# Amber Valley Borough Council

## Carbon Reduction Management Programme and Action Plan

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**Date:** 16th July 2020
**Version:** 1.4

**ENERGY** **ENVIRONMENT** **TRAINING**

## Contents

## Guidance

This report has been prepared by GEP Environmental Ltd (GEPEnv) solely for use of Amber Valley Borough Council to whom it is addressed and should not be relied upon by any person or entity other than the Amber Valley Borough Council.

### GHG Baseline Emissions

This report is designed to provide Amber Valley Borough Council with an overview of their baseline GHG emissions for the 2018/19, as well as the GHG emissions reductions potential for several suggested technological and behavioural energy reduction strategies. As such the results of the Net Zero Carbon Pathways modelling should be treated as advisory and is recommended that Amber Valley Borough Council complete full feasibility surveys to better quantify potential GHG emissions reductions.

### Location-Based GHG Emissions

Location-based emissions are calculated based on electricity and natural gas conversion factors sourced from the UK Government, which are an average of the supply mixture for the National Grid. These factors have been used in the modelling of all GHG Emissions Reduction Pathways.

### Market-Based GHG Emissions

Market-based GHG emissions are calculated based specific energy supply mixtures for low carbon/renewable energy tariffs and can be used to demonstrate the impact of switching supplies upon GHG emissions. The impact of switching energy supplies (electricity and gas) to renewable/low carbon energy tariffs on GHG emissions, has been modelled assuming that selected tariffs supplied via Crown Commercial Services are backed up with Renewable Energy Guarantees of Origin Certificates (REGOs).

**Market-based GHG emissions cannot be reported as standalone results** and need to be reported in **conjunction with location-based GHG emissions (dual reporting).**

### Tree Planting & Carbon Sequestration

Carbon Sequestration figures outlined in Section 7 of this report are calculated using a methodology from the Woodland Carbon Code (a voluntary UK standard). These figures should be treated as advisory as to the maximum sequestration potential from proposed 5-year planting timescale for the proposed Forest of the Future project.

It is recommended that Amber Valley Borough Council consider the tree planting programme not as a standalone activity to achieve Net Zero Carbon emissions, but as part of a wider programme to reduce overall resource consumption in the first instance.

## Executive Summary

Amber Valley Borough Council has set itself an ambitious Net Zero Carbon target to be achieved by 2030. Having analysed emissions from its current operations and determined emission-reduction trajectories, the Council will now be undertaking more detailed investigations of cost-effective energy reduction measures across all its assets, operations, and spheres of influence within the Borough.

In the first instance and in line with what's been proven with other public and private organisations, we will focus on cost effective reduction measures across the Councils largest sites and fleet of vehicles, as it is here where the greatest impact will be achieved.

It should be noted that the current baseline is approximately 55.5% better than when some ten years ago the Carbon Trust undertook a similar exercise. This can be attributed to a number of factors such as the effect of public sector cuts, demolition of obsolete and inefficient building assets, the installation of renewable energy (Solar PV), large scale LED retrofit, and a progressively more efficient fleet of vehicles.

Budgets must be set aside, including an appetite to extend return on investment periods, to upgrade the existing built environment, such as installing LED lighting, automated building controls and effective insulation. Electric vehicles will need to be phased into the vehicle fleet. The following report details the methodology used to determine the Council's Greenhouse Gas emissions, likely emission reduction trajectories and measures to be undertaken.

## Overall Report Summary

### Net Zero Carbon Emissions:

Amber Valley Borough Council has pledged to achieve Net Zero Carbon emissions across its property portfolio and owned vehicle fleet by 2030. The Net Zero Carbon strategy will tie in with strategies adopted by both Derbyshire County Council and the UK Government

### Amber Valley Borough Council's Baseline Year Emissions (2018/19):

The Council's baseline year emissions are 520.85 tonnes CO2e (1st April 2018 – 31st March), arising from the operation of its buildings and transport assets. The Councils baseline GHG emissions and will act as a benchmark for target setting and for tracking future emissions reductions towards the Net Zero target.

### Identifying Reduction Measures:

We have identified several technological and behavioural measures which will enable Amber Valley BC to reduce its GHG emissions, in both buildings and transport. These measures include energy efficiency, technological upgrades, expansion of on-site renewables, and behavioural change (increasing awareness and encouraging staff to use energy efficiently). In addition, we are also looking at opportunities to switch energy supplies to low carbon/renewable energy tariffs.

### Net Zero Reduction Pathways:

Scenarios have been modelled (based on the identified reduction measures above) to define different Net Zero Reduction Pathways which the Council could choose to follow or benchmark its performance against. Following the best-case scenario (all measures implemented) we may be able to reduce GHG emissions by 62.3% (324.06 $tCO_2e$) compared to the 2018/19 baseline.

### Amber Valley's Forest for the Future:

The Forest for the Future programme aims to plant between 2,500 and 5,000 trees per year over 16 hectares of Council owned land and open spaces, across the Borough. This planting will form a network of community woodlands and orchards (where appropriate) which will provide valuable recreational and wildlife areas in addition to sequestering a proportion of the Council's GHG emissions. The Council completed the first phase of planting during April 2019, with the aim to plant a total of 16 hectares of native trees by 2025. By 2030 this planting programme could potentially sequester c.1,680 tonnes of carbon dioxide from the atmosphere.

# 1 Introduction and Context

## 1.1 Amber Valley Borough Council Climate Emergency

Whilst Climate Change is regarded as a global environmental issue, the impacts can be identified on a global, national, and local scale. As a developed country, the UK's business operations provide a sizeable contribution to Climate Change. In order to reduce the national impact, the UK Government declared a national Climate Emergency on 1st May 2019. The declaration of a Climate Emergency symbolises the UK's ambition to decarbonise the UK economy in order to lead the way and reduce national contributions to Climate Change. The declaration of a Climate Emergency by the UK Government makes room for feasible carbon reduction measures and initiatives to be developed and established within the existing economy and infrastructure.

Whilst the impacts of Climate Change are often viewed on a global scale, Amber Valley Borough Council recognises that its day-to-day operational activities contribute to Climate Change. On 24th July 2019, Amber Valley Borough Council declared a Climate Emergency and pledged to reduce the environmental impact of its services and operations. This Councils Net Zero ambition compliments Derbyshire County Council's Carbon Reduction Plan to achieve carbon neutrality for the wider county by 2032.

## 1.2 Net Zero Carbon Emissions

Amber Valley Borough Council has pledged to achieve Net Zero Carbon emissions across its property portfolio and owned vehicle fleet by 2030. Net Zero Carbon emissions reflects a reduction of Greenhouse Gas emissions associated with an organisation's operations through the implementation of carbon reduction measures and initiatives. The Net Zero Carbon strategy will tie in with strategies adopted by both Derbyshire County Council and the UK Government, focusing on the following key areas:

- **Improving resource and energy efficiency** within buildings, procurement operations and owned fleet to reduce the demand for energy across the Council.
- **Encouraging behavioral and societal change** that lead to a reduced demand for carbon-intensive activities and a more responsible use of resources.
- **Extensive electrification** for Council wide transportation and heating supported by a major expansion of renewable and other low-carbon power generation to remove the need for unsustainable fuels.
- **Utilising the Councils green spaces** promoting sustainable and eco-friendly practices, including a focus on encouraging the uptake of carbon sequestration.

To achieve Net Zero Carbon emissions by 2030, Amber Valley Borough Council is establishing a comprehensive Carbon Reduction Management Plan.

This Plan will detail the Council's carbon reduction measures and initiatives that will be implemented over a 10-year period to deliver a pragmatic and sustainable approach to achieving Net Zero Carbon emissions by 2030.

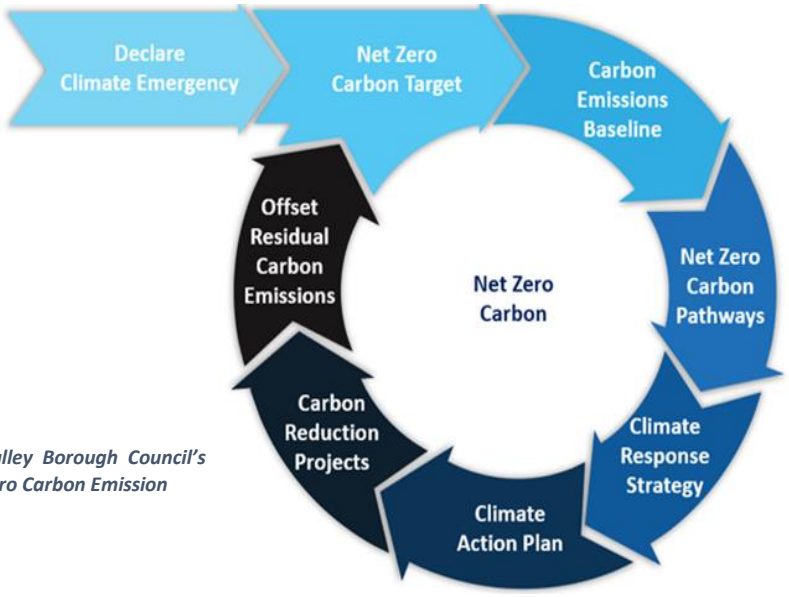



*Figure 1 (right) – Amber Valley Borough Council's approach to delivering Net Zero Carbon Emission*

## 1.3 Context to Net Zero Target

Amber Valley is home to a vast expanse of green spaces and rural countryside providing residents and visitors with stunning views and access to nature. To preserve the beauty of Amber Valley's environment, the Council will be establishing a Carbon Reduction Plan to minimise its contribution to Climate Change.

Climate Change presents a variety of environmental impacts, affecting countries on a global scale. On a national scale, the most noticeable impacts the UK faces include sea level rise, a rise in summer temperatures and an increase in extreme weather events, such as flooding.

The key impacts arising from Climate Change that are likely to affect Amber Valley Borough Council are as follows:

*Table 1 – Potential impacts of climate change upon Amber Valley*

| Climate Change Impact | How will this impact on Amber Valley? |
|---|---|
| Rising global temperatures | An increase in global temperature will mean that the UK will have hotter summers and milder winters. More frequent and severe heat waves during summer months will lead to higher mortality rates due to inadequate cooling infrastructure.<br>Transportation infrastructure, such as roads in and around Amber Valley, will become degraded at a faster rate, leading to disruption.<br>Hotter temperatures will impact on water sources located within Amber Valley, such as the River Amber, leading to reduced water quality and availability. |
| Rising River Levels | Derbyshire is very susceptible to surface water flooding due to the presence of large flood plains throughout the county. Increased flooding events lead to increased disruption to transportation links, wide scale damage to properties and an increase in local water pollution levels. |
| Extreme changes in temperature and weather patterns | Changes in natural temperature and weather patterns would lead to changes in biodiversity richness and abundance as tolerance ranges for species are exceeded.<br>Changes in temperatures can lead to rapidly changing growing seasons for plants and crops present within Amber Valley, disrupting existing food webs and providing unstable environments for many native species.<br>Migratory species, such as birds and insects, will be impacted by changes in temperatures and weather patterns, leading to earlier migration occurring each year. This may also impact on the annual relocation of non-native species within the UK to favour warming climates. |

Though Climate Change requires a global response, it is recognised that actions to mitigate and adapt to climate change must be undertaken at a local level.

The Committee on Climate Change's report "Net Zero – the UK's contribution to stopping global warming", surmises that Local Authorities are ideally placed to influence and make changes to local infrastructure to help achieve net zero emissions. Local Authorities across the UK and worldwide have responded to this by declaring their own regional climate emergencies, making significant moves towards mitigating the impacts of Climate Change.

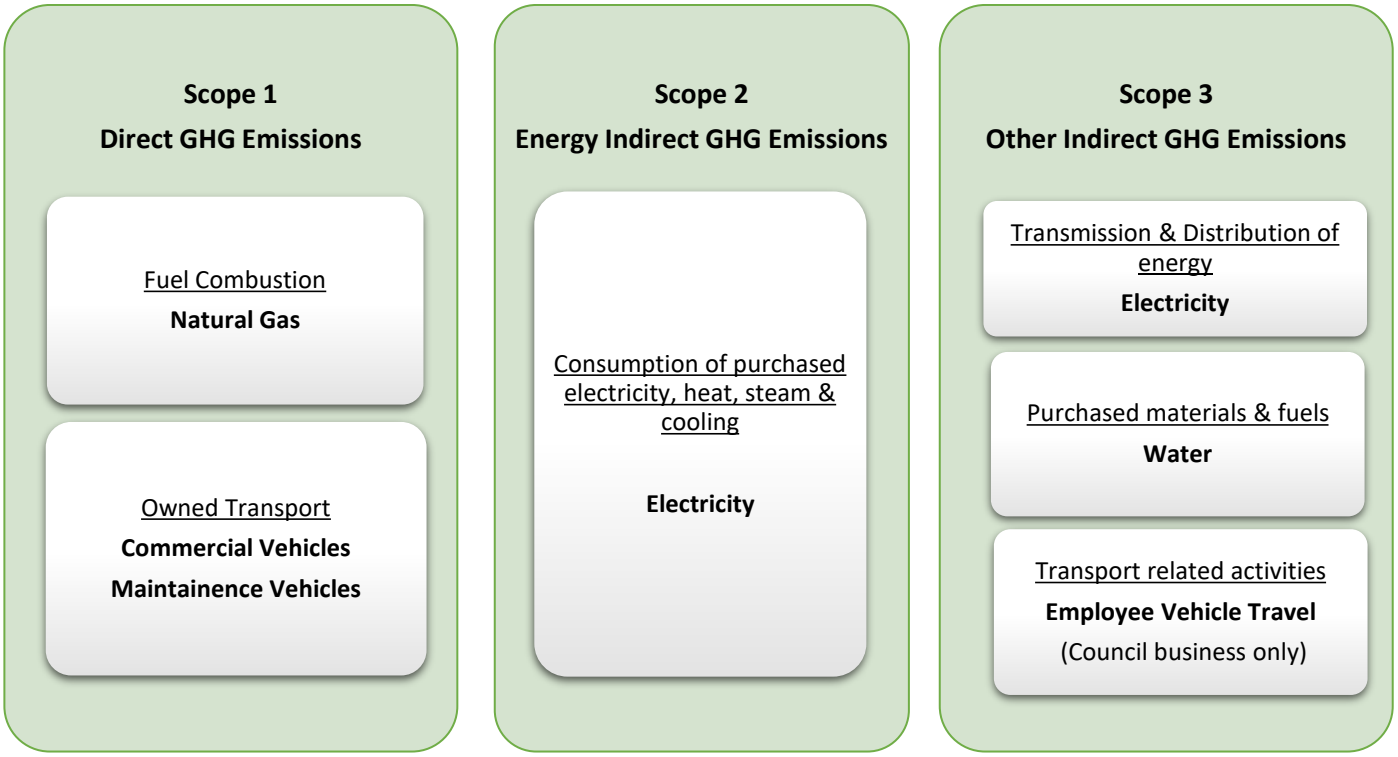
**This is why Amber Valley Borough Council has committed to Net Zero Carbon by 2030.**

## 2 Carbon Emissions Baseline

The first step towards achieving Net Zero Carbon by 2030 is to quantify and understand Amber Valley Borough Council's Carbon Emissions Baseline. This assessment will enable better understanding the distribution of energy consumption across the Council's operations and will allow reduction measures to be focused where they will have the greatest amount of impact. The Council has chosen the 2018/19 financial year (running from 1st April 2018 – 31st March 2019) as their baseline GHG emissions inventory.

