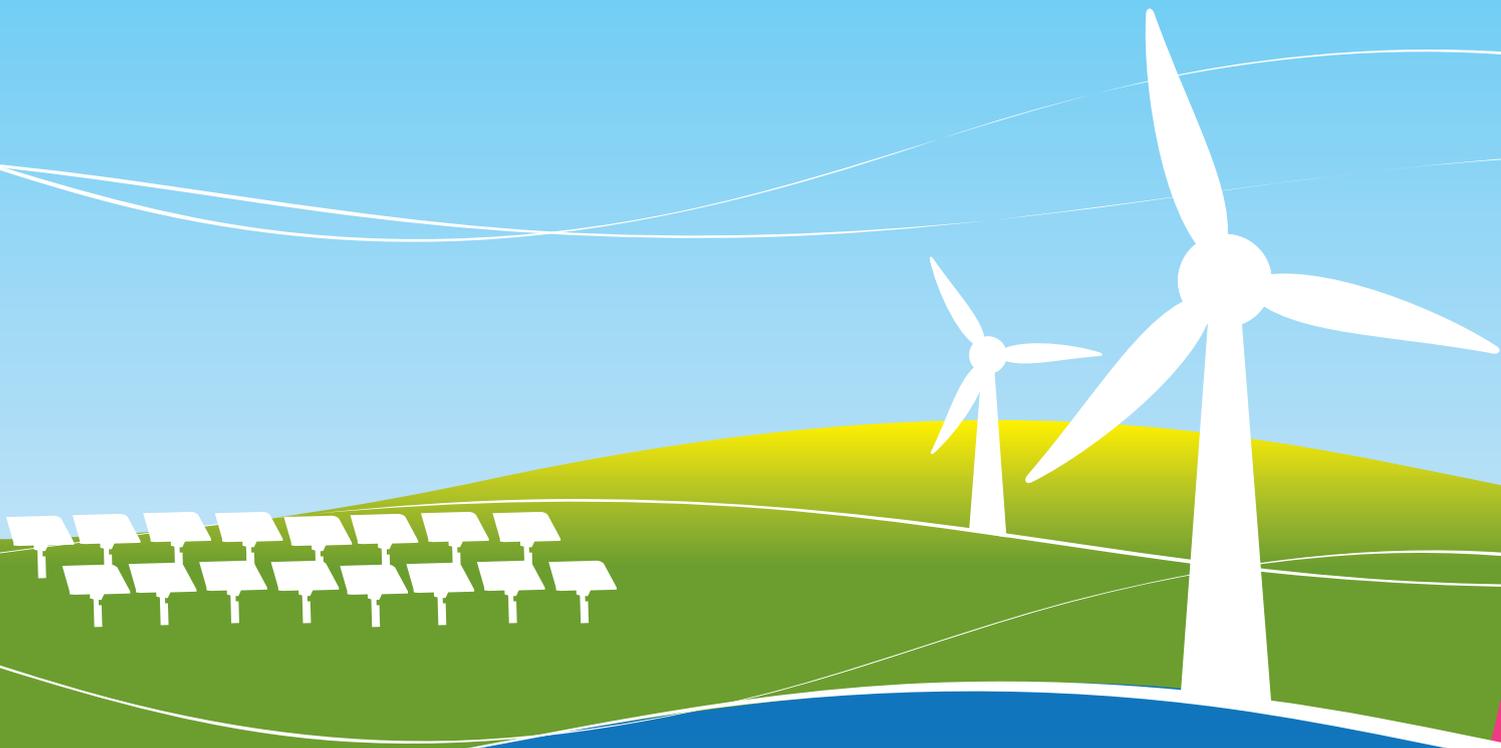




# Renfrewshire Council Carbon Management Plan 2014/15 – 2019/20



# Key

The icons below are used throughout the Carbon Management Plan to provide a quick access guide to the relevant areas of carbon intensity within the council.



Electricity



Gas



Oil



Water



Transport Fleet



Waste



Street Lighting



Car Mileage

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## Executive Summary

In the previous Carbon Management Plan covering 2009/10 to 2013/14, Renfrewshire Council stated its aspiration to achieve a reduction target of 25%, based on the 2008/09 carbon footprint baseline, by 31<sup>st</sup> March 2014. A number of factors have made this a challenging target including: the complexity of the carbon management process; demands for new skills within, and time from, existing staff in the identification, planning, resourcing and tracking of carbon reduction projects/initiatives; a changing legislative and policy framework, and the changing nature of estate and building use which has increased the energy intensiveness of the building stock.

**Overall, a carbon reduction of 28.35% was achieved.**

These factors combined to suggest that a review and revision of the original Carbon Management Plan, including reduction targets, would help Renfrewshire Council move forward constructively. A new baseline year of 2012/13 has been set; the carbon footprint for this year was calculated to be at 53,514 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) and includes electricity, gas, oil and water and wastewater in buildings, street lighting, waste disposal and transport (council owned fleet).

Renfrewshire Council has set a target to reduce its total annual carbon footprint by 19,389 tCO<sub>2</sub>e by the end of financial year 2019/20, this equates to a reduction of 36%. Reductions will be achieved through a range of projects including energy, fleet, waste, street lighting, staff travel and awareness raising initiatives.

The Energy Management Unit had capital funding of £2.56M approved by Finance for energy reduction projects in 2009 to help achieve the 25% carbon reduction target in buildings by 2013/14. To date these funds have been invested in a range of initiatives such as boiler upgrades, voltage optimisation, insulation, boiler controls, lighting upgrades and renewable energy projects. This Carbon Management Plan will continue to focus on the following areas:

- Upgrade to Efficiency – continuing to upgrade inefficient buildings and replace inefficient appliances.
- Build Better – all new buildings to be sustainably designed and resource efficient. Further details are included in **Appendix A** (Renfrewshire Councils Sustainable Building Design Document).
- Move to clean power – continue with the purchase or generation of electricity from renewable sources.
- Fuel efficient transport – continued investment in cleaner vehicles.
- Waste – increase recycling rates from domestic properties and reduce the quantity of waste being sent to landfill.
- Street lighting – undertake a business case for the retro fit and column replacement of inefficient street lighting to LED equivalents.
- Procurement – continue with, and expand the criteria for the procurement of products that use less energy, last longer and are good for the environment.
- Awareness – create a culture of awareness across the organisation through all the areas covered under this Carbon Management Plan.

The Project Sponsors for this Carbon Management Plan are the Chief Executive and the Council Leader, who will be assisted in its delivery by the Energy Team Leader, Amenity



Services Manager, Supervisory Engineer (Light & Asset Management) and the Transport Manager, amongst others. Renfrewshire Council is aiming to introduce Green Internships and Green Trainees to enhance communication and awareness-raising by actively promoting and monitoring environmental projects both locally and among wider stakeholders.

This Carbon Management Plan is viewed as a 'live' document and it is envisaged that there may be changes on an annual basis as Renfrewshire Council's estate changes and planning assumptions become a reality. To ensure that it remains 'fit for purpose' to deliver targeted carbon savings, this document will be reviewed on an annual basis. This process will be overseen by the newly formed Climate Change Working Group and coordinated by the Energy Team Leader. A digital copy of the Plan will be available on the internet for public access.

The annual review will examine a number of areas including: progress towards overall carbon reduction target; progress with identified carbon reduction projects; financial savings achieved as a result of carbon reduction projects; wider benefits; stakeholder engagement and Risk Register. The review will be presented to the Property Services (SMT). The SMT will in turn present this to the Planning & Property Policy Board and Greener Thematic Board.

# Foreword from the Project Sponsors

Climate change is described by many as the biggest challenge humankind has ever faced. In order to avoid the worst impacts of a changing climate we all need to change our behaviour to cut energy and resource use and so reduce emissions of climate changing gases. As an energy user and community leader, Renfrewshire Council has an important role to play by reducing our own emissions and setting an example for others, including our Community partners to follow. Renfrewshire Council is a Council known for its Leadership. This, our third Carbon Management Plan ensures that this trend continues. We are the first Local Authority in Scotland to sign up to our third Carbon Management Plan.

By working in partnership with Resource Efficient Scotland, the Council has developed this Carbon Management Plan, which will guide us in reducing our emissions from building use (electricity, gas, oil & water), waste management, fleet transport and street lighting. The plan puts in place a governance system and projects that will make us more aware of the consequences of our decisions and allow us to significantly reduce our impact on the environment.

This is an ambitious Plan that will reduce Council energy use, reduce climate changing emissions and have a positive impact on our financial management. Our low carbon vision is for Renfrewshire to become a leader in carbon management and for us all to work together - organisations, individuals and communities to create a greener, cleaner, safer environment for all.



David Martin  
Chief Executive



Councillor Mark Macmillan  
Council Leader

## Foreword from Resource Efficient Scotland

On behalf of Zero Waste Scotland, which delivers Resource Efficient Scotland programme for the Scottish Government, I commend the commitment of Renfrewshire Council in their commitment to improving their resource efficiency throughout their operations. These positive actions are demonstrated in this revised Carbon Management Plan which builds upon the impressive carbon reduction achievements that the Council has already delivered.

There are clear business benefits of using fewer resources and emission reduction and we look forward to supporting the organisations in the implementation of resource efficiency measures. Renfrewshire Council is leading the way in Scotland with their integrated approach to carbon reduction and can be viewed as an exemplar in this area. In addition to a very challenging new carbon reduction target the organisation has set individual reduction targets for electricity, gas, waste, water and transport fuel.

This updated Carbon Management Plan details how Renfrewshire Council Police Scotland will achieve savings of up to 36% by 2019/20 based on the 2012/13 baseline. By implementing these savings it is anticipated that significant cumulative financial savings can be made.



Iain Gulland,  
Director of Zero Waste Scotland

# 1 Introduction

## 1.1 General

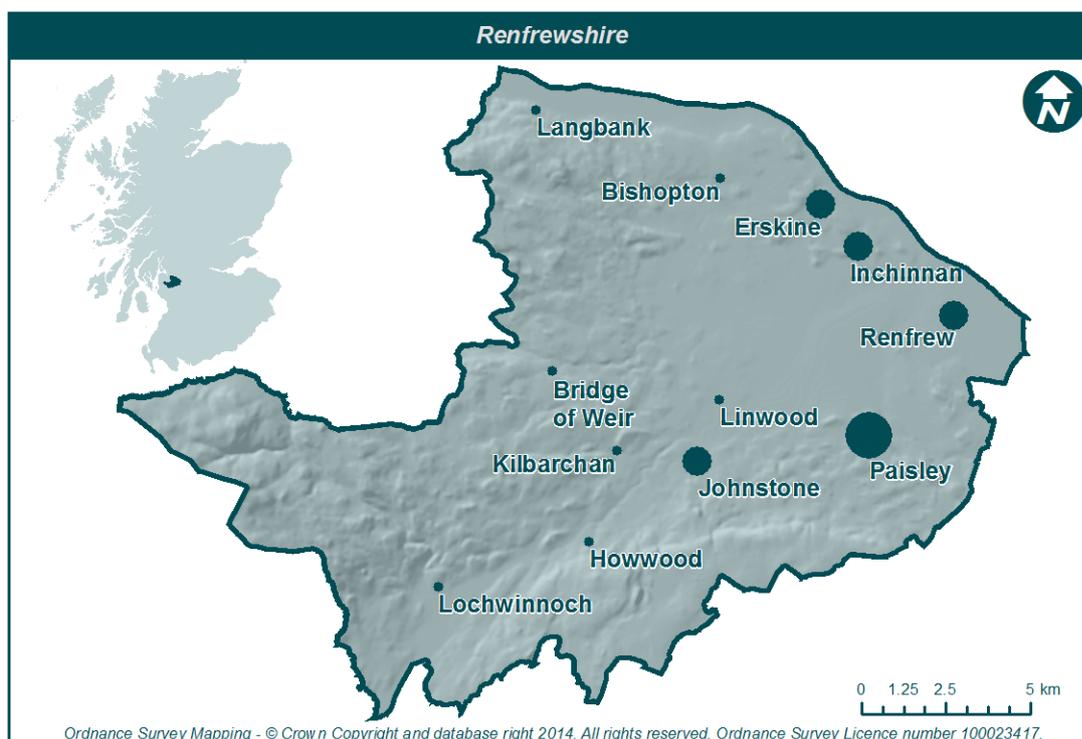
Renfrewshire Council began their Carbon Management Plan journey in 2002, with the second Carbon Management Plan signed off in 2010. A review undertaken indicates that the following were reasonably well established: the original carbon footprint; the process for managing carbon emissions, and project list to achieve carbon savings. However, the review also acknowledged that, strengthening of progress tracking and further project opportunity development would support ongoing efforts.

Renfrewshire Council therefore recognises that it has reached a point in its carbon management maturity where the decisions it makes in this current plan period with respect to future funding of carbon management reduction measures will have a significant impact on the organisation's ability to meet its stated reduction targets.

## 1.2 Background to the Organisation

Renfrewshire Council was created in 1996 following the break-up of Strathclyde Regional Council. Renfrewshire is the ninth largest Council area in Scotland and is home to a population of 170,000 people, which is 3% of the total Scottish Population. Renfrewshire Council has a variety of Public Buildings, which number in excess of 260 and include education establishments, libraries, offices, recreational buildings etc.

The main areas of population are shown in the map in **Figure 1**.



**Figure 1 – Main areas of population in Renfrewshire**

## 1.3 Renfrewshire Council's Performance on Carbon Management

With Renfrewshire Council's reporting obligations through the Carbon Reduction Commitment Energy Efficiency Scheme (CRC) and previous Carbon Management Plan's,

there is already a well-established process for measuring and monitoring carbon emissions and a project list to achieve carbon savings.

The key issues facing the organisation are changes to the operational estate and increasing use of energy consuming equipment and facilities; both of which have significant impacts on future carbon emissions. Renfrewshire Council's Climate Change Working Group will continue to take measures to adapt the Plan to any potentially significant impacts on achieving the agreed Carbon Management Plan targets.

A further challenge which is beginning to impact on the organisation is the future of the Carbon Reduction Commitment Energy Efficiency Scheme (CRC); this Scheme currently results in additional costs (£296,000 for financial year 2012/13 & £268,000 for 2013/14) associated with the organisation's carbon emissions. Implementation of this Carbon Management Plan aims to deliver year-on-year benefits by realising cost savings and minimising future CRC exposure. The existing CRC covers many of our operational properties and during the lifetime of this Plan, street lighting will also be included, which will add an additional CRC cost of £130,000 per annum based on the 'Business As Usual' (BAU) model. A cost increase from £12 per tonne of carbon to £16.40 per tonne is also due for implementation during the lifetime of this Plan. This will also result in significant cost increases.

One of the key issues in setting a reduction target is the ability to forecast future footprints to enable the setting of a target which is both realistic and achievable. As an example, a 10% reduction on a year 1 footprint of 10,000 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) (1,000 tCO<sub>2</sub>e saved to achieve the target figure of 9,000 tCO<sub>2</sub>) is equivalent to a 25% reduction on a year 5 footprint of 12,000 tCO<sub>2</sub>e (3,000 tCO<sub>2</sub>e saved to achieve the target figure of 9,000 tCO<sub>2</sub>e).

As noted, any future footprint forecast needs to reflect anticipated changes in the size and use of the estate (e.g. increases in energy consumption due to refurbished offices) and its use. This Business as Usual scenario then provides a clearer picture to set a target that is achievable, based on a practical project list. Misinterpretation of the BAU trajectory can result in masking the savings achieved as the footprint grows faster than it can be reduced.

Renfrewshire Council, including senior management, staff and partners, recognises the true value of the carbon management process and hence the development of an accurate BAU and annual carbon footprints that reveal the true savings being achieved and how these are mitigating against a constant flux.

In the previous Carbon Management Plan published in 2010, Renfrewshire Council set a reduction target of 25% based on a 2008/09 carbon footprint baseline of 43,899 tCO<sub>2</sub>e and emission factors available at the time; this equated to a target footprint of 32,924 tCO<sub>2</sub>e. The 2008/09 footprint boundary included emissions from: electricity, gas and oil consumption in buildings; transport (fleet) and street lighting.

A number of factors have made this a challenging target. Despite Renfrewshire Council's good history of implementing energy efficiency measures, the increasing demands on staff time associated with the identification, planning, resourcing and tracking of carbon reduction projects/initiatives have meant that they were effectively developing new skill sets and increasing their knowledge base whilst still continuing to perform existing duties.

Furthermore, the changing legislative and policy framework has meant that the drive to meet the stated Plan carbon reduction target has often been overshadowed. Finally, energy intensiveness within buildings is increasing, estate is changing and there is a constant drive to improve service delivery.

These factors have combined to suggest that a review and revision of the original Carbon Management Plan, including targets, would help the organisation move forward constructively.

## 1.4 Plan Structure

This Carbon Management Plan details the Renfrewshire Council's strategy for reducing carbon emissions over the next six years and sets out a clear timetable as well as identifying the responsibilities and internal resources required to deliver the programme.

The main objectives of the plan are:

- To continue to take a whole business approach so that carbon management is adopted as a key objective. Key stakeholders will continue to be appointed to ensure that carbon reduction is fully integrated into the organisation's culture.
- To adopt revised targets for the measurable reduction of carbon emissions and to deliver these reductions.

In order to ensure that there is effective and ongoing ownership of the programme, it is important to define a governance structure. The Chief Executive and Council Leader, as Project Sponsors, will be responsible for implementation of the plan. The Carbon Management Plan will be regularly reviewed and updated, and information on the organisation's performance will be published on an annual basis.

This Plan contains the following Sections:

**Emissions Baseline and Projections** - this details the results from the revised carbon footprint baseline and includes a clear definition on the organisation and operational boundaries applied, and the data sources and availability. It also discusses the BAU scenario and Value at Stake.

**Carbon Management Projects** - this outlines the carbon reduction projects currently being implemented (and thus captured in the most recent carbon footprint) and those planned future projects, and evaluates likely success in achieving the revised reduction targets.

**Carbon Management Plan Financing** - this describes the financial support available for carbon management within the organisation.

**Management and Delivery** of the Carbon Management Plan defines the management structure in place to ensure the Plan's success.

The final section on **Progress Reporting** outlines how the carbon management progress will be monitored measured and communicated both internally and externally.

## 2 Carbon Management Strategy

### 2.1 Context and Drivers for Carbon Management

The organisation faces a complex set of drivers which set the context for carbon management. Crucially, Renfrewshire Council recognises that these cannot and should not be viewed in isolation from each other or the principle goal of continuously minimising its environmental impact whilst maximising its contribution to society and the economy.

Reducing carbon emissions should also deliver financial benefits to the authority from reduced resource consumption and also mitigate the risks associated with increases in energy prices and levies such as the CRC.

