

**CARBON REDUCTION STRATEGY**

**REPORT OF DIRECTOR OF ENVIRONMENT**

**AGENDA ITEM: 8**

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**PORTFOLIO: TRANSPORT, PLANNING & SUSTAINABILITY (COUNCILLOR  
RAMESH PATEL)**

**Reason for this Report**

1. To approve the draft Carbon Reduction Strategy as attached as Appendix A to this report and supporting policies as attached to Appendix C.

**Background**

2. The Council currently spends approximately £10.4m on electricity and gas per annum on its activities and this is set to continue to rise in the medium to long term due to the increasing cost of these utilities.
3. These activities generate an equivalent of over 50,000 tonnes of CO2 emission.
4. The Council also pays a carbon tax based on its electricity and gas consumption per annum through the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme.
5. In 2014/15 this cost the Council over £440k. This was a reduction on the previous year's CRC expenditure, due to the positive impact of previous carbon reduction and energy efficiency. However, the CRC Tax is set to rise year on year with RPI, in addition for the first time in 2015/16 the emissions arising from street lighting supplies must also be paid. The 2015/16 submission is therefore expected to be above £800k.
6. The Carbon Reduction Strategy has been produced to set the framework to manage our ongoing carbon emissions and energy efficiency activities. It sets a specific carbon reduction target that will assist in achieving wider national and local carbon reduction targets. These include:
  - a) UK Target - Climate Change Act 2008 - To help the UK reduce greenhouse gas emissions by at least 80% by 2050.
  - b) UK Target - 15% of the UK's energy demand is required to come from renewable sources by 2020.

- c) Welsh Government Target - A 40% reduction by 2020 compared to figures from 1990.
- d) The Council's EU Covenant of Mayors commitment to reduce carbon emission across the city.

## Issues

- 7. An existing Carbon Management Plan was developed in 2005/06 to cover the period up to 2018. This committed us to reducing the carbon emissions arising from Council Activities by 60%. Significant progress has been made on this Plan and we are on track to achieve the 60% target, much of which has been supported by reductions in landfilling of waste strategies and increasing recycling as well as building retrofit for energy efficiency.
- 8. The newly developed Carbon Reduction Strategy is proposed to build on these outputs and to refresh the policy to take account of regulatory, operational and technical changes and opportunities that have arisen since the first strategy. The new policy will span from 2015/16 to 2022. The scope of the strategy is more focussed on electricity and gas consumption across the council's operations Estate. The strategy has been developed in consultation with the following directorates and groups: Facilities Management, Health and Safety, Projects Design and Development, Education and Life Long Learning, Health and Social Care, Sports Leisure and Culture, Arts and Theatres, Catering, Harbour Authority, City Services, Information and Communication Technology, Finance (procurement) and Environment.
- 9. The new Strategy focusses on emissions arising from the Council's direct operational activities. It complements other key carbon and energy policies and actions including:
  - a) Energy efficiency retrofit measures across the Council's housing estate
  - b) Major renewable energy generation schemes contained within the Energy Prospectus including Radyr Weir, Lamby Way Buildings and Solar Farm and activities to address fuel efficiency in the Council's vehicle fleet.
- 10. It is anticipated that through delivery of projects and initiatives identified within the Carbon Reduction Strategy that a 35% reduction in current carbon emissions associated with electricity and gas can be achieved by 2022 using 2013/14 as the new baseline year.
- 11. Four key strands have been identified which will contribute to reduction in carbon. These are:
  - a) Renewables - Renewable energy generation on council buildings
  - b) Invest to Save - Retrofit projects to our own estate of buildings including technologies such as insulation, LED lighting, building controls, boilers etc