### 2.1 Scope of Carbon Emissions Inventory

The Council has accounted for all emissions sources over which it has **operational control**, and has identified the following emissions sources which are included within the assessment:




For the Council's carbon emissions inventory their vehicle fleet has been split into commercial vehicles and maintenance vehicles.

Commercial vehicles are classed as vans and small HGVs, whilst maintenance vehicles include the Street Cleansing vehicles, ride-on mowers and tractors used by maintenance teams.

For the purposes of Figures 2 and 3 (on the following page) these have been grouped together as 'Council owned Vehicles'.

### 2.2 Calculation Methodology

Amber Valley Borough Council's baseline footprint is calculated using the 2018 Conversion Factors developed by the UK Department for Environment, Food and Rural Affairs (Defra) and the Department for Business, Energy & Industrial Strategy (BEIS).

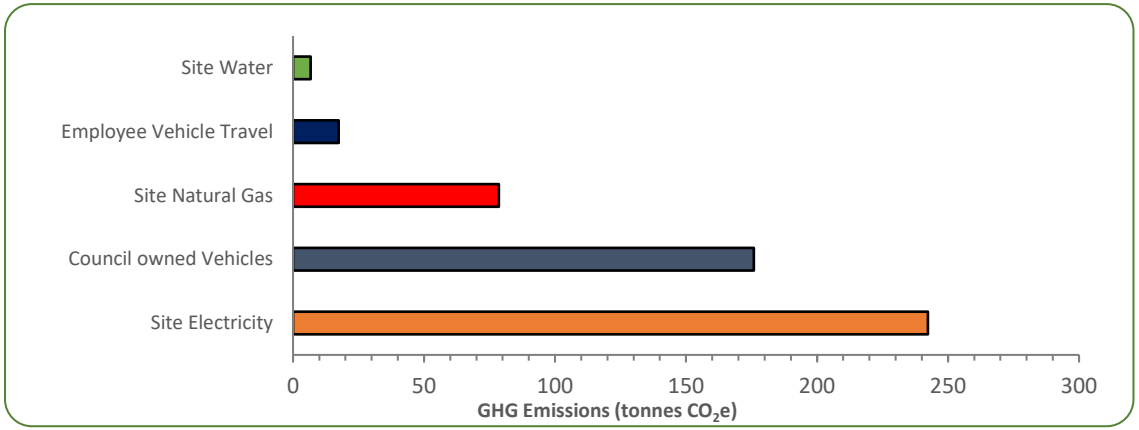
Activity data (i.e. gas, electricity, fuels) is multiplied with specific emissions factors, to determine GHG emissions. The results of the assessment are provided in tonnes of carbon dioxide equivalent ($tCO_2e$). This methodology is an internationally recognised approach to compiling a GHG Inventory and follows best practice guidance.

## 2.3 Baseline Carbon Emissions (FY 2018/19)

### 2.3.1 Summary of Results

**The total carbon footprint for Amber Valley Borough Council for the period ending 31st March 2019 was 520.85 tonnes $CO_2e$.** The following table and graphs provide a summary of results by scope and source activity.

| Element of Footprint | Location-Based GHG Emissions ($tCO_2e$) |
|---|---|
| **Scope 1 – Direct GHG Emissions** | |
| Maintenance Vehicles | 90.22 |
| Commercial Vehicles | 85.65 |
| Site Natural Gas | 78.55 |
| **Scope 2 –Energy Indirect GHG Emissions** | |
| Site Electricity (Generation) | 223.27 |
| **Scope 3 – Other Indirect Emissions** | |
| Electricity (Transmission & Distribution) | 19.03 |
| Employee Vehicle Travel | 17.41 |
| Water (and Wastewater) Consumption | 6.71 |
| **Total GHG Emissions (tonnes $CO_2e$)** | **520.85** |
| **Emissions per $m^2$ Floor Area (tonnes $CO_2e$)** | **0.05** |



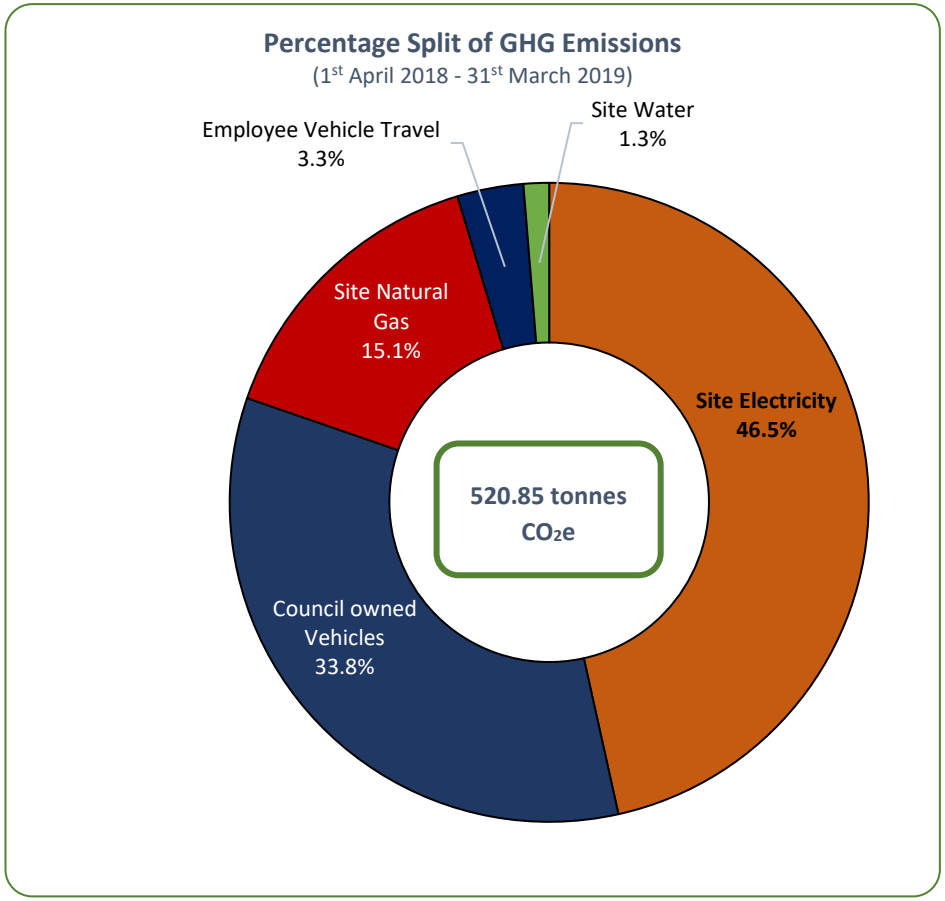




*Figure 2 (left) Detailed overview of AVBC's baseline GHG emissions. Figure 3 (above) AVBC's Baseline GHG emissions split by percentage (%).*

### 2.3.2 Property Portfolio & Non-Building Supply GHG Emissions

The majority of the Council's GHG emissions result from electricity consumption (46.5%) and natural gas consumption (15.1%) across its property portfolio and open sites. The tables below highlight the sites and supplies which contribute the most to the Council's GHG emissions.

#### Property Portfolio

It is recommended that the Council focuses their initial energy and GHG emissions reduction programme across these sites. Any reductions made here will have the greatest overall impact on the Council's GHG emissions and help meet its Net Zero Emissions target by 2030.

| Site Name | Annual Consumption | | | GHG Emissions ($tCO_2e$) | | | |
|---|---|---|---|---|---|---|---|
| | Electricity (kWh) | Natural Gas (kWh) | Water ($m^3$) | Electricity | Natural Gas | Water | Total Emissions ($tCO_2e$) |
| Central Headquarters | 362,116 | 351,730 | 2,349 | 111.24 | 64.70 | 2.47 | 178.42 |
| Main Buildings (Leafy Lane Dpt) | 41,020 | 0.00 | 2,260 | 12.60 | - | 2.38 | 14.98 |
| Alfreton Market Hall | 44,964 | 0.00 | 570 | 13.81 | - | 0.60 | 14.41 |
| **Totals** | *448,100* | *351,730* | *5,179* | *137.65* | *64.70* | *5.45* | **207.81** |

#### Non-Building Supplies

The Council's non-building supplies also account for a large proportion of its GHG emissions. In addition to technological and behavioural reduction measures focused on its sites, the Council will also consider opportunities to switch energy supplies to low carbon/renewable energy tariffs where possible (see Sections 4.1 and 4.2 for further details).

| Site Name | Electricity Consumption (kWh) | GHG Emissions (tonnes $CO_2e$) |
|---|---|---|
| Unmetered Lighting & CCTV | 139,783 | 42.94 |
| Three Phase Supply | 33,366 | 10.25 |
| Pay & Display Machines | 22,785 | 7.00 |
| **Totals** | **195,934** | **60.19** |

### 2.3.3 Transport GHG Emissions

Amber Valley Borough Council's transport emissions are focused upon its maintenance and commercial vehicle fleets which collectively account for 33.8% of the Council's total baseline GHG emissions. Emissions from employee travel (grey fleet) accounts for 3.3% of total baseline GHG emissions.

Whilst the commercial and maintenance fleets should be the priority for the GHG emissions reduction measures, the Council may also be able to make significant savings from reducing grey fleet (travel by Council employees using their own vehicles) mileage.

| Transport Type | Fuel Consumption (Litres) | Annual Mileage (Grey Fleet only) | Total Emissions ($tCO_2e$) |
|---|---|---|---|
| Maintenance Vehicles | 34,345 | - | 90.22 |
| Commercial Vehicles (vans) | 32,606 | - | 85.65 |
| Employee Vehicles (Grey Fleet) | - | 59,878 | 17.41 |
| **Totals** | **66,951** | **59,878** | **193.28** |

# 3 Identifying Reduction Measures

## 3.1 Reducing Emissions from Council Buildings

The following technologies and reduction measures listed in the table below have been identified as being the most applicable to the Council's property portfolio.

| Utility | Technology/Measure | Consumption Reduction Potential (% kWh per annum) | Maximum Emissions Savings Potential (tonnes $CO_2e$)[1] |
|---|---|---|---|
| Electricity | LED Lighting upgrade/retrofit | 65% | 93.41 |
| | Installation of PIR Sensors | 20% | 28.74 |
| | Solar PV | 11%[2] | - |
| | Increased HVAC controls | 5% | 1.37 |
| | Replacement of older/less efficient equipment | 5% | 1.37 |
| | Behavioural Change (sites with electricity only/electricity and gas)[3] | 5% / 2.5% | 2.69 / 2.93 |
| | | | |
| Gas | Building Heating Zone controls | 25% | 17.67[4] |
| | Installation of a BMS | 15% | 10.60 |
| | Central Heating controls | 8% | 6.28 |
| | Insulation (building fabric) | 3% | 2.12 |
| | Behavioural Change (gas only sites/gas and electricity) | 5% / 2.5% | 0.16 / 0.96 |
| | | | |

For the purposes of modelling reduction trajectories, it is assumed that energy and efficiency savings from technological measures will **only** be realised in the first year that they are implemented on a site.

Behavioural change measures focus upon encouraging employees to use heating and lighting more efficiently in Council buildings. In practice typical behavioural change measures may include 'Switch it off' campaigns, encouraging sensible use of heating and cooling, facilitating greater remote/home working to increase the use of webinars and virtual meetings (to reduce travel related GHG emissions and pollution).

At time of producing Amber Valley Borough Council's plan under the lockdown imposed as a consequence of the Covid-19 pandemic, it has become clear around the World that pollution levels have decreased and air quality has significantly increased due to less vehicles being on the road, as more people have been home working who would otherwise have been commuting.

## 3.2 Reducing Emissions from Council Vehicles

The following technologies and reduction measures listed in the table below have been identified as being the most applicable to the Council's vehicle fleet. Research was completed into alternative fuel vehicles for the Council's maintenance fleet, however suitable vehicles for comparison have not been found. As the technology for alternative fuel vehicles continues to evolve the Council will review opportunities for switching some or all the maintenance fleet to CNG (compressed natural gas) or other alternative fuelled vehicles.

| Fleet | Technology/Measure | Maximum Emissions Savings Potential by 2030 (tonnes $CO_2e$) |
|---|---|---|
| Commercial Fleet (Vans) | Switching commercial vehicles to electric alternatives | 52.84 |
| Employee Vehicle Travel | Reducing travel distances by 5% per annum until 2029/30 | 10.15 |

[1] If applied across the whole of the Council's property portfolio based on Defra/BEIS 2018 emissions factors for each energy type.
[2] Based on the performance of current 19kWp (kilowatts peak) array installed at Central Headquarters (Ripley) and potential upgrade to 40 kWp system.
[3] Reductions from behavioural change are assumed as follows for each energy type: 5% for sites with only one energy source (electricity or gas); 2.5% for sites with both electricity and gas. Reductions are applied across total energy consumption and exclude unmetered supplies/open sites.
[4] Based on 7 sites in the property portfolio which use natural gas.

# 4 Net Zero Reduction Pathways

## 4.1 Scenario Modelling

The following scenarios have been modelled to define different Net Zero Reduction Pathways which the Council could choose to follow or benchmark its performance against. **These scenarios are designed to provide an overview of the maximum potential for emissions savings across the Council's portfolio and vehicle fleets.**

| Modelled Scenario | Details and Assumptions |
|---|---|
| **Combined Maximum (CM)** | Maximum possible reductions and savings from energy efficiency measures implemented in buildings;<br>Maximum potential reductions from behavioural change across the property portfolio;<br>Maximum possible reductions in transport emissions from switching to electric vehicles and achieving a 5% reduction in grey fleet mileage per annum;<br>Grey Fleet emissions calculated to reflect an increase in hybrid/electric vehicles. |
| **Building Maximum (BM)** | Maximum possible reductions and savings from energy efficiency measures implemented in buildings;<br>Maximum potential reductions from behavioural change across the property portfolio;<br>Assumes transport fleet will still use fossil fuels until 2029/30;<br>Grey Fleet emissions calculated to reflect an increase in hybrid/electric vehicles based on an average distance per annum. |
| **Transport Maximum (TM)** | Maximum possible reductions in transport emissions from switching to electric vehicles and achieving a 5% reduction in grey fleet mileage per annum;<br>Grey Fleet emissions calculated to reflect an increase in hybrid/electric vehicles;<br>Assumes that no energy efficiency measures have been implemented in Council buildings. |
| **No Action (NA)** | Assumes that no action will be taken to reduce emissions from the Council's building portfolio, the vehicle fleet will continue to utilise current fossil fuels and grey fleet will continue at an average distance per annum.<br>Emissions reductions from this scenario are from forecast changes in emissions factors; the continued decarbonisation of the UK electricity grid. |
| **Science Based Target (SBT)** | Reduction trajectory modelled using the Science Based Targets Initiative, based on their Better than 2°C Scenario[5]. This approach considers sectoral change (forecast growth, decarbonisation of electricity grids) across different industry sectors. |

All building energy scenarios and Net Zero trajectories are based on the Council's location-based[6] GHG emissions footprint**,** assuming that energy supplies are sourced from tariffs which utilise the current and future modelled projections, of the energy supply mixture from the National Grid. These are published by the National Grid as part of their Future Energy Scenarios (FES) reporting (http://fes.nationalgrid.com/).