The following list covers the key carbon drivers for Renfrewshire Council:

- Scottish Government Climate Change targets to reduce emissions of GHGs and increase energy efficiency
- UK & European targets to reduce GHG emissions and increase energy efficiency
- Rising energy costs
- Principle that investments in carbon reduction are generally associated with commensurate reductions in future expenditure
- The need to eliminate waste of resources and to increase efficiency
- The organisation's own carbon management targets
- Depletion of the world's finite resources

#### 2.1.1 Climate change

Greenhouse gases (GHGs) produced by human activity, also referred to generically as 'carbon emissions', are a major cause of climate change due to their effect on global temperatures. The scientific evidence for climate change is well established. The Intergovernmental Panel on Climate Change, the leading international body for the assessment of climate change published an updated assessment of the current state of scientific knowledge relevant to climate change in 2013 and concluded that climate change is unequivocal and that human influence is clear<sup>1</sup>.

The Climate Change (Scotland) Act<sup>2</sup> set out a statutory framework for GHG emissions reductions in Scotland with a reduction target of at least 80% for 2050 and an interim 42% reduction target by 2020, both based upon the 1990 base year. In 2012, Scottish GHG emissions, including international aviation and shipping, were 52.9 million tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e), 0.8% higher than in 2011.

#### 2.1.2 Resources

With material scarcity and energy security becoming increasingly important priorities, a circular economy is an alternative to a traditional linear economy of make, use and dispose. In a circular economy the aim is to keep resources in use for as long as possible, extract the

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1 IPCC (2013) Fifth Assessment Report <http://www.ipcc.ch/>

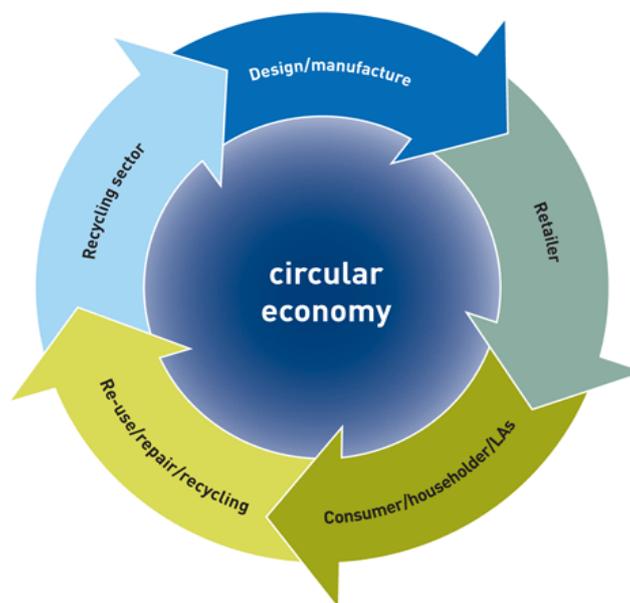
2 Climate Change (Scotland) Act, 2009

maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

This model however is not simple to achieve - it requires product life-cycle thinking across supply chains, production processes and consumers. But by turning the challenges identified into opportunities and then actions, a circular economy can be developed that delivers significant cost and environmental savings as shown in **figure 2**.

The most significant circular economic outcomes in each Product Loop involve:

- Keeping products in use for longer (through design for longer life, redeployment, reconditioning etc.).
- Ensuring that unwanted products are returned to the economy for re-use.
- Developing opportunities for closed-loop recycling of materials for high value applications.



**Figure 2 – A circular economy**

### 2.1.3 Legislative drivers for carbon management

There has been increasing amounts of legislation introduced in the UK and Scottish Parliaments which aim to address the issue of climate change, greenhouse gas emissions, and sustainability.

The UK Climate Change Programme (launched in 2000) set a target of 20% reduction by 2010 and 60% reduction by 2050. The Climate Change (Scotland) Act 2009 set legally binding targets to reduce Scotland's GHG emissions by 42% by the year 2020 and by 80% by the year 2050, both based on 1990 emissions. Significant carbon savings will be required across all sectors in Scotland including the public sector. The Scottish Climate Change Act created duties for public sector organisations in Scotland to report and reduce their carbon emissions. Scottish Ministers are also committed to the promotion of renewable energy in Scotland. They set a target that the equivalent of 100% of Scotland's electricity needs are met from renewable sources by 2020, with an interim target of 50% by 2015, along with an 11% heat demand target and 500MW of community and locally-owned renewable energy by 2020.

The UK Government has placed an emphasis on the public sector setting a leading example. Public sector leadership will be critical to the achievement of the Government's climate change objectives.

The Scottish and UK government have led the European and international community in the creation of legislation to reduce carbon emissions.

A number of legislative instruments such as the Climate Change Levy (CCL) and Carbon Reduction Commitment – Energy Efficiency Scheme (CRC) have been introduced by the UK Government, designed to encourage organisations to reduce emissions. The CRC introduces carbon trading to energy intensive organisations who meet a certain criteria. The EU Energy Performance of Buildings Directive (EPBD) was transposed into Scottish law in 2008 and has placed an obligation to evaluate energy usage for inclusion in Energy Performance Certificates (EPC's) to be displayed in all public buildings meeting certain criteria. The 2010 recast Directive also includes provisions to include nearly zero energy requirements for new public buildings within 8 years or less while Scottish and UK Sustainable Construction strategies aim for zero energy buildings in the same time-frame. This, allied to recent changes in Buildings Regulations, will require the organisation to be proactive in terms of building design, construction and use. Renfrewshire Councils 'Sustainable Building Design Document' (**Appendix A**) provides information for the Councils 'Design Teams' to adopt to minimise the carbon footprint of any new builds and refurbishment project. This, along with the Councils 'Building Energy Management Controls' specification document (**Appendix B**) will help ensure that once complete, any new builds/refurbishments will be properly controlled to minimise their energy usage. New and existing buildings will adhere to the recommended temperature set points and heating season where possible (**Appendix C**).

The Renewable Heat Incentive (RHI) can play a key role in reducing our dependency on natural gas through a greater uptake of biomass. The economy of Renfrewshire can benefit by increasing the use of biomass energy across Renfrewshire. This will help cut carbon emissions across the Council and will secure a local source of energy. The local economy will be strengthened through local contractors increasing their skills in installation and maintenance of biomass boilers, and employment in new skills through apprenticeship schemes in biomass engineering. Woodland owners and managers will see an increased demand for wood for fuel, bringing them a better return from their woodlands. Biodiversity will benefit from the increased area of woodlands coming into sustainable management across the Council. This Plan provides a platform to promote biomass energy in providing a local, sustainable, cost-effective and secure source of energy. It will maximise benefits to residents, business and the environment with the following aims:

- Developing a local Green Economy by supporting and expanding biomass related industry.
- Supporting Sustainable Forestry by bringing unmanaged woodlands back into management by providing a viable source of income.
- Increasing the demand for biomass energy, ensuring we meet national Renewable Energy targets.
- Increasing the supply of local biomass to ensure a stable, reliable and Un-interrupted energy supply.

This present strategy document will aid the delivery of key sustainability and estate management programmes in a carbon efficient and sustainable manner.

Some of the main legislative drivers affecting the organisation are shown in **Figure 3** and **Appendix D**. However, the list is not definitive.



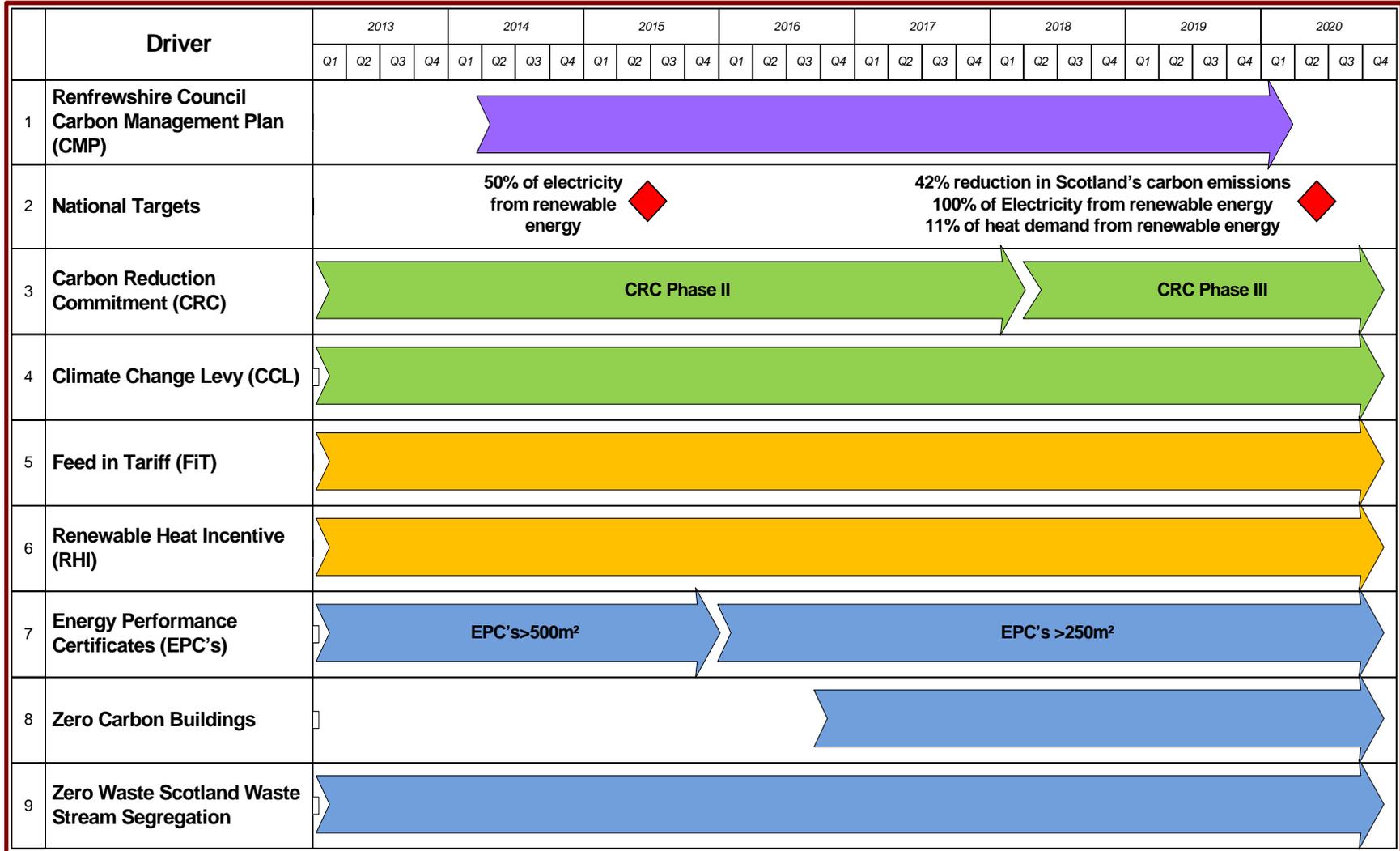


Figure 3: Key Legislative Drivers

## 2.1.4 Other drivers for carbon management

While reducing the financial and legal risks posed by various legislative requirements is a significant driver behind the carbon management programme there are other factors supporting the need for improving energy efficiency and reducing carbon emissions.

**Cost saving:** The Stern Review<sup>3</sup> estimated that if no action is taken, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year.

The case for carbon reduction is strengthened by the financial constraints facing all organisations. Funding cuts provide significant incentive to reduce resource consumption and therefore carbon emissions. A sensitive world economy, limitations on energy supply and a more challenging regime in terms of carbon taxation will drive energy prices above general inflation for the foreseeable future. This is particularly significant given the large proportion of Renfrewshire Council's carbon emissions (55%) that are derived from gas, electricity, oil and water in buildings.

**Reputational benefit:** Reducing Renfrewshire Council's carbon emissions will demonstrate its commitment to good carbon management and sustainability and will enable the organisation to act as an exemplar to encourage others. In addition, a commitment to sustainability is increasingly linked to an organisation's reputation with better sustainability credentials and good carbon management enhancing the organisation's reputation.

**Improved staff satisfaction:** A number of studies have identified a correlation between a focus on sustainability and staff satisfaction (particularly where staff are fully involved) and this can lead to improved 'productivity' or morale.

**Improved engagement with key stakeholders:** The organisation's key stakeholders, including staff, Councillors and the local community, are increasingly focusing on sustainability. Renfrewshire Council's engagement and enhanced commitment and leadership with this agenda will improve its relationship with these stakeholders. Renfrewshire Council will seek to become an exemplar of good practice and so engage others in making a positive contribution to sustainable development.

## 2.2 Renfrewshire Council's Low Carbon Vision

Renfrewshire Council began its commitment to sustainability in early 2002 when the Energy Management Unit was formed.

The organisation has developed two comprehensive Carbon Management Plans with targets and timetables for substantially reducing greenhouse gas emissions and improving its impact on the environment. The core themes within this Plan include:

- Upgrade to Efficiency – continuing upgrading inefficient buildings and replacing inefficient appliances.
- Build Better – all new buildings should be sustainably designed and resource efficient. Further details are included in **Appendix A**.
- Better control – all buildings will adhere to the recommended temperature set points listed in **Appendix C**. Where practical, this will be facilitated with the help of a Building Management System that meets the Building Energy Management Controls specification document in **Appendix B**.

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<sup>3</sup> The Stern Review: The economics of Climate Change (2006). N Stern  
[www.hm-treasury.gov.uk/sternreview\\_index.htm](http://www.hm-treasury.gov.uk/sternreview_index.htm)



- Move to clean power – continue with the purchase or generation of electricity from renewable sources.
- Fuel efficient transport – continued investment in cleaner vehicles.
- Waste – increase recycling rates from domestic properties and reduce the quantity of waste being sent to landfill.
- Street lighting – undertake a business case for the retro fit and column replacement of inefficient street lighting to LED equivalents.
- Procurement – continue and expand the criteria for the procurement of products that use less energy, last longer and are good for the environment.
- Awareness – create a culture of awareness across the organisation through all the areas covered under this Carbon Management Plan.
- Green Energy Internship and Trainees Programme– create training opportunities and a graduate programme for 2 internship and 3 school leavers.
- Staff Travel – reduce staff mileage when on Council Business.

Capital funding for carbon reduction measures will be decided on a business case from each of the service areas covered under the Carbon Management Plan.

The objectives listed create a number of opportunities and challenges. Critical to the success of the Carbon Management Plan is the understanding and buy-in of staff across the Council. An effective communication plan will facilitate this, and is an important element of maintaining the profile of the Plan throughout the six year lifecycle. The following objectives have been set for this strategy:

- To raise awareness of the Carbon Management Plan.
- To obtain buy-in to the Plan from stakeholders.
- To inform staff of progress and key milestones.
- To ensure there is an opportunity to contribute to the project Plan consultation and feedback.
- To champion a low-carbon approach to the wider community by publicising successes.

A range of communication channels have been defined and will be used as appropriate for the audience/message. The channels used and overall effectiveness of the communications strategy will be reviewed regularly during the project to determine whether the objectives are being attained; this shall include: Facebook, Twitter, Council publications, the Council website and the intranet.

To further enhance communication and awareness raising, the organisation will look to introduce Green Champions who will actively promote and monitor environmental projects both locally and across the wider community.

## 2.3 Strategic Themes

There are two primary objectives of the Carbon Management Plan: to achieve a reduction in carbon emissions and to embed carbon management within the culture of Renfrewshire Council. In order to achieve these objectives, Renfrewshire Council will continue to build on the key themes identified in the 2009/10 to 2013/14 Carbon Management Plan. The



organisation's strategy and implementation plan will therefore need to address the following specific areas.

### 2.3.1 Energy & Water

Energy use in buildings (electricity, gas, oil and water) is by far the most significant source of carbon emissions, contributing 55% of the organisation's total footprint, as calculated. Rising fuel costs and legislative drivers such as the CRC combine to make this a priority area for action.

The Energy Management Unit will continue to focus on increasing the energy efficiency of the estate by installing up-to-date technologies, including renewables where practicable, and engaging with staff and other stakeholders.

In addition to Planned Preventive Maintenance which ensures water loss from infrastructure is minimised, the organisation continues to invest in water conservation measures which reduce both consumption and waste water production.

*Strategic Target:*

- To reduce energy and water carbon emissions in buildings by 15% by 2019/20.

### 2.3.2 Transport

The organisation continues to strive to reduce carbon emissions arising from transport through fleet rationalisation and the purchase of more efficient vehicles.

*Strategic Target:*

- The Carbon Management Plan aims to reduce the CO<sub>2</sub>e associated with Fleet vehicles by 20% by 2019/20.
- The Carbon Management Plan aims to reduce Staff Mileage by 5% by 2019/20.

### 2.3.3 Waste

The organisation continues its commitment to reducing the quantity of waste going to landfill. Community Resources have a responsibility for promoting the utilisation of the available recycling facilities within Renfrewshire. Council operated recycling facilities collect paper, cardboard and glass collection. These facilities divert materials from landfill into the recycling stream and include:

- Underwood Road, Paisley
- Barrhill Road, Erskine
- Haining Road, Renfrew
- Miller Street, Johnstone
- Middleton Road, Linwood

*Strategic Targets:*

- To comply with the Scottish Government's targets for recycling and waste reduction strategies.
- To reduce CO<sub>2</sub>e associated with waste by 89% by 2019/20.
- To comply with Wrap recycled content and waste minimisation targets in construction projects in public buildings.



### 2.3.4 Street Lighting

The organisation continues to strive to reduce carbon emissions arising from street lighting. The proposed roll out of LED street lights will significantly reduce our consumption.

*Strategic Target:*

- To reduce street lighting carbon emissions by 34% by 2019/20.

### 2.3.5 Procurement

The prudent use of natural resources is still a cornerstone of carbon management in the organisation. Renfrewshire Council's electricity in buildings is supplied under a 100% green electricity tariff from its utility suppliers.

All new builds are tasked with achieving a minimum B Energy Performance Certificate (EPC) rating and major refurbishment projects to meet a minimum C rating.

On the wider procurement front, the Corporate Procurement Unit has access to contracts negotiated by Procurement Scotland<sup>4</sup> and other external bodies for a wide range of goods and services procured on a collaborative basis. All of these bodies have sustainability as a central focus of their procurement process, and increasingly environmental factors are featuring within the evaluation criteria applied in awarding contracts. Further guidance on sustainable procurement in Scotland is available from Zero Waste Scotland<sup>5</sup>.

"One off" purchases for equipment and tangible goods always takes account of the whole life cost of the goods which ensure a healthy evaluation weighting is given to long warranty and maintenance contracts, ongoing running costs and the use of consumables.

