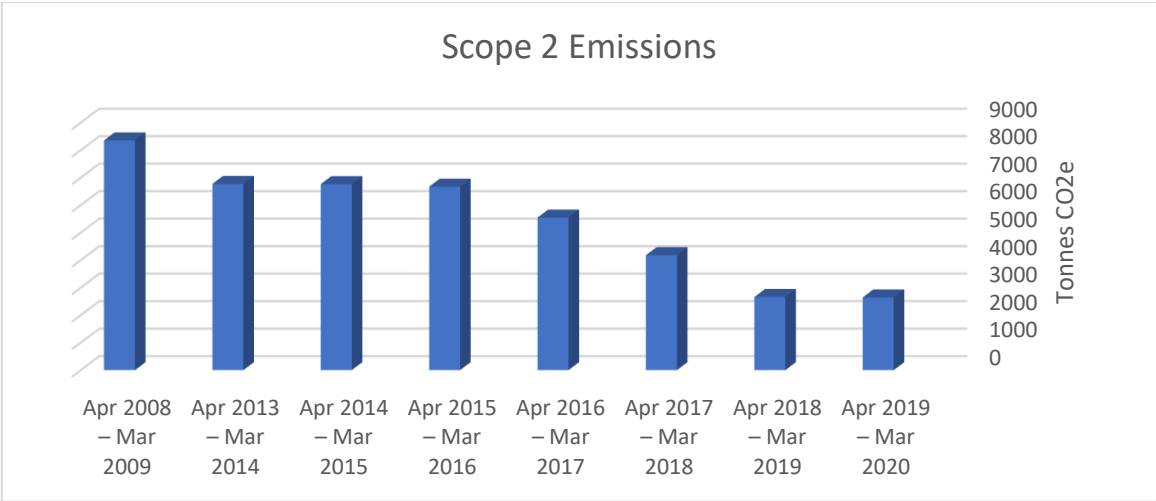
	Tonnes CO_2e							
Emissions	Reporting Year							Baseline Year
	Apr 2019 – Mar 2020	**Apr 2018 – Mar 2019**	**Apr 2017 – Mar 2018**	**Apr 2016 – Mar 2017**	**Apr 2015 – Mar 2016**	**Apr 2014 – Mar 2015**	**Apr 2013 – Mar 2014**	**Apr 2008 – Mar 2009**
Scope 1 - Direct Emissions	**5161.6**	**4963.0**	**4385.7**	**4468.8**	**4673.1**	**4707.3**	**5022**	**5829**
Natural Gas	3606.7	3378.2	2780.9	2811.2	*3051.7*	*3052.8*	*3340.3*	*4161.1*
Transport Fuels (operational)	1554.9	1565.2	1584.5	1631.1	*1499.1*	*1535.3*	*1549.9*	*1595.3*
Biomass (CO_2 outside of scope)	Decommissioned	Decommissioned	2.2	5.0	2.3	1.7	4.5	0
Other Fuels	Decommissioned	19.5	18.1	21.5	120	117.5	127.3	72.6
Refrigerant	Not Available	Not Available	Not Available	Not Available	*Not Available*	*0*	*0*	*Not Available*
Scope 2 – Electricity Emissions	**2645.7**	**2660**	**4182.3**	**5548.05**	**6671.6**	**6763.4**	**6771.5**	**8354.9**
Total Scope 1 & 2 Emissions	**7,807**	**7,623**	**8,568**	**10,017**	**11,345**	**11,471**	**11,793**	**14,184**
Scope 3 – Indirect Emissions	**806**	**859**	**991**	**1,080**	**1345.9**	**1489.4**	**1556.9**	**1510.6**
Gas – transmission emissions	469	443	421	382	*414.3*	*409.8*	*448.4*	*363.4*
Fuels – transmission emissions	*Decommissioned*	5.0	4.1	3.9	*313.5*	*364.8*	*369.9*	*319.6*
Electricity – transmission	225	240	391	502	*500.9*	*591.4*	*592.1*	*601.6*
Biomass – transmission	*Decommissioned*	*Decommissioned*	1.4	3.1	*1.4*	*2.3*	*6.1*	*Not Installed*
Water Supply	14	31	30	27	*57*	*60.6*	*58.1*	*115*
Water Treatment	26	60	58	53				
Business Travel by car	49	55	61	64	*45*	*47*	*67*	*111*
Business Travel by Train	1.31	2.12	2.22	1.60	*2.1*	*1.9*	*1.8*	*Not Available*
Business Travel by Underground	0.17	0.33	0.32	0.34	*0.3*	*0.3*	*0.2*	*Not Available*
Waste from Council operations	*20.87*	*20.88*	*20.94*	*41.40*	*8.5*	*8.5*	*recycling &waste 13.3*	*Not Available*
Recycling from Council operations	*1.13*	*1.13*	*1.15*	*1.11*	*2.9*	*2.8*	*As above*	*Not Available*
Total Gross Emissions	**8,613**	**8,482**	**9,559**	**11,096**	**12,691**	**12,960**	**13,350**	**15,694**
Carbon offset								
Hydro generated and exported	*12.0*	*47.7*	*59.7*	*74.6*	95.7	55.8	86.7	118.5
Total Net Emissions	**8,601**	**8,435**	**9,499**	**11,022**	**12,595**	**12,904**	**13,263**	**15,576**
Further Information								
Out of Scope								
Biomass (outside of scope)	*Decommissioned*	*Decommissioned*	*60.1*	*134.6*	*62.9*	*51*	*133.9*	*Not Installed*
Renewable/CHP CO_2 avoided								
Generated & consumed (CHP)	625	754	CHP not operational	CHP not operational	0	101	531	486
Biomass CO_2 offset					27.4	21.7	56.9	0
Degree Days at 15.5 ^{o}C	1856	1757	1950	1974	1792.7	1885.7	1941.9	2016.8
(an indicator of heat demand)								
Total electricity kWh	10,350,984	9,396,811	11,885,691	13,464,504				
Total gas kWh	19,617,366	18,374,817	15,099,950	15,278,504				
Conversion Factors used above								
Electricity kWh to kgCO_2e	0.2556	0.28307	0.35156	0.41205	0.49636	0.49426	0.49426	0.543
Gas kWh to kgCO2e	0.18385	0.18396	0.18416	0.184	0.18407	0.184973	0.184973	0.206
Diesel litres to kgCO2e					2.661163	2.6024	2.6024	2.63
Gas transmission factor kgCO2e	0.02391	0.02413	0.02785	0.02499	0.02499	0.02483	0.02483	0.1799
Electricity transmission factor kgCO2e	0.0217	0.02557	0.03287	0.03727	0.03727	0.04322	0.04322	0.0390982
Fuels – transmission factor kgCO2e (litres)	NA	0.60122	0.60061	0.58484				
General Refuse to landfill to kgCO2e	99.8	99.8	100.1	199.0				
General Refuse to combustion to kgCO2e	21.4	21.4	21.8	21.0				
Biomass woodchip to kgCO2e	NA	NA	6.1	13.5				

*An Excel version of this table is in Appendix A

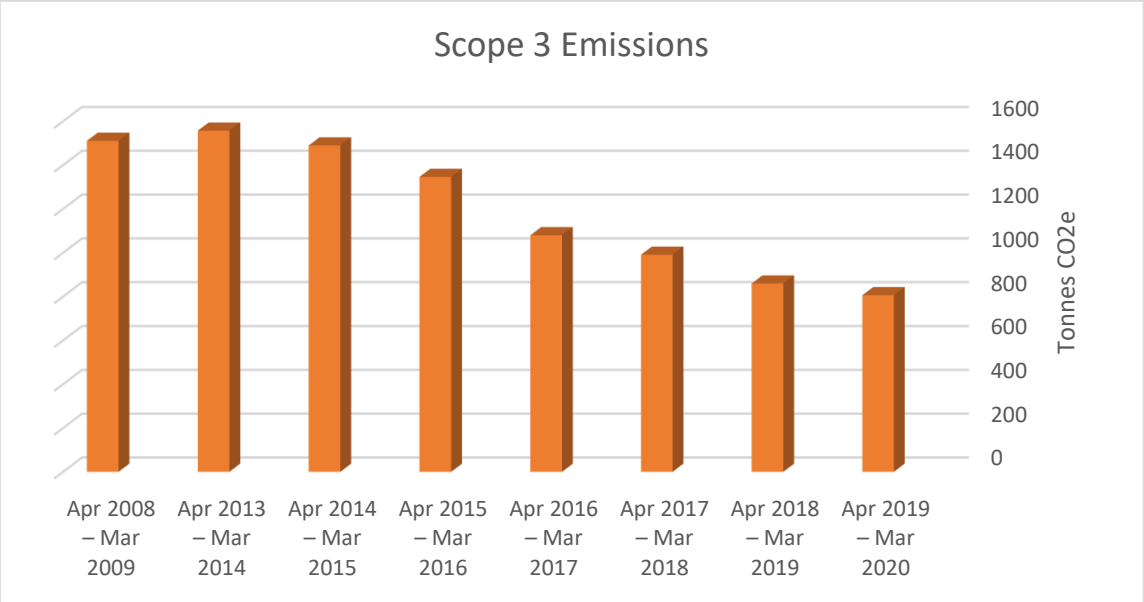
Graph showing Scope 1 emissions between 2008/09 and 2019/20 – This graph shows that there has been an overall reduction in emissions since 2008/09 and emissions have reduced by 11%, although the emissions have increased over the last two years. The increase largely seems to be due to a significant increase in gas usage at the Spectrum which is assumed to be attributed to an increased use of the Combined Heat and Power (CHP) plant.