## 4.2 Switching to Low Carbon/Renewable Energy Tariffs

Amber Valley Borough Council is planning to switch its current energy supplies to 100% low carbon or renewable sourced electricity and natural gas. Switching to low carbon or renewably sourced energy, will have a significantly positive impact on the reduction of carbon across the Council's estate.

The potential for GHG emissions reduction from switching to low carbon/renewable energy tariffs, has been modelled based on switching the Council's supply tariffs in their 2020/21 financial year. It is important to note that any reductions can only be quantified for the Council's **market-based[7]** GHG emissions, and not **location-based GHG emissions.** For further definition on market and location based GHG emissions please see Annex 1.

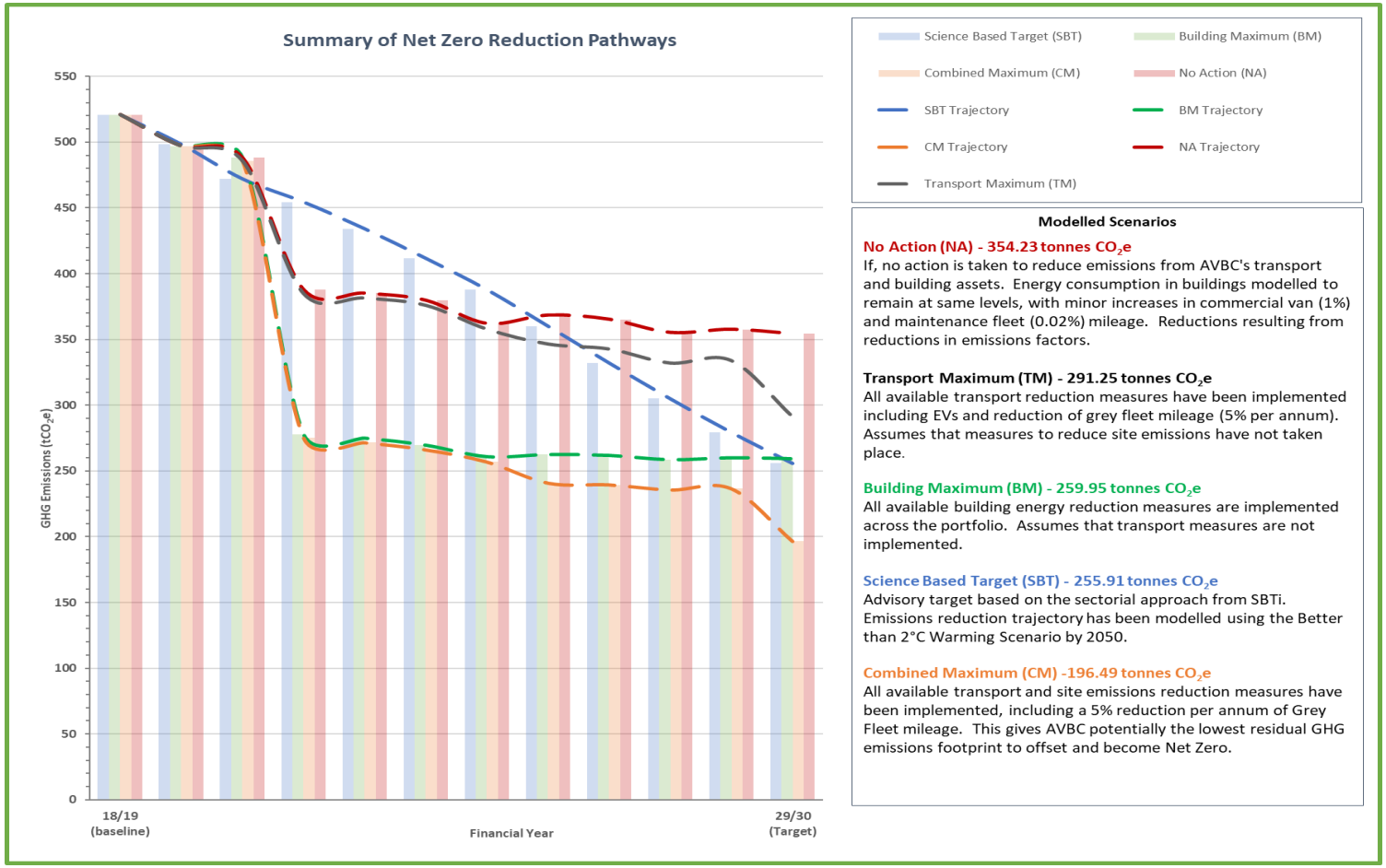
For modelling results please see Section 5.3 of this report.

[5] The Science Based Targets Initiative's '1.5°c Target Setting Tool' is currently not available, and so a more ambitious SBT could not be modelled.
[6] GHG Emissions calculated based on average generation emissions from national supply grids.
[7] GHG emissions calculated based on energy supply mixtures from specific energy tariffs.

## 4.3 Overview of Reduction Pathways

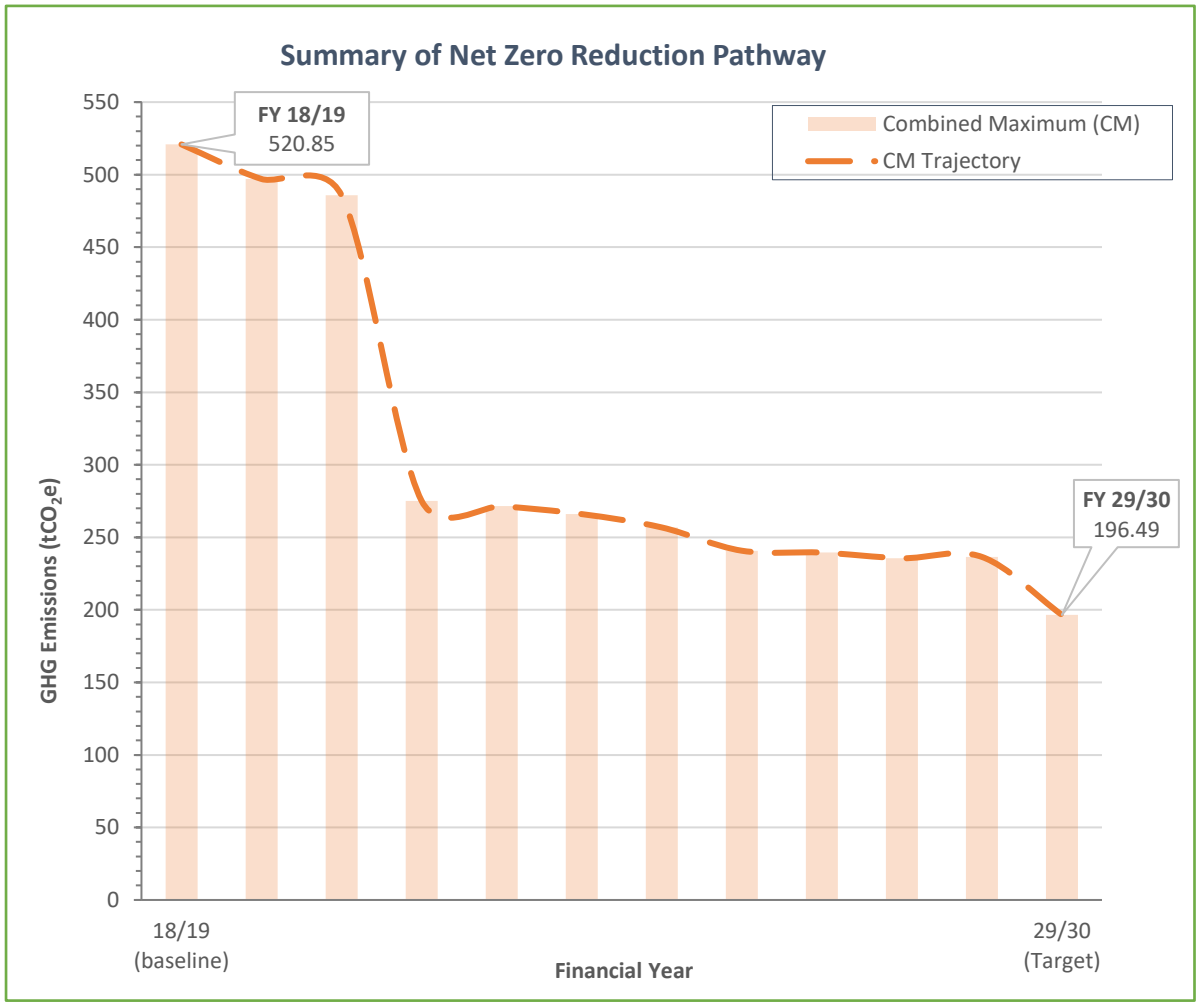
The following scenarios were modelled to develop trajectories which the Council can follow or benchmark its performance against to meet their Net Zero Carbon emissions target by 2030. The chart below details an overview of all modelled scenarios and their results. Results for each of these individual scenarios are presented in the following pages.

All scenarios have a trajectory (shown as a line graph) and a GHG budget for each financial year. Each scenario is designed to demonstrate the relative impacts of implementing suggested reductions measures for the property portfolio and transport assets. A combined scenario (assuming all transport and building energy reduction measures are implemented) has been modelled to demonstrate the maximum potential reductions that can be achieved.



## 4.4 Combined Maximum Reduction Pathway

This scenario details the maximum possible reductions and savings from energy efficiency measures implemented across the property portfolio as well as reduction in transport emissions (from switching to electric vehicles and reducing grey fleet mileage by 5% per annum). To clearly demonstrate the relative impact of building and transport reduction measures, it has been modelled that significant buildings emissions reductions will occur in 2021/22 and significant transport reductions will occur in 2025/26 and 2029/30



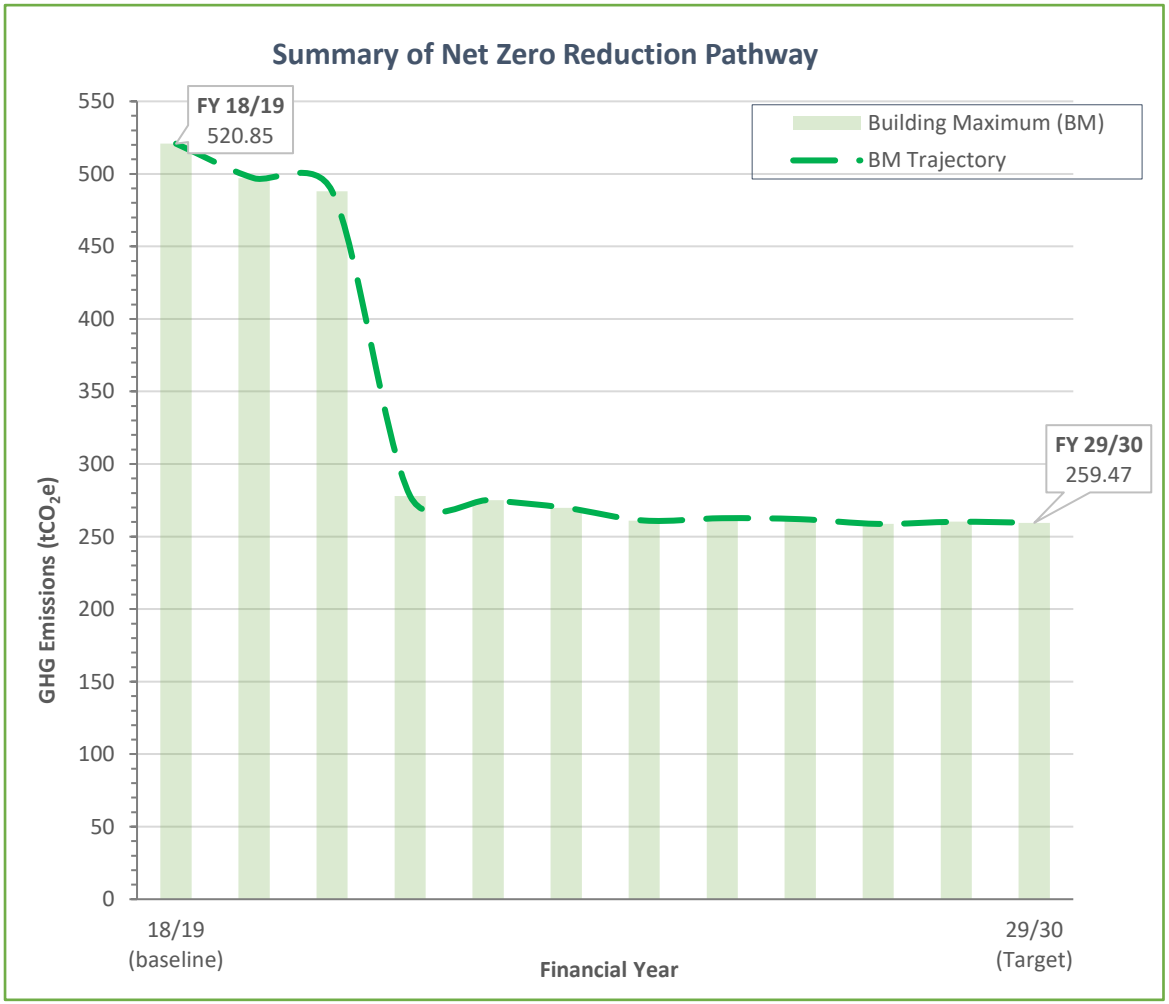

**Model Assumptions**

- ✓ Building reduction measures implemented in FY 2021/22.
- ✓ Maximum energy saving is achieved in the first-year post installation with energy consumption remaining at a lower level thereafter.
- ✓ Transition of commercial fleet to EV in two phases - FY 2025/26 and FY 2029/30.
- ✓ Grey fleet mileage reduces at 5% per annum with assumed increase in use of EV/hybrid vehicles.

| Reporting Year | GHG Budget ($tCO_2e$) | Y.o.Y Reduction (%) |
|---|---|---|
| **18/19** | **520.85** | 0.0% |
| 19/20 | 497.02 | -4.58% |
| 20/21 | 485.71 | -2.28% |
| 21/22 | 275.12 | -43.36% |
| 22/23 | 271.48 | -1.32% |
| 23/24 | 266.01 | -2.01% |
| 24/25 | 256.82 | -3.45% |
| 25/26 | 240.76 | -6.25% |
| 26/27 | 239.47 | -0.54% |
| 27/28 | 235.60 | -1.62% |
| 28/29 | 236.49 | 0.38% |
| **29/30** | **196.49** | -16.91% |
| **Modelled Reductions** | **324.36** | **-62.3%** |

## 4.5 Building Maximum Reduction Pathway

This scenario details the maximum possible reductions and savings from implementing all energy efficiency measures (outlined in Section 3.1) across the property portfolio. As with the Combined Maximum scenario significant GHG emissions reductions are modelled to occur during the 2021/22 reporting year. This scenario assumes that the maximum amount of energy saving is achieved in the first year (post installation) and thereafter energy consumption remains at a lower level. The graph and table below outline both the trajectory and carbon budget for each reporting year in this scenario.