*Strategic Targets:*

- To procure a minimum of 70% of all electricity from green tariffs.
- All new builds to achieve a minimum EPC rating of B and major refurbishment projects to meet a minimum EPC rating of C, where financially possible.

### 2.3.6 Communication

Energy Awareness Campaigns are designed to drive awareness of the benefits of carbon reduction; with the objective of changing the behaviour of all staff. The campaign will use print and electronic media, as well as talks and roadshows, to promote the message across the organisation. It is anticipated it will contribute by addressing the following:

- Awareness raising amongst staff in relation to basic energy-saving, waste reduction and efficient driving practices in daily life.
- Use of equipment in a sustainable way, preserving the lifespan of our current facilities and reducing our expenditure.
- Concurrent financial benefits of energy saving; financial benefits will further allow improvement of facilities, enhancing the organisation's reputation.
- Creation of an enduring culture change such that good practice will be easily adopted by all new staff.
- Promote staff feedback to widen the debate around carbon management.

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4 <http://www.scotland.gov.uk/Topics/Government/Procurement>

5 [www.zerowastescotland.org.uk/scotlandprocurement](http://www.zerowastescotland.org.uk/scotlandprocurement)



Key to the delivery of the carbon management programme is the development of the 'Green Champion' network that will ensure that efforts to reduce carbon emissions will be ongoing.

## 2.4 Carbon Reduction: Targets and Objectives

The crux of the review process is the setting off a carbon reduction target for the lifespan of this current Carbon Management Plan.

**Renfrewshire Council will reduce its calculated 2012/13 baseline carbon footprint by 19,389 tonnes of carbon dioxide equivalent by the end of 2019/20.**

This represents a reduction of 36% based on the total carbon footprint of 53,514 tCO<sub>2</sub>e emissions for the year 2012/13 as shown in **Table 1**. This 2012/13 carbon footprint baseline covers consumption of electricity, gas, oil, water and wastewater in buildings, transport (fleet), street lighting and waste. The 36% target will be met through the implementation of a range of projects and awareness raising initiatives.

	2012/13 Baseline (kW/Cubic Meters/Litres/To nnes/Miles)	2012/13 Baseline CO2 (tonnes)	Proposed CO2 Savings over CMP (tonnes)	2019/20 CMP Target (tonnes CO2)	% Reduction per Section
Electricity (buildings)	25,193,669	12,505	1,402	11,103	11.2%
Gas (buildings)	78,175,859	14,479	1,434	13,045	9.9%
Oil (buildings)	576,760	1,735	1,473	262	84.9%
Water (buildings)	422,820	395	51	345	12.8%
Transport (Council Fleet)	1,355,621	3,521	704	2,817	20.0%
Street Lighting	14,134,523	7,016	2,408	4,608	34.3%
Waste	75,652	13,348	11,893	1,455	89.1%
Staff Mileage	1,684,448	516	26	490	5.0%
<b>Total</b>		<b>53,514</b>	<b>19,389</b>	<b>34,126</b>	<b>36.2%</b>

Table 1 – Carbon Reduction by Category

## 2.5 Measuring Success

As this Carbon Management Plan currently stands, Renfrewshire Council would aim to meet the overall reduction target within the prescribed timeframe.

### 2.5.1 Business as Usual (BAU) – Asset Changes:

**Building closures and commissioning:** Delays in any estate closures and new builds/refurbishments would result in an increase in the forecasted consumption due to older inefficient buildings remaining in operation for a longer period of time.

**Building type:** It is widely known that new builds will consume more energy than the buildings they have replaced. This is predominantly down to an increase in IT equipment, mechanical ventilation etc. Schools in particular will have an increase in electricity consumption due to this reason.



### **2.5.2 BAU - Grid emission factors:**

Although the UK Government has plans to move towards decarbonisation of the Grid, the BAU scenario modelled within this Plan uses the published DEFRA 2013 figures for the future years of the plan.

### **2.5.3 Project funding and implementation**

Capital funding for carbon reduction measures will be decided on a business case from each of the service areas covered under the Carbon Management Plan. The lead officer for that service will have responsibility for overseeing their element of the Project Register to ensure the projects are identified and undertaken in the agreed timescales.

Key Performance Indicators will be agreed by the Climate Change Working Group to ensure projects are monitored against the Project Register. The Project Register is a live document that will change and evolve throughout the life of the Carbon Management Plan.

### 3 Emissions Baseline and Projections

The first step in developing a Carbon Management Plan is to determine the organisation’s current emissions; their ‘carbon footprint baseline’, facilitating the setting of a realistic reduction target.

The emission sources and assets to be included in the footprint must be decided at the outset. The boundary of the carbon footprint should be determined by the extent of the estate, goods and services over which the organisation has operational control, and the availability of good quality data.

After calculating the baseline carbon footprint for a specified year, there needs to be a forecasting exercise to estimate what the projected emissions would be at the end of the target period if no action were taken (known as the Business as Usual, or BAU, scenario).

#### 3.1 Boundaries

Carbon footprints are generally defined in relation to two boundaries: the organisational boundary and the operational boundary.

##### 3.1.1 Summary of boundaries in the Carbon Management Plan

The categories included and excluded from the 2012/13 carbon footprint baseline for the organisation are shown below in **Table 2**.

Included in Renfrewshire Council’s carbon footprint	Excluded from Renfrewshire Council’s carbon footprint
<ul style="list-style-type: none"> <li>■ Electricity in Buildings</li> <li>■ Natural gas in buildings</li> <li>■ Oil in buildings</li> <li>■ Water &amp; wastewater in buildings</li> <li>■ Waste</li> <li>■ Electricity for street lighting</li> <li>■ Fleet transport (owned vehicles)</li> <li>■ Staff Mileage</li> </ul>	<ul style="list-style-type: none"> <li>■ Fugitive emissions - refrigerant gas</li> <li>■ Business travel in staff-owned vehicles &amp; public transport</li> <li>■ Embodied energy from construction projects</li> </ul>

**Table 2: Scopes included in Renfrewshire Council’s carbon footprint 2012/13.**

##### 3.1.2 Organisational Boundary

In line with the World Resources Institute (WRI) Greenhouse Gas Protocol, the organisational boundary sets out which assets are to be included in the footprint and how any shared assets will be accounted for. The organisational boundaries used for the production of the carbon footprint are outlined in **Figure 4**.





Figure 4 - Organisational boundary for Renfrewshire Council's carbon footprint 2013/14 to 2019/20.

### 3.1.3 Operational Boundary

The operational boundary essentially sets out the emission sources included in the footprint.

**Energy** : this includes all energy used in buildings, including electricity, gas and oil.

**Water**: this includes water supplied and waste water disposed of from council owned operational buildings. The water utility provider provides the annual carbon emissions for both water and wastewater.

**Waste**: Waste treatment activities can include disposal in landfill, incineration and composting. Emission factors associated with waste to landfill include transportation and methane emissions<sup>6</sup> whilst emissions from composting/recycling include transportation and minimal preparation emissions.

**Transport**: this is measured by litres of fuel used in Council owned fleet.

**Staff Mileage**: this includes all mileage claims by staff whilst travelling on work business.

The operational boundaries used for the production of the carbon footprint outlined are shown in **Figure 5**.

<sup>6</sup> Transportation distances are based on UK average assuming a 50% loading; CH<sub>4</sub> emissions from landfill take into consideration a 75% capture rate and 10% oxidisation at cap.



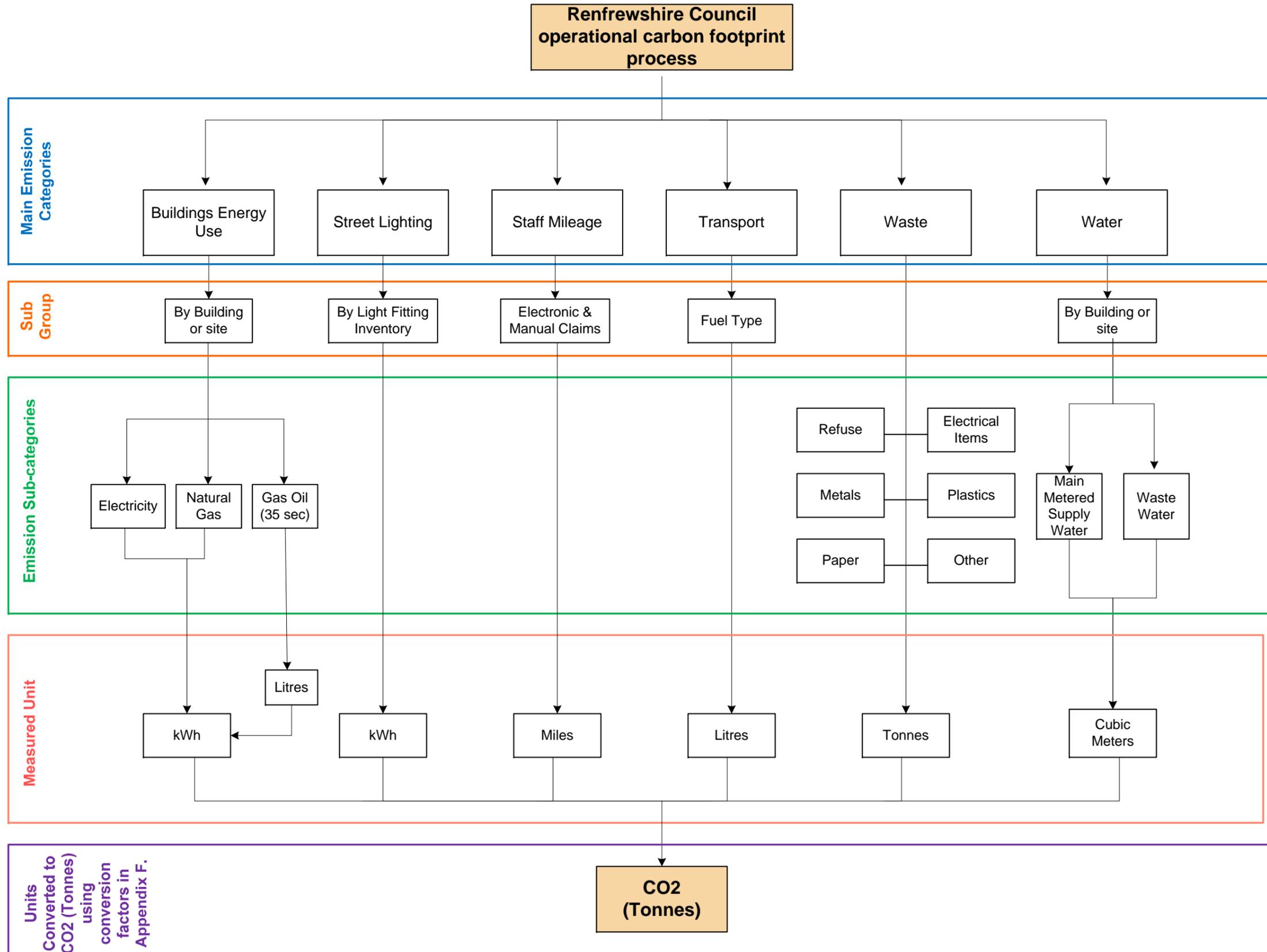


Figure 5: Operational boundary for Renfrewshire Council's carbon footprint



## 3.2 Data Sources

The consumption data detailed in **Figure 5** is collected and then converted to tonnes carbon dioxide equivalent (tCO<sub>2e</sub>) by the application of emission factors (EFs) which estimate the carbon emissions produced per unit of energy/goods/services. A complete set of relevant emission factors are sourced and published annually by the UK Government<sup>7</sup>.

### 3.2.1 Organisational data sources

Like all public sector bodies, Renfrewshire Council routinely collects data for and reports performance via a number of mechanisms, both mandatory and voluntary.

To calculate the total baseline carbon footprint for Renfrewshire Council, data for the financial year 2012/13 was used. The data sources used in the calculation of the carbon footprint are detailed in **Table 3** below.

Category	Subcategory	Main Source/s
Energy in Buildings	Electricity Natural Gas Water Oil	Carbon Management Plan spreadsheet held by EMU and generated using Stark Essentials Monitoring & Targeting software. Oil data received annually from Community Resources.
Transport	Fleet	Transport fuel consumption is sourced by deliveries to the transport Depot.
Waste	Landfill Recycling	A detailed procedural process is shown in <b>Appendix E</b> .
Street Lighting	Electricity	A monthly street lighting inventory and hours of use are passed to the utility provider in the form of a certificate for all unmetered supplies.
Staff Mileage	Staff Mileage	Data held by the MIT team

**Table 3: Data sources for Renfrewshire Councils carbon footprint 2012/13.**

**Energy & Water:** electricity, gas and water data are collated on a monthly basis. Data is imported into the Council's monitoring and targeting software (Stark Essentials) from the utility provider. Oil consumption is reported annually and received from Community Resources. Oil deliveries are made direct to each site and invoices are collated for annual usage.

**Transport:** Transport fuel consumption is calculated using litres of fuel delivered to the transport Depot.

**Waste:** Waste data is collated on a monthly basis and is largely comprehensive. The process is described in detail in **Appendix D**.

**Street Lighting:** Electricity usage is from an un-metered supply and is calculated monthly using the council's street lighting inventory and multiplied by hours of use throughout the authority for that month.

**Staff Mileage:** Staff mileage is collated electronically through MyView and using manual forms. Reports on annual mileage is available at request through the MIT team mailbox.

<sup>7</sup> 2013 Government GHG Conversion Factors for Company Reporting. [www.ukconversionfactorscarbonsmart.co.uk/](http://www.ukconversionfactorscarbonsmart.co.uk/)



### 3.2.2 Emission factor sources

Data on energy use and transport, water and waste have been converted into carbon emissions using recognised GHG Protocol consistent emission factors provided by Defra in the 2013 Guidelines to Defra/DECC's Greenhouse Gas Conversion Factors for Company Reporting v1.1.

Carbon factors, in particular the emission factor for electricity, change over time and this can have a significant impact on the carbon footprint calculation. More details on the emission factors applied can be found in **Appendix F**.

### 3.3 Baseline

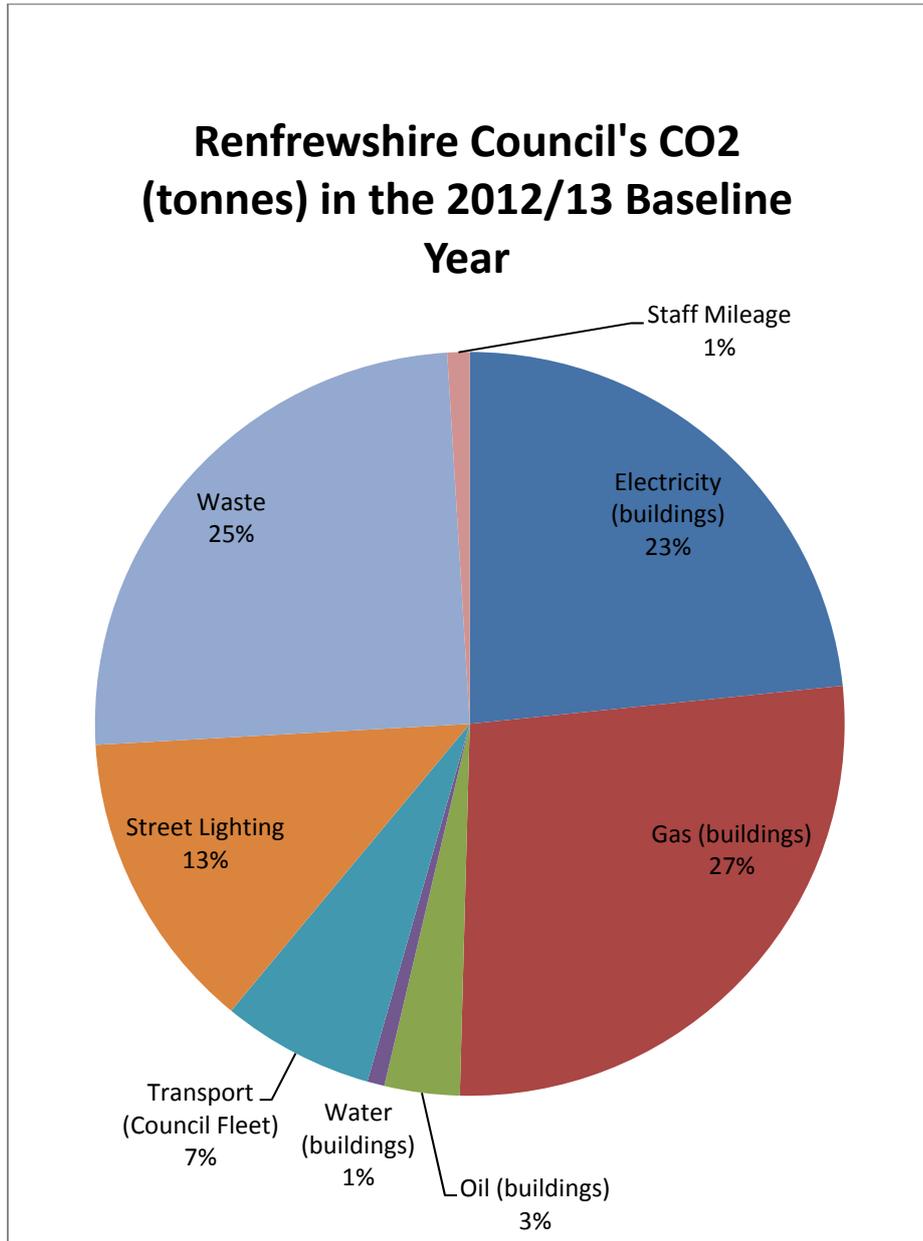
The baseline year for this Carbon Management Plan is the 2012/13 financial year. Based on the scope outlined above, Renfrewshire Council's carbon footprint baseline, for 2012/13 was 52,239tCO<sub>2</sub>e. Calculated carbon emission for each category are shown in **Table 4**.

	2012/13 Baseline (kW/Cubic Meters/Litres/Tonnes/ Miles)	2012/13 Baseline CO2 (tonnes)	Proposed CO2 Savings over CMP (tonnes)	2019/20 CMP Target (tonnes CO2)	% Reduction per Section
Electricity(buildings)	25,193,669	12,505	1,402	11,103	11.2%
Gas(buildings)	78,175,859	14,479	1,434	13,045	9.9%
Oil(buildings)	576,760	1,735	1,473	262	84.9%
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Staff Mileage	1,684,448	516	26	490	5.0%
<b>Total</b>		<b>53,514</b>	<b>19,389</b>	<b>34,126</b>	<b>36.2%</b>

**Table 4: Breakdown of Renfrewshire Council's baseline carbon footprint by carbon emission sources.**

The greatest contributor to the organisation's carbon footprint is gas in buildings which accounts for 27% of the footprint; this is followed by waste which contributes 25% and closely by electricity in buildings at 23%. Emissions from oil, transport, street lighting, staff mileage and water consumption together account for less than 20% of the total footprint as shown in **Figure 6**. Therefore, reducing consumption in buildings and waste should be seen as a priority area for action. However, reductions achieved in all categories will contribute to an overall decrease in Renfrewshire Council's total carbon footprint.