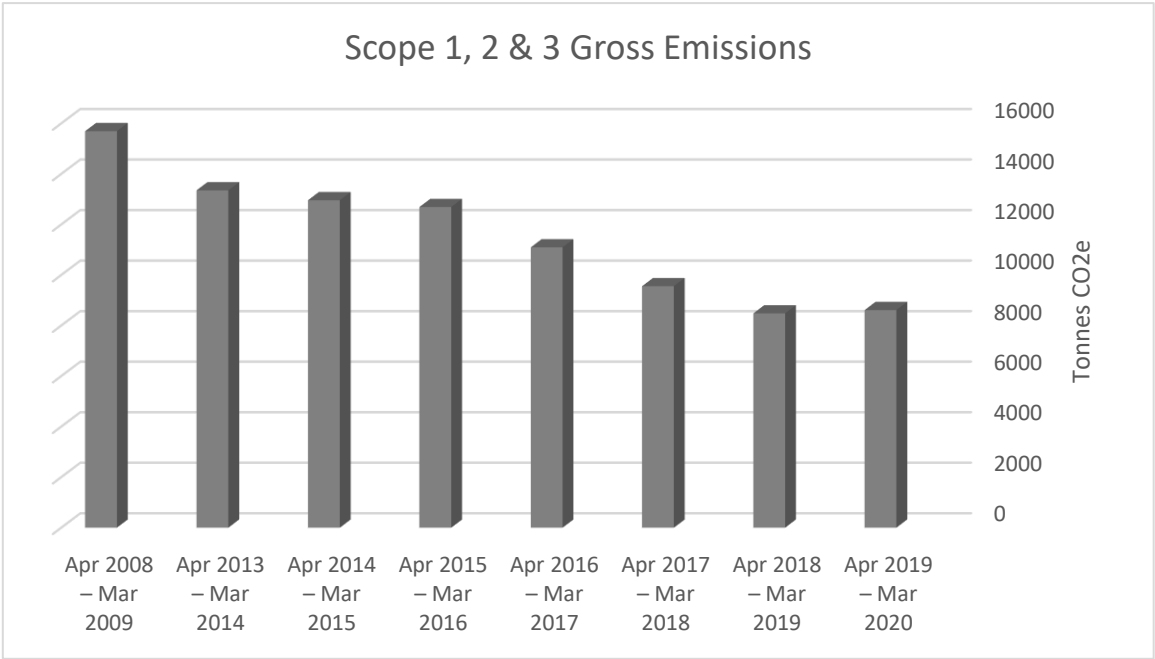
Graph showing Scope 2 emissions between 2008/09 and 2019/20 – This graph shows that there has been a steady decrease in emissions since 2008/09 and emissions have reduced by 68%. The emissions carbon factor of grid supplied electricity has decreased by 53%, so if the electricity usage had stayed the same over the term the carbon emissions would reduce by this value.



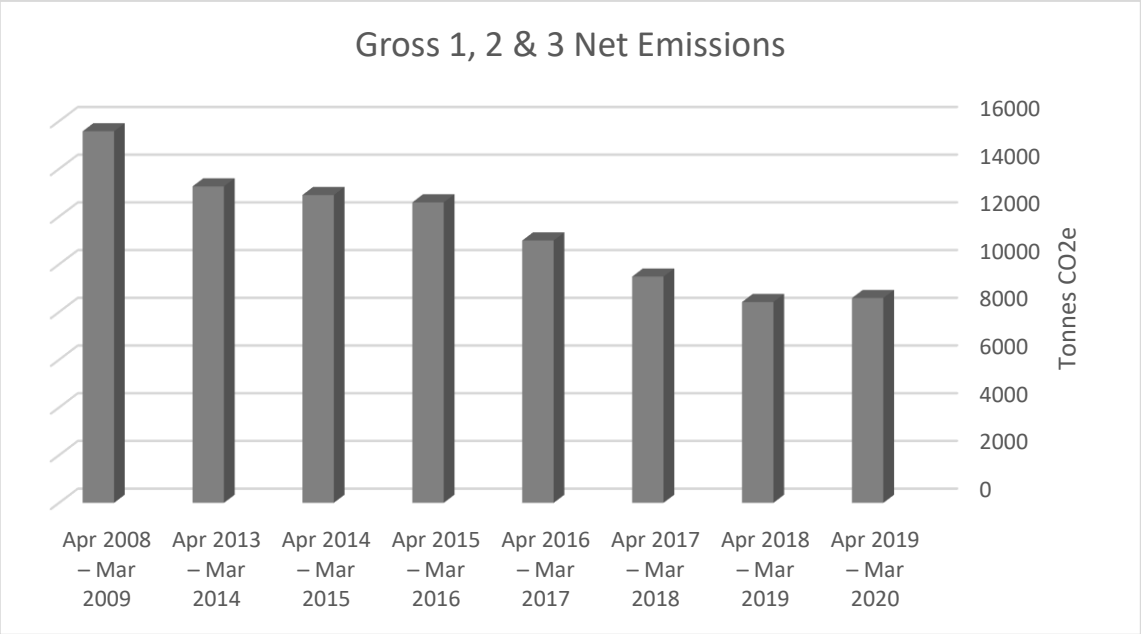
Graph showing Scope 3 emissions between 2008/09 and 2019/20 – This graph shows that there has been a steady decrease in emissions since 2008/09 and emissions have reduced by 47%.



Graph showing Scope 1,2 & 3 gross emissions between 2008/09 and 2019/20 – This graph shows that there has been a steady decrease across Scope 1, 2 & 3 emissions since 2008/09 where emissions have reduced by 45%.



Graph showing Scope 1,2 & 3 net emissions between 2008/09 and 2019/20 – This graph shows that there has been a steady decrease across Scope 1, 2 & 3 net emissions since 2008/09 where emissions have reduced by 45%. The net emissions are the gross emissions less the carbon offset measures.



It is recommended that a detailed analysis is taken place of the consumption data over the last two years to fully understand why energy usage has increased. An initial investigation shows that the energy usage at the Spectrum has increased. The energy increase could be for several reasons such as errors in the energy data, an increase in gas usage due to using the CHP, longer operational hours, increased services, deterioration in building controls, etc. As the Spectrum is the Council's largest single energy user, an increase in energy usage can make a significant impact on overall emissions.

3 Notes and Observations

Scope 1

Mains Gas

Gas usage data has been provided by both Total Gas and Power and LASER. There is a discrepancy between the kWh usage between the two and a sense check identified that some data was missing from the TGP file. Therefore, the gas data from LASER was used.

Biomass

Biomass fuels are often referred to as being carbon neutral because the amount of carbon emitted during combustion is equivalent to the amount of carbon that is absorbed as part of photosynthesis during the lifetime of the plant.

Within the Scope 1 conversion factors for biofuels, the CO_2 emissions value is set as net '0' to account for the CO_2 absorbed by fast-growing bioenergy sources during their growth. The Scope 1 conversion factors presented in this listing contain values for nitrous oxide (N_2O) and methane (CH_4) emissions (which are not absorbed during growth).

The biomass boiler was decommissioned in 2018.

Council Owned Vehicles

Data was provided for fuel consumption as below:

- Dsl – Recorded as standard diesel bought from any local filling station.
- Unl – Recorded as standard petrol bought from any local filling station.
- Goil - Medium oil used in diesel engines and heating systems (also known as red diesel). The main uses for gas oil are as an off-road fuel, power generation fuel and in heating applications.

The gas oil has been recorded under vehicle usage and is assumed to be for off road vehicles, but if it is used for power generation in generators, or heating, then it will need to be reclassified accordingly.

The fuel usage for Waste Ops (assumed to be refuse vehicles) is much higher than the rest of the fleet combined. The distance travelled, and fuel consumed is expected to be high for refuse vehicles, and this makes up 64% of the total fuel used across all vehicles.

Other Fuels

Delivery details have been provided for Kerosene. The carbon conversion factors for 'fuel oil' have been applied.

There is no data for 2019/20 as Burpham Court Farm buildings were sold in 2018 and Midleton Industrial was demolished in July 2020.

Scope 2

Electricity

Carbon emissions were calculated from the electricity usage as provided by LASER, who procure the Council's energy data on their behalf. A spot check showed that there were some discrepancies between the consumption data provided by the supplier (Npower), LASER and the half hourly data which records the sites electricity usage every half hour through the electricity meter. A sense check should be carried out to monitor all sources of energy use and cross reference to identify any anomalies and to raise with the relevant third party to rectify any issues so that consumption data, and billing, is aligned and correct.

Scope 3

Water

Consumption data has only been provided for the water supply and not the Return to Sewer (water treatment) element. The volume of water that is supplied and returned to the sewer is typically estimated to be 95%. However, this is not always the case if the premises uses water for other purposes such as irrigation, etc.

As water treatment data was not available an assumption has been made that this element is 95% of the water supply volume. For future reporting, the Council should source data directly from the wastewater company to get more accurate data. This is particularly prominent, as the carbon emissions associated with wastewater are twice as high as water supply.

Selected sites have the water consumption as a negative figure, which is likely to be due to billing credits. The associated carbon emissions from these sites have been recorded as not applicable (NA).

Emissions from water consumption is not included within the GHG Protocol, but emissions from wastewater are. Following the principle that as much data should be collected as possible, APSE Energy recommends that emissions from water should be included within the reporting for the Council as water consumption has associated carbon emissions and an environmental impact. Including water consumption helps to keep it on the environmental agenda and prioritise it with other categories by converting usage into a standardised unit of CO_2e.