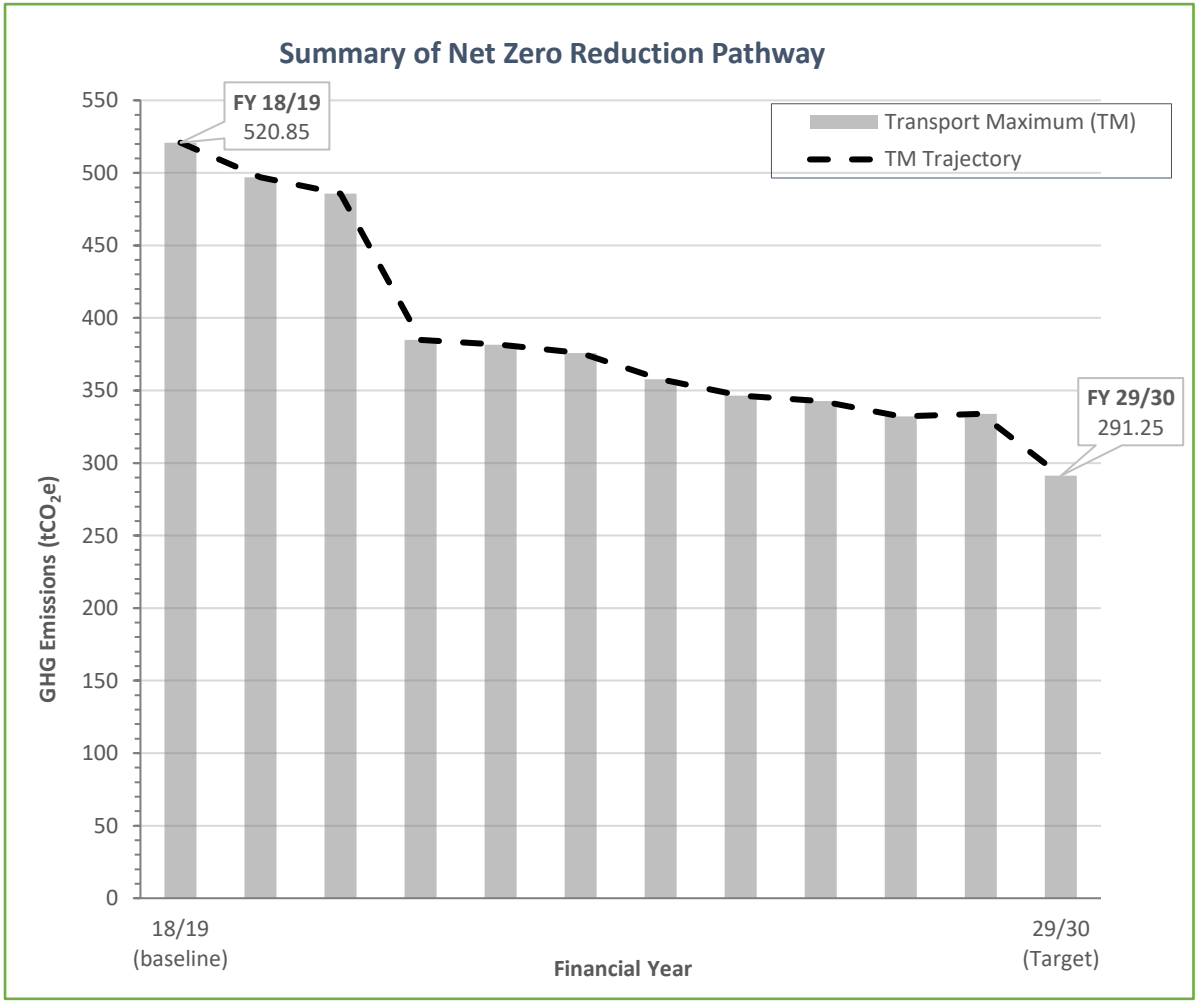

**Model Assumptions**

- ✓ Building reduction measures implemented in FY 2021/22.
- ✓ Maximum energy saving is achieved in the first-year post installation with energy consumption remaining at a lower level thereafter.
- ✓ Council transport fleets will continue to use fossil fuels.
- ✓ Grey fleet mileage will remain at a similar level using fossil fuel vehicles.

| Reporting Year | GHG Budget ($tCO_2e$) | Y.o.Y Reduction (%) |
|---|---|---|
| **18/19** | **520.85** | 0.0% |
| 19/20 | 497.02 | -4.6% |
| 20/21 | 488.04 | -1.8% |
| 21/22 | 278.01 | -43.0% |
| 22/23 | 275.07 | -1.1% |
| 23/24 | 269.75 | -1.9% |
| 24/25 | 261.05 | -3.2% |
| 25/26 | 262.65 | 0.6% |
| 26/27 | 261.99 | -0.3% |
| 27/28 | 258.72 | -1.2% |
| 28/29 | 262.20 | 1.3% |
| **29/30** | **259.47** | -1.0% |
| **Modelled Reductions** | **259.47** | **-50.2%** |

## 4.6 Transport Maximum Reduction Pathway

This scenario details the maximum possible reductions in transport emissions (from switching to electric vehicles and reducing grey fleet mileage by 5% per annum). The graph and table below outline both the trajectory and carbon budget for each reporting year in this scenario. For this scenario, the transition of the commercial fleet to electric vehicles (EV) is modelled as being completed in two distinct phases – the first in FY 2025/26 and the second in FY 2029/30. The composition of the Grey Fleet (employee owned vehicles) is assumed to shift from predominantly fossil fuels to being mostly electric/hybrid vehicles by FY 2029/30.



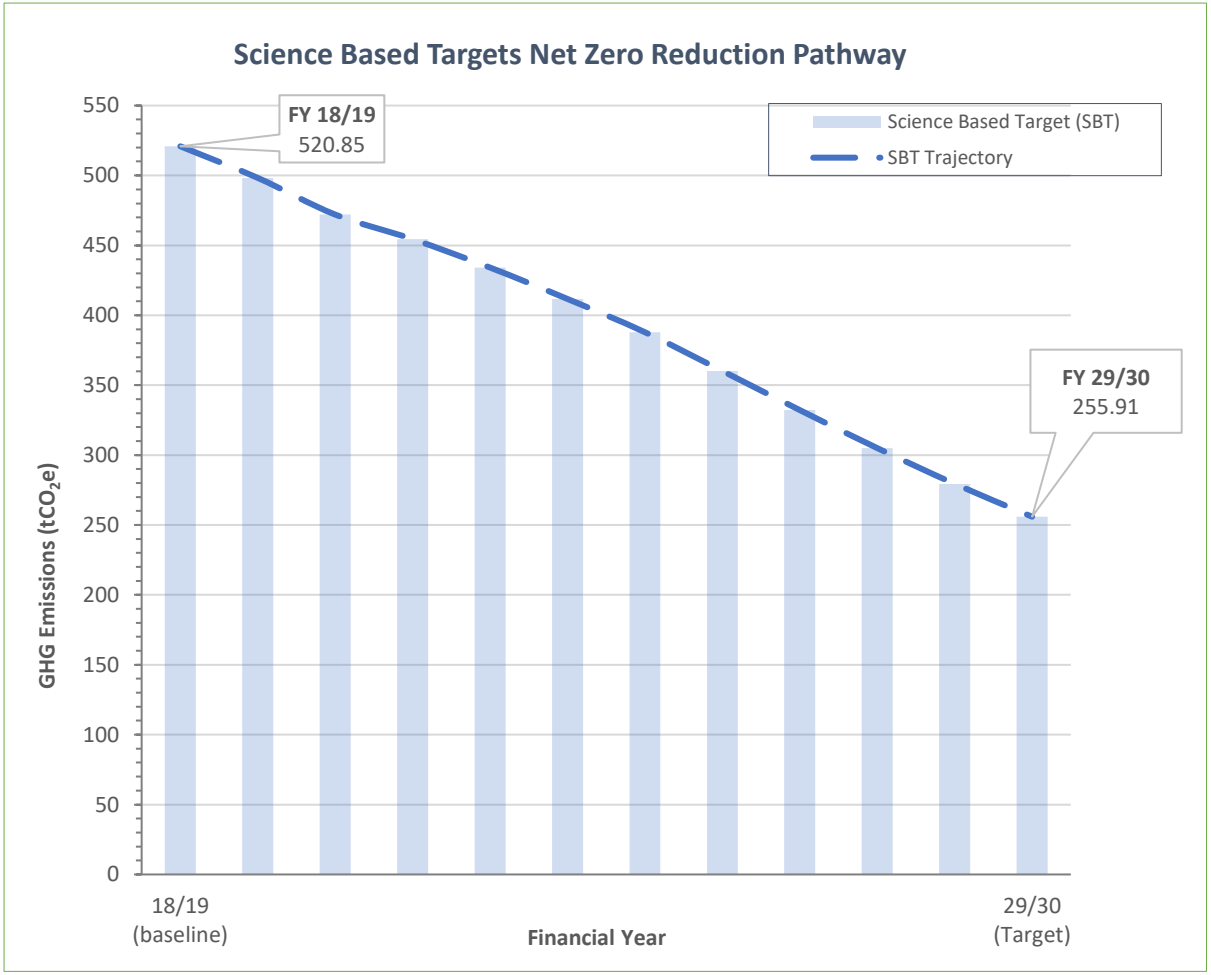

**Model Assumptions**

- ✓ Transition of commercial fleet to EV in two phases - FY 2025/26 and FY 2029/30.
- ✓ Grey fleet mileage reduces at 5% per annum with assumed increase in use of EV/hybrid vehicles.
- ✓ Maintenance fleet will continue to use fossil fuels.
- ✓ Building energy reduction measures have not been implemented.

| Reporting Year | Modelled GHG Budget ($tCO_2e$) | Y.o.Y Reduction (%) |
|---|---|---|
| **18/19** | **520.85** | 0.0% |
| 19/20 | 497.02 | -4.6% |
| 20/21 | 485.71 | -2.3% |
| 21/22 | 384.81 | -20.8% |
| 22/23 | 381.50 | -0.9% |
| 23/24 | 375.92 | -1.5% |
| 24/25 | 357.81 | -4.8% |
| 25/26 | 346.50 | -3.2% |
| 26/27 | 342.70 | -1.1% |
| 27/28 | 332.06 | -3.1% |
| 28/29 | 333.91 | 0.6% |
| **29/30** | **291.25** | -12.8% |
| **Modelled Reductions** | **229.58** | **-44.0%** |

## 4.7 Science Based Targets Reduction Pathway

This scenario has been modelled utilising the Science Based Targets Initiative's (SBTi)[8] Better than 2°C Scenario. The SBTI tool generates emissions reduction targets based on forecast rates of change across many industry sectors and is designed to provide a reduction pathway towards Net Zero carbon emissions by 2050. Whilst there is not currently a tool available specifically for the Public Sector, this scenario is based on existing tools for other industry sectors, which closely align with elements of the Council's emissions footprint.

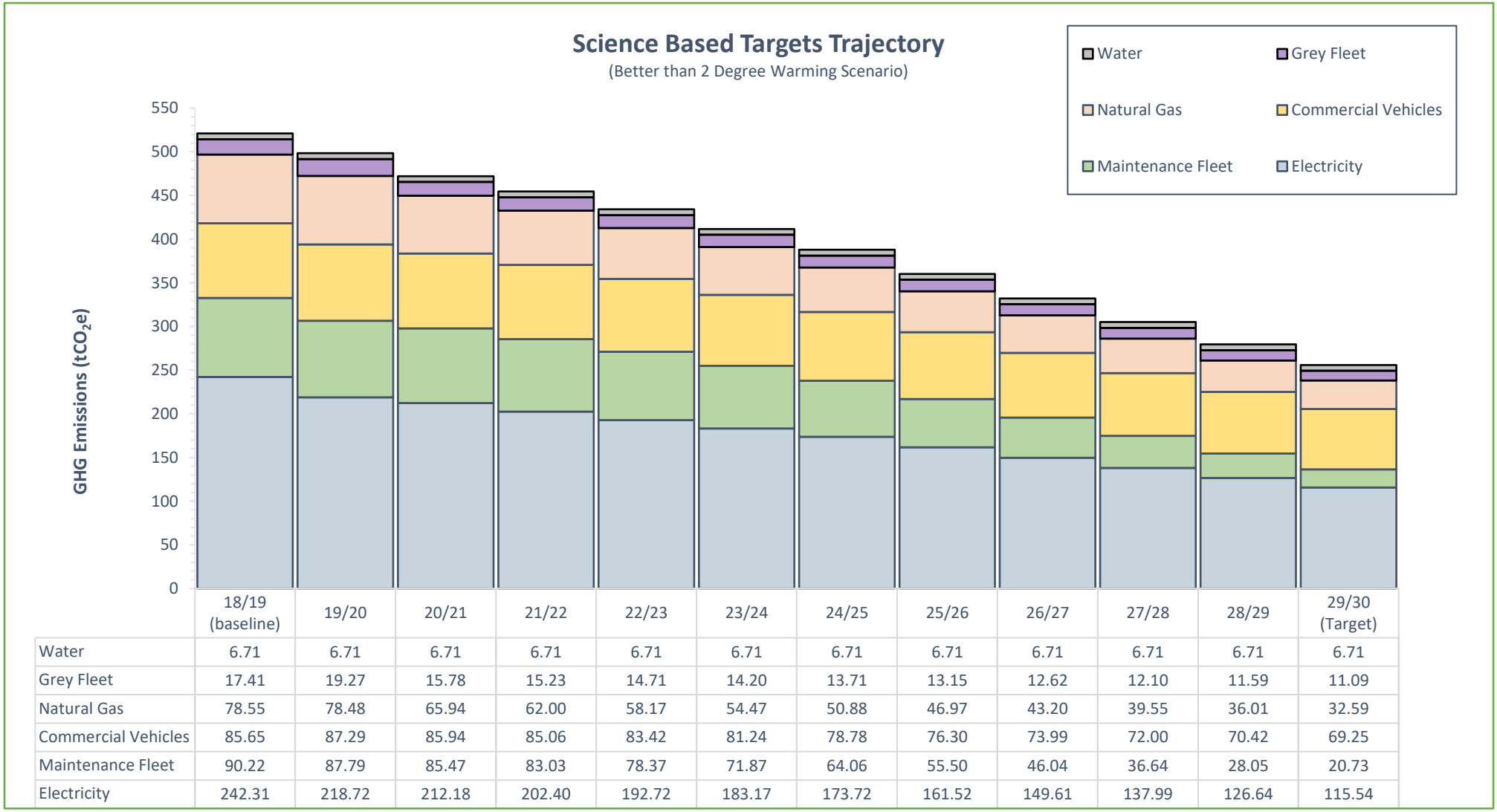



| Reporting Year | GHG Budget ($tCO_2e$) | Y.o.Y Reduction (%) |
|---|---|---|
| **18/19** | **520.85** | 0.0% |
| 19/20 | 498.26 | -4.3% |
| 20/21 | 472.02 | -5.3% |
| 21/22 | 454.43 | -3.7% |
| 22/23 | 434.11 | -4.5% |
| 23/24 | 411.66 | -5.2% |
| 24/25 | 387.86 | -5.8% |
| 25/26 | 360.15 | -7.1% |
| 26/27 | 332.17 | -7.8% |
| 27/28 | 304.99 | -8.2% |
| 28/29 | 279.42 | -8.4% |
| **29/30** | 255.91 | -8.4% |
| **Modelled Reductions** | **264.94** | **49.1%** |