**Figure 6 - Renfrewshire Council CO2 emissions (tonnes) by Sector.**



## 4 Carbon Management Projects

### 4.1 Introduction

In order to continue achieving emissions reductions and avoiding financial exposure, Renfrewshire Council is committed to identifying and implementing carbon saving projects. To achieve its emissions reduction target, it will need to achieve a reduction of 19,389 tCO<sub>2</sub>e against its 2012/13 baseline carbon footprint (taking into consideration changes to the carbon emission factors).

Renfrewshire Council recognises that successful attainment of its carbon reduction targets is contingent upon the following key elements being in place:

- An organisational framework within the organisation that is sufficiently robust to support the financing, delivery and monitoring of carbon reduction projects.
- Clearly identified responsibility and accountability for delivery against carbon reduction targets from the Carbon Management Plan outset.
- Identification of a realistic suite of carbon reduction projects across a range of areas relevant to the carbon footprint; this list must be regularly reviewed and flexible to adapt to emerging needs and opportunities for funding.
- A data collection and collation system that is integrated sufficiently to inform both an annual progress update on the Carbon Management Plan. This will be delivered to the Planning & Property Policy Board.

In this Section, the term “activities” is applied to the full range of interventions that contribute to emissions reductions. These may include traditional ‘projects’ such as the installation of voltage optimisation units or boiler controls. For projects of this nature, it is generally easier to predict and subsequently quantify the carbon savings that will be or have been achieved. However, activities may also include interventions such as staff energy awareness training where carbon savings are much harder to predict and subsequently quantify accurately.

### 4.2 Planned Future Projects

The projects identified below are a sample of those that have been selected for implementation during the financial years 2014/15 – 2015/16.

#### 4.2.1 Energy/Water

- Boiler optimisation equipment,
- Photovoltaic panels,
- LED lighting,
- Boiler replacement
- Boiler conversion from oil to gas,
- Waterless urinals
- etc.



#### 4.2.2 Transport

- Purchase of more efficient vehicles
- Continued piloting of electric vehicles

#### 4.2.3 Waste

- Delivery of kerbside recycling and waste separation

#### 4.2.4 Street Lighting

- LED Street lights

#### 4.2.5 Staff Mileage

- Promote Conference calls

### 4.3 Project Register

The Project Register is a tool used to support Renfrewshire Council with the recording of carbon reduction project data, calculation, and the analysis and reporting of progress against the carbon reduction target.

The tool was populated with Renfrewshire Council's 2012/13 footprint figure, reduction target and project information in order to identify whether the organisation will meet its reduction targets and where applicable the quantity of additional emission savings required to enable reduction targets to be met.

The project register is a 'live' tool for the organisation to retain ownership of and continue to update regularly to allow tracking of progress of carbon emission reductions. The project register is managed and maintained by the Energy Management Unit. A summary of the project register can be found in **Appendix H**.

### 4.4 Projected Achievement towards Target

This Carbon Management Plan aims to achieve a 19,389 tCO<sub>2</sub>e (36%) reduction on the 2012/13 carbon footprint by 2019/20.

Within the next 6 years, Renfrewshire Council will potentially see a number of changes in the Carbon Management Plan, with the associated partial or complete closure of a number of buildings, along with the construction of new ones. This, coupled with the forecasted changes to the grid emissions factors, provides the Business as Usual scenario for the council if no carbon reduction projects were taken forward. This is indicated in the Council's carbon forecast in **Figure 7**. This illustrates the expected Business as Usual (BAU) from 2012/13 – 2019/20 against the target carbon emissions as set out in the plan through the adoption of carbon reduction projects. Further information on areas affecting the Business as Usual are shown in **Appendix G**. Figure 7 illustrates a carbon reduction of 36% over 6 years 2019/20 with the 'Value at Stake' representing the carbon savings that will be achieved.

The figure illustrates how the projects outlined above will contribute towards achieving the carbon reduction target over the course of the plan timeframe.



This shows that Renfrewshire Council would be likely to achieve our emission reduction target if all projects within the Project Register with quantified savings were to be implemented in accordance with the intended timescales.

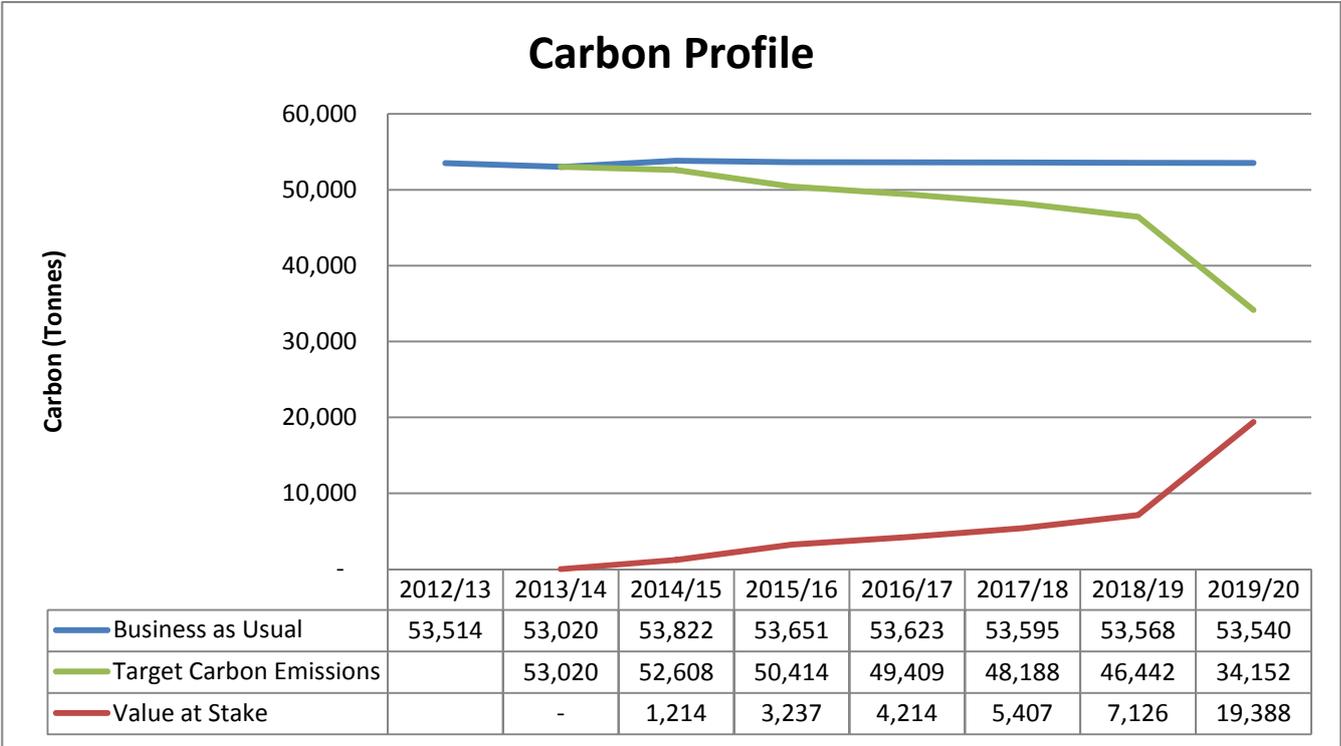


Figure 7: Carbon emission projections over time.



## 5 Carbon Management Plan Financing

### 5.1 Introduction

The capital cost of financing the planned Carbon Management Plan over the next 6 years is the responsibility of each Service within the Council for making a business case.

This Section will draw on information inputted into the Project Register.

### 5.2 Assumptions

**Costs:** Actual costs have been used for projects that have already started and supplier quotes for planned projects. Where supplier quotes were not available, quotes for similar projects have been used (e.g. costs for one boiler replacement based on quote for another boiler replacement).

**Cost saving:** Cost saving were calculated using the utility costs for the current utility contract year (2014/15) and assumed energy savings. Carbon Reduction Commitment costs were included as part of a saving where applicable.

**Carbon saving:** Calculated carbon savings were derived using assumed energy savings (as outlined above) and Defra's emission factors.

The key assumptions made in calculating the benefits and savings are:

- The unit price of gas and electricity over the next 5 years.
- Project capital requirements and financial and CO<sub>2</sub>e savings are based on feasibility reports and on consultant design teams.
- Default emission factors were used in converting energy kWh to tonnes CO<sub>2</sub>e emissions.

Utility unit price assumptions are the most critical in determining the project financial savings. Utility supply markets are very volatile which makes prediction of future prices very difficult.

**Energy Awareness:** A budget of has been secured to run an Energy Awareness Campaign each year, and to run an ongoing awareness and communications campaign throughout each year. Awareness and communication around energy efficiency and climate change will therefore be a constant theme running through Council business. A joint awareness campaign with Waste is being discussed at the Climate Change Working Group.

### 5.3 Benefits

As well as improving efficiency and reducing utility costs, implementation of the Carbon Management Plan reduces the legal and financial risks associated with the various national and international regulatory regimes relating to the organisation.

In addition to quantified benefits, the successful implementation of the identified projects will offer the organisation further benefits including:

- The creation of an improved, more comfortable and more energy efficient built environment for visitors, staff, pupils and end users.
- Enhanced reputation from reducing the organisation's carbon footprint.
- Improved platform for providing a lead in carbon management and sustainability to other stakeholders and organisations.



- Meeting of Government and other targets.
- Carbon Reduction Commitment reduction.
- etc

## 5.4 Financial Costs, Sources of Funding and Opportunities

### 5.4.1 Potential funding sources

Internal funding for carbon management for energy in buildings will come from the Energy Investment Fund. This is a dedicated fund cover specific carbon management projects and individual projects will be assessed on their business case with financial paybacks assessed.

Awareness raising campaigns are being funded through the annual Energy Awareness budget.

The other project funding sources emanate from ongoing funding allocated to the Corporate Landlord and Property Services Technical Section for managing maintenance and capital development projects respectively. As part of the long term maintenance plans, ongoing replacement of building fabric and infrastructure will aim to utilise materials and units producing enhanced building performance with concurrent carbon savings.

Any other potential funding and income sources such as Renewable Heat Incentives and Feed-in Tariffs will continue to be fully explored to support the capital funding within the Capital Plan.

Community Resources are currently investigating funding opportunities for street lighting, waste and transport, with the UK Government funding source of Salix being investigated.

### 5.4.2 Additional Resources

The identified projects are predominantly of an energy efficiency nature. The delivery of these will be the responsibility of the Energy Management Unit, within Development & Housing Services. However, responsibility will extend to other departments, where appropriate, Community Resources for fleet rationalisation, waste and street lighting and Finance & Corporate Services for ICT review.

The Green Graduate Internships and Green Trainees will be a lynchpin in delivering the awareness raising campaigns to encourage behavioural change.

Carbon Management is an integral part of the everyday functioning of property operations and development, with Property Services managing all major refurbishment and new-build projects.



## 6 Management and Delivery of the Carbon Management Plan

### 6.1 Introduction

In order to ensure that there is effective and ongoing ownership of the Carbon Management Plan, it is important to have a fully defined governance structure. Renfrewshire Council will continue to adopt the following structure for management accountability.

### 6.2 The Climate Change Working Group

The Climate Change Working Group has responsibility for the strategic direction and implementation of the Carbon Management Plan. Updates of each meeting will be reported to the Property Services Strategic Management Team (SMT) convened by the Director of Development & Housing Services.

The Climate Change Working Group is convened by the Corporate Asset & Energy Manager and meets quarterly.

Twice per annum, the main focus of the Climate Change Working Group will be the Carbon Management Plan. The required attendees are listed in **Table 5** below and comprises a wide range of operational managers and senior technical staff who are committed to driving the carbon reduction agenda forward.

Name	Role
Craig Doogan	Energy Team Leader
Karen Anderson	Amenity Services Manager (Waste)
John P Wallace	Supervisory Engineer (Light & Asset Management)
David Burnie	Vehicle Maintenance & Fleet Manager

**Table 5: Carbon Management Committee membership.**

The remit of the Climate Change Working Group – for the Carbon Management Plan includes:

- ensuring effective communication of the organisation's policies to staff
- monitoring the organisation's performance against its carbon management targets,
- raising the profile of carbon management in the community and promoting environmentally sustainable behaviour by staff, pupils and visitors.



## 6.3 Operational Roles and Responsibilities

### **Carbon Management Plan/Project Sponsor**

The Chief Executive and the Council Leader will champion the project and have ultimate responsibility for strategic direction and for agreeing budgets outside those already available.

### **Corporate Energy/Asset Manager**

The Corporate Energy/Asset Manager will oversee the strategic implementation of the Carbon Management Plan, have strategic input into its development, and review progress.

### **Energy Team Leader**

The Energy Team Leader will coordinate the implementation of the Carbon Management Plan and report on its progress to the Planning & Property Policy Board and the Greener Thematic Board. Responsibilities of the Energy Team Leader will also include the incorporation of progress into the organisation's existing Sustainable Building Design Document and the BEMS controls specification.

### **Climate Change Working Group – Carbon Management Plan**

Operations team will work closely with project leaders and manage the technical aspects of projects. The Energy Team Leader will be responsible for data collection and reporting.

### **Green Graduate Internships & Green Trainees**

The Green Champions will work closely with the Energy Team Leader to collect and collate carbon data, raise awareness and engage staff to promote more environmentally conscious behaviour.

## 6.4 Resourcing and Ownership

The Carbon Management Plan and carbon saving target will be approved by the Chief Executive providing endorsement and a clear commitment at the highest level, reinforcing the need for action across the organisation. The specific objectives of the Plan will be included in the organisation's strategic plan and other high level plans. Chief Executive accountability will continue to provide long-term organisational momentum for embedding the Carbon Management Plan and carbon savings across the organisation. This will primarily be delivered through the governance structure for carbon management described earlier in this Section.

Key stakeholders at all levels of management will provide overall support for promoting a culture of carbon reduction throughout faculties and buildings.

The Carbon Management Plan will be published online, with a limited number of printed copies available for key stakeholders, thus leading by example and saving paper and distribution costs.

The key to success of this updated Plan is effective engagement with staff and the local communities. Everyone has a role to play in the delivering the Plan and collaborative working is essential to deliver the desired carbon savings.

The key stakeholders in the organisation who will continue to shape and change culture and awareness are:

- Chief Executive
- Council Leader
- Directors

- Heads of services and officers including (Finance, Communications, Corporate Landlord, Procurement, Energy, Waste, Transport, Street Lighting etc.)
- All staff (key staff including chief technicians, administrators, care takers, janitors, cleaners, and security)

## 6.5 The Internal Delivery Model

Green Champions are to be appointed and will be members of the Climate Change Working Group. Their task is to encourage good practices amongst colleagues by setting an example in their own work places. They will receive training so that they can answer basic questions about issues such as climate change, energy efficiency and building performance.

Green Champions implement energy saving activities within their area, from educating and encouraging staff to monitoring and evaluating energy usage and identifying opportunities for reduction. The scope covers carbon reduction, energy saving, recycling, travel reduction, and climate impacts. The Green Champions will be supported by the Green Graduate Interns and Green Trainees.

## 6.6 Partnership Working Opportunities

Renfrewshire Council is working, and will continue to work, with a number of partners to deliver the Carbon Management Plan, including:

- Engage Renfrewshire
- FLAIR
- Forum for Empowering Communities
- Glasgow Airport
- Keep Scotland Beautiful
- Renfrewshire Community Health Partnership
- Resource Efficient Scotland
- Scottish Environmental Protection Agency
- Scottish Fire and Rescue Service
- Scottish Water
- Strathclyde Partnership for Transport
- Sustrans
- University of the West of Scotland
- Zero Waste Scotland

## 6.7 Data Collection and Management

Renfrewshire Council's present data collection system affords reasonable data analysis using Stark Essential Energy Monitoring & Targeting Software; AMR metering; un-metered street lighting supplies, waste collection and segregation (weight/tonnes).

Performance data will be communicated to staff to raise their awareness of the implications of their energy use to their unit. This will be done regularly through Senior Managers and monthly property progress report to each Departments Senior Accountant.

## 6.8 Communication and Training

The Corporate Communications team have developed a planned approach to raising carbon reduction awareness through the development of a robust communications and awareness strategy. The Energy Management Unit, based in Property Services, and the network of Green Champions, Internships and Trainees will provide support in delivering the low carbon message.

There are many avenues of communication available and these will be fully utilised in promoting the carbon reduction message to all staff and visitors. Effective communication and engagement is the key to success. It is recognised that substantial cultural change will take time to deliver.

Initiatives for building awareness include:

- publishing the Carbon Management Plan
- energy and carbon awareness campaigns
- the roll-out of 'Empower', interactive energy awareness raising software
- regular communication
- staff induction training
- the introduction of a suggestion schemes

The Energy Management Unit will regularly monitor progress and formally report on an annual basis to the Climate Change Working Group ensuring that all major stakeholders are kept informed.

## 7 Progress Reporting

### 7.1 Annual Updates to the Carbon Management Plan

The Carbon Management Plan is viewed as a 'live' document and it is envisaged this will change on an annual basis as the organisation's estate changes and planning assumptions become a reality. To ensure that the Plan remains 'fit for purpose' to deliver targeted carbon savings, the document will be reviewed on an annual basis. This process will be overseen by the Climate Change Working Group – Carbon Management Plan and coordinated by the Energy Team Leader.

Specifically, the following areas of the Carbon Management Plan will be subject to annual review with the production of an Annual Carbon Management Report to the Planning & Property Policy Board:

- Progress towards overall carbon reduction target including CO<sub>2</sub>e savings against target.
- Progress with identified carbon reduction projects.
- Risk Register (**Appendix I**).

The annual progress review will be placed on the intranet.

## **Appendix A**

# **Renfrewshire Council: Sustainable Building Design**

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# 1 Introduction

Sustainable buildings are designed, constructed and operated to minimise their impact on the environment. By ensuring that any new build or refurbishments that Renfrewshire Council procures meets strong sustainability targets, we will provide future generations with pleasant and productive working environments that are inexpensive to run and have minimal impact on the environment.