- c) Design and Asset Management - Efficient use of our building assets including asset disposal and refurbishment
  - d) Good Housekeeping - Focussing on staff's behaviour to energy and ensuring buildings are operated efficiently.
12. The Strategy includes detailed policies and actions around each of these key strands. The Capital programme already includes provision for early actions, including the development of localised renewables on the roofs of Council buildings and other energy efficiency measures in parts of the estate. The Strategy has also analysed and identified a full range of other measures that will be developed and brought forward through the longer term up to 2022.
13. It should be noted that other schemes such as the Radyr Weir Hydroelectric project and the Lamby Way Solar Farm as invest to earn schemes are outside the direct scope of the Strategy but will also contribute to our wider carbon reduction ambitions. A wide range of projects and funding sources support both the Council's infrastructure such as: ReFIT- Council building retrofit of energy saving technologies, Arbed - housing insulation and Salix – Street lighting energy saving measures.
14. Each type of Council funded renewable energy investment requires a limited risk approach with a return above that which would be received as Gilt edged bonds at a risk free rate for example. The overall investments are decided upon via individual robust business case process that would also incorporate any timescale risks against subsidies such as Feed In Tariffs (FITs) or Renewable Heat incentives (RHI). However, it is also crucial that the right investment is made in the city's infrastructure to secure a sustainable energy management resilience for the City's future. As such further development plans are progressing that could include both shared investment and risk, propositions with other public bodies and the private sector as part of an Energy Prospectus for Cardiff. This approach will be the subject of a future report to Cabinet.

### **Scrutiny Consideration.**

15. The strategy and policy documents were presented to Environmental Scrutiny on the 9th of December 2014.

### **Reason for Recommendations**

16. Adoption of the strategy will:
- contribute towards Cardiff's One Planet aspiration
  - contribute towards the national and local carbon reduction and renewable energy targets
  - contribute towards Cardiff's energy resilience with less reliance on the grid for its energy
  - promote energy efficient behaviour of its occupiers and staff
  - help reduce the Council's operational costs

## **Financial Implications**

17. The report provides details on potential short medium and long terms strategies in relation to Carbon reduction as well as potential savings that reducing carbon could generate. The Council's capital programme already includes allocations for retrofit, street lighting as well as energy reduction measures for Street lighting in residential and streets and principal roads. The report highlights that securing energy efficient projects often has a higher capital cost, but may be the cheapest over the expected lifespan of the project. The budget report for 2015/16 highlighted the revenue expenditure and capital expenditure pressures particularly in relation to affordability of additional borrowing. This carbon strategy report highlights significant potential capital expenditure implications of C £16m up to 2022, which equates to c £2.4m p.a.
18. Whilst the strategy makes a number of recommendations it is essential that the taking forward of schemes is undertaken following consideration of budget framework requirements, approval of robustly prepared and assessed business cases as well as consideration of the risks of affordability of any additional borrowing that may be required to be undertaken compared to alternative priorities for investment. Where significant, such business cases may need to be the subject of future Cabinet reports.
19. Opportunities for external funding should be sought where applicable and consideration of future long term use of assets considered before any approved investment takes place e.g. whether properties are planned to be retained, replaced or used in alternative ways. There needs to be clear linkages to any Property and Infrastructure asset management plans.

## **Legal Implications**

20. The proposed recommendation, put simply, is to approve the draft Carbon Reduction Strategy.
21. Legal Services has not been involved in the preparation of the Strategy. The decision maker will need to be satisfied that the Strategy addresses all material factors, including legislative and government guidance (including Welsh Government guidance), that the same have been taken into account, that there has been adequate consultation with all those who may be affected by the Strategy and that their views have been taken into account. Legal Services has advised that this is addressed in the body of the report.
22. In considering this matter the decision maker must have regard to the Council's duties under the Equality Act 2010. Pursuant to these legal duties Councils must, in making decisions, have due regard to the need to (1) eliminate unlawful discrimination, (2) advance equality of opportunity and (3) foster good relations on the basis of protected characteristics. Protected characteristics are:
  - Age

- Gender reassignment
- Sex
- Race – including ethnic or national origin, colour or nationality
- Disability
- Pregnancy and maternity
- Marriage and civil partnership
- Sexual orientation
- Religion or belief – including lack of belief

23. Consideration should be given as to whether an equalities impact assessment( EQIA) is required, (including an updated assessment if there has been a time lapse since the assessment was carried out), to ensure that the Council has understood the potential impacts of the proposed decision in terms of its public sector equality duty.