[8] https://sciencebasedtargets.org/

## 4.8 Science Based Targets Reduction Pathway – Detailed Overview

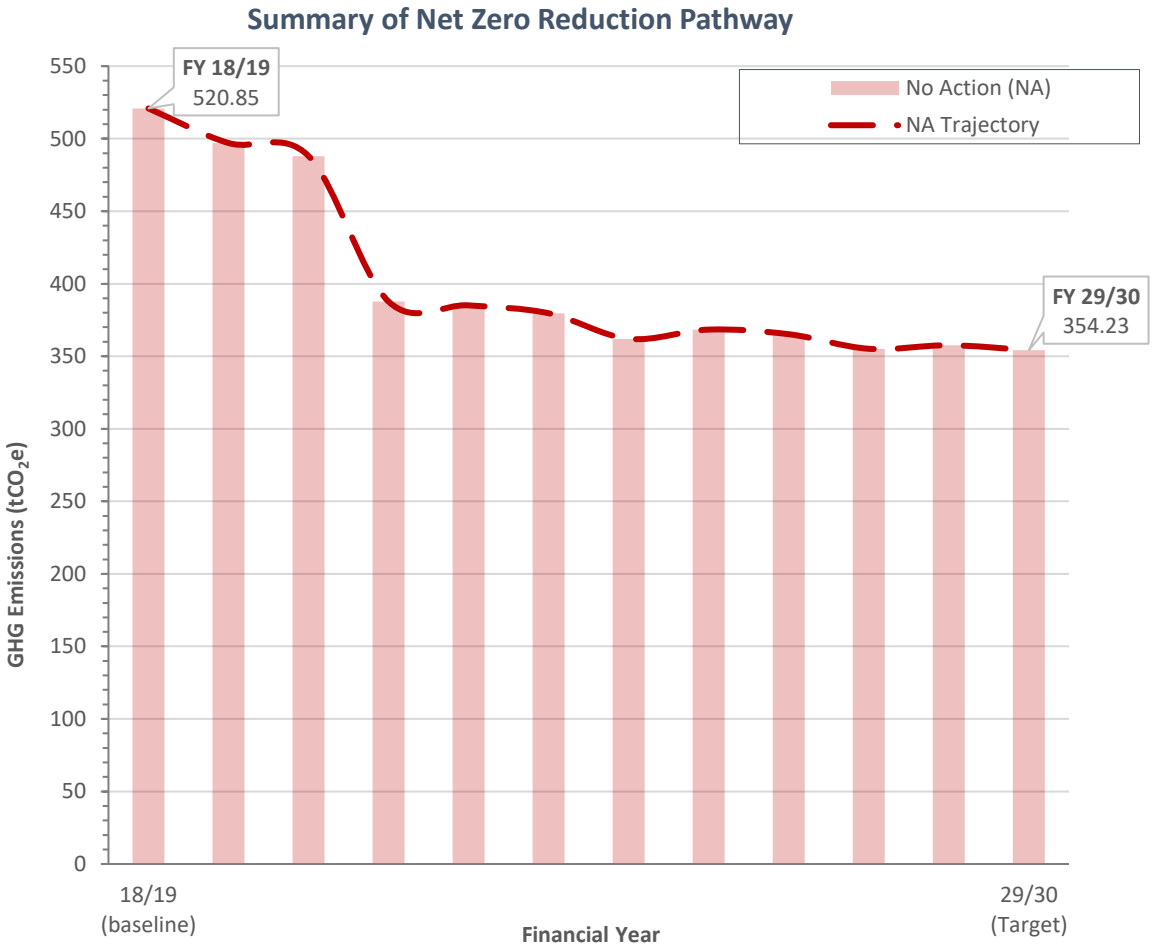
This chart below details the exact reduction trajectories for each of the individual elements of the Council's GHG emissions footprint which have been modelled utilising the Science Based Targets Initiative's (SBTi) Better than 2°C Scenario.




| | 18/19 (baseline) | 19/20 | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/30 (Target) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 |
| Grey Fleet | 17.41 | 19.27 | 15.78 | 15.23 | 14.71 | 14.20 | 13.71 | 13.15 | 12.62 | 12.10 | 11.59 | 11.09 |
| Natural Gas | 78.55 | 78.48 | 65.94 | 62.00 | 58.17 | 54.47 | 50.88 | 46.97 | 43.20 | 39.55 | 36.01 | 32.59 |
| Commercial Vehicles | 85.65 | 87.29 | 85.94 | 85.06 | 83.42 | 81.24 | 78.78 | 76.30 | 73.99 | 72.00 | 70.42 | 69.25 |
| Maintenance Fleet | 90.22 | 87.79 | 85.47 | 83.03 | 78.37 | 71.87 | 64.06 | 55.50 | 46.04 | 36.64 | 28.05 | 20.73 |
| Electricity | 242.31 | 218.72 | 212.18 | 202.40 | 192.72 | 183.17 | 173.72 | 161.52 | 149.61 | 137.99 | 126.64 | 115.54 |

## 4.9 No Action Scenario

This scenario has been modelled assuming that the Council takes no action to reduce emissions from its property and transport assets. This scenario is designed only for reference to provide an overview of the likely emissions reductions through continued decarbonisation of the electricity grid as well as forecast changes in emissions factors for other fuels and vehicle types until 2029/30.




**Model Assumptions**

- ✓ Maintenance fleet will continue to use fossil fuels.
- ✓ Building energy reduction measures have not been implemented.
- ✓ Modelled year on year change in National Grid (electricity) supply mixture based on Future Energy Scenarios (FES) assessment.
- ✓ Modelled year on year change in gas and transport emissions factors based upon reductions seen in published emissions factors datasets.

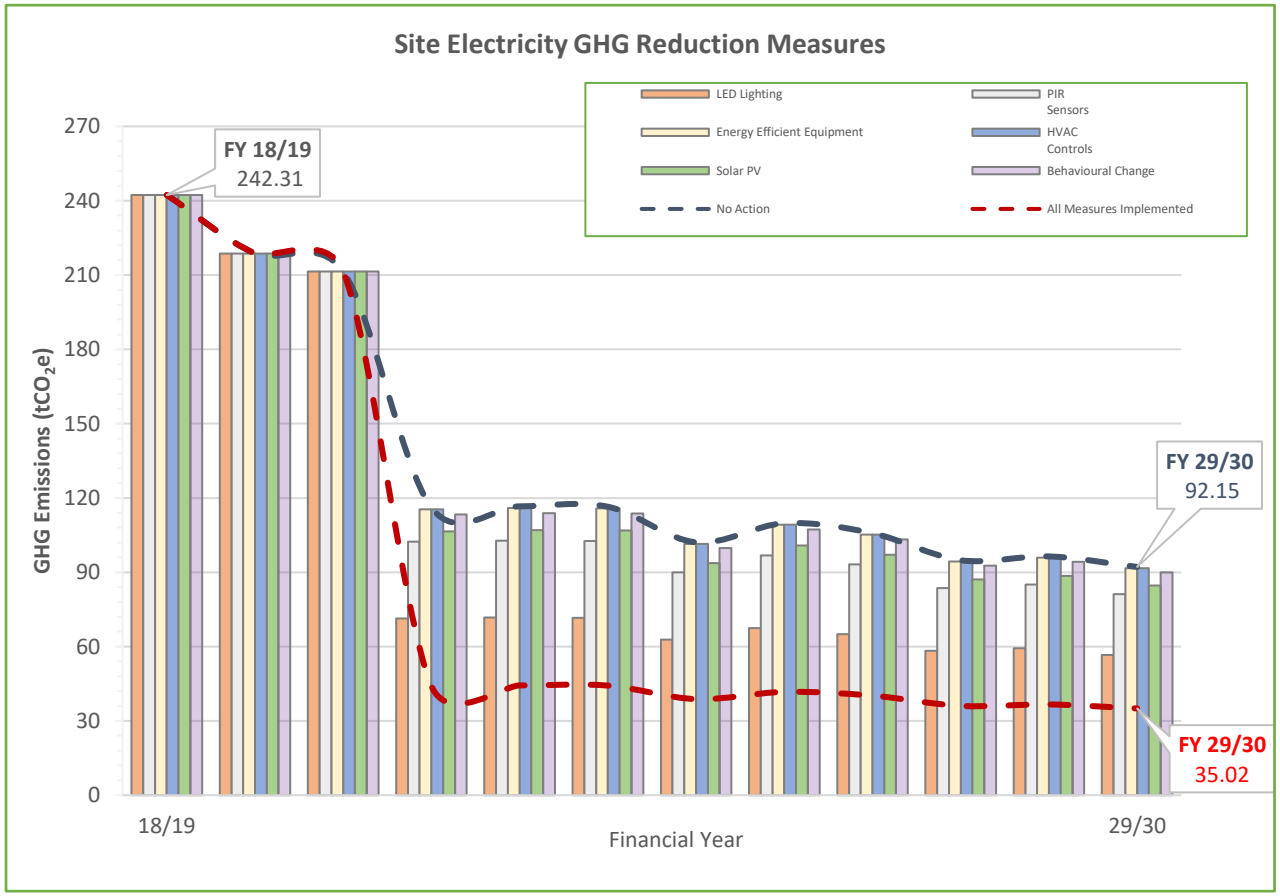
| Reporting Year | GHG Budget ($tCO_2e$) | Y.o.Y Reduction (%) |
|---|---|---|
| **18/19** | **520.85** | 0.0% |
| 19/20 | 497.02 | -4.6% |
| 20/21 | 488.04 | -1.8% |
| 21/22 | 387.70 | -20.6% |
| 22/23 | 385.09 | -0.7% |
| 23/24 | 379.65 | -1.4% |
| 24/25 | 362.03 | -4.6% |
| 25/26 | 368.39 | 1.8% |
| 26/27 | 365.22 | -0.9% |
| 27/28 | 355.17 | -2.7% |
| 28/29 | 357.61 | 0.7% |
| **29/30** | **354.23** | -0.9% |
| **Modelled Reductions** | **166.62** | **-32.0%** |

## 5 Carbon Reduction Action Plan – Council Buildings

Building reduction measures identified in Section 3 and modelled reduction trajectories listed in Section 4, are now used to define the potential impact upon GHG emissions from the Council's property portfolio. These measures and their modelled benefits can inform the ongoing carbon reduction actions which can be reviewed regularly to ensure the Council is on track to meet their Net Zero target.

### 5.1 Site Electricity Consumption

Electricity consumption accounts for the majority of GHG emissions from the property portfolio. The following energy reduction and efficiency measures (also outlined in the chart below) have been identified as being the most applicable to the estate. As with all building reduction measures, maximum reductions are modelled to occur only in the year following installation.




Electricity GHG Reduction Measures

**LED Lighting Upgrade/Retrofit – 93.41 $tCO_2e$ potential reduction**

The replacement of existing lighting and ongoing lighting replacement across the property portfolio will increase energy efficiency and reduce consumption.

**Installation of PIR sensors – 28.74 $tCO_2e$ potential reduction**

The installation of passive infra-red sensors (PIR) in low occupancy areas of buildings will reduce unnecessary electricity consumption from lighting/equipment being left on.

**Installation of Solar PV**

Using solar PV to generate renewable energy to supply some or all of a site's energy demand will reduce reliance on grid electricity and reduce emissions.

**Tighter HVAC Controls & Energy efficient equipment – 1.37 $tCO_2e$ potential reduction (each)**

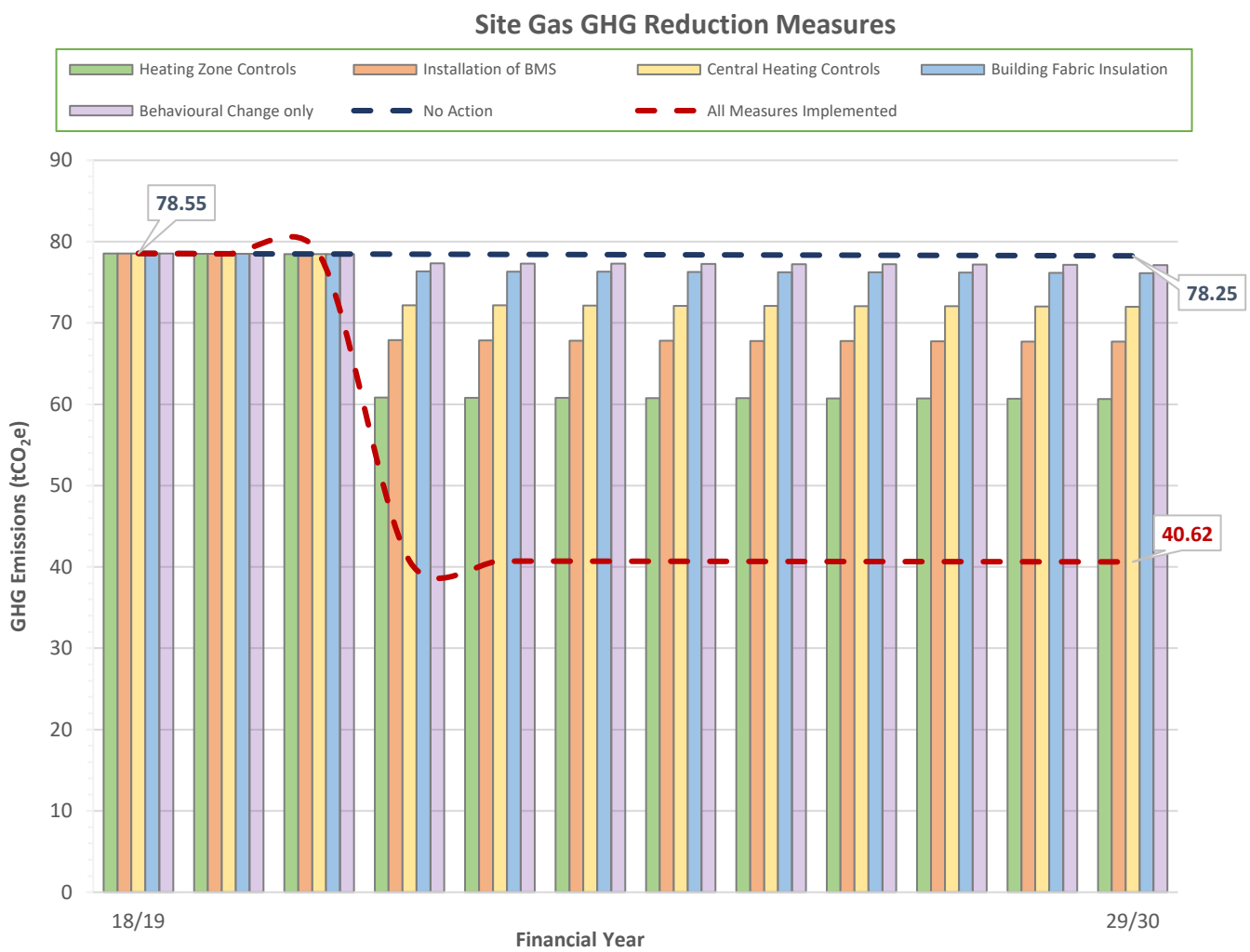
Greater control over existing HVAC systems and its usage will enable the Council to reduce unnecessary energy consumption and reduce GHG emissions. Replacing older less energy efficient equipment will also help reduce consumption and the Council's emissions.