Business Travel by Staff Owned Car

There is a single electric vehicle in the grey fleet. The transmission and distribution factor has been added to the main emissions rather than separated as this is a single vehicle and negligible. This element should be separated in future carbon reporting as more electric vehicles are used.

Two vehicles have been recorded as using 'Euro IV Diesel'. For carbon conversion purposes, this has been recorded as Urea, also known as AdBlue.

Business Travel by Rail

In most cases, the recorded distance travelled for National Rail and the London Underground is provided as an average per trip so that all train journeys are recorded to be 53 miles long and all underground journeys are recorded as being 14 miles long. In subsequent years, the actual distance travelled for each journey should be recorded and reported.

Waste

Specific waste data is not available from 2016 to 2020 and an average and equal volume of waste has been applied across all years based on a sample of weekly collection figures. The carbon emissions of waste across years changes because of the carbon emissions factor, rather than the volumes of waste.

The carbon conversion factor for General Refuse to landfill is twice as high in 2016/17 compared to the other reporting years. BEIS were contacted to query this and the response stated that 'Jumps in the Conversion Factors for waste disposal can occur between years due to more relevant/up to date/accurate data becoming available'. However, this does not explain why there is such a high variation.

Refuse waste has been categorised under 'Commercial and Industrial Waste' for carbon conversion purposes. This has been assessed assuming that 95% of the refuse waste goes to an Energy from Waste facility and the remaining 5% goes to landfill.

The waste associated with sites managed by Freedom Leisure have not been included as this is managed by the third party. However, the electricity and gas from these sites is included under Scope 1&2 as the Council pay for the fuel.

Carbon Offsetting

Electricity that is generated locally and exported to the gird is considered a carbon offset as the Council do not directly benefit from using the electricity onsite. Power generation would be a direct carbon saving if it were used on site as this will mean that less grid supplied electricity will be used.

Exported electricity is accounted as an emissions reduction against the gross figure to report a net figure in tonnes of CO_2e. This net figure is additional to the gross figure and does not replace it.

Hydroelectric

All the electricity generated from the hydro-electricity plant is exported to the grid. The grid average emissions factor is used to calculate the emissions which are considered as an offset as the generated electricity is not used by any council owned assets. It is understood that consideration is in place to provide a private wire to connect the hydroelectricity to Council owned buildings which should reduce electricity costs and carbon emissions.

Solar Photovoltaics (PV)

The total generation from solar panels includes sheltered housing blocks. It was highlighted that these sites were excluded from previous GHG (CRC) reporting as these are classed as domestic.

A spreadsheet was provided showing a summary of electricity generated from PV. It was explained by the Council that all power generated at these sites was exported to the grid and not used on site. In a typical setup where PV is installed on the roof of a building, the generated power would be used by the buildings day-to-day operations and any excess generated electricity (when the generated electricity is higher than the building load) is exported to the gird. For most commercial premises, the exported electricity is minimal or nothing as the building typically uses more electricity than is generated.

If the electricity is used on site, and not exported to the grid, then this is not counted as a carbon offset and should not contribute towards the net emissions as this is already taken into account from the buildings electricity usage and this would be double counted. A new entry on the Carbon Summary table should be created under 'Renewable/CHP CO_2 avoided' to account for PV generated electricity used on site.

It is recommended that firm confirmation is provided on how much PV electricity is used on site and how much is exported.

Further Notes and Observations

The bottom section of the Carbon Summary shows further information that was used in each reporting year such as a summary of annual energy usage (kWh), avoided CO_2 from renewables, degree days (see Glossary) in each year and a summary of conversion factors.

The carbon savings associated with the CHP at The Spectrum are taken from the offset of producing electricity on site and does not include the heat. This is because the heat produced is associated with the gas used by the CHP. The CO_2 savings are shown for information and have not been included separately under the gross or net emissions as this is already accounted for under the sites main metering consumption.

Degree day data has been sourced from a weather station located at Gatwick Airport.

Billing from LASER shows that the Council are responsible for 299 electricity meters, which provides a reasonable representation of how many assets the Council operate. A review should be carried out of each asset to determine if the Council are responsible for paying the electricity and gas usage and taking ownership for the associated carbon emissions. It is not uncommon for assets to be sold, leased or decommissioned yet the Council continue to pay for the utilities.

Further details are required of the vehicle make, model and size as this will help develop the action plan in more detail.

There is a line in the Carbon Summary table for 'Biomass CO_2 Offset', which has been populated between 2008/09 and 2015/16. After much deliberation with the Council, it was inconclusive about what this was reference to as emissions from biomass are identified under Scope 1 and the Council has not engaged in any planting schemes that could be considered an offset.

4 Recommendations for Gathering Data Going Forward

4.1 Scope 1 and 2 Emissions

The Council should develop a procedure for gathering and storing data as it is made available. The benefit of this is that the carbon reporting process is streamlined and progress towards targets can be tracked. The Council already has SystemsLink

software in place which should be utilised to store all energy data so it is readily accessible.

4.2 Scope 3 Emissions

Scope 3 emissions can account for 70-80% of a council's total footprint (Carbon Trust), given the use of contractors for waste collection, construction, social services and other services.

Appendix C shows the 15 different categories of Scope 3 emissions and what data should be gathered to report on emissions in future years. Where applicable, the Council should develop policies/procedures to gather the data from third parties. This should be incorporated into the procurement process and contracts with suppliers.

It is discretionary for an organisation to report on Scope 3 emissions. It should be explained and documented in subsequent carbon reports if the Council is unable to obtain data for any of the items below as it is deemed financially impractical or not significant. The reporting principles should be based on:

- Relevance;
- Completeness;
- Consistency;
- Transparency;
- Accuracy.

Emissions data that should be improved in subsequent years includes waste. Policies should be put in place to start recording waste data. This could be through contractual changes i.e. waste contractor weighing and recording waste type, or the Council can measure its own waste. There are tracking sheets from WRAP to monitor waste streams and these could be used in the short term until the waste contractor can record it.

Purchased goods and services could also be included under Scope 3 as this will represent a high level of emissions down the supply chain. However, obtaining this data from third parties may prove difficult and the Council should assess what relevant goods and services could be recorded in subsequent years.

5 Pathway Methodology

5.1 Energy Efficiency

Appendix B shows generic measures that could be taken to reduce energy usage from the 2019/20 baseline emissions. This is a desktop assessment based on the consumption data and typical saving initiatives and is not based on site specific information. Estimated energy savings and forecast capital costs shown are for representative purposes to give an illustrative outcome and should not be used for budgeting purposes.

The Council should be able to achieve significant carbon and cost savings by reviewing its maintenance policies to specify highly efficient plant and services, and electric vehicles, rather replacing like-for-like. Changing policies to specify materials with low embodied carbon should also reduce Scope 3 emissions by considering the carbon life cycle cost in terms of the supply chain, operation and decommissioning.

It is recommended that a detailed audit and feasibility study is carried out for all assets to determine the site-specific initiatives. This will provide an indication of the realistic interventions that could be provided and the likely cost savings, capital cost and carbon savings.

The following assumptions have been made which can be updated once more information is available:

- Future CO_2 emissions and tariff rates have been taken from Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions published by BEIS. These emissions factors include transmission and distribution losses, including significant losses due to power station inefficiency meaning that the emissions factors differ slightly to those calculated in Section 2.
- BEIS have not published future CO_2 emission factors for natural gas. Although it is likely that the carbon emissions factor of gas will decrease as non-fossil fuel gases are injected into the grid, such as hydrogen, the applied emissions factor of gas in this pathway was constant.
- The energy costs are calculated using the retail fuel price which includes the Climate Change Levy but excludes standing charges that are not directly impacted by consumption fluctuations.
- The intervention capital cost is calculated by multiplying the typical payback of the intervention by the annual energy cost savings.
- Not all interventions are applicable to each site e.g. replacement lighting is the only intervention that is assumed in car parks.
- The Council has provided a list of where projects have already been delivered, such as LED lighting, and this has been taken into account under the recommendations.
- The pathway is based on current technology available today and assumes that all interventions could be delivered by 2030.

5.2 Interventions for Reducing Gas Usage (Heat)

Generic interventions for heating (gas usage) include:

Intervention	Saving on Heat Demand	Payback in Years	Detail
More efficient plant	20%	8	Could include new CHP or boilers
Controls	15%	5	Could include a new or optimised BMS for larger sites and controllers and TRVs for smaller sites
Insulation	15%	5	Could include building fabric insulation, draught proofing, pool cover and pipework insulation
Other	15%	5	Could include more efficient heat emitters, heat recovery and distribution improvements

It should be noted that savings from these interventions have been calculated concurrently rather than independently i.e. each intervention reduces the heat demand following on from the previous intervention. For example:

- 100kWh less 20% saving from more efficient plant = 80kWh >
- 80kWh less 15% saving from controls = 68kWh >
- 68kWh less 15% saving from insulation = 58kWh >
- 58kWh less 15% saving from 'other' = 49kWh
- Total reduction = 51%

5.2.1 Heat Pumps

Using heat pumps is a good initiative for heating systems because the carbon factor of electricity will reduce as the grid is decarbonised and due to their efficiency and Coefficient of Performance (COP). For a heat pump, a COP value of 3 means that 1kW of electric energy is needed to generate 3kW of heat.