The Energy Management Unit is based within Property Services, a Section within Development & Housing Services. Our remit is to reduce the energy consumption and associated carbon emissions within all Renfrewshire Council's Public Buildings. In order to achieve this, we have set ambitious targets to reduce our carbon emissions by 25% by 2015 (based on 2007/08 baseline data). These targets can only be achieved through a multi-faceted approach. Along with increasing the energy efficiency of our operational buildings, we must also change the way we design and build.

In recent years, growing concerns over the security of energy supplies has led to an overall increase in global energy prices. Whilst this is increasing energy budgets within the Council, it is also enabling the installation of more energy efficient technologies due to an overall reduction in payback.

Renfrewshire Council is responsible for a wide range of buildings and facilities, including Offices, Schools, Libraries, Community Centres, Day Centres, Care Homes and Park facilities. This puts Renfrewshire Council in an ideal position to design efficient and sustainable buildings. However, what do we term as a sustainable building? Buildings are "sustainable" when they are designed, built and operated with low environmental impacts whilst enhancing the health, welfare and quality of life for the people that live or work in them. A sustainable building, if designed well will also create an attractive and pleasant working environment that will help to reduce absenteeism, increase productivity and help attract and retain staff.

The objective of this document is to highlight the issues that should be implemented in any new build or refurbishment project to ensure that energy and resource efficiency is designed into all projects. This will require high standards of design that incorporate low and zero carbon energy sources, sustainable construction methods and "green" technologies. The design and understanding of the building from inception through to construction, completion and its final demolition is pivotal in reducing the overall environmental effect brought about by its construction. This will not only minimise our energy consumption, but will ensure that sustainability is fundamental to the design process by providing the necessary information and tools for technical staff. This will also enable the implementation of projects with higher capital costs due to it being offset against the environmental benefits that they will bring. The factors that should be taken into account are highlighted in this Sustainable Building Design Document. A checklist is provided in the appendix to this document to assist the design team through the activities required to adhere to the Renfrewshire Council Sustainable Building Design requirements.

## 2 Project Initiation

The first steps of the procurement process are the time at which the most important aspects of sustainable building design are set.

The design team selected will need comprehensive guidance on the values required for the resulting building, the capital cost and operating cost constraints and the quality of internal environment required. Ensuring that the design team have the appropriate skills and experience to deliver a sustainable building within budget must be central to the process.

The initial siting, orientation and form of the building will drive the majority of design decisions as this will determine what impact of the local environment has on the building. For example, large areas of south facing glass will result in excessive heat gains requiring installation of cooling within the building increasing both capital and operating costs.

Use of passive techniques for heating, lighting, cooling and ventilation should be considered for all buildings. These will normally result in a lower build cost and reduced ongoing operating costs.

The remainder of this document should be read and the targets and principles considered prior to commencing any project to ensure that they can be incorporated into the design.

### **Information Sources and Guidance**

Zero Waste Scotland provides comprehensive advice on procuring resource efficient buildings.

<http://www.zerowastescotland.org.uk/content/approach-procurement-resource-efficiency>

Guidance on specifying and procuring low carbon buildings is given in the Carbon Trust "Delivering the Future" suite of documents and tools.

<http://www.carbontrust.com/resources/guides/energy-efficiency/delivering-the-future-today>

### 3 Securing a Sustainable Design Approach

The list below describes the general aspects which should be considered at the different RIBA stages with regards to embedding sustainability in the project. This is based on the 2013 version of the RIBA stages. Time to achieve these aspects must be built into the project timeline at project inception.

Stage	Activity
<b>Strategic Definition</b>	<ul style="list-style-type: none"> <li>• Develop sustainability vision for the project</li> <li>• Identify major issues relating to sustainability</li> <li>• Set sustainability priorities based on context</li> </ul>
<b>Preparation and Brief</b>	<ul style="list-style-type: none"> <li>• Establish and define sustainability goals, targets and key performance indicators (KPIs)</li> <li>• Review sustainability issues, goals, targets and KPIs</li> <li>• Develop and implement procedures to monitor and record sustainability targets</li> <li>• Identify certification and testing measures required for sustainability assessment</li> <li>• Review all existing sustainability directives and policies to ensure compliance</li> </ul>
<b>Concept Design</b>	<ul style="list-style-type: none"> <li>• Re-evaluate sustainability targets required to meet project goals</li> <li>• Create a plan to achieve sustainability goals, coordinate with project work plan</li> <li>• Assess need for a preliminary sustainability assessment</li> </ul>
<b>Developed Design</b>	<ul style="list-style-type: none"> <li>• Implement sustainability action plan in the schematic design</li> <li>• Implement preliminary sustainability assessment to guide the design</li> </ul>
<b>Technical Design</b>	<ul style="list-style-type: none"> <li>• Continue to evaluate sustainability action plan in the technical design</li> <li>• Monitor and ensure that sustainability objectives and targets are maintained</li> <li>• Conduct detailed sustainability assessment of the design</li> </ul>
<b>Construction</b>	<ul style="list-style-type: none"> <li>• Ensure information produced includes sustainability action plan, and sustainability goals and targets</li> <li>• Ensure tender documentation includes sustainability action plan, sustainability goals and targets and relevant sustainability documentation</li> <li>• Assess ability of tender to comply with sustainability goals and targets</li> <li>• Monitor compliance with sustainability goals, targets and KPIs</li> <li>• Evaluate sustainability action plan associated with mobilisation stage</li> <li>• Monitor implementation and compliance with sustainability goals and targets for mobilisation</li> <li>• Evaluate sustainability action plan during construction</li> </ul>
<b>Handover and Close Out</b>	<ul style="list-style-type: none"> <li>• Assess sustainability of completed building</li> <li>• Monitor implementation and compliance with sustainability goals and targets and KPIs</li> </ul>

**In Use**

- Audit implementation and compliance with sustainability goals, targets and KPIs
- Implement systems to monitor sustainability performance during occupation and post-occupancy
- Assess sustainability performance of the building
- Monitor sustainability performance during occupancy against targets and KPIs
- Audit sustainability performance during occupancy targets and KPIs

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Zero Waste Scotland provides tools and guidance to support all stages of the process of procuring a sustainable building at:

<http://www.zerowastescotland.org.uk/content/construction-designers>

The following sections provide guidelines to assist with achieving these activities. They also provide specific targets, goals and tasks that should be combined into all projects.

Where it is not possible to meet one of the targets in this guide, the Energy Management Unit should be notified and their assistance requested to assist in meeting the target.

## 4 Energy

<p><b>Energy Consumption / Carbon Emissions</b></p>	<p>The building's energy consumption must reduce in line with the targets set out in the Council's Carbon Management Plan. An ambitious target of 36 % reduction in CO<sub>2</sub> emissions will be set.</p> <p>We must also aim to achieve the following:</p> <p><b>A:</b> Minimise energy demand through orientation and passive solar design.</p> <p><b>B:</b> Maximise thermal efficiency through thermal mass and insulation.</p> <p><b>C:</b> Minimise demand for water heating, space heating and cooling, lighting and power in individual dwellings through efficient equipment and control.</p> <p><b>D:</b> Calculate the residual energy demand for the site.</p> <p><b>E:</b> Maximise the amount of residual demand which can be provided by on-site renewable energy.</p> <p><b>F:</b> Meeting the remaining demand efficiently e.g. Renewables, CHP, district heating and cooling, ground source heating and cooling.</p> <p><b>G:</b> Ensure that the building is properly commissioned and appropriate training is provided at handover</p> <p><b>Information Sources and Guidance</b></p> <p>The methods for assessing the energy performance of 'whole buildings', a general approach for both dwellings and non-domestic buildings, is set out in the calculation tools Standard Assessment Procedure for Energy Rating of Dwellings (<a href="http://www.bre.co.uk/sap2005">www.bre.co.uk/sap2005</a>) and the Simplified Building Energy Model (SBEM) (<a href="http://www.ncm.bre.co.uk">www.ncm.bre.co.uk</a>). For more complex buildings, dynamic thermal simulation should be used.</p> <p>These methods are detailed in the Building Standards (Scotland) Regulations and the technical standards.</p> <p><a href="http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards">http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards</a></p>
<p><b>Project Inception</b></p>	<p>At project inception it should be ensured that the project brief includes a requirement to meet the targets and requirements outlined in this document.</p> <p>If any deviations from these requirements and targets occur, the cost impact of these changes must be evaluated on a whole life cost basis and provided to the EMU who will distribute to relevant stakeholders.</p>

<p><b>Initial Design</b></p>	<p>The building orientation, shape and construction materials are normally set at initial design stage before any consideration of the impact of the design on energy consumption is made. As this can have a major impact on building operating costs and occupant comfort, it is essential that this omission does not occur.</p> <p>A dynamic thermal simulation model of the proposed building should be created at initial design stage to allow testing of the impact on energy consumption of different orientations, building footprints and building materials. The results of this analysis should be discussed with the EMU prior to finalising the design.</p> <p>The proposed designs should be evaluated on a whole life cost basis. Any value engineering decisions should also be evaluated using whole life costs.</p> <p><b>Information Sources and Guidance</b></p> <p><a href="http://www.architecture.com/SustainabilityHub/Designstrategies/Earth/1-1-3-2-Buildingorientation.aspx">http://www.architecture.com/SustainabilityHub/Designstrategies/Earth/1-1-3-2-Buildingorientation.aspx</a></p>
<p><b>EPC Rating</b></p>	<p>Setting a target EPC rating excluding reductions due to renewables will ensure that the design minimises energy. This avoids retrospective inclusion of renewables into designs in order to meet building standards increasing costs.</p> <p>All new build buildings should achieve an EPC rating of B+</p> <p><b>Information Sources and Guidance</b></p> <p>A description of Energy Performance Certificate (EPC) ratings is shown on the BRE website.</p> <p><a href="http://www.bre.co.uk/epcotland/page.jsp?id=1453">http://www.bre.co.uk/epcotland/page.jsp?id=1453</a></p>
<p><b>Operating Energy</b></p>	<p>Much of the energy use in buildings is not governed by the building standards. Building standards govern how a building is built but not how it is operated. Actual energy use will depend on how the building is controlled and what equipment is installed in it. This should be considered in detail during the design phase of a project. Including an operating energy target will assist this process.</p> <p>All new build offices and schools to achieve an emission rate of no more than 40kgCO<sub>2</sub>/m<sup>2</sup>. Note that this is the emissions once occupied and includes emissions related to small power.</p> <p>Operating targets should also be set for other types of building. The EMU should be consulted to set operating targets for types of buildings other than offices and schools.</p>

<b>Insulation (U-Values)</b>	<p><b>New Build:</b></p> <p>Roof U-Value <math>\leq 0.16 \text{ W/m}^2\text{K}</math></p> <p>Wall U-Value <math>\leq 0.25 \text{ W/m}^2\text{K}</math></p> <p>Floor U-Value <math>\leq 0.20 \text{ W/m}^2\text{K}</math></p> <p>Doors U-Value <math>\leq 1.80 \text{ W/m}^2\text{K}</math></p> <p><b>Refurbishment:</b></p> <p>Roof U-Value <math>\leq 0.16 \text{ W/m}^2\text{K}</math> pitched roof  <math>\leq 0.30 \text{ W/m}^2\text{K}</math> flat roof</p> <p>Wall U-Value <math>\leq 0.30 \text{ W/m}^2\text{K}</math></p> <p>Floor U-Value <math>\leq 0.25 \text{ W/m}^2\text{K}</math></p> <p>Doors U-Value <math>\leq 1.80 \text{ W/m}^2\text{K}</math></p> <p><b>Information Sources and Guidance</b></p> <p>An introduction to u-values is given on the RIBA website:  <a href="http://www.architecture.com/SustainabilityHub/Designstrategies/Earth/1-1-1-10-Uvalues%28INCOMPLETE%29.aspx">http://www.architecture.com/SustainabilityHub/Designstrategies/Earth/1-1-1-10-Uvalues%28INCOMPLETE%29.aspx</a></p>
<b>Windows</b>	<p>BRFC rating in Band C or better</p> <p><b>Information Sources and Guidance</b></p> <p>The BRFC Energy Rating is an energy efficient measure for windows and doors.  Energy Savings Trust Technical Guidance Documents: Windows: CE66</p>

<b>Ventilation</b>	<p>Achieving the correct level of ventilation is a balancing act. If ventilation rates are too low carbon dioxide levels may rise in the room causing occupants to lose concentration. Ventilation rates that are too high will result in excess heat losses increasing building operating costs.</p> <p>Where possible the design philosophy of the cooling system should be to achieve passive or “free” cooling. The potential for its use in each room should be evaluated.</p> <p>The evaluation should include:</p> <ul style="list-style-type: none"> <li>• Assessment of external noise levels</li> <li>• Prevailing wind direction</li> <li>• Potential for single sided, stack or cross-flow ventilation</li> <li>• Indoor air quality</li> </ul> <p>Where mechanical ventilation is required, the following should be considered:</p> <ul style="list-style-type: none"> <li>• Size of ductwork to minimise noise levels and fan power</li> <li>• Heat recovery must be installed where a centralised system is used</li> <li>• The ventilation should be controlled by CO2 levels in all rooms except toilets and kitchens</li> </ul> <p><b>Information Sources and Guidance</b></p> <p>AM10 Natural Ventilation in Non-Domestic Buildings (CIBSE Applications Manual 10)</p>
<b>Air Permeability</b>	<p>Air infiltration rate of 3 m<sup>3</sup>/hr/m<sup>2</sup> @50 Pa or less should be achieved.</p> <p>It should be noted that checks should be carried out to ensure that adequate ventilation rates are maintained.</p> <p><b>Information Sources and Guidance</b></p> <p>Energy Savings Trust Technical Guidance Documents: Improved air tightness in dwellings: GPG224, CE137 <a href="http://www.greenspec.co.uk/files/refurb/sedano2.pdf">http://www.greenspec.co.uk/files/refurb/sedano2.pdf</a></p>
<b>IT Servers</b>	<p>Server room cooling should be designed to operate when the temperature exceeds 23°C, thus reducing cooling demand and energy consumption. Heat should not be introduced until the temperature falls below 18°C.</p> <p>Where additional cooling is required, ceiling mounted split units should not be used. Wall mounted units provide a better flow and return path.</p> <p>Where multiple server cabinets are used, they should be aligned in a warm isle cool isle configuration and any cooling or extract should be focused on the cool isle.</p> <p><b>Information Sources and Guidance</b></p> <p>Guide to server room energy use and layout: <a href="http://www.seai.ie/Publications/Your_Business_Publications/Technology_Guides/Guide-to-ICT_Server-Room-Energy-Efficiency.pdf">http://www.seai.ie/Publications/Your_Business_Publications/Technology_Guides/Guide-to-ICT_Server-Room-Energy-Efficiency.pdf</a></p>

## Natural Daylight

Good levels of daylight can assist performance and improve learning ability.

These improvements are thought to be as a result of:

- Improved visibility due to more consistent illumination levels, better distribution of light and better colour rendition
- Avoidance of seasonal affective disorder and suppression of melatonin production
- Improved mood, alertness and behaviour.

For educational buildings, at least 75% of all spaces should achieve a daylight factor of at least 3% with a uniformity of 0.4. Areas with glazed roofs should achieve a uniformity of at least 0.7.

For other buildings, at least 80% of all spaces should achieve a daylight factor of at least 2% with a uniformity of 0.4. Areas with glazed roofs should achieve a uniformity of at least 0.7.

The room dimensions should ensure that the following criteria is met:

$$\frac{d}{w} + \frac{d}{WinH} < \frac{2}{1 - SRef}$$

Where:

d = room depth,

w = room width,

WinH = window head height from floor level,

SRef = average reflectance of surfaces in the half of the room furthest from the glazing. Determined from the wall, ceiling and floor coverings on an area weighted basis

### Information Sources and Guidance

Research into the impact of daylight on learning and performance:

Heschong Mahone Group. Daylighting in Schools, An Investigation into the Relationship Between Daylighting and Human Performance. Pacific Gas and Electric Company, 1999.

Windows and Offices: A Study of Office Worker Performance and the Indoor Environment. California Energy Commission, 2003.