**Behavioural Change – 5.63 $tCO_2e$ potential reduction**

Encouraging employees to use lighting and equipment more efficiently will help to increase energy efficiency and contribute towards reducing the Council's GHG emissions.

## 5.2 Site Gas Consumption

Gas consumption accounts for a significant proportion of the Council's GHG emissions from its property portfolio. Focused across seven sites in the portfolio, the following energy reduction and efficiency measures (also outlined in the chart below) have been identified as being the most applicable to the Council's estate. As with all building reduction measures, maximum reductions are modelled to occur only in the year following installation.




Gas GHG Reduction Measures

**Heating Zone Controls – 17.67 $tCO_2e$ potential reduction**

Setting up heating zones within buildings will ensure that unoccupied or low occupancy areas are not being heated unnecessarily, reducing heating demand.

**Installation of a BMS – 10.60 $tCO_2e$ potential reduction**

The installation of a BMS at larger sites will ensure that heating is being used appropriately and can be more easily managed.

**Central Heating Controls – 6.28 $tCO_2e$ potential reduction**

Greater control over existing central heating systems and its usage will enable the Council to reduce unnecessary energy consumption and reduce GHG emissions.

**Building Fabric Insulation – 2.12 $tCO_2e$ potential reduction**

Ensuring that buildings are properly insulated will help to increase their thermal efficiency by retaining more heat and reducing subsequent heating demand.

**Behavioural Change – 1.13 $tCO_2e$ potential reduction**

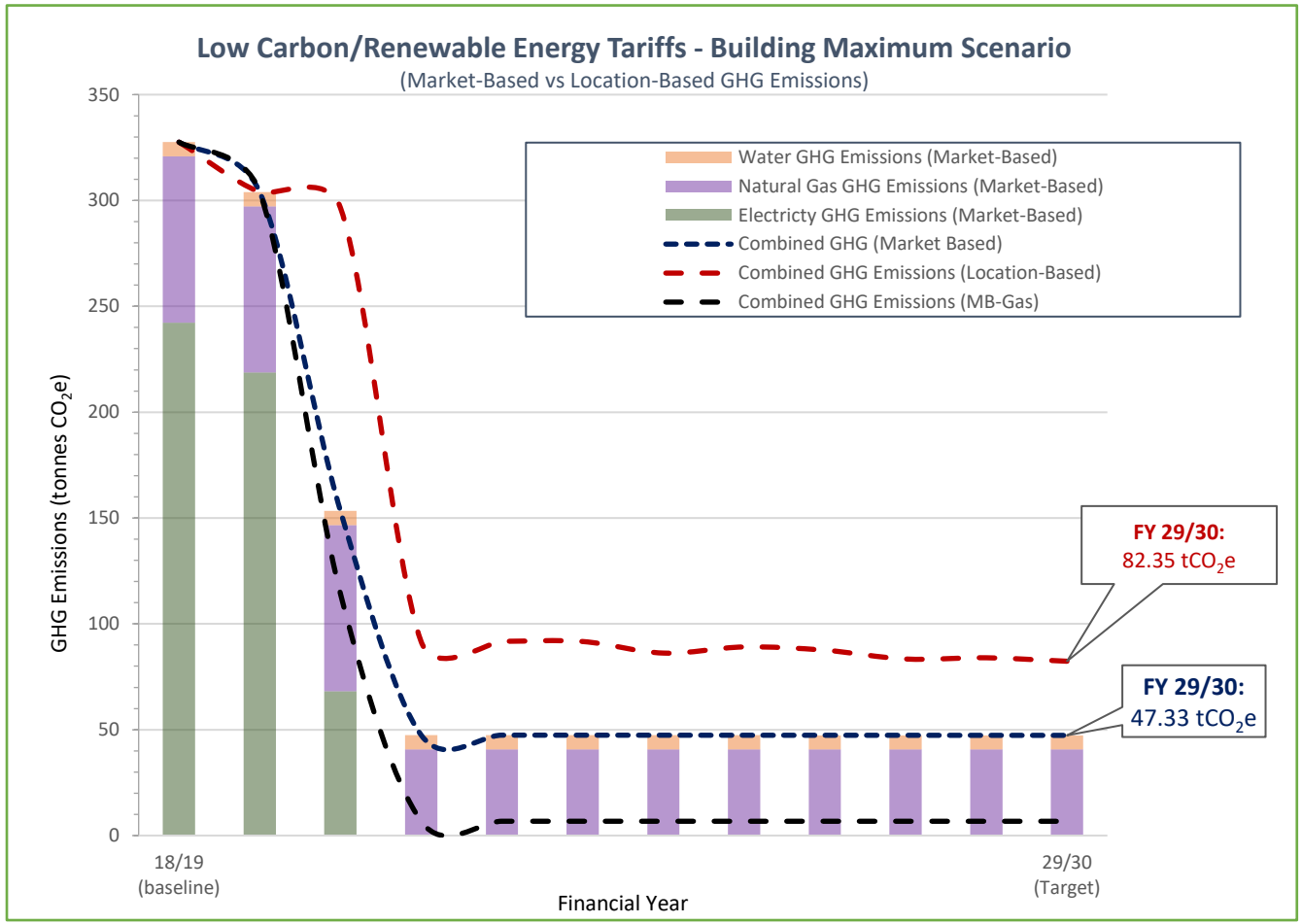
Helping employees to use heating more effectively will help to increase energy efficiency, further reduce unnecessary heating use, and contribute towards reducing the Council's GHG emissions.

## 5.3 Switching to Low Carbon/Renewable Energy Tariffs

The impact of switching to low carbon/renewable energy tariffs for the Council's property and supply portfolio in FY 2020/21, has been modelled below, based on the No Action and Building Maximum Scenarios. Modelled reduction results only relate to market-based GHG emissions rather than location-based GHG emissions (as used in other previous scenarios). To demonstrate relative GHG emissions impacts, location based GHG emissions (using National Grid averages) are also presented.

**For guidance both market and location based GHG emissions footprints should be reported in conjunction**, to demonstrate relative impacts of choosing low carbon/renewable energy tariffs.

### Building Maximum Scenario (all energy reduction measures implemented)




Modelled Scenario

Scenario models the impact of switching all electricity supplies (building and non-building) to low carbon/renewable tariffs. This switch can take place at any time subject to approval and available finance via Crown Commercial Services-the public sector energy framework provider.

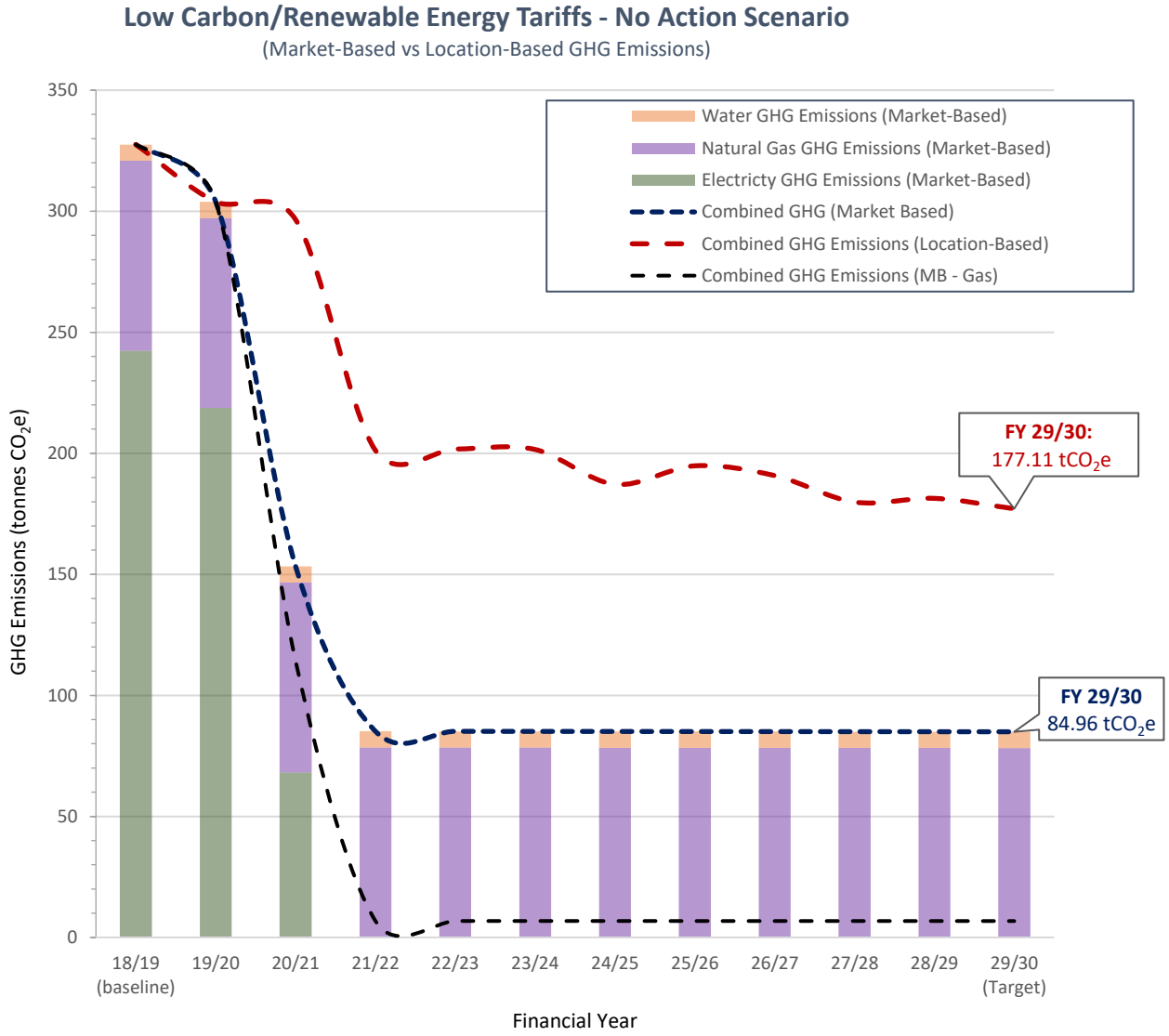
The results show combined GHG emissions footprints which include electricity, natural gas, and water consumption GHG emissions (excludes transport), based upon the modelled Energy Maximum Reduction Pathway.

The scenario assumes that the electricity tariff is backed up with Renewable Energy Guarantees of Origin (REGO) Certificates.

For FY 29/30 the Council's combined market-based GHG emissions footprint for energy use, may be up to 73% lower than the location-based (grid average) equivalent.

**Should the Council be able to procure a low carbon/renewable energy tariff for natural gas, further reductions in market-based emissions can be achieved. achieved (black dashed line).** This trajectory has been modelled based on Biogas conversion factor (and subsequent forecasting) sourced from the UK Government's Conversion Factors for Company Reporting

## No Action Scenario (excluding transport - no energy reduction measures implemented)




Modelled Scenario

Scenario models the impact of switching all electricity supplies (building and non-building) to low carbon/renewable tariffs. This switch could take place subject to approval , in 2020/21 financial year, via the public sector framework arrangement we have with Crown Commercial Services (CCS).

The results show combined GHG emissions footprints which include electricity, natural gas, and water consumption GHG emissions (excludes transport), based upon the modelled No Action Scenario.

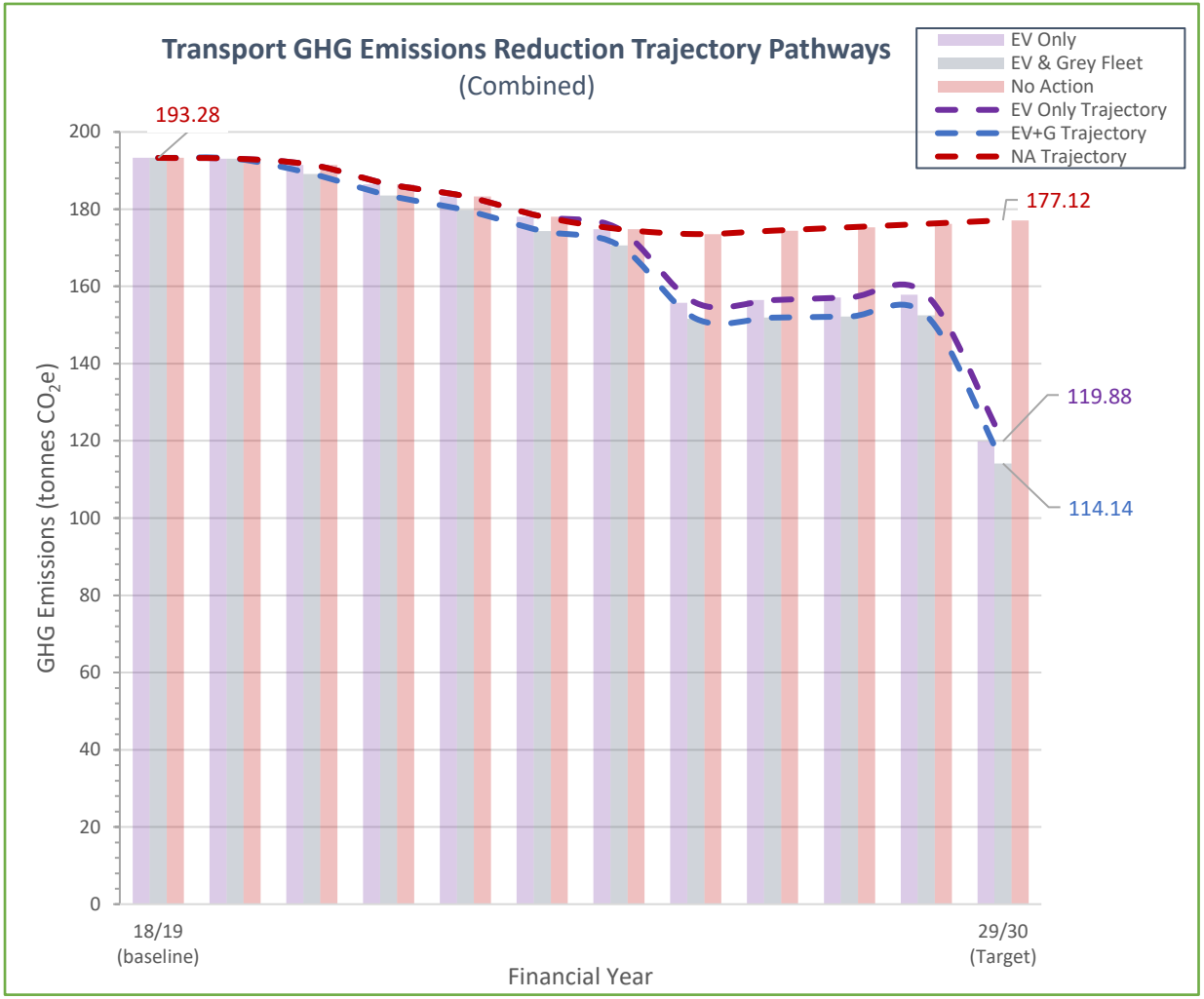
The scenario assumes that the electricity tariff is backed up with Renewable Energy Guarantees of Origin (REGO) Certificates.