It is assumed that heat pumps by themselves will not be financially viable across all sites by 2030 based on today's cost and current technology. This is because the existing boilers distribute heat at around 80°C and heat pumps distribute heat at around 50°C. In most cases, it is assumed that the cost to retrofit an existing site with a heat pump and the associated

infrastructure would be disproportionate compared to the benefits unless financial incentives are used such as the Renewable Heat Incentive or grant funding as with the Public Sector Decarbonisation Scheme. A detailed feasibility study is required for each building to review the viability of low carbon heating.

The total carbon emissions from gas (heat) below up to 2030 does not include any heat pump systems. Heat pumps may be suitable in buildings or hybrid systems could be feasible where there is a combination of heat sources however, this cannot be determined from a desktop investigation at this stage.

The pathway has been based on current technology and pricing. It is likely that changes in technology will mean that options for more low carbon heating systems will be available by 2030.

For reference purposes, if all gas heating systems were replaced with heat pump technology with a COP of 3, the carbon emissions in 2030 would change from **1,772 tCO_2e for gas plant to 157 tCO_2e for electric heat pumps**.

5.3 Interventions for Reducing Electricity Usage

Generic interventions for electricity include:

Intervention	Saving on Electricity Usage	Payback in Years	Proportion of building services	Apportioned saving across whole building	Detail
LED Lighting and Control	60%	5	33%	20%	Replace existing luminaires with LED and automatic control
Controls and HVAC	15%	5	41%	6%	Controlling building services with a BMS
Office Equipment	15%	5	15%	2%	Replacing aging equipment with more efficient equipment
Other	15%	5	11%	2%	Could include variable speed drives, motors, hand dryers

*Building information sourced from the Chartered Institute of Building Services Engineers (CIBSE)

Savings from these interventions have been calculated independently from the total electricity usage and their estimated proportion to building services e.g. lighting is assumed to account for 33% of all electricity usage in a building and a potential saving of 60% could be achieved from installing LED lighting and control which leads to an apportioned whole building saving of 20%.

A change in policies to upgrade existing building services to the most efficient option through planned maintenance, and upgrading fossil fuel vehicles with electric when they are due to be replaced, will impact the action plan significantly.

5.4 Project Phasing

Projects have been programmed to start in 2023 and end by 2030, with the delivery of projects ramping up each year. This is shown in the table below:

	2023	2024	2025	2026	2027	2028	2029	2030
Percentage of Projects Delivered Per Year	5%	8%	10%	12%	12%	13%	17%	20%

There is a draft plan to ban the sale of all new petrol and diesel vehicles by 2030, so it is possible that the transition away from fossil fuel vehicles may happen sooner.

6 Achieving Net Zero Target of Council Emissions

A “net zero” target refers to reaching net zero carbon emissions by the nominated year of 2030, as chosen by the Council, but differs from zero carbon, which requires no carbon to be emitted at all.

Net-zero refers to balancing the amount of emitted greenhouse gases with the equivalent emissions that are either offset or sequestered through rewilding and tree planting or carbon capture and storage. It is much more beneficial to reduce carbon emissions and offsetting techniques can be used for hard to reduce emissions.

6.1 Power Generation

It is assumed that solar PV could be placed on selected buildings with a generation capacity of approximately 500kWp generating 475MWh per year of electricity that could feed directly into council buildings, with no units exported to the grid. It is suggested to install 150kWp to the Civic Offices and a carpark over the next year.

The trajectory also assumes that 5MW of land-based PV can be installed up to 2030 which will count towards carbon offsetting. This is considered a carbon offset as it is assumed that

the system will connect directly to the electricity grid rather than connect directly to council owned buildings through a private wire.

6.2 Transport

A detailed feasibility study is required to determine a more accurate projection for replacing the vehicle fleet with electric vehicles.

Data provided categorised vehicles into several different vehicle types such as refuse, gritter, plant, van, etc. Further information on the vehicle make, model and size would provide a more accurate projection.

Savings in emissions do not consider vehicle efficiency improvements between 2020 to 2030 as a more detailed analysis is required to assess this.

The kWh/mile of electric vehicles and their cost to purchase have been categorised as below:

Vehicle	kWh/mile	Cost	mpg of Vehicle
Car	0.29	£24,000	64
Small van	0.33	£20,000	53.3
Medium Van (based on Volkswagen ABT eTransporter 6.1 panel van)	0.45	£42,000	53.3
Ride on mower	2.41	£6,500	4.5
Refuse lorry (based on Cambridge City Council)	2.41	£375,000	4.5

No information could be found on the performance or cost of an electric road sweeper, tractor or gritter. The specification of a refuse lorry has been used for the performance and cost of the tractor and a gritter and sweeper have been based on a medium van. It should be noted that the cost and performance of these vehicles can range significantly depending on the vehicle type, size and specification particularly around battery size. It is possible that these types of vehicles may still be too specialist before 2030 to make them commercially viable and it is possible that fossil fuels, or low carbon fuels like hydrogen, may still be required for these vehicles. Also, these vehicles are unlikely to be used throughout the year and may sit idle so it could be considered to use their batteries as storage to gain a better return.

Savings in emissions do not consider vehicle efficiency improvements between 2021 to 2030 nor the likely reduction in cost to purchase electric vehicles. A more detailed analysis is required to asses this.

6.2.1 Employee Vehicles

The trajectory assumes that staff vehicle usage will reduce by 5% per year compared to the 2019/20 baseline. It is unrealistic to expect all staff to replace their own vehicle with an EV by 2030, so a combination of interventions would be required such as providing EV pool cars, bicycles and encouraging staff use of public transport.

6.2.2 Business Travel by Rail

The current carbon emissions from rail and underground are 1.5 tonnes and make up 0.02% of the total emissions i.e. very low. BEIS have not published future emissions factors for rail but it is anticipated that the number of trips via rail will be similar to the current usage up to 2030, but the emissions should reduce slightly as the electricity grid is decarbonised. As the emissions are already low, the trajectory assumes that carbon emissions from rail travel will not change over the term.

6.2.3 Water Supply and Wastewater

Water supply and wastewater combined account for 0.6% of the total emissions and 41tCO_2e. However, simple measures can be taken to reduce water usage and cost such as installing low flow appliances and fixing leaks.

It has been assumed that emissions from water supply and wastewater will reduce by 5% annually.

6.2.4 Transmissions and Distribution

This has not been accounted for separately as the forecast carbon conversion factors provided by BEIS include losses from transmission and distribution.

7.0 Net Zero Trajectory to 2030

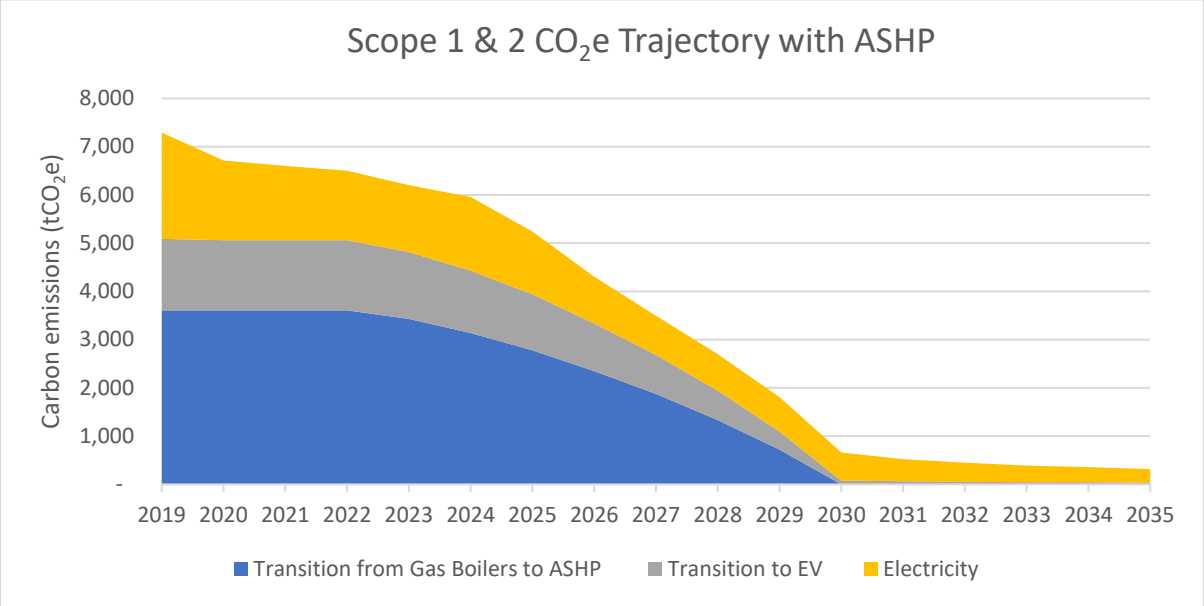
Carbon Emissions Trajectory 2019 to 2030

Future emissions data was taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions.

A breakdown of the year-on-year carbon savings can be found in Appendix B.