## **RECOMMENDATIONS**

Cabinet is recommend to approve the Carbon Reduction Strategy as the basis for ongoing energy saving and carbon reduction activity across the Council's Estate.

### **JANE FORSHAW**

Director  
22 May 2015

*The following appendices are attached:*

Appendix A: Draft Carbon Reduction Strategy (Executive Summary)  
Appendix B: Draft Carbon Reduction Strategy (Detailed Report and Appendices)  
Appendix C: Draft Supporting Policies



# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

[www.oneplanetcardiff.co.uk](http://www.oneplanetcardiff.co.uk)



# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## Executive Summary



### Background

In 2005 the City of Cardiff Council (CCC) approved a Carbon Reduction Strategy which set a target of reducing carbon emissions from Council activities by 60% by 2018. At the start of that Strategy the Council's total emissions were 120,000 tCO<sub>2</sub>e/annum. The 60% reduction ambition therefore gave a target to reduce to 48,000 tCO<sub>2</sub>e/annum by 2018. The CO<sub>2</sub>e emissions for 2013/14 were 50,931 tCO<sub>2</sub>e/annum, meaning that we are well on course to meet the 60% target in advance of the 2018 timeframe.

Successful carbon management projects over the lifespan of the Strategy have included energy efficiency projects, such as LED lighting schemes, boiler replacement, heating controls, variable speed drive. Improved data collection and reporting have also been key features, including smart meter roll out to over 90% of the council's portfolio and implementation of the Carbon Culture platform which

reports on energy consumption in real time and has helped to identify opportunities to lower demand. Waste management also played a key role in the previous strategy, especially in activities to divert waste from landfill.

Recycling volumes have increased and residual landfill waste is now processed in a waste to energy plant, resulting in equivalent CO<sub>2</sub> emissions from landfill being avoided and landfill waste being used to generate electricity.

Following from the success of the 2005 Strategy, the 2015 Carbon Reduction Strategy has been prepared to provide updated targets for the next period up to 2021

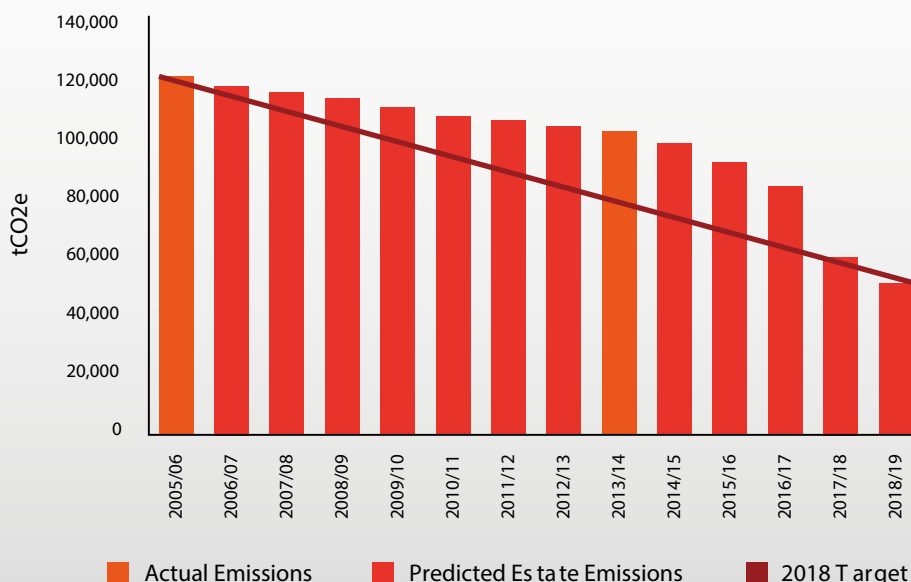
### Key Strands

The new Strategy has re-focused the scope of new targets and places a sharpened focus on direct carbon

emissions that CCC is responsible for and in control of, specifically for the built estate and city infrastructure (street lighting, traffic lighting etc). It is also more directly focussed on reducing our energy costs, which currently stand at around £10m per annum.