For FY 29/30 the Council's combined market-based GHG emissions footprint for energy use, may be up to 52% lower than the location-based (grid average) equivalent.

**Should the Council be able to procure a low carbon/renewable energy tariff for natural gas, further reductions in market-based emissions can be achieved (black dashed line).** This trajectory has been modelled based on Biogas conversion factor (and subsequent forecasting) sourced from the UK Government's Conversion Factors for Company Reporting.

## 6 Carbon Reduction Action Plan – Council Transport

The following opportunities have been identified to reduce GHG emissions from the Council's owned vehicle fleets and well as from travel completed by employees using their own vehicles (Grey Fleet). It is recommended that these measures and their modelled benefits are used to inform ongoing carbon reduction actions in this area which are reviewed regularly to ensure the Council is on track to meet their Net Zero target.




Transport GHG Reduction Measures

**Replacing commercial vehicles with EV alternatives:**

**52.84 $tCO_2e$ Potential reduction**

Replacing the commercial fleet with EV alternatives will help the Council to significantly reduce transport GHG emissions.

The scenario shown in the chart is modelled based on a phased replacement of the commercial fleet (FY 2025/26 and FY 2029/30).

**Replacing commercial vehicles with EV alternatives and reducing Grey Fleet mileage by 5% per annum:**

**62.98 $tCO_2e$ potential reduction**

In addition, to replacing the commercial fleet with EVs the Council may be able to reduce the amount of mileage being completed by employees by encouraging teleconferencing, remote working opportunities, and behavioural change.

The model assumes that there will be a steady increase in the numbers of hybrids and EVs within the Grey Fleet, which will also help to reduce GHG emissions.

It is recommended that the Council identifies future opportunities to reduce GHG emissions from maintenance vehicles (i.e. tractors, street sweepers, diggers) by using alternative fuels or by switching to EV alternatives (where feasible).

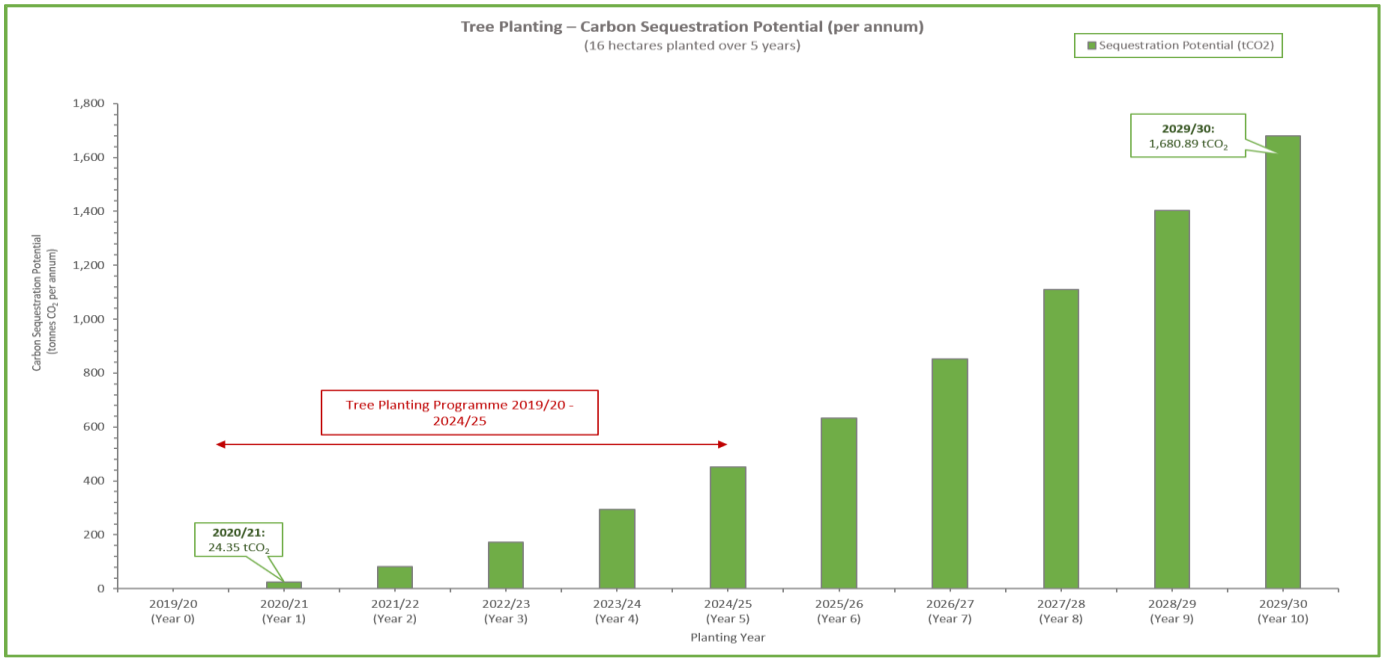
# 7 Carbon Offsetting/Sequestration

Amber Valley Borough Council is currently reviewing opportunities to offset residual GHG emissions to achieve and maintain Net Zero Carbon from 2030 onwards. The Council has begun implementing their 'Forest of the Future' programme, with the first phase (5,802 trees planted over 2.5 hectares) completed in April 2020. The Council is on track to complete the planting of 16 hectares of woodland planted across the Borough by 2025. This programme will not only help to mitigate climate change but also create a network of community woodlands to improve the local environment.

## 7.1 Amber Valley's Forest for the Future

The Forest for the Future programme aims to plant between 2,500 and 5,000 trees per year over 16 hectares of Council owned land and open spaces, across the Borough. This planting will form a network of community woodlands and orchards (where appropriate) which will provide valuable recreational and wildlife areas in addition to sequestering a proportion of the Council's GHG emissions.

### Carbon Sequestration Potential




Using the Woodland Carbon Code (a voluntary UK standard) methodology[9], planting 16 hectares of native mixed woodland species has the potential to sequester as much as 1,680 tonnes of carbon dioxide within 10 years of planting (assuming a spacing distance of 1.5m between trees and no substantial thinning). Sequestration of carbon dioxide from the atmosphere is proportionate to the rate at which trees are planted and the spaces between saplings.

The Forest for the Future programme, by 2050, depending on the rate of tree planting, has the potential to sequester up to 11,000 tonnes of carbon dioxide from the atmosphere.

*Figure 4 - Carbon sequestration potential (tonnes $CO_2$) for 16 hectares of UK native trees planted over 5 years (c.3.4 ha per annum between 2020/21 and 2024/25)*

[9] https://woodlandcarboncode.org.uk/

## Carbon Sequestration Potential and GHG Emissions – No Action Scenario

The chart below shows the modelled Annual GHG Emissions under the **'no action scenario'** (Orange Bars) against the modelled Annual Carbon Sequestration Potential (Green Bars). This chart shows that if the Forest for the Future programme is fulfilled then by 2030, Amber Valley Borough Council will be sequestering more carbon that it emits on an annual basis. For example, in 2030 the Annual GHG Emissions will be 354.23 $tCO_2e$ and the Annual Carbon Sequestration will be 1,680.99 $tCO_2$.

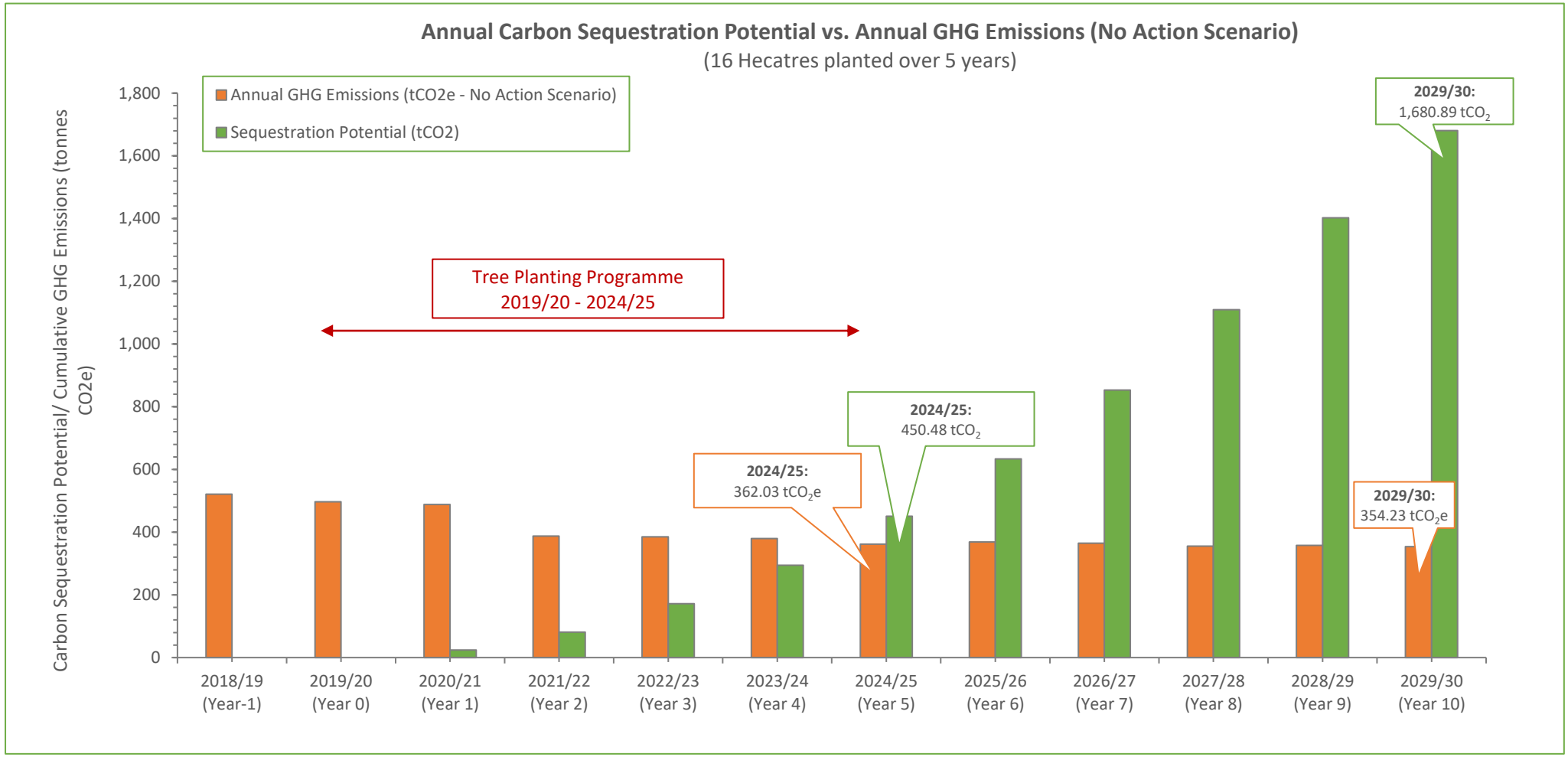



*Figure 5 - Carbon sequestration potential of planting 16 hectares of UK native trees planted over 5 years (based on No Action scenario) compared with annual GHG emissions.*

Amber Valley Borough Council should recognise that although by 2030 the Council will be sequestering more carbon than it produces; it will still be producing GHG emissions on an annual basis which have consequential impacts on the climate. The chart below uses the same information as the previous page but has been produced to demonstrate the Annual GHG Emission (Orange Bars) that are still being emitted, versus the Annual Carbon Sequestration Potential (Green Bars). Therefore, the Council should still seek to prioritise a combination of decarbonisation (from buildings and transport) and increasing renewables, along with sequestration activities.