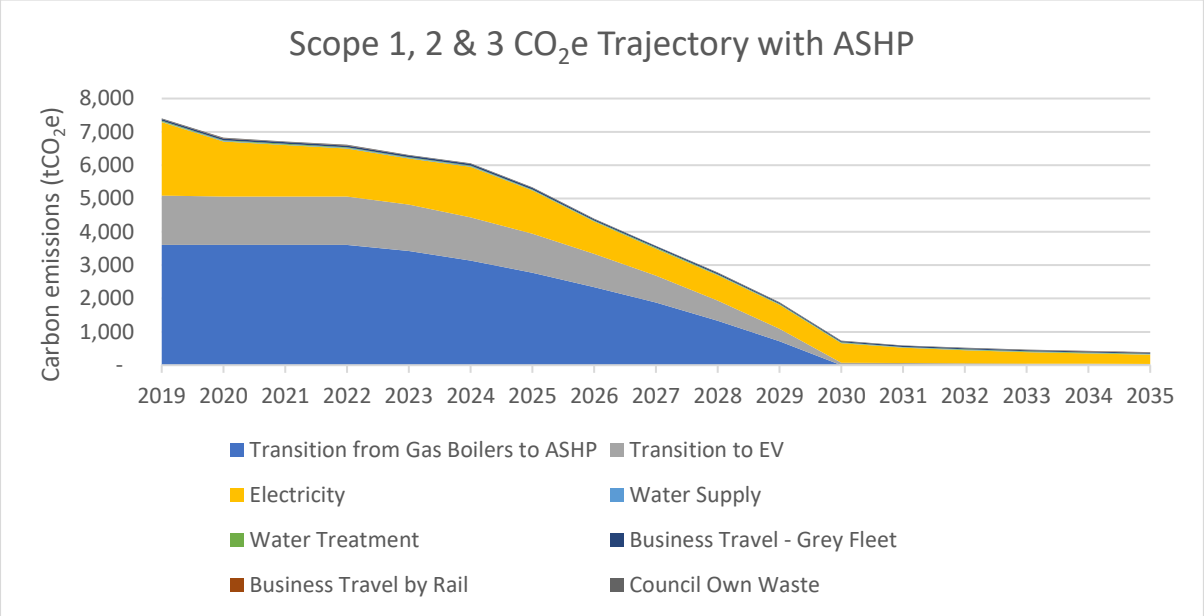
The graph below shows the Scope 1 and 2 carbon emission trajectory if the Council improved energy efficiency, replaced the boilers with ASHP and transitioned to electric vehicles.

Carbon Emissions Trajectory 2020 to 2035 with ASHP



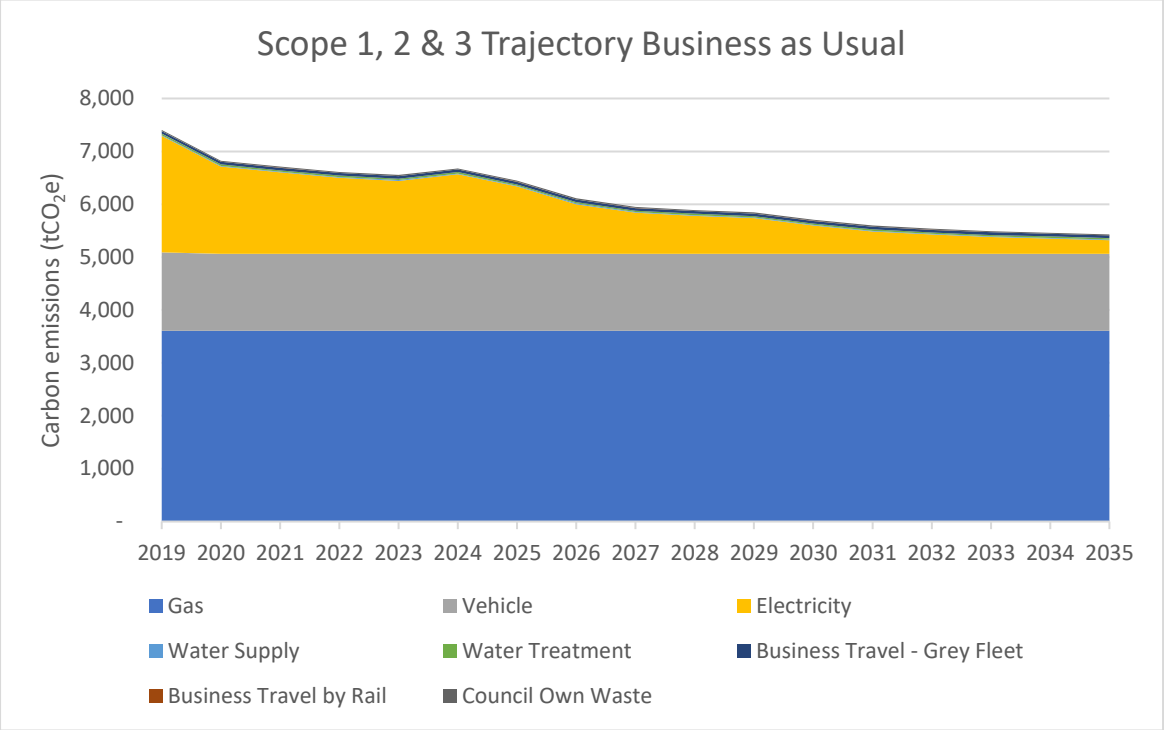
The graph above shows the carbon savings when installing heat pumps and removing gas boilers entirely by 2030. This is a carbon saving of 91% compared to 2019/20 if replacing gas boilers with ASHP.

Carbon Emissions Trajectory 2020 to 2035 with ASHP for Scope 1, 2 & 3



The trajectory in the graph above shows that there are 733tCO_2e that are unavoidable up to 2030 if boilers are replaced with ASHP. This is the amount of carbon that will need to be offset to balance the emissions that cannot directly be removed based on current technology and within a reasonable budget.

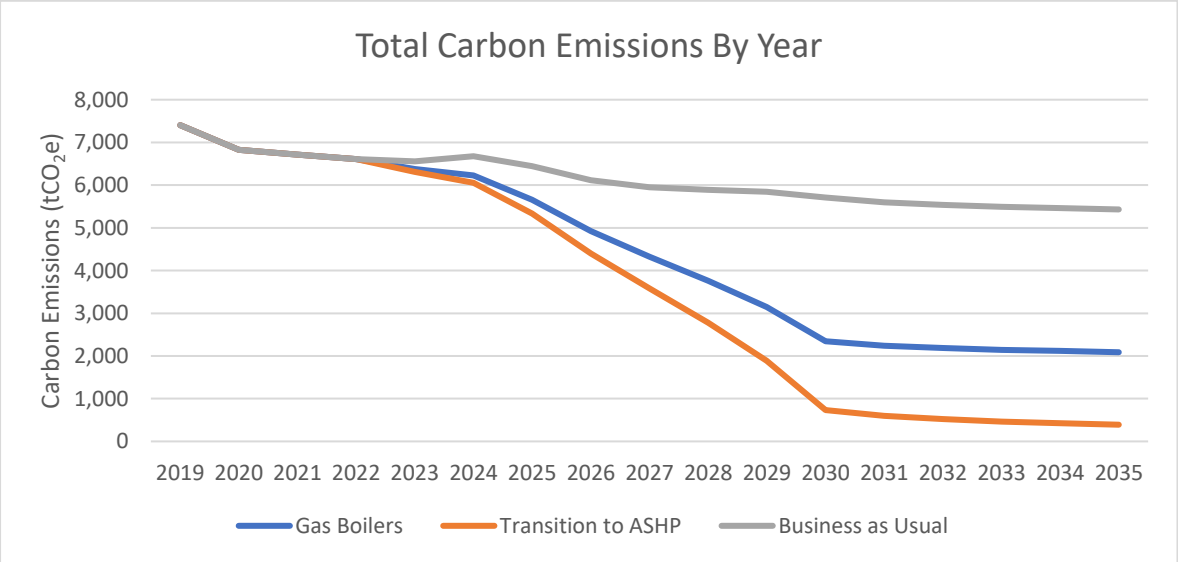
Business as Usual Carbon Emissions Trajectory 2020 to 2035 with No Interventions



The table above shows the trajectory if no interventions were delivered, and the amount of energy used by the Council is the same across the term. There is a decrease in electricity carbon emissions as the grid decarbonises which is shown in electricity, but emissions from other sources barely change. By doing nothing, the carbon emissions in 2030 will be 5,708tCO_2e.

7.1 Boiler vs. Heat Pumps

Carbon Emissions Trajectory 2019 to 2035 comparing Heating by Gas Boilers and ASHP Emissions



The "Transition to ASHP" line in the graph above includes those interventions to improve efficiencies by improving controls and insulation and replacing existing gas boilers with ASHPs. The graph shows that there is a significant reduction in emissions if all boilers are replaced with heat pumps.

It is therefore the recommendation that all boilers are replaced with heat pumps.

7.2 Offsetting when Installing ASHP

A carbon offset is a reduction in emissions of CO_2e made to compensate for emissions made elsewhere. There are several ways of offsetting carbon emissions such as carbon capture and storage however, this is not deemed financially or technically feasible to the Council. More typical options available to the Council to directly offset emissions include renewable energy generation projects and rewilding/tree planting. However, the effectiveness of tree planting to quickly offset emissions can be questioned as it can take many decades for trees to reach maturity.

It is assumed that solar PV could be placed on land with a generation capacity of approximately 5MWp generating 4.75GWh of electricity that feeds directly into the electricity grid. This could include open space, car parks, etc.

A 5MWp system would have a capital cost of approximately £4,500,000 and would offset 245tCO_2e per year by 2030 and 118tCO_2e per year by 2035. This demonstrates that the carbon offset benefits of a 'solar farm' decrease as the grid decarbonises.