Figure A - Absolute Carbon Emissions





## > Executive Summary

The Strategy provides a framework and set of actions for achieving emission reductions and cost savings through the implementation of measures through 4 key strands. These include:

**Good Housekeeping**  
Improved building management by building managers and occupiers.

**Design and Asset Management**  
including improvement to the council's built estate and improved building rationalisation.

**Invest-to-Save Projects**  
Including retrofit energy efficiency projects

**Renewable Energy Generation Projects**  
Generation of on site renewable energy to reduce import of energy from the grid.

Figure B - CO2e Reduction Initiatives

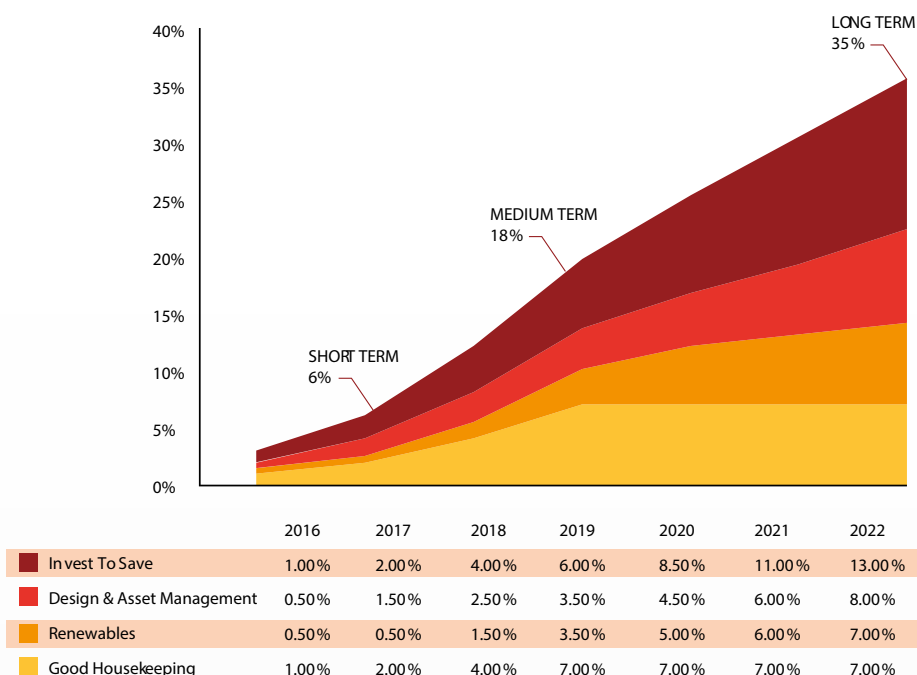


Table A – Summary of Initiatives

Initiatives	Cost Saving [£/year]	CO2e Savings [tCO2e/annum]	Cost [£]	Estimated Payback [Years]
Good Housekeeping	£0.945M	3,565 tCO2e (7%)	Absorbed current budget	Immediate
Invest to Save	£1.0M	6,621 tCO2e (13%)	£6.6M	6.4 years
Renewables	£1.03M	3,565 tCO2e (7%)	£9.5M	12.9 years
Asset Rationalisation	£0.625M	4,075 tCO2e (8%)	-	-
<b>Total</b>	<b>£3.6M</b>	<b>17,826 tCO2e (35.0%)</b>	<b>£16.1M</b>	<b>-</b>



# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## > Executive Summary

Table B - Summary of Targets

	By Fiscal Year	Accrued Target	Strategy Focus
Short Term	2017	6%	Focus on implementing Good Housekeeping measures and develop invest to save initiatives funding and implement some small scale invest to save initiatives.
Medium Term	2019	18%	Complete invest to save initiatives, allocating 18% of the readily achievable target savings in the medium term with the remainder in the long term.
Long Term	2022	35%	Target the remaining invest to save initiatives, and allocate budget to implementation of renewable energy generation on the built estate.

The Strategy has been informed primarily with data collated in studies undertaken to identify energy inefficiencies and savings opportunities across the Council Estate.