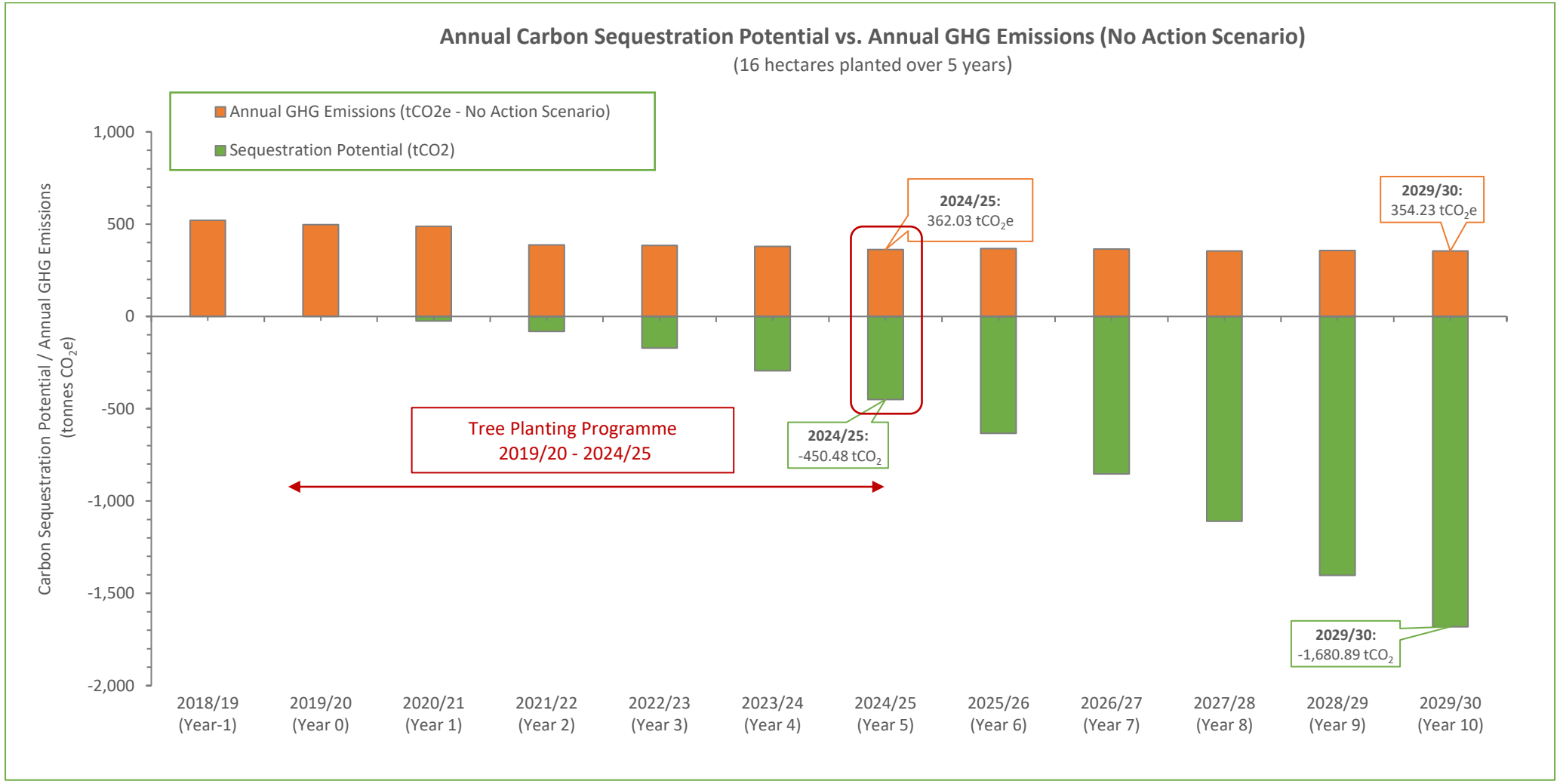



*Figure 6 - Carbon sequestration potential of planting 16 hectares of UK native trees planted over 5 years (based on No Action scenario) compared with annual GHG emissions.*

## Carbon Sequestration Potential and GHG Emissions – Combined Maximum Scenario

The chart below shows the modelled Annual GHG Emissions under the **'combined maximum scenario'** (Blue Bars) against the modelled Annual Carbon Sequestration Potential (Green Bars). This chart shows that if the Forest for the Future programme is fulfilled then by 2030, Amber Valley Borough Council will be sequestering more carbon that it emits on an annual basis. For example, in 2030 the Annual GHG Emissions will be 196.49 $tCO_2e$ and the Annual Carbon Sequestration will be 1,680.89 $tCO_2$.

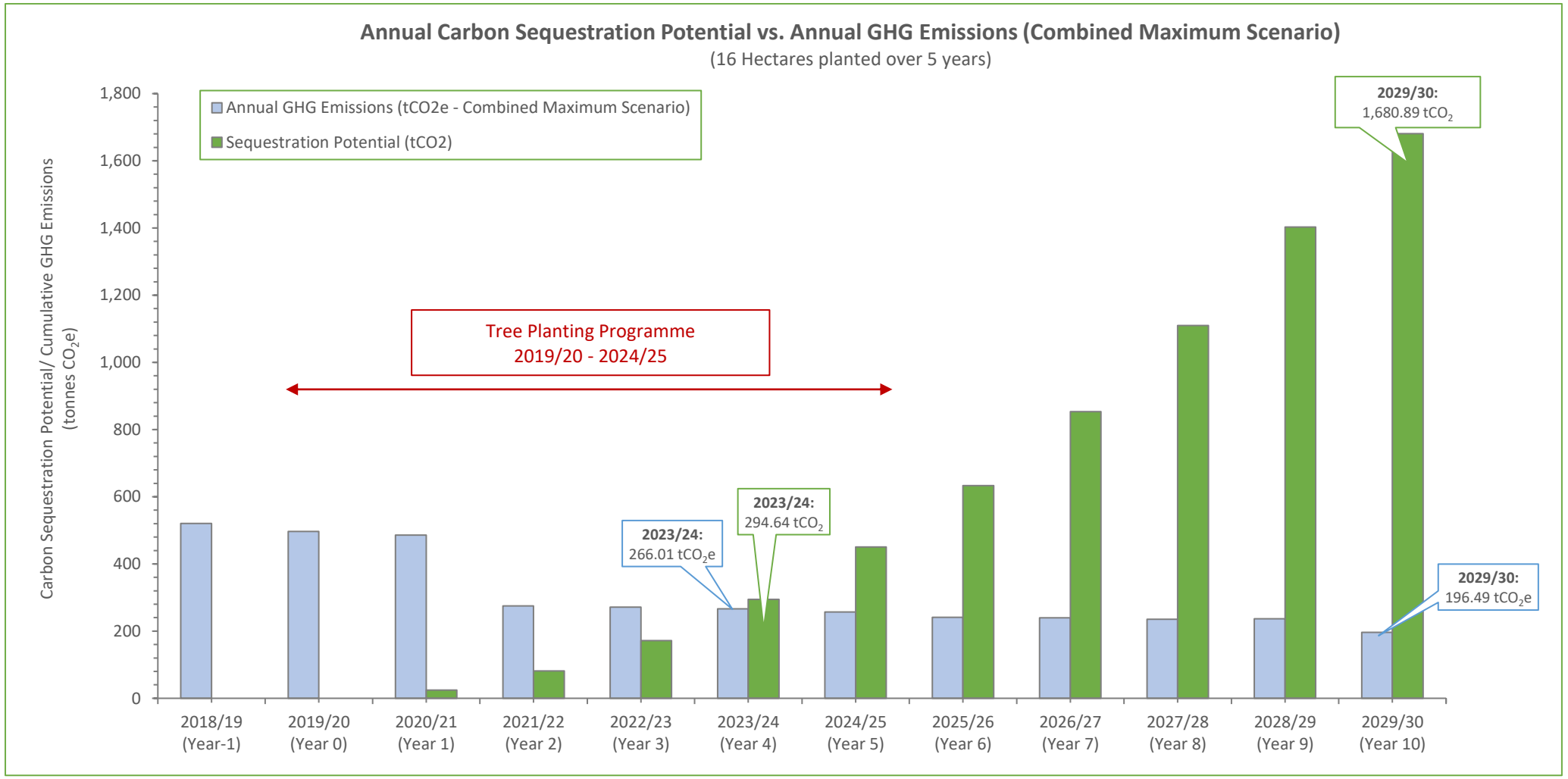



*Figure 7 - Carbon sequestration potential of planting 16 hectares of UK native trees over 5 years (based on Combined Maximum scenario) compared with annual GHG emissions.*

Amber Valley Borough Council should recognise that although by 2030 the Council will be sequestering more carbon that it produces; it will still be producing GHG emissions on an annual basis which have consequential impacts on the climate. The chart below uses the same information as the previous page but has been produced to demonstrate the Annual GHG Emission (Blue Bars) that are still being emitted, versus the Annual Carbon Sequestration Potential (Green Bars). Therefore, the Council should still seek to prioritise a combination of decarbonisation (from buildings and transport) and increasing renewables, along with sequestration activities

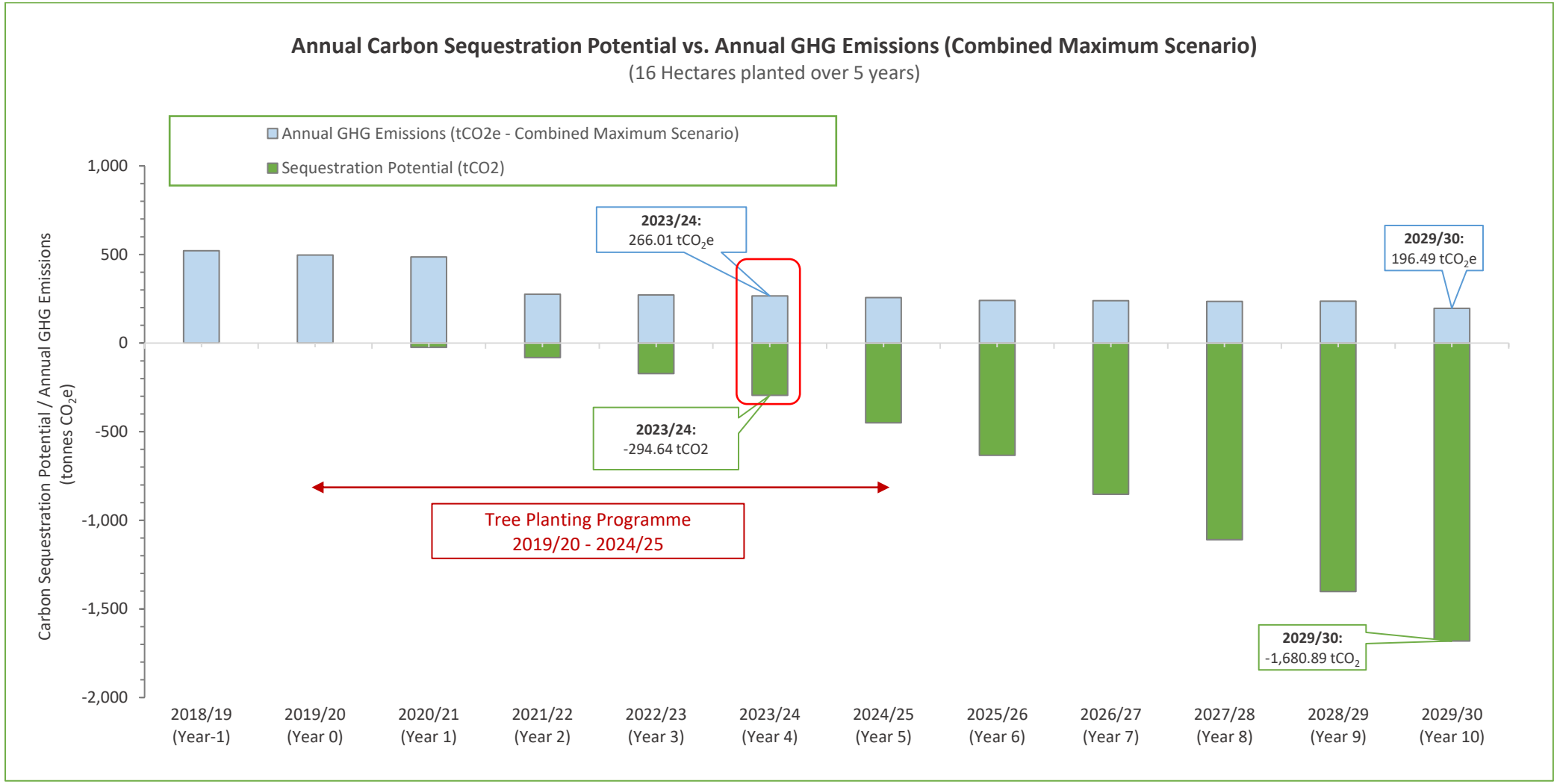



*Figure 7 - Carbon sequestration potential of planting 16 hectares of UK native trees planted over 5 years (based on Combined Maximum scenario) compared with annual GHG emissions*

## 8 Conclusion/Next Steps

Amber Valley Borough Council will determine an appropriate level of ambition to achieve their Net Zero Carbon aspiration. The Council acknowledges that there will be an appreciable amount of cumulative residual emissions resulting from their operations between 2018/19 and 2029/30. The implementation of the Council's Forest for the Future (16 hectares of tree planting) programme will mean that by 2030 the Council will be sequestering more carbon then it emits on an annual basis, however it will still be producing GHG emissions on an annual basis which have consequential impacts on the climate.

The Council should seek to prioritise a combination of decarbonisation (from buildings and transport) and increasing renewables, along with sequestration activities. It is recommended that the Council now undertakes further detailed analysis of energy reduction measures within their buildings and ascertain the most cost-effective solutions which can be taken forward. Similarly, budgets must be allocated to both building and vehicle upgrades (including electric vehicle charging infrastructure).

Amber Valley Borough Council should use either the Combined Maximum or Science Based Target scenarios as a basis to develop a more detailed action plan on emission reduction initiatives. This will help to keep the Council on track to and monitor their contribution towards the mitigation of climate change, embed resilience throughout their operations and upkeep a high level of public service over the coming years.

## Annex 1 - Terms and Definitions

**Behavioural Change (BC):** refers to a suite reduction measures based on the modification of the behaviour of employees and/or building users. Typically, these can include energy efficiency measures ('Switch it off' campaigns, better understanding of heating and ventilation controls) and changes in work practices (increased home/remote working to reduce transport emissions). To have greatest effect these measures need to be implemented with other GHG emissions reduction activities and can be re-enforced with regular training and reminders.

**Carbon Budget:** the amount of greenhouse gases that could be emitted globally before their concentrations reached dangerous levels.

**Carbon Sequestration:** describes long-term storage of carbon dioxide from the atmosphere to slow or reverse atmospheric $CO_2$ pollution and to mitigate and reverse global warming.

**Climate Emergency:** Climate Emergency refers both to the state of emergency and to a specific approach to tackling climate change, considering the scale and speed required to restore a safe climate.

**Emission Boundary:** an organisation's emissions boundary defines which emissions are included in their greenhouse gas inventory and reporting (and which are excluded).

**Fossil Fuels:** non-renewable hydrocarbons formed within the earth over thousands of years (i.e. coal, gas, petrol) that create greenhouse gases when used as a source of energy.

**Greenhouse gases (GHG) emissions:** carbon dioxide, methane, nitrous oxide, and other gases that contribute to climate change, commonly expressed in units of carbon dioxide equivalent ($CO_2e$).

**Location-based GHG Emissions Reporting** describes the standard form of GHG emissions calculation which utilises **grid average** emissions factors, based upon the average supply mixture for National Grid electricity and gas, to calculate emissions from energy use. This approach does not consider the benefits of switching energy to low carbon/renewable energy tariffs.

**Market-based GHG Emission Reporting:** market-based reporting reflects emissions from energy tariffs (electricity and gas only) that organisations have purposefully chosen. The methodology derives emission factors from sources such as energy attribute certificates (also known as REGOs), direct contracts, and supplier-specific emissions rates regarding the generation supply mixture of specific tariff or tariffs. The market-based approach allows organisations to account for the impact of switching to low carbon/renewable energy tariffs upon their GHG emissions targets. **Market-based GHG emissions can only be reported in conjunction with location-based GHG emissions**.

**Net Zero Emissions:** when an organisation or activity balances a measured amount of greenhouse gas across a defined sector(s) with an equivalent amount of carbon sequestration, offsets, or carbon credits.

**Renewable Energy Guarantees of Origin (REGO) Certificates:** energy attribute certificates which certify that specific energy tariffs are sourced from 100% renewable or low carbon sources.

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