<p><b>Internal Lighting</b></p>	<p>Poorly or oversized lighting not only increases lighting electricity consumption but can also increase cooling loads.</p> <p>Lighting energy in spaces larger than 20m<sup>2</sup>, occupied for more than two hours per day shall be not more than 4 W/m<sup>2</sup>/100 lux.</p> <p>Low energy lighting with PIR and daylight controls must be used in all locations.</p> <p>Luminaire light output ratios must be better than 80%.</p> <p>Unless otherwise specified, in spaces with an areas greater than 15m<sup>2</sup> the maximum light level from indoor artificial lighting shall not exceed the required lighting level by more than the sum of 50 lux + 30% of the required lighting level at any point in the space.</p> <p>The following areas should be separately zoned:</p> <ul style="list-style-type: none"> <li>• Workstations adjacent to windows or other glazing</li> <li>• Presentation, whiteboard/projector screen, audience and demonstration areas in teaching and lecture spaces</li> <li>• Counter, reading and stacks in library spaces</li> <li>• Audience, circulation space and presentation areas in auditoria</li> <li>• Serving and seating/dining areas in restaurant, canteen, bar and café areas</li> <li>• Bed spaces, treatment areas, dayrooms, waiting areas, recreation and activity areas and circulation spaces in health and care areas</li> </ul> <p>Lighting controls in areas used for teaching, seminar or lecture purposes should be designed in accordance with SLL Lighting Guide 5.</p> <p><b>Information Sources and Guidance</b></p> <p><a href="http://www.carbontrust.com/resources/guides/energy-efficiency/lighting">http://www.carbontrust.com/resources/guides/energy-efficiency/lighting</a></p>
<p><b>External Lighting</b></p>	<p>Illuminance is to be specified in accordance with BS 5489-1:2013+A2:2008 Lighting of roads and public amenity areas.</p> <p>LED lights should be used in all cases.</p> <p><b>Information Sources and Guidance</b></p> <p>Energy Savings Trust Technical Guidance Documents:</p> <p>Energy efficient lighting: CE61</p>
<p><b>Hot Water</b></p>	<p>Hot water should be provided using direct fired hot water systems.</p> <p>In smaller properties or areas of a building with intermittent usage, the use of instantaneous hot water units should be considered.</p> <p>The overall efficiency (defined as energy contained in the hot water exiting from the tap or shower head, related to the supply side energy used for hot water generation) shall not be less than 45% on an annual basis.</p>

<p><b>Renewable Energy</b></p>	<p>All new builds and refurbishments should evaluate the use of renewable energy technologies. The evaluation must be on the basis of life cycle costing.</p> <p>There are a number of options available for incorporating renewable energy and onsite energy generation into buildings, such as:</p> <ul style="list-style-type: none"> <li>• Solar thermal</li> <li>• PV</li> <li>• Biomass</li> <li>• Wind</li> <li>• Ground and air source heat pumps</li> <li>• Combined heat and power</li> </ul> <p>The evaluation should take into account available renewable resource, the expected energy profile of the building, local planning restrictions, operation and maintenance considerations and available financial support mechanisms.</p>
<p><b>Heating Systems</b></p>	<p>The maximum heating demand for the whole building under design conditions, with occupancy gains, but no lighting or solar gains, with internal conditions as defined in the Room Data Sheets, shall be no more than 25 W/m<sup>2</sup> for new builds and 45 W/m<sup>2</sup> for refurbishments.</p> <p>The boiler standing losses shall not exceed 25% of the heat input on an annual basis.</p> <p><b>Information Sources and Guidance</b></p> <p>Passivhaus requires a maximum heat demand of less than 15W/m<sup>2</sup> for new builds and 25 W/m<sup>2</sup> for refurbishments.</p> <p><a href="http://www.passivhaus.org.uk/">http://www.passivhaus.org.uk/</a></p>
<p><b>Zoning and Controls</b></p>	<p>The entire building should be broken into zones for the purpose of heating and cooling and lighting. Each zone should allow for the following settings, independent of other zones:</p> <ul style="list-style-type: none"> <li>• Temperature set points (Summer or winter)</li> <li>• Operating times (Normal hours, overtime, etc.)</li> <li>• Lighting levels</li> <li>• Energy monitoring and reporting</li> </ul> <p>Consideration should be given to how much control over the zone conditions building users should be given.</p> <p>Where cooling is installed, a dead-band between the temperature that the heating is switched off and the cooling is switched on of at least 4°C should be included.</p> <p>Where a BMS is installed, the Renfrewshire Council BEMS Heating Specification must be followed and the Council's appointed BMS contractor must be consulted during design discussions.</p> <p><b>Information Sources and Guidance</b></p> <p>See CIBSE and the Carbon Trust for temperature design benchmarks.</p>

<b>Automatic Meter Reading</b>	<p>Smart metering will be used to inform on-site staff of their energy consumption. This should be specified in all new builds and refurbishment. EMU must be consulted to ensure the desired meter is installed that fits our requirements.</p> <p><b>Information Sources and Guidance</b></p> <p>For further information refer to: <a href="http://www.energysavingtrust.org.uk">www.energysavingtrust.org.uk</a></p>
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## 5 Water

<p><b>Surface Water Management</b></p>	<p>50% of the building roof and hard surfaces should include one or more of the following Sustainable Urban Drainage (SUD) measures capable of controlling 50% capacity of the predicted rainfall for the overall site and also enhance the biodiversity value of the site:</p> <ul style="list-style-type: none"> <li>• attenuation ponds</li> <li>• swales</li> <li>• rainwater harvesting for the flushing of WCs</li> <li>• permeable surfaces to enable total infiltration of surface water to the underlying ground. Where existing soil types do not permit total infiltration the paved surface may direct surface water to a soakaway, swale, attenuation pond or natural water course</li> <li>• a green roof or living wall.</li> </ul> <p><b>Information Sources and Guidance</b></p> <p>SEPA Sustainable Urban Drainage requirements.</p> <p><a href="http://www.sepa.org.uk/water/water_regulation/regimes/pollution_control/suds.aspx">http://www.sepa.org.uk/water/water_regulation/regimes/pollution_control/suds.aspx</a></p>
<p><b>Water efficiency</b></p>	<p>The following water efficiency measures will be installed in all buildings:</p> <ul style="list-style-type: none"> <li>• water efficient low flush toilet (i.e. 6/4 litre dual flush or less)</li> <li>• Proximity flushing detectors on urinals</li> <li>• water efficient spray / aerated taps in all sinks with percussion taps as minimum with a flow rate of less than 6l/min</li> <li>• water efficient showers with flow rates of less than 8l/min</li> <li>• minimised pipe runs to hot taps</li> <li>• water efficient dishwasher if provided (energy A rated)</li> <li>• water efficient laundry facilities</li> <li>• Consideration should be given to the purchasing of low energy, low water use appliances for kitchen areas and the staff restaurant.</li> </ul> <p><b>Information Sources and Guidance</b></p> <p>Zero Waste Scotland has advice on ensuring that new buildings reflect good water efficiency practice:</p> <p><a href="http://www.zerowastescotland.org.uk/content/asking-water-efficient-buildings-through-good-procurement-practice">http://www.zerowastescotland.org.uk/content/asking-water-efficient-buildings-through-good-procurement-practice</a></p>
<p><b>Water Reuse and Recycling</b></p>	<p>Recycling of waste water from showers, hand basins and washing machines should be evaluated (known as grey water recycling).</p> <p><b>Information Sources and Guidance</b></p> <p>Manufacturers of proprietary systems or guidance documents such as CIRIA C539 or 'Harvesting Rainwater for domestic use: an information guide' published by the Environment Agency provides helpful guidance on design considerations.</p>

## 6 Waste

<b>Waste management and minimisation</b>	<p>To help achieve sustainable development, materials efficiency should be considered at every stage of the design and construction process. This should take into account the waste hierarchy: Reduce; reuse; recycle; dispose.</p> <p>At design stage a strategy document should be produced that identifies dedicated spaces for the collection and storage of everyday recyclable materials.</p> <p>A site waste management plan is required prior to the commencement of work to limit the environmental impact of the construction activities. The Site Waste Management Plan (SWMP) should incorporate final reporting of waste management performance (with respect to recycled and secondary materials, waste reduction, segregation, recovery and disposal) and cost savings identified.</p> <p><b>Information Sources and Guidance</b></p> <p>Guidance on construction waste: <a href="http://www.zerowastescotland.org.uk/category/sector/construction">http://www.zerowastescotland.org.uk/category/sector/construction</a></p> <p>Site Waste Management Plan advice: <a href="http://www.zerowastescotland.org.uk/content/site-waste-management-plans-1">http://www.zerowastescotland.org.uk/content/site-waste-management-plans-1</a></p> <p>Guidance on operational waste: <a href="http://www.zerowastescotland.org.uk/category/sector/local-authorities">http://www.zerowastescotland.org.uk/category/sector/local-authorities</a></p>
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## 7 Resource Use

<p><b>Appropriate use of resources</b></p>	<p>100 % of timber used in the construction of buildings and site infrastructure will be from FSC/PEFC accredited source.</p> <p><b>Information Sources and Guidance</b></p> <p>For this criteria, the term 'basic building elements' extends to include all elements listed below:</p> <ul style="list-style-type: none"> <li>• Timber frame (walls)</li> <li>• Floor joists</li> <li>• Roof timbers</li> <li>• Wall studding (interior and exterior)</li> <li>• Window sub-frames</li> <li>• Door sub-frames</li> <li>• Upper/suspended ground floors</li> <li>• Loft boarding</li> <li>• Fascias (soft boards, bargeboards, gutter boards, others)</li> <li>• External cladding/weatherboarding</li> <li>• Staircases (excluding balustrades, etc)</li> <li>• Other major items</li> </ul>
<p><b>Recycled / reclaimed materials</b></p>	<p>It should be ensured that at least 20% of total construction material derives from reused and recycled content in new builds, car parks and hard-standing.</p> <p>The practicality of crushing masonry materials for reuse in hardcore or as aggregates in concrete will be explored.</p> <p><b>Information Sources and Guidance</b></p> <p>For further advice on recycled materials and waste refer to the WRAP website:</p> <p><a href="http://www.wrap.org.uk/">http://www.wrap.org.uk/</a></p>

## 8 Ecology

<p><b>Conservation</b></p>	<p>For any site with an area greater than 2,500 m<sup>2</sup> The site's short term protection must be evaluated against the long term enhancement by appointing a qualified Ecologist.</p> <p>The design strategy is to be produced by an ecologist (or equivalent) to enhance the ecological value of the site or recreate to a greater level of quality than previously present.</p>
<p><b>Local Biodiversity</b></p>	<p>There will be an increase in important or sensitive habitats identified in the Local, Regional or National Biodiversity Action Plan (BAP), either by creating or restoring ecological value, or support for a species identified in the Local, Regional or National (BAP).</p> <p>For any project with a site area greater than x m2, a biodiversity strategy document should be produced. This should be in the form of a bespoke user guide for the school, for use by both occupants and the wider community related to enhancing biodiversity and developing ecological understanding, prepared by a person with appropriate training, knowledge, experience and skill.</p> <p>Any planting scheme should target species specified in the Local, Regional or National Biodiversity Action Plan (BAP).</p> <p><b>Information Sources and Guidance</b></p> <p>For a copy of the Renfrewshire LBAP Action Plan, Species Action Plan and Habitat Action Plan refer to:</p> <p><a href="http://www.renfrewshire.gov.uk/webcontent/home/services/planning+and+building+standards/nature+conservation+and+greenspace/pt-ab-biodiversity">http://www.renfrewshire.gov.uk/webcontent/home/services/planning+and+building+standards/nature+conservation+and+greenspace/pt-ab-biodiversity</a></p>

## 9 Pollution and Toxicity

<p><b>Avoid or Eliminate Volatile Organic Compounds</b></p>	<p>The specification should be designed to avoid materials with high volatile organic compound levels.</p> <p>Areas that should be addressed include:</p> <ul style="list-style-type: none"> <li>• Selection of paints with reduced organic solvent content</li> <li>• Avoidance of adhesives and preservatives with high solvent contents</li> <li>• Specification of MDF and other fibre boards to relevant British and European Standards</li> <li>• Preference for natural materials that are less highly processed.</li> </ul> <p>Highly processed construction materials and finishes often contain volatile organic compounds which will be released into the air after installation, the levels are usually at their highest immediately after construction. Preference should be given to design solutions that limit exposure to VOCs.</p> <p><b>Information Sources and Guidance</b></p> <p>For the details of VOC's found in paints, visit:  <a href="http://www.legislation.gov.uk/ukxi/2012/1715/contents/made">http://www.legislation.gov.uk/ukxi/2012/1715/contents/made</a></p>
<p><b>Reduced Use of PVC</b></p>	<p>Concern has been expressed about the emission of dioxins and hormone disrupting phthalates in the manufacture and disposal of PVC, while the claims are disputed by the PVC industry, the European Parliament recently voted to restrict the manufacture of certain PVC products with added softeners.</p> <p>As a precautionary approach, the use of PVC should be avoided in those applications where there are suitable alternatives available.</p> <p>It is also thought that smoke and acidic compounds released from PVC cabling in the event of fire are harmful although this is disputed by the Plastics Federation. This risk should be avoided by the use of low smoke zero halogen cabling (LSOH).</p> <p>The use of PVC should also where possible be avoided in the following applications:</p> <ul style="list-style-type: none"> <li>• Vinyl flooring</li> <li>• Waterproof membranes</li> </ul> <p><b>Information Sources and Guidance</b></p> <p>For details on PVC in building materials, look at:  <a href="http://www.greenspec.co.uk/pvc.php">http://www.greenspec.co.uk/pvc.php</a></p>

## 10 Community

<p><b>Supporting public services, social economy and community structure</b></p>	<p>A building user guide should be produced encouraging sustainable lifestyles and integration will be provided which includes:</p> <ul style="list-style-type: none"> <li>• Energy efficiency - including measures incorporated into the development and/or dwelling</li> <li>• Recycling facilities</li> <li>• Utility suppliers</li> <li>• Local transport services</li> <li>• Local organisations and community groups</li> <li>• Local amenities</li> </ul> <p><b>Information Sources and Guidance</b></p> <p>For details on PVC in building materials, look at:</p> <p><a href="http://www.greenspec.co.uk/pvc.php">http://www.greenspec.co.uk/pvc.php</a></p>
<p><b>Considerate Constructor's Scheme</b></p>	<p>To ensure good practice is maintained throughout the construction process the appointed contractor should be instructed to sign up to the Construction Industry Board's Considerate Constructors Scheme. This scheme requires constructors to adhere to a code of practice that includes:</p> <ul style="list-style-type: none"> <li>• Being considerate to the needs of those affected by construction</li> <li>• Being environmentally aware including minimising use of resources, waste and noise.</li> <li>• Keeping the site clean and in good order</li> <li>• Being a good neighbour and consulting those affected by construction.</li> <li>• Promoting safe and respectable standards of dress and avoiding lewd behaviour</li> <li>• Promoting safety to those on site and passers-by.</li> </ul> <p><b>Information Sources and Guidance</b></p> <p><a href="http://www.ccscheme.org.uk/">http://www.ccscheme.org.uk/</a></p>

## 11 Commissioning and Handover

<p><b>Commissioning</b></p>	<p>Commissioning is vital to the efficient operation of a building. It is normally specified on a system-by-system basis, which can lead to poor interfaces and conflicting operation – for example independent heating and cooling equipment in the same space operating at the same time.</p> <p>A commissioning strategy needs to be set at an early stage in the project. This allows the necessary monitoring to be incorporated into the design and will also assist in ensuring that sufficient consideration is taken of how the different elements of the building will work together. This should also be included in contractor preliminaries.</p> <p>The commissioning strategy should ensure that the whole building is commissioned, not just discrete pieces of equipment.</p> <p><b>Information Sources and Guidance</b></p> <p>BSRIA provides extensive advice on commissioning in their “Soft Landings” section.</p> <p><a href="https://www.bsria.co.uk/services/design/soft-landings/">https://www.bsria.co.uk/services/design/soft-landings/</a></p>
<p><b>Post Occupancy Evaluation</b></p>	<p>All new buildings or major refurbishments with an area of over 1,000 m<sup>2</sup> should have a post occupancy evaluation carried out.</p> <p>This should take place at least six months after the building has been occupied to allow any teething problems to be rectified.</p> <p>The post occupancy should include a number of the following methods of analysis and surveys:</p> <ul style="list-style-type: none"> <li>• Evaluation of monitoring data</li> <li>• Walk through and observation</li> <li>• Interviews</li> <li>• Questionnaires</li> <li>• Focus groups</li> <li>• Workshops.</li> </ul> <p>The choice of which of these to use will depend on the building use and the particular aspects requiring investigation.</p> <p>The results from the POE should be used to inform future construction projects.</p>

## 12 Conclusion

Meeting the targets and following the guidelines in this document will ensure that the new build and refurbished buildings that Renfrewshire Council procures are designed, constructed and can be operated to minimise the impact on the environment. Whilst meeting the targets may require additional activities during the design process, this will be more than compensated by the reduced operating costs and improved working environment that will result. The buildings will have appreciably lower whole life costs than less sustainable equivalents putting Renfrewshire Council at the leading edge of public sector building procurement.

## Appendix: Checklist

Stage	Activity
<b>Concept Design</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> Project brief includes all required sustainability targets</li><li><input type="checkbox"/> Thermal dynamic simulation of building created to optimise façade, form and orientation</li><li><input type="checkbox"/> Renewable and low carbon generation opportunities assessed</li><li><input type="checkbox"/> Internal and external space requirements determined for sustainable measures</li><li><input type="checkbox"/> Design reviewed with EMU</li></ul>
<b>Developed Design</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> User requirements assessed and detailed room datasheets developed</li><li><input type="checkbox"/> Operating energy target agreed with EMU</li></ul>
<b>Technical Design</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> Detailed renewables feasibility carried out</li><li><input type="checkbox"/> Day-lighting modelling carried out</li><li><input type="checkbox"/> Passive ventilation modelling carried out</li><li><input type="checkbox"/> Whole building commissioning plan developed</li><li><input type="checkbox"/> Whole life costing and dynamic thermal simulation of value engineering measures performed</li><li><input type="checkbox"/> Review final design against sustainability targets and report deviations to the EMU</li></ul>
<b>Construction</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> Tender documents reviewed to ensure sustainability targets are included</li><li><input type="checkbox"/> Tender responses reviewed to ensure sustainability targets are committed to</li><li><input type="checkbox"/> Whole life costing and dynamic thermal simulation of material or equipment substitutions performed</li></ul>
<b>Handover and Close Out</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> Review adherence to sustainability targets and report deviations to the EMU</li></ul>
<b>In Use</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> Building user guide provided to occupants</li><li><input type="checkbox"/> Post occupancy evaluation reviewed and disseminated to all individuals involved in design team and the EMU</li></ul>

**Appendix B**

**Building Energy Management Controls Document**

# AUTOMATIC CONTROLS SPECIFICATION

## 1.0 General

The Contractor shall install a new electric/electronic automatic control system for various Renfrewshire sites described in this section of the Specification.

All controllers shall communicate and share data, utilizing either of LonWorks or BACnet communications protocols only for the plant controllers. All controllers shall be either BTL listed in the case of BACnet based systems or bear the LonMark logo in the case of Lonworks. In the case where a combination of both BACnet and LonWorks controllers are utilised, the network management device must be capable of communicating with both types of network on the same device.

The proposed system must maintain strict adherence to industry standards including ANSI/ASHRAE Standard 135, Annex L, Device Profile and/or Functional Profiles identified in LonMark Interoperability Guideline standards to assure interoperability between all system components. BACnet system must be tested and listed on BACnet Testing Laboratory (BTL) web site. LonWorks system must be certified and listed on LonMark web site.

The Contractor shall install flow switches and dampers in ductwork and the like. All flow switches, dampers and the like shall be supplied by the controls specialist and handed to the contractor for installation. All other items, comprising the installation including motor starters, all power and control wiring, wire ways and containment shall be installed by the Automatic Controls Specialist.

## 2.0 Standard Features

### 2.1 Outstation Integration and Distributed Intelligence

The whole of the BMS shall constitute an integrated system but each plant controller (outstation) shall be stand-alone working on the principle of distributed intelligence. Each system of controllers shall work independently such that in the event of failure of the communications system no localised control shall be lost. All outstations shall be connected to a communications bus and accessible from the keypad or PC interface point on the main control panel.

### 2.2 Controller Configuration

The Controllers shall contain all necessary power supply units, I/O cards/modules, memory boards, termination boards, processing capability, intelligence, communications cards/modules, battery back-up and any other cards/modules as required to receive, process, transmit and control all requisite information to enable full stand-alone automatic monitoring, data-logging, and control whilst allowing bi-directional communication with the BMS Central PC.

Controller power supplies will incorporate filters to ensure that the outstations are protected from transients in the electrical supply due to magnetic, electrical and atmospheric disturbance.

Controllers shall incorporate battery back-up supplies so that in the event of power failures the outstation programme and logged data shall be retained for a period of not less than 30 days.

Where more than one outstation is required in a specific plantroom, outstations shall communicate with each other without the necessity to act through a PC.

Any loss of outstation programmed data shall be communicated to the Central PC and Local Keypad and the controller reprogrammed accordingly from either. This data shall be inclusive of all control, time and self learnt data.