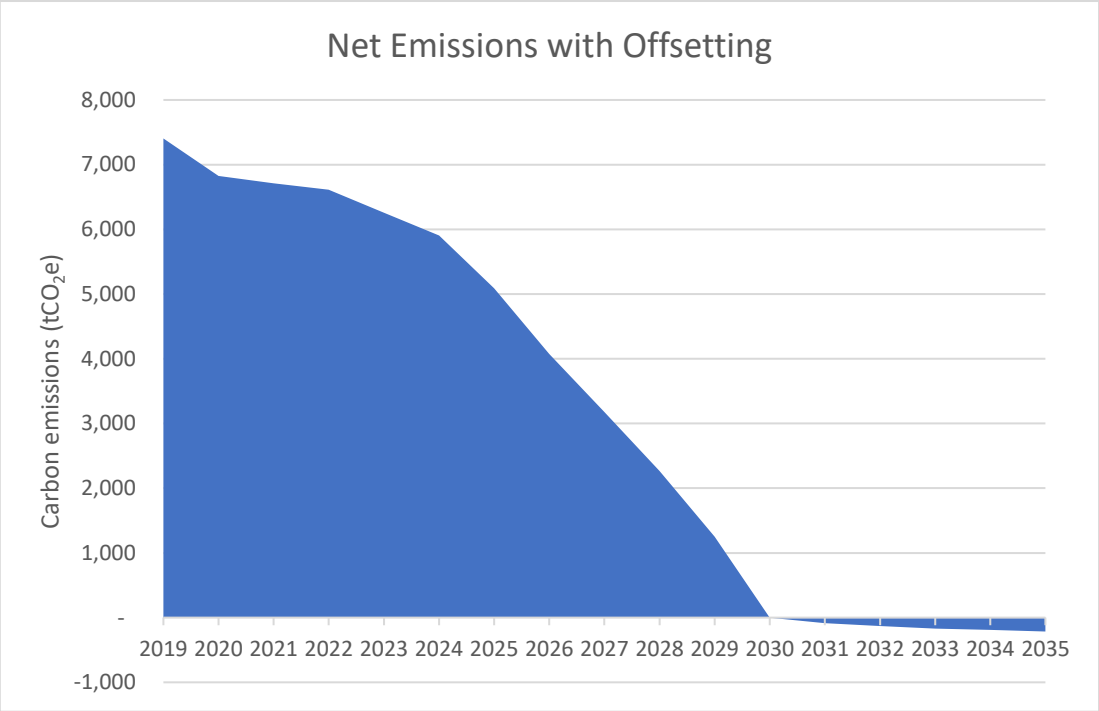
The installation of 5MWp PV would leave 488tCO_2e of unavoidable emissions by 2030 that will need to be offset. The Woodland Trust states that it costs £25 to offset 1 tonne of CO_2 in British woodlands which would result in a cost of £12,200 to offset the remaining emissions per year.

There are other schemes that provide carbon offsetting through international planting schemes such as One Carbon World which contributes funding towards large scale forestry schemes for as much as £1.20/tCO_2e.

A detailed feasibility study is required to determine the impact that planting will have as a carbon sink. It will provide an understanding of what will be needed to ensure that mature trees are in place to absorb the appropriate amount of CO_2 by 2030.

The graph on the next page shows the pathway for net zero carbon which includes reducing carbon initiatives and installing ASHP combined with offsetting measures. The graph shows that the Council will be net zero in 2030 and net carbon positive in subsequent years if the same level of offsetting is applied year-on-year.

Carbon Emissions Trajectory to 2035 with Carbon Offsetting and ASHP



7.3 Forecast Capital Cost with ASHP

Investing in energy efficiency projects and power generation will, in most cases, have a positive financial benefit with a good return on investment. The Council should set its own guidelines on a cap for ROI to measure the viability of projects.

Grid supplied electricity and gas rates are taken from BEIS modelling published in October 2021[1]. Market conditions have changed drastically since this time for several reasons, but largely due to the war in Ukraine. It is therefore likely that the forecast energy rates provided are outdated, but this was still the best source to use at the time of writing.

The future grid export rates are based on the current price and increased by 2.5% annually.

[1] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Forecast Capital Cost and Financial Savings from Initiatives including ASHP

Intervention	Cost of all interventions	Accumulative cost saving up to 2030	Total annual saving of all interventions in the year 2030	Accumulative CO2e Savings by 2030	Accumulative £/CO2e Savings by 2030
Transition from Gas Boilers to ASHP	£25,803,900	£2,658,800	£745,490	13,238	£1,949
Transition to EV Accumulative Savings	£26,599,500	£96,200	£33,302	5,234	£5,082
Electricity Saving from energy efficiency	£1,185,700	£890,600	£241,574	12,260	£97
Electricity Increase for transition to ASHP	£0	-£1,641,900	-£445,395	-821	N/A
Building PV (500kWp by 2030)	£450,000	£255,500	£69,318	128	£3,524
Land Based PV (5MWp by 2030)	£4,500,000	£1,115,300	£318,613	11,567	£389
Tree Planting	£12,201	N/A	N/A	1,791	£7
Total	**£58,551,301**	**£3,374,500**	**£962,900**	**43,396**	**£11,048**

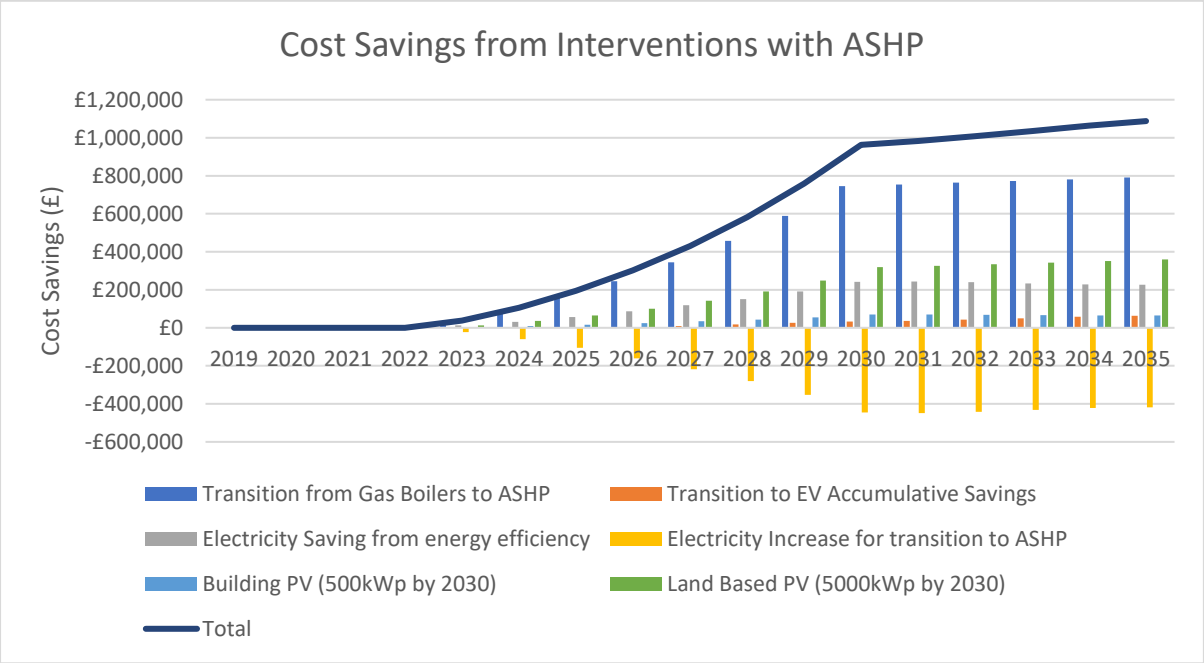
The forecast capital cost to upgrade all vehicles to electric is high, this is largely due to the 43no. refuse vehicles. The cost to purchase an electric refuse vehicle is based on Cambridge City Council who purchased electric refuse vehicles at a cost of £375,000 each. Based on these prices, it would cost over £16million to upgrade the refuse vehicles alone.

This shows that the potential capital to upgrade fossil fuel vehicles to electric vehicles could be significant however, it is acknowledged that the information around the number and type of council owned vehicles is not complete. A separate exercise should take place to review all existing council owned vehicles and assess the benefits of purchasing against lease. The table below shows the forecast cost and benefits of electric vehicles. The total forecast capital cost to achieve net zero is £58.6million and the total annual savings achieved by 2030 would be the equivalent of £962,900 per year.

7.4 Cost Savings with ASHP

The graph below shows the total savings if all initiatives are installed.