A comprehensive list of potential interventions has been developed and this has been used to generate an implementation plan across the four key strands listed above. Some of these actions are already included as live funded projects in the Capital programme, or as "behaviour change" activities facilitated by the Energy team.

Short term funded proposals are supported by detailed business cases showing efficiencies and payback periods etc. It is anticipated that wider Action plan will be updated periodically to take account of lessons learned and emerging energy policies and technologies. Its longer term purpose will be to inform future carbon reduction actions and investments

throughout the period up to 2021. The graph on page 3 highlights the possible CO<sub>2</sub>e reduction initiatives that could be implemented across the 4 activity strands.

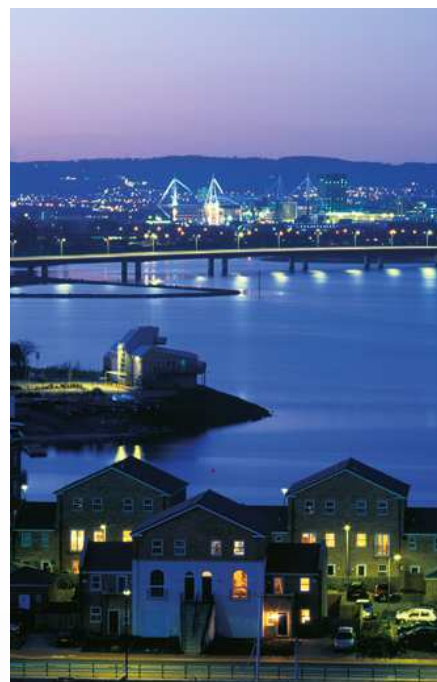
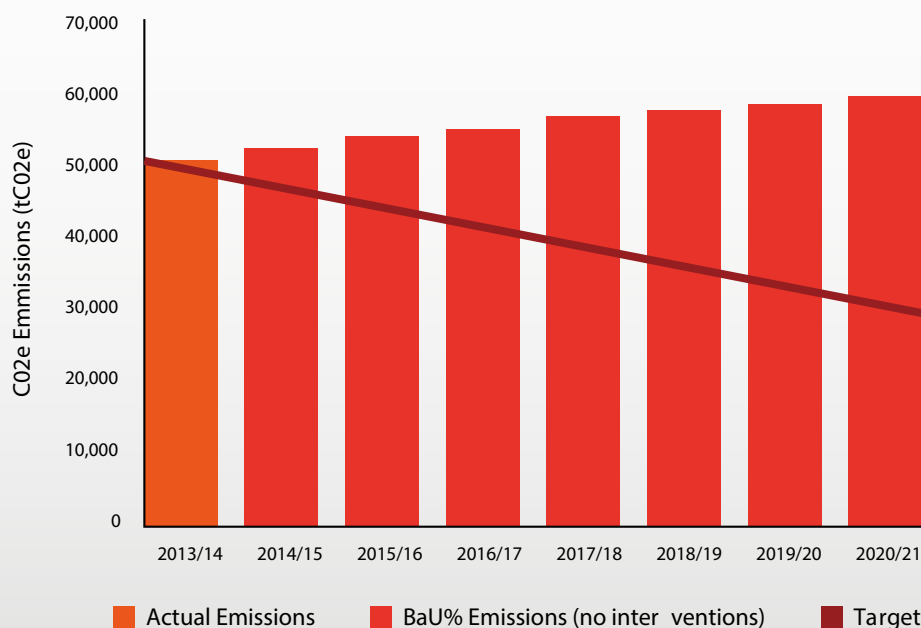


Figure D - Implementation Plan Utility Cost Projections



# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## > Introduction

### Function

This Carbon Reduction Strategy details the existing and future commitment of The City of Cardiff Council (CCC) to manage and reduce energy consumption and resultant carbon dioxide equivalent (CO<sub>2</sub>e) emissions. Historic CO<sub>2</sub>e emission data are analysed with future projections to 2020 to review the impact on future targets. Financial and CO<sub>2</sub>e emission reduction option evaluation demonstrates a proposed plan to ensure carbon targets are not missed, to manage future CO<sub>2</sub>e emissions, rising carbon taxes and utility costs. This document integrates

issues relating to energy and carbon management to provide a formal document for future update.