The control panel shall have one permanently fixed local user interface tablet keypad. This shall be installed in the reception area of the building along with a control panel in the boiler plant. Both shall have the capability of accepting a user interface to permit local programming and interrogation if required by a lap top computer via Ethernet connection.

Each controller shall have its node number clearly identified with a permanent label on the door to assist in fault finding and servicing.

The controller shall be capable of implementing the following control strategies with all time and set-point parameters user defined and adjustable from a Supervisor and at the outstation via the local user interface.

1. Time switching control
2. On/off setpoint control
3. Optimisation (start/stop)
4. Day economisation (separate set-points for cleaning staff)
5. Weather compensation
6. Sequential control of plant
7. Night set-back
8. Three stage frost protection
9. OFF control based on maximum internal/external temperature
10. Zone control with separate calendar functions per zone
11. Digital logic control interlocks
12. Analogue control interlocks
13. Maximum demand/load shedding
14. Energy monitoring
15. Calendar Function for addition of on/off days
16. Time Extension Button

The outstation shall be capable of implementing the following functions but shall not be limited to them.

1. Self-diagnostics with malfunction reporting to the Central Station or local keypad interface.
2. Analogue input/output
3. Digital input/output

4. Status monitoring of digital and analogue points
5. Data logging of operator-specified digital and analogue points. Logging shall include trend logs of analogue points, event logs of change of state of digital points and rate logging of digital counting inputs. Logging intervals other than for event logs shall be operator-defined. Controller memory shall be sufficient to enable logging to be carried out on every sensor within that outstation for a period of one week at 30 minute intervals.
6. Run-time totals of plant
7. Communication to/from the PC and/or remote terminal(s).

### **3.0 Controller Software**

All software shall be capable of performing as a minimum all the tasks and functions as described.

All software shall have permanent immunity from corruption arising from

- (i) Magnetic, electrical and atmospheric disturbance
- (ii) Environmental factors including transients and electrical supply failure
- (iii) Programme faults
- (iv) Switching on or off any outstation
- (v) Testing

All related programmable points such as high/low limits, overrides etc shall be programmed to refer to the main control set point for that control loop and shall be adjusted automatically on adjustment of the main control set point or value.

Alarm priorities shall be agreed with the Renfrewshire Council, prior to commencing programming.

Holiday schedules shall be programmed and placed in their own index level as agreed with Renfrewshire Council.

Controllers shall be capable of automatic time change from BST/GMT.

The specialist installer shall arrange any necessary meetings with the engineer during the development of the software at which final details of the programming can be determined.

### **4.0 Communications/ Remote Web-based Access**

Access to the system, should be either through a Workstation on the LAN, within the building or remotely through the Internet. In the case where a BACnet system is deployed, the operator workstation shall be BTL certified and listed as a BACnet Operator Workstation (B-OWS). Access to the operator workstation should be accomplished through a standard Web browser.

Access to the BMS should also be possible via an embedded web-server installed on the control system network. The embedded web-server, or multiples of, shall contain all system graphics and be capable of providing data logging, alarming, scheduling and network

management functions. The web-server should be multi-protocol and able to incorporate two of the following protocols on the same device:

- Modbus,
- Lonworks
- Bacnet.

Ideally, access to the BMS should be capable using both of the methods described in above.

Software Tools - All software tools needed for full functional use, including programming of controllers, network management and expansion, and graphical user interface use and development, of the system described within these specifications shall be provided to the owner or his designated agent. Any licensing required by the manufacturer now and to the completion of the warranty period, including changes to the licensee of the software tools and the addition of hardware corresponding to the licenses, to allow for a complete and operational system for both normal day to day operation and servicing shall be provided. Any such changes to the designated license holders shall be made by the manufacturer upon written request by the owner or his agent. Any cost associated with the license changes shall be identified within the submittals.

## **5.0 Energy Monitoring**

The new controller shall be capable of monitoring the energy usage of each element of BEMS installation.

The system shall be capable of providing energy usage figures for each of the above for daily, weekly, monthly and yearly periods. The data shall be capable of being printed or downloaded in separate graphs or multiple data outputs overlaid on the same graph.

## **6.0 Design Document Requirements**

The contractor shall submit a preliminary design document for review. This document shall contain the following information:

- Provide a description of the proposed system along with a system architecture diagram with the intention of showing the contractors solution to meet this specification.
- Provide product data sheets and a technical description of all direct digital controller hardware required to meet specifications listed herein.
- Provide product brochures and a technical description of the Server, Operator Workstation, and network management device software required to meet this specification. Provide a description of software programs included.
- Open Protocols - For all direct digital controller hardware BACnet Protocol Implementation Conformance Statement PICS or proof of conformance to LonMark Certification and interoperability guidelines including the provision of all controller XIF files. Provide complete description and documentation of any proprietary services and/or objects where used in the system.

- Provide a description and samples of Operator Workstation graphics.
- BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of BACnet controller.
- LonMark Certification and XIF file for each submitted type of LonWorks controller.
- Bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
- Manufacturer's description and technical data such including product specifications and installation and maintenance instructions for items listed herein:
  - Direct digital controllers (BACnet and LonWorks)
  - Sensors and Transmitters
  - Transducers
  - Actuators
  - Automatic Control Valves
  - Automatic Control Dampers
  - Air Flow Stations
  - Control panels
  - Operator interface equipment

## **7.0 Control Panels**

All units mounted inside control panels shall be completely accessible for servicing and setting from the front door opening of the cubicle. Access shall be so arranged that setting and adjustments may be carried out without accidental contact of live terminals or isolation of the control panel.

The panel shall have a minimum of 10% space on the back plate and 10% spare incoming terminal connections to allow for future modifications.

The door isolating switch to the power section of the panel shall be interlocked, but shall not isolate the controls section.

## **8.0 Control Description**

The heating plant within this building is served by the control panel which is operated by a BACNET/Lonworks BEMS system. The system will carry out all the temperature and time control functions etc..

### **OPTIMUM START CONTROL**

The heating circuit will be started via an Optimiser within the BEMS Outstation. The BEMS looks at the outside air temperature and the space temperature and calculates the plant start-up time to achieve satisfactory heating by occupancy time.

## **BOILER CONTROL**

There are several boilers serving the heating circuits. The boilers will be sequenced depending on the demand required as sensed by the flow and return temperature sensors. The duty boiler will be rotated on a weekly basis by the BEMS controller.

## **BOILER SAFETY CONTROLS**

The boiler gas supply is fitted with a solenoid valve. This will be closed if the local Emergency Push-Button is activated; the gas detection system senses gas within the Boilerhouse or a Fire condition arises. On any of the above being activated the control panel will shut down.

## **PRESSURISATION UNIT**

The package pressurisation unit maintains the LPHW System at design pressure. In the event of a High or Low pressure occurring the automatic control panel interlock will shut down the boilers and pumps.

## **VARIABLE TEMPERATURE CIRCUITS**

There is a variable temperature circuit within, serving the radiators. Each circuit is served by a duty and stand-by pump set.

A Differential Pressure Switch fitted across the pump set will detect that flow has been established. Once enabled and flow has not been detected by the BEMS system, the stand-by pump will be enabled and an alarm will be activated. The pumps will be duty shared by the BEMS system; these will be changed over on a weekly basis.

The temperature will be controlled by a 3 Port Mixing Valve fitted in the flow pipework. A temperature sensor fitted in the flow and will pass a signal to the BEMS Controller which will look at the reading and the outside air temperature then modulate the valve to the 'by-pass' position.

The above control will be influenced by a Space Temperature Sensor.

## **FROST CONTROL**

There are 3 stages of Frost Control programmed into the BEMS system.

Stage 1 – Outside Air Frost

This will enable all pumps should a low temperature be detected.

Stage 2 – Immersion Frost

This will enable all pumps and boilers should a low return water temperature be detected.

Stage 3 – Fabric Frost

This will also enable the pumps and boilers should a low average space temperature be detected.

### **PUMP CONTINUATION**

On plant shutdown, the pumps will continue to run until the boiler flow has dissipated. This will ensure that the boilers will not cut off their integral High-Limit controls.

### **COLD WATER TANK**

The overflow pipe from the Cold Water Tank is fitted with a Flow Sensor.

Should an overflow situation be detected an alarm will be activated on the BEMS.

### **METERING**

The BMS software is programmed to monitor the following metering:-

- Main Water Meter
- Electricity Meter (Supplied with Distribution Board)
- Gas Meter

All historical logging of the above meters may be accessed from the BEMS.

## Appendix C

### Recommended temperature set-points

Room/Building Type	Temperature (°C)
Office	21
Public buildings - General building areas	19-21
Libraries	19-21
Museums / Art Galleries / Town Halls	19-21
Sports and leisure Changing rooms	20-25
Sports halls	16
Classroom/Learning Spaces	19-21
Corridor	17
Care Homes	21
Light works	16-19
Industrial/Factories Heavy works	11-19

Table 6 – recommended temperature set points.

### Heating Season

In order to help reduce running cost through period of warm weather, the heating within buildings shall only operate between October to May. Out-with this time period the heating will only come on if the outside air temperature is 12°C or lower, this will enable the building to get up to temperature.

## Appendix D

### Carbon Management Drivers

1. National Targets
  2. Carbon Reduction Commitment (CRC)
  3. Climate Change Levy (CCL)
  4. Feed in tariffs (FiTs)
  5. Renewable Heat Incentive (RHI)
  6. Energy Performance Certificates (EPC)
  7. Zero Carbon Buildings
  8. Zero Waste Plan
- Key policy drivers - the Waste (Scotland) Regulations and the Safeguarding Scotland's Resources action plan.
  - Reduce the carbon impact of waste by 3MtCO<sub>2</sub>e.

The key points outlined in the new Waste (Scotland) Regulations are as follows:

- All businesses and organisations to present key recyclable material for collection from 1 January 2014 - paper, card, glass, plastic, and metals
- Food waste businesses producing over 50kg of food waste per week to present it for separate collection from 1 January 2014
- Food waste businesses producing over 5kg of food waste per week to present it for separate collection from 1 January 2016
- A ban on the use of macerators to discharge food waste into the public sewer from 1 January 2016
- Local authorities to provide a basic recycling service to all households by 1 January 2014
- Local Authorities to offer a food waste recycling service in non-rural areas from 1 January 2016
- A ban on material collected for recycling going to landfill or incineration
- A ban on municipal biodegradable waste going to landfill by 1 January 2021

### Carbon Metric

- The Carbon Metric is a systematic approach to measuring and reducing the whole life cycle carbon impacts of Scotland's waste. Scotland is the first country to measure the carbon impact of its waste in this way. By giving decision makers a more complete understanding of the impacts of waste, we have a better chance of reducing these impacts.
- In 2011, the carbon impact of Scotland's waste was 13.9 MtCO<sub>2</sub>e. We saved 1.8 MtCO<sub>2</sub>e from recycling our waste in 2011. By 2025, if our current waste policies are implemented, we can reduce the carbon impact of waste by a further 20% or 3 MtCO<sub>2</sub>e.
- Zero Waste Scotland Carbon Metric tool<sup>8</sup> allows organisations to calculate the carbon impact of their waste in a way that is compatible with the national Carbon Metric approach. Data can be entered on the waste they produce and how this is managed. The results show the overall carbon impact of their waste and highlights which materials are contributing the most to this. Organisations can use the results to plan how to reduce their carbon impacts from preventing and more sustainable management of waste.

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<sup>8</sup> <http://www.zerowastescotland.org.uk/category/subject/carbon-metric>

- The carbon metric looks at a different boundary from the Carbon Management Plan and includes the upstream material consumption as well as the waste disposal. This additional information can help organisations understand how to make lower carbon decisions in terms of purchasing of goods and disposal of waste.
- Uptake of the carbon metric is encouraged (though not mandatory) within the Public sector Sustainability Reporting guidelines 'early adopters' = best practice/leaders as applied to internal waste (in conjunction with application to overall waste management service delivered to whole LA by Council).

# Appendix E

## Waste Reporting Procedure

### Overview of the WDF System and Calculation of Performance Indicators by SEPA

The waste tonnage data collected by Renfrewshire Council (i.e. the LACMW-see page 2) is reported to SEPA on a quarterly basis through the Waste Data Flow (WDF) system. Tonnage information is entered into the system manually through a series of question sheets. The system gathers data from two sides of the waste management process,

- **The tonnage of waste collected**, broken down by material type, its source (i.e. kerbside, recycling sites, special uplifts etc) and the contractor it is processed by.
- **The tonnage of waste treated**, broken down by material type and its destination (i.e. landfill, recycling, composting or diversion).

Defining waste from these areas allows the WDF software to verify the tonnage information inputted by using a mass balance, comparing the total tonnage of waste collected with the total tonnage of waste treated/managed.

Once verified the WDF software generates a summary sheet which can be printed for checking or used as a record of the waste data, see Appendix 1. It shows the recycling rate and the tonnage of BMW landfilled.

The recycling rate is calculated as follows;

$$\frac{\text{Tonnage of Household waste recycled or composted}}{\text{Total Tonnage of household waste collected}}$$

The tonnage of Biodegradable Municipal Waste landfilled is calculated using the biodegradability of the materials that are present in the landfill. This equates to approximately 63% as follows;

$$\text{Tonnage of LACMW sent to landfill} * 0.63$$

## Waste Flow in Renfrewshire – Collection and Treatment – Diagram 1

### Waste Collected in Renfrewshire

- Waste is collected from various sources in Renfrewshire. These are shown in the Waste Flow Figure 8.
- All the waste collected by the Council services, together is called the LACMW (shown as box 1 on the diagram). The calculation of the BMW landfilled includes all tonnages of LACMW.
- There is a small amount of non-household waste within the LACMW but the majority of it is Household Waste (shown as box 2 on the diagram). The calculation of the recycling rate **only** includes the tonnages of the household waste stream.
- The diagram shows the sources of Non-household waste shown in orange. It consists of flytipped waste, street sweepings and trade waste.
- The diagram shows the sources of Household waste in blue. It consists of waste collected from;
  - the kerbside
  - through the HWRC's and other recycling points
  - special uplift waste
  - fire reduction task force waste.
- The diagram shows the further split of the waste from the kerbside into refuse, blue bin waste, brown bin waste and glass box waste. It also shows that at the HWRCs waste is collected in both segregated waste streams and a mixed waste stream. It is important to detail these two sources further because that is what defines which type of treatment the material goes through.

## Waste Treated in Renfrewshire

- Each waste stream is taken to or collected by an appointed contractor for treatment.
- There are a number of contractors and a number of different processes for the treatment of waste and they are shown in the middle section of Figure 8. The current Council contractors and the waste streams they receive and the treatment they carry out are listed in Appendix 2, in addition the waste flows shown in Figure 8.
- On receipt of a quantity of waste a contractor measures the weight of the waste in tonnes. For the majority of waste streams this tonnage is calculated by weighing the vehicle plus waste. After the waste has been deposited the vehicle is then weighed again. Taking this off the first weight that gives the weight of the waste alone.
- Each contractor provides a report of the tonnages they have received either every financial period or quarterly. For the majority of waste streams a summary is provided as well as all vehicle loads listed individually.
- Contractor reports can be found at Z/Waste Data Returns/Waste Data Collection Information/Contractor name/Year.

- HWRC and Special Uplifts

These waste streams are processed as mixed waste or source segregated waste either through a clean MRF or Dirty MRF. The outputs from these processes are recyclate, landfill and a small amount of waste to EfW (dirty only).

- Refuse Collection

Kerbside refuse collection is taken to a bulking facility prior to taking it for landfill At this point some waste is removed for EfW or reclaimed for recycling.

- Dry Recyclate

Dry Recyclate from the kerbside and the recycling points is taken to a transfer station where it is then bulked up and transported to an MRF for processing.

- Garden Waste

Only green waste is taken to this site from the kerbside brown bins and the HWRC's. All the waste is composted.

- Food Waste

Food waste is taken to a transfer station where it is bulked up before being taken to an Anaerobic Digestion Plant for treatment. The outcome of this is a fertilizer and energy.

- Specialist Contractors

Some of the materials collected at the HWRC's and textiles from the recycling points and kerbside collection is collected by specialist contractors who recycle the material, there is no processing involved.

### **Overview of the Preparation of Data for Entry into the WDF System – Figure 9**

- Each contractor provides a report of the tonnages they have received either every financial period or quarterly. For the majority of waste streams a summary is provided as well as all vehicle loads listed individually.
- The raw data from all the contractor reports are prepared for entry into the WDF using the Waste Data Returns spreadsheet. The data cannot be entered directly into the WDF because some of the questions in the WDF require data from more than one contractor added together or data from more than one source to be added together.
- The WDR spreadsheet consists of a series of input worksheets into which the raw data provided by the contractors is entered. These figures are then brought together as required for the WDF through a series of linked summary spreadsheets. This provides a fast and consistent data set to for entry that is calculated automatically as soon as the raw data has been entered.

- The worksheets are listed below;

	Worksheet
1	Period dates
2	List of contractors
3	Recycling material split
4	Overall Waste Arising Summary
5	HWRC WT summary
6	Specific contractors
7	Breakdown of waste reclaimed from HWRC general waste
8	Garden waste from kerbside
9	Redundant
9a	Dry recyclate from kerbside
9b	Dry recyclate from kerbside
10	Street sweepings
11	HWRC throughput
12	Garden waste from HWRC
13	HWRC breakdown to WT
14	Scrap metal
15	EfW
16	Special uplifts
17	Landfill
18	WEEE
19	Final Destinations - William Tracey
Q10	Kerbside recyclate collection question
Q16	Redundant
Q17	Redundant
Q18	Redundant
Q23	Waste for Disposal collection question
Q100	Summary sheets and all processors with Final destinations

- The summary sheets resemble the entry sheets of the WDF system so that the information can be directly copied into the system.
- In addition there are 3 summary sheets that are used for producing internal KPI figures, completing the Quarterly site returns, verification of the WDF summary sheet and waste analysis in general.
- The WDR spreadsheets are filed at Z/Waste Data Returns/Waste Data Returns/Year/Quarter. There is a file for each period and then one for each quarter adding the periods together.