Cost savings from interventions between 2019 to 2035

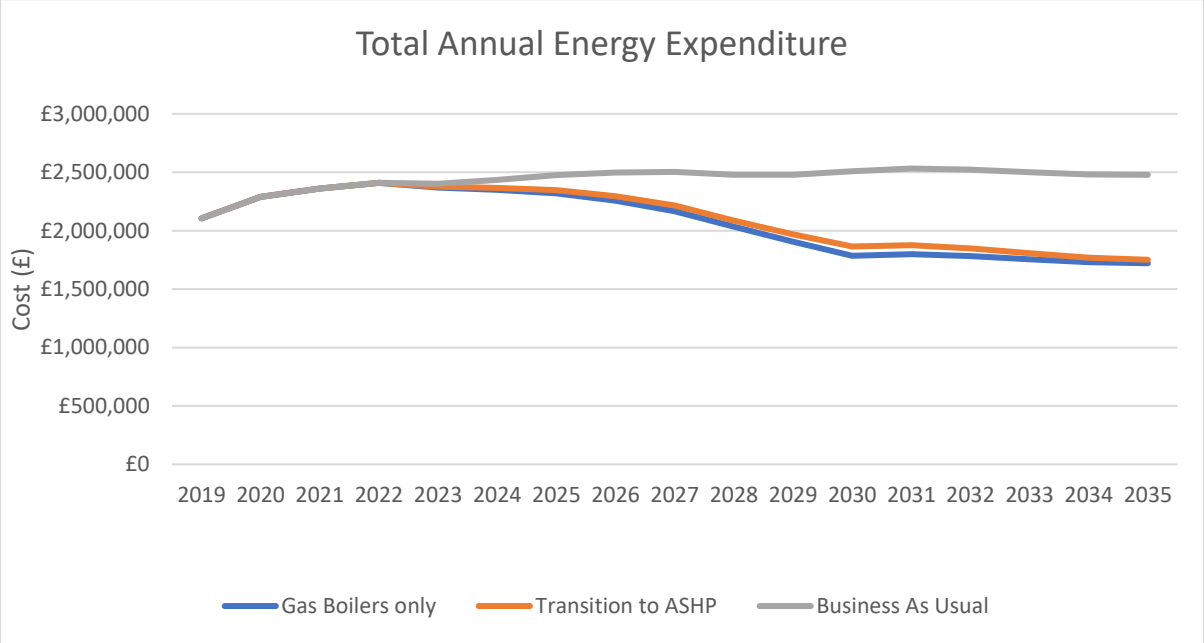


The graph considers savings made through efficiency savings (insulation, controls, etc.) and installing heat pumps. It should be noted that it could be more expensive to run a heat pump compared to a gas boiler if no other interventions are included as the cost of electricity is typically 4 times more expensive than gas up to 2035. However, it is anticipated that the 'spark gap' will close and gas becomes more expensive to incentivise a move from gas to electric.

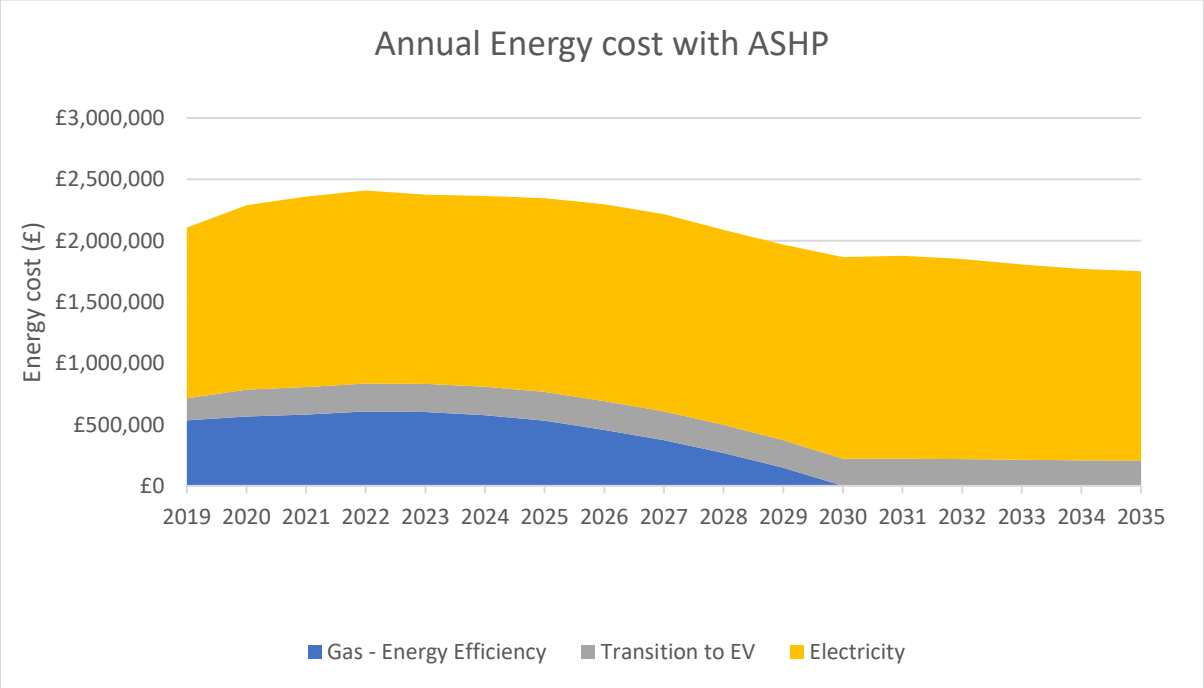
Although the 5MWp solar farm is larger than the 500kWp system on buildings, the financial savings are not proportional as the [current] export rate for a solar farm is much less than the savings achieved by having PV on buildings and reducing the amount of electricity purchased from the grid.

Annual cost comparison between Gas Boilers and ASHPs between 2019 to 2045

The graph below shows the cost on energy bills by comparing the installation of gas boilers with heat pumps as well as making the other capital investments, and with business as usual for scope 1 and 2 emissions.

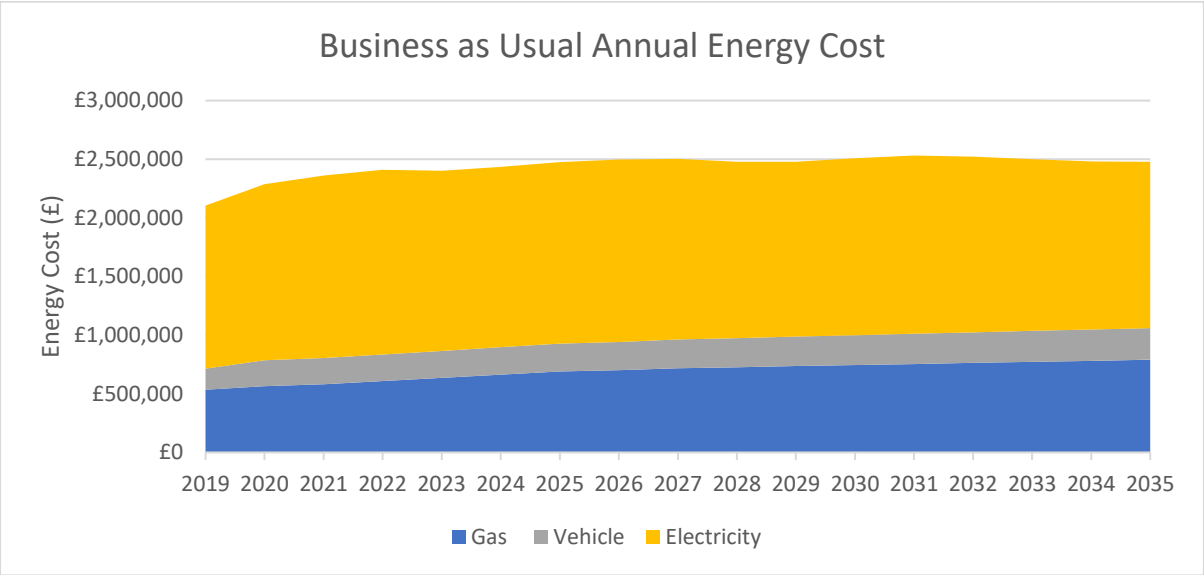


Annual energy expenditure if interventions are delivered between 2019 to 2035



The graph shows that energy costs will decrease from £2.1million in 2019 to £1.9million by 2030 if initiatives are delivered.

Annual energy expenditure for Business as Usual with no interventions between 2019 to 2035



The graph shows that energy costs will increase from £2.1million in 2019 to £2.5million by 2030 if energy consumption remains the same.

The forecast unit rate is taken from the 'Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal'. This was published in October 2021 and markets have changed significantly since so it is likely that future operational costs, and savings, will be higher.

8 Conclusion

It is recommended to report annually on the progress of reducing carbon emissions. Emissions from the Council's own operations should be calculated using the methodology in this report and policies and procedures should be put in place to record emissions data as it is made available rather than trying to retrieve the data in bulk retrospectively.

The Paris Climate Agreement aims to keep global temperature increases well below 2°C and pursuing 1.5°C. This calls for organisations to set a 'carbon budget' which is a term used to indicate the maximum amount of carbon an organisation can produce in a particular period of time to stay within the Paris Agreement. This often requires setting a science-based target and carbon budget.

The minimum reduction required for targets in line with well-below 2°C scenarios is 2.5% in annual linear terms over 15 years. Organisations are strongly encouraged to adopt targets with a 4.2% annual linear reduction to be aligned with limiting warming to 1.5°C. This carbon trajectory should reduce emissions by 90% between 2019 and 2030.

The carbon trajectory in this report is a desktop study performed without any prior knowledge of the building estate and is based on rule of thumb; and engineering and industry experience. A detailed energy audit should be provided for each building to provide

a clear action plan of what interventions can be provided, their capital cost, funding opportunities and the cost/carbon savings.

8.1 Recommendations

Short Term Action – Up to 6 Months
Collect and save emissions data as it is made available for all core Scope 1, 2 and 3 emissions.
Set up processes and procedures to request and record emissions data from suppliers and staff.
Carry out detailed energy audits of all buildings.
Use existing energy data to investigate why the energy usage at the Spectrum has increased.
Create a full inventory of all council owned vehicles.
Medium Term Action – Up to 18 Months
Develop detailed feasibility studies to identify viable energy efficiency projects, localised power generation projects and carbon offsetting schemes.
Carry out detailed engineering design.
Develop a procurement strategy to deliver projects.
Understand which funding options are available and develop a strategy on how to fund specific projects.
Liaise with the Distribution Network Operator (DNO) to understand the grid capacity and how this relates to future electricity demands.
Calculate the carbon footprint of the whole Local Authority area and provide an action plan for the whole district to be zero carbon.
Long Term Action – Within 10 Years
Make a transition away from fossil fuel vehicles.
Increase electric vehicle charging network and sustainable travel infrastructure.
Develop large scale renewable heat and power generation projects.
Roll out energy efficiency and power generation projects to all buildings.
Develop an on-going tree planting and biodiversity improvement schemes.