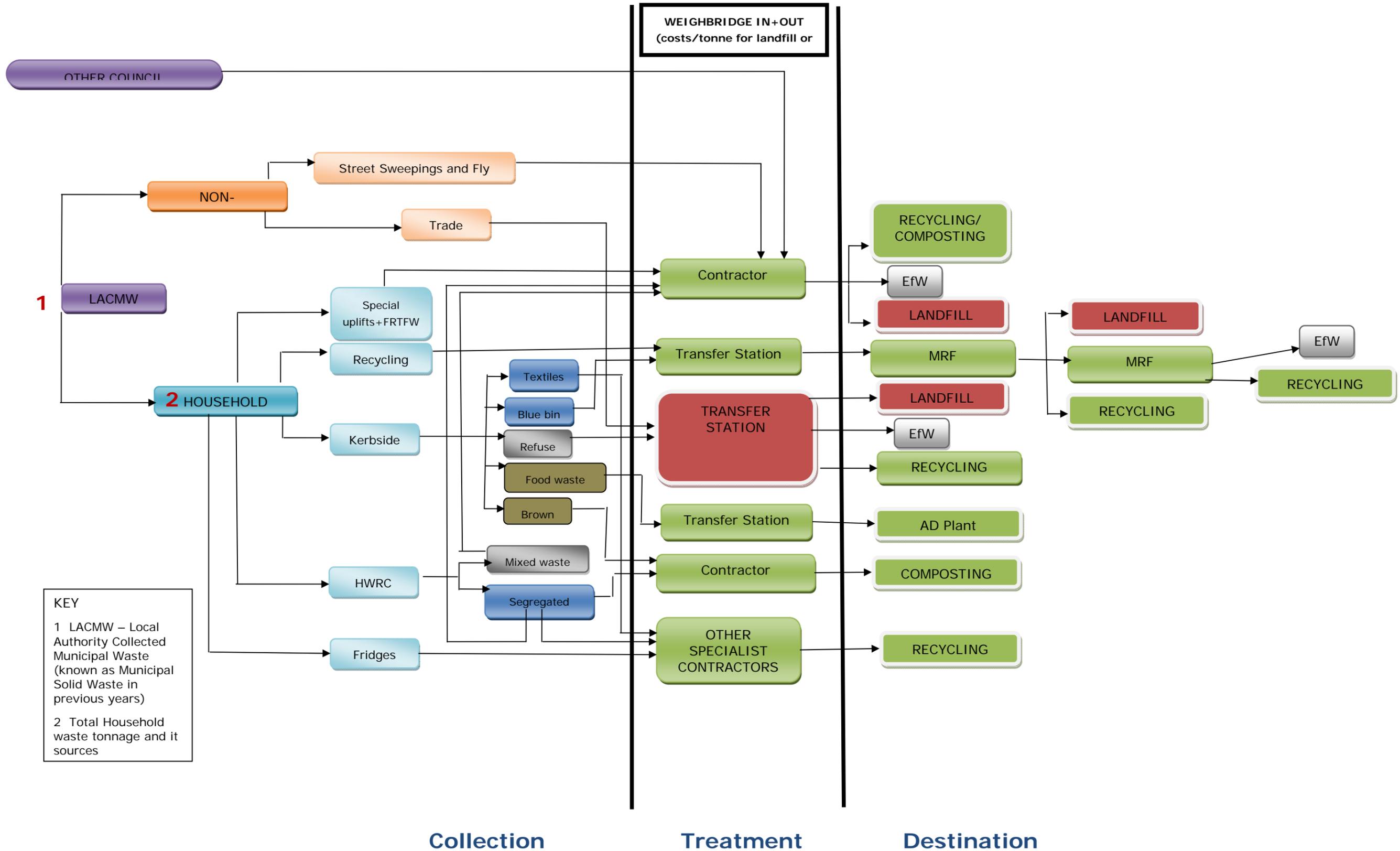
## **The Waste Data Flow System**

The WDF Scotland guidance April 2013 details how to complete it WDF. The summary sheets generated by the Waste Data Returns sheet are copies of the data entry sheets of the WDF system so figures can be copied straight into the system.

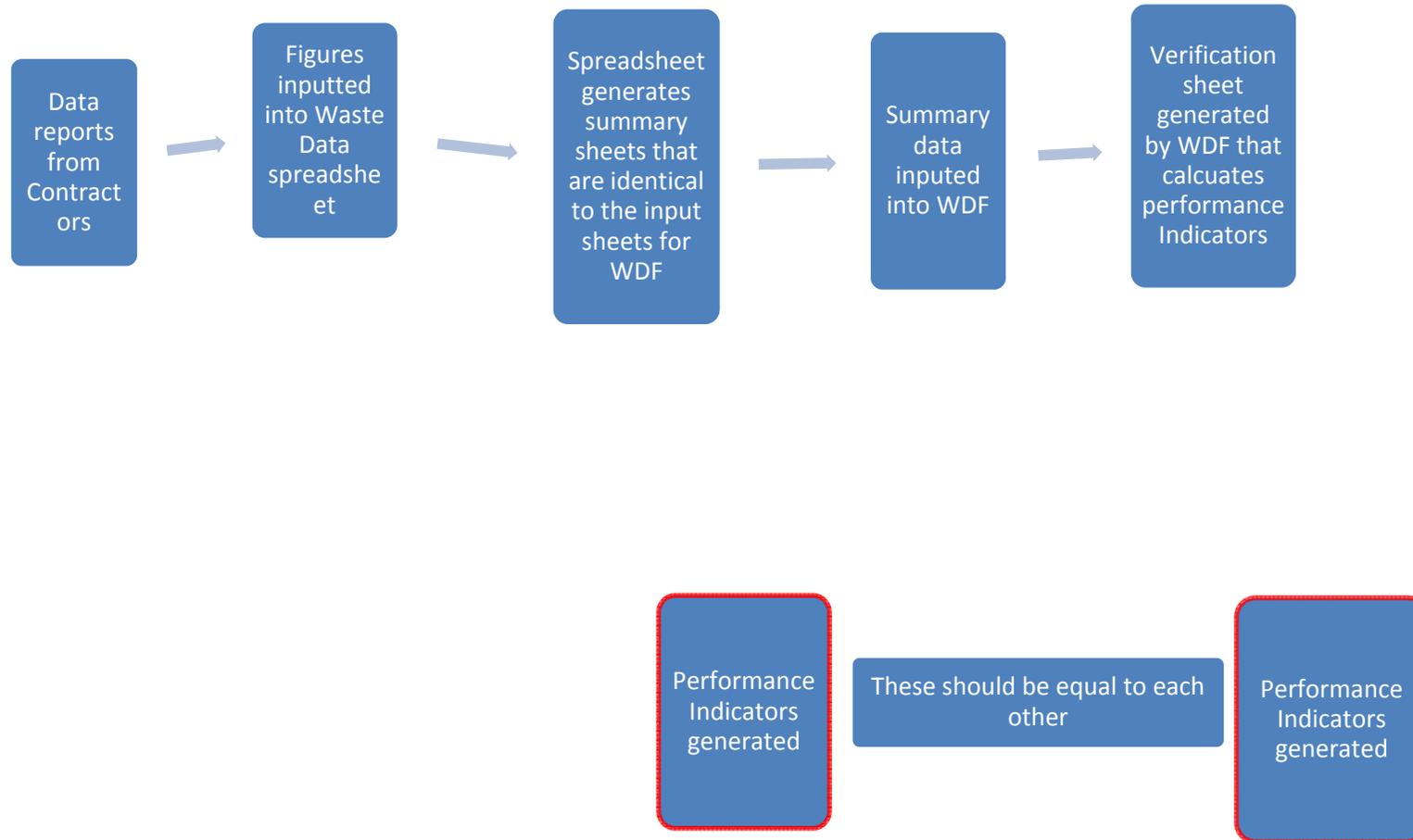
### **Reference Documents**

- WDF Scotland guidance April 2013
- User group meetings
- SEPA information updates by email

Figure 8: Waste Flow in Renfrewshire Council – Collection, Treatment and Destination.



**Figure 9:** Preparation of Waste Data for Entry into the WDF System



## Appendix F

### Carbon Emission Factor Used

The following Emission Factors from Defra's Guidelines to Defra/DECC's Greenhouse Gas Conversion Factors for Company Reporting 2013 were applied in the modeling of the 2012/13 baseline footprint.

Category	Emission Factor
Electricity	0.48357 kgCO <sub>2</sub> /kWh
Natural Gas	0.18404 kgCO <sub>2</sub> /kWh
Gas Oil	2.9343 kgCO <sub>2</sub> /Litre
Water and Wastewater supply	0.9353 kgCO <sub>2</sub> /m <sup>3</sup>
Diesel (average biofuel blend)	2.6008 kgCO <sub>2</sub> /Litre
Petrol (average biofuel blend)	2.2144 kgCO <sub>2</sub> /Litre
Average Car Mileage	0.306 kgCO <sub>2</sub> /mile

**Table 7: Defra emissions factors used in the calculation of the 2012/13 baseline carbon footprint. Water and Wastewater emission factor provided by Business Stream.**

**Table 8: Defra emission factors used in the calculation of the 2012/13 baseline carbon footprint for waste.**

Activity	Waste Type	Unit	Reuse kg CO2e	Open Loop kg CO2e	Closed Loop kg CO2e	Combustion kg CO2e	Composting kg CO2e	Landfill kg CO2e
Other	Books	tonnes			21	21	21	553
	Glass	tonnes		21	21	21		26
	Clothing	tonnes	21		21	21		552

Activity	Waste Type	Unit	Open Loop kg CO2e	Closed Loop kg CO2e	Combustion kg CO2e	Anaerobic Digestion kg CO2e	Composting kg CO2e	Landfill kg CO2e
Refuse	Municipal Waste	tonnes	21	21	21	21		289.835514
	Organic: food and drink waste	tonnes			21	21	6	570
	Organic: garden waste	tonnes			21	21	6	212.5
	Organic: mixed food and garden waste	tonnes			21	21	6	254.0625
	Commercial and industrial waste	tonnes		21	21	21		199

Activity	Waste Type	Unit	Reuse kg CO2e	Open Loop kg CO2e	Combustion kg CO2e
Electrical Items	WEEE - fridges and freezers	tonnes		21	
	WEEE - large	tonnes		21	21
	WEEE - mixed	tonnes		21	21
	WEEE - small	tonnes		21	21
	Batteries	tonnes		65	

Activity	Waste Type	Unit	Closed Loop	Combustion	Landfill
			kg CO2e	kg CO2e	kg CO2e
Metal	Metal - aluminium cans and foil (excl. Forming)	tonnes	21	21	21
	Metal - mixed cans	tonnes	21	21	21
	Metal - Scrap metal	tonnes	21	29	20
	Metal - Steel Cans	tonnes	21	31	21

Activity	Waste Type	Unit	Open Loop	Closed Loop	Combustion	Landfill
			kg CO2e	kg CO2e	kg CO2e	kg CO2e
Plastic	Plastics - average plastics	tonnes	21	21	21	34
	Plastics - average plastic film	tonnes	21	21	21	34
	Plastics - average plastic rigid	tonnes	21	21	21	34
	Plastics - HDPE (incl. Forming)	tonnes	21	21	21	34
	Plastics - LDPE and LLDPE (incl. Forming)	tonnes	21	21	21	34
	Plastics - PET (incl. Forming)	tonnes	21	21	21	34
	Plastics - PP (incl. Forming)	tonnes	21	21	21	34
	Plastics - PS (incl. Forming)	tonnes	21	21	21	34
	Plastics - PVC (incl. Forming)	tonnes	21	21	21	34

Activity	Waste Type	Unit	Open Loop	Closed Loop	Combustion	Composting	Landfill
			kg CO2e	kg CO2e	kg CO2e	kg CO2e	kg CO2e
Paper	Paper and Board - board	tonnes		21	21	21	553
	Paper and Board - mixed	tonnes		21	21	21	553
	Paper and Board - paper	tonnes		21	21	21	553

# Appendix G

## Business As Usual

### What is Business as Usual (BAU)

Business as usual (BAU) is the normal execution of standard operations within an organisation, particularly in contrast to a project or programme which would introduce change. In the context of carbon management, this means that BAU represents an estimate of what the overall carbon footprint of the organisation (based on the current footprint boundary) is likely to be in future years.

This BAU scenario needs to take into account internal and external growth factors that are likely to affect the carbon footprint over time. Although an overall carbon footprint is a single figure, in reality it is a complex underlying calculation, with different emission sources affected by these factors in different ways. Table 9 shows a sample of some of the key factors identified that affect BAU.

**Table 9: Examples of key internal and external factors impacting on BAU**

External Factors	Impact on Carbon Management Plan
Electricity grid carbon factor -the factor applied to convert units of kWh of electricity consumed to a figure of carbon dioxide equivalents emitted.	Grid factor changes year on year due to a variety of external factors outside of the organisation’s control including relative price of different fuels for power generation. Over a longer period of time, the grid factor changes due to energy policy and the relative contribution of different fuels and sources of generation e.g. renewables. The aim of energy policy is to reduce the carbon intensity of the grid and this will have a large effect on the overall footprint
Population growth/changing demographics	The need for the organisation’s services depends on both the size and structure of the population served and therefore changes to this population may need to be incorporated
Internal Factors	Impact on Carbon Management Plan
Energy intensity of service provision	The energy used per building is likely to change over time, due to changing nature of services and also changing efficiency of equipment. This is one of the areas that is particularly difficult to model at this point in time.
Asset changes	Over time, Renfrewshire Council will build and decommission buildings in order to meet the requirements of the population served. The more this can be modelled with real data e.g. known floor areas or energy efficiency data, the more accurate this forecast can be.

## **Why is it important to model BAU?**

As carbon management has become more sophisticated, organisations have become aware that the use of a single annual percentage growth to represent BAU is not necessarily accurate. Furthermore, by failing to model BAU, energy managers cannot clearly demonstrate progress against targets and value for money for the carbon management programme, which in turn has a knock-on effect on internal investment.

If an organisation's BAU carbon footprint is actually increasing faster than anticipated, the efforts of the Climate Change Working Group would be underestimated – this is especially true when the measured footprint appears to be flat-lining or even increasing and senior managers might question the impact of investment. However, a more accurate model of the BAU could show that without the efforts of the climate change working group, the footprint would have risen even more steeply.

More sophisticated models of BAU also provide a more in-depth look at which parts of the footprint are increasing and decreasing over time and this, along with financial models of the costs of fuels and services such as waste and water, can help organisations make better strategic decisions for future investment.

## **Growth factors**

The following growth factors were applied:

- 1) Estate Changes: based on discussion with the Head of Property Services. The modelled changes include a number of new buildings scheduled for commissioning, with complete or partial closure of buildings throughout the period of the Carbon Management Plan (2014/15 - 2019/20). Energy use in the new buildings was based on actual predicted energy consumption bespoke for the building where possible, or consumption of similar existing stock.

With this data inputted, the spreadsheet calculates the overall carbon footprint for the organisation in future years. This information has been used in the Carbon Management Plan to forecast 'Value at Stake', (re)set targets and determine the scale of carbon saving projects required to be implemented.

## **Future modelling of BAU**

BAU models are likely to change over time as organisations understand and incorporate more internal factors in their BAU model, especially in terms of in-depth understanding of future estate changes. There are also likely to be improvements in the available forecasts of external factors, especially grid electricity, which is one of the key determinates of future BAU, affecting a significant proportion of the carbon footprint.

Therefore, BAU forecasts need to be updated on a yearly basis, with improved information to help understand where best to allocate resources and efforts in the future.

## Appendix H

### Summary of projects listed in the Project Register

<b>Project</b>	<b>Summary of Measure</b>
<b>LED internal lighting</b>	Installation of LED tubes and PIR/photocell controls in buildings.
<b>Boiler optimisation equipment</b>	Supply and fit of dry cycle boiler optimisation equipment to reduce standing losses caused when boilers fire to compensate for heat lost to the surroundings, even when there is no requirement for space heating or hot water.
<b>Building Energy Management Systems (BEMS)</b>	Supply and fit Building Energy Management Systems to control boiler set points within buildings. Each BEMS shall be remotely accessed for interrogation.
<b>BEMS Bureau service</b>	Service to maintain, monitor and repair the existing BEMS within council public buildings.
<b>Photovoltaic Panels</b>	Supply and install PV panels in public buildings to generate on-site electricity and maximise the uptake of the Feed in Tariff (FiT).
<b>Conversion from oil to gas boilers</b>	Replace old and inefficient oil fired boiler plants with energy efficient mains natural gas with BEMS as per Controls Specification in Appendix B.
<b>Installation of biomass boilers</b>	Increase the installation of biomass boilers to reduce the council's dependency on fossil fuels.
<b>Energy awareness</b>	Increase energy awareness amongst staff to operate their equipment more efficiently and to switch off equipment when not in use.
<b>LED street lighting</b>	Replace traditional street lighting with LED lighting. Surveys are underway to determine the quantity of columns requiring replacement.
<b>Fuel efficient transport fleet</b>	Replace older vehicle with a new and more efficient fleet.
<b>Increase in recycling</b>	Increase the uptake of recycling throughout Renfrewshire and divert more waste from landfill.

## Appendix I

### Risk Register

	Description	Impact	Probability	Mitigating actions
1	<p><b>Timing</b></p> <p>If Carbon Management Plan is not completed on time and is not sustainable in its implementation and long term goals then projected carbon savings will not accrue within the expected timescale and could lead to failure of entire exercise</p>	H	L	Liaise with Project Sponsor to ensure sufficient time and resource available
2	<p><b>Negative Financial implications</b></p> <p>If finance is not made available as required and there is resistance to the implementation of major schemes then the expected scope for carbon reduction will be greatly minimised</p>	H	M	Ensure projects identified are approved by Finance
3	<p><b>Resistance to Cultural change</b></p> <p>Whilst many staff appear to embrace the general "sustainability" agenda the need to change behaviours with regard to energy efficiency in the workplace needs to be embraced.</p> <p>If behaviours do not change then the overall reduction in CO<sub>2</sub>e will be impacted on by 3-5% of the target.</p>	H	M	Liaise/lobby staff, colleagues and Departments through a joint Awareness Campaign
4	<p><b>Legislative Changes</b></p> <p>Forthcoming legislative changes are likely to enhance opportunities both for investment and also technical improvement of buildings and related energy efficiency. If this is delayed or shelved, there may be less leverage with certain departments to ensure change.</p>	H	L	Ensure that legal ramifications of regulatory changes are fed through early in any communication and are understood by all participants
5	<p><b>Development Team Interfaces</b></p> <p>Property Services to incorporate exemplar design business decisions into The Capital Works Programmes the Carbon Plan savings will be compromised.</p>	M	L	Ensure Property Services Project Managers embed the Sustainable Building Design document into all design for new build and major refurbishments
6	<p><b>Continuity of Project Managers</b></p> <p>If the Carbon Plan Management is to be</p>	M	M	Ensure succession

	<p>delivered effectively the key personnel involved must be fully engaged and retained on the Project. The most important personnel are the Climate Change Working Group, project sponsor and the Energy Team Leader</p>			<p>planning is in place. Ensure PDP's/Objectives reflect the CMT needs.</p>
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**For further information on this  
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