9. Glossary

Term	Definition
BMS	Building Management System – Automated control for building services.
Carbon dioxide equivalent (CO_2e)	The carbon dioxide equivalent (CO_2e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO_2 and includes the six greenhouse gases with the greatest global warming potential (GWP).
Carbon footprint	A carbon footprint measures the total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product. A carbon footprint is measured in tonnes of carbon dioxide equivalent (tCO_2e).
Council Vehicles	Vehicles that are owned or controlled by the Council. This does not include employee-owned vehicles that are used for business purposes.
Degree Day	A heating degree day (HDD) is a measurement designed to quantify the demand for energy needed to heat a building. It is the number of degrees that a day's average temperature is below a baseline temperature, which is the temperature below which buildings need to be heated.
Electricity	Electricity used at sites owned/controlled by the Council. This is reported as a Scope 2, indirect emission. The conversion factors used are for the electricity supplied by the grid that the Council purchase - they do not include the emissions associated with the transmission and distribution of electricity.
Employee Vehicles	Travel for business purposes in assets not owned or directly operated by the Council. This includes mileage for business purposes in cars owned by employees, public transport, hire cars etc.
[Natural] Gas	Primary fuel sources combusted at a site or in an asset owned or controlled by the Council.
MPAN & MPR	The MPAN (Meter Point Administration Number) and MPRN (Meter Point Reference Number) are unique numbers assigned to the electricity and gas supplies. This information has been provided as a reference and can be used to identify each meter.
Solar PV	Solar Photovoltaic panels to generate renewable electricity from the sun.

Transmission and Distribution	Transmission and distribution (T&D) factors are used to report the Scope 3 emissions associated with grid losses (the energy loss that occurs in getting the electricity from the power plant to the premises).
TRV	A Thermostatic Radiator Valve is a self-regulating valve which is fitted to radiators to control localised temperatures.
Wastewater	Water returned into the sewage system through mains drains.
Water Supply	Water delivered through the mains supply network.

Appendix A – Carbon Footprint Calculations

Appendix B – Asset Reduction Plan

The above appendices are provided separately as spreadsheets.

Appendix C – Data that should be gathered to report on Scope 3 emissions

The reporting of Scope 3 emissions is discretionary.

Item	Category	Details Required
1	Purchased goods and services	This category includes all upstream (i.e. cradle-to-gate) emissions from the production of products purchased or acquired by the Council in the reporting year. Products include both goods (tangible products) and services (intangible products). This category includes emissions from all purchased goods and services not otherwise included in the other categories of upstream scope 3 emissions (i.e. category 2 through category 8 below). Cradle-to-gate emissions include all emissions that occur in the life cycle of purchased products, up to the point of receipt by the Council. Cradle-to-gate emissions may include: • Extraction of raw materials • Agricultural activities • Manufacturing, production, and processing • Generation of electricity consumed by upstream activities • Disposal/treatment of waste generated by upstream activities • Land use and land-use change • Transportation of materials and products between suppliers • Any other activities prior to acquisition by the reporting company Relevant purchases to the Council may include capital goods, such as office supplies, office furniture, computers, telephones, travel services, IT support, outsourced administrative functions,

		consulting services, janitorial, landscaping services, maintenance, repairs and operations. For accurate carbon reporting emissions, the Council should request cradle-to-gate emission factors for materials used by suppliers to produce purchased goods such as Environmental Product Declarations (EPDs). It is likely that many suppliers will not be able to provide all the emission data. If an EPD cannot be provided, supplementary information required includes the volume of product (kg) and the carbon emission factor (kg CO_2e). A policy should be developed so that suppliers in the supply chain are required to provide this data as part of the contract, where the volume of goods is noteworthy.
2	Capital goods	Capital goods are final products that have an extended life and are used by the Council to manufacture a product, provide a service, or sell, store, and deliver merchandise. Capital goods are treated as fixed assets or as plant, property, and equipment (PP&E). Examples of capital goods include equipment, machinery, buildings, facilities, and vehicles. The required information is the same as Category 1 above. A policy should be developed so that suppliers in the supply chain are required to provide this data as part of the contract.
3	Fuel- and energy related activities (not included in Scope 1 or Scope 2)	Transmission and distribution (T&D) losses have been included and calculated from the data provided in Scope 2.
4	Upstream transportation and distribution	Category 4 includes emissions from: • Transportation and distribution of products purchased in the reporting year, between suppliers and its own operations in vehicles not owned or operated by the Council. • Third-party transportation and distribution services purchased by the Council in the reporting year (either directly or through an intermediary), including inbound logistics, outbound logistics (e.g. of sold products), and third-party transportation and distribution between the Council's own facilities.

		The Council requires data on: • Quantities of fuel (e.g., diesel, petrol, jet fuel, biofuels) consumed • Amount spent on fuels • Distance travelled • Vehicle type This may include managed assets - Vehicles that are used by the Council but are not owned by the organisation and generally do not appear on the organisation's balance sheet, for example, maintenance contractor vehicles, outsourced refuse and recycling trucks, road sweepers, grounds maintenance mowers etc. A policy should be developed so that suppliers using their own vehicles are required to provide this data as part of the contract.
5	Waste generated in operations	This includes emissions from third-party disposal and treatment of waste generated in the Councils owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater. The Council should request volume and emissions data from the waste treatment company applicable to **its own waste stream**. If this cannot be provided, the emissions can be calculated by requesting the volume of waste, type and disposal method: Example of data required: Total weight (kg) of waste type and disposal method e.g. • 5,000kg municipal waste to landfill • 500kg organic garden waste to composting • 1,000kg metal recycled • 1,000kg plastic recycled • 1,000kg paper recycled Data is required for the volume of supply and wastewater in cubic metres (m^3) from water bills. Local authorities have an important role in waste prevention and sustainable waste management through awareness-raising campaigns, providing separate collection for recycling and food waste, and implementing waste-to-energy schemes. It is

		therefore voluntary on whether the Council choose to include the emissions from waste associated with the whole borough, or just the Council's own operation.
6	Business travel	Travel for assets not owned or directly operated by the Council. This includes mileage for business purposes in cars owned by employees, public transport, hire cars etc. Require details for: <u>Vehicle</u> Fuel type, size of vehicle and distance for: • Car • Motorbike • Taxis • Bus • Rail <u>Flights</u> • Airport travelled to/from • Number of passengers • Class type • Distance <u>Ferry</u> • Foot or car passenger • Distance
7	Employee commuting	This category includes emissions from the transportation of employees between their homes and their worksites. Emissions from employee commuting may arise from: • Car • Bus • Rail • Other modes of transportation Staff would be required to provide method of transport and distance travelled. It may be difficult and time consuming to collect accurate data.
8	Upstream leased assets	This category is applicable from the operation of assets that are leased by the Council. If the Council procures the energy then this should be considered as Scope 1 and 2.

		If the landlord is responsible for the Scope 1 and 2 emissions, the Council should include the reporting under Scope 3. An example may include an office that the Council lease from a private landlord. All energy bills may be included as part of the lease and the energy contract is under the name of the landlord. The Council should therefore request the energy data from the landlord and include this under Scope 3. Data required include the Scope 1 and 2 data from the leased asset.
9	Downstream transportation and distribution	This category includes emissions that occur in the reporting year from transportation and distribution of sold products in vehicles and facilities not owned or controlled by the Council in the reporting year. It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
10	Processing of sold products	It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
11	Use of sold products	It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
12	End-of-life treatment of sold products	It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
13	Downstream leased assets	This category is applicable where the Council is the landlord to a lessee. If the Council procures the energy on behalf of a lessee then this should be considered as Scope 1 and 2. An example of this is where the Council may lease a premises to a lessee and include all energy costs as part of the lease. The energy contract is under the name of the Council and is therefore reported under Scope 1 and 2. If the lessee is responsible for the Scope 1 and 2 emissions, the council should include the reporting under Scope 3. An example of this is a shop that the Council own and the occupant pays for the energy bills and the contract is under their name. The Council should request the energy data from the shop occupier and report this under Scope 3.

		Data required include the Scope 1 and 2 data from the leased asset.
14	Franchises	It is assumed that this category is not applicable to the Council as it does not operate any franchises.
15	Investments	This category includes scope 3 emissions associated with the Council's investments in the reporting year, not already included in scope 1 or scope 2. This category is applicable to investors (i.e. organisations that make an investment with the objective of making a profit) and organisations that provide financial services. This category also applies to investors that are not profit driven (e.g. multilateral development banks). Investments are categorised as a downstream scope 3 category because providing capital or financing is a service provided by the organisation. Category 15 is designed primarily for private financial institutions (e.g., commercial banks), but is also relevant to public financial institutions (e.g., multilateral development banks, export credit agencies) and other entities with investments not included in scope 1 and scope 2. The Councils scope 3 emissions from investments are the scope 1 and scope 2 emissions of investees. For purposes of greenhouse gas accounting, this standard divides financial investments into four types: • Equity investments • Debt investments • Project finance • Managed investments and client services An example of the information required is the Scope 1 and 2 emissions from the bank where an investment is in place. This is based on the Council's proportional share of investment in the investee. If the Council has £1million invested in the bank and the banks total investments amount to £100million, the Council should report on 1% of the banks Scope 1 and 2 emissions. It is assumed that this information will be difficult to collate from third parties and that the total emissions will be proportionally small compared to other emission sources and these emissions could be excluded from the reporting.