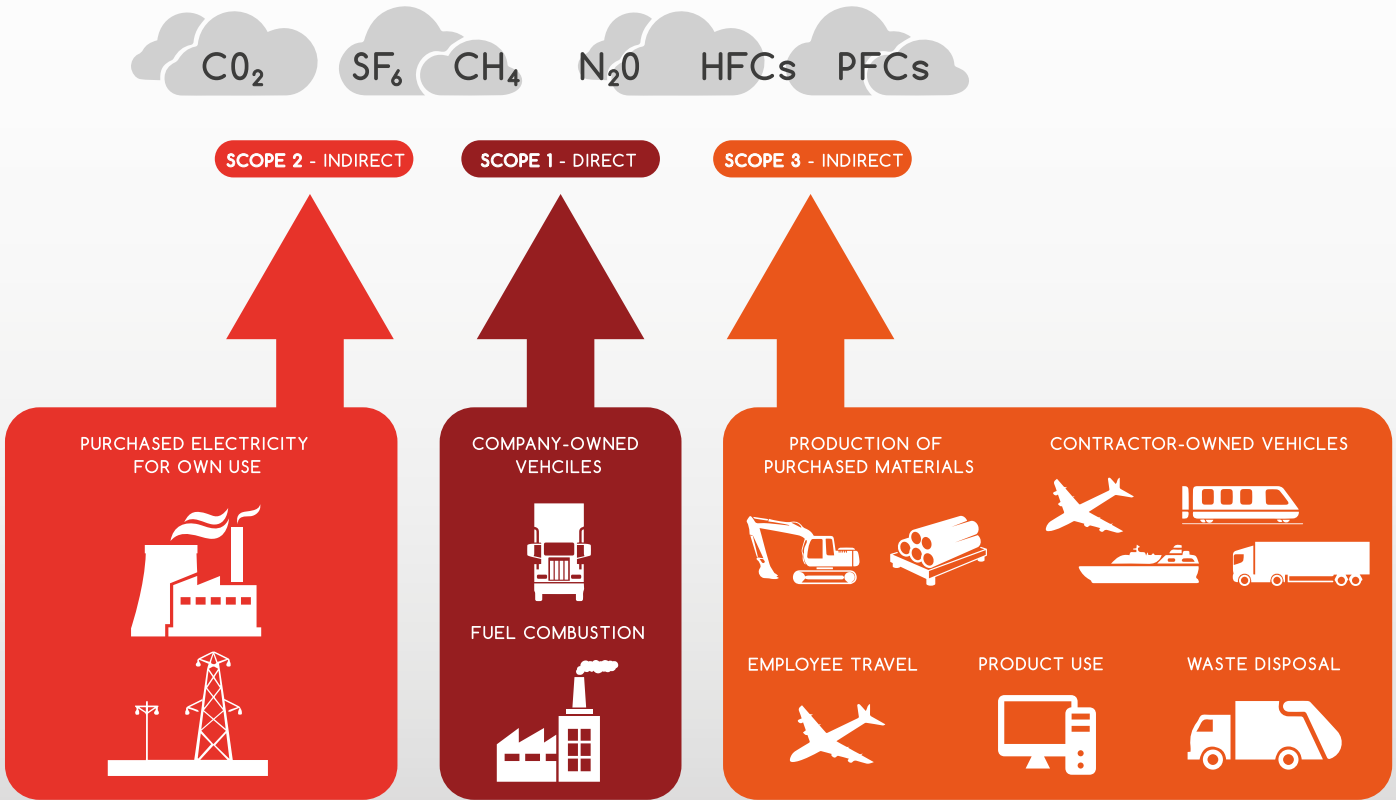
This document focuses on what are referred to as Scope 1 and Scope 2 CO<sub>2</sub>e emissions:

- Scope 1 emissions are defined as direct CO<sub>2</sub>e emissions which occur from sources owned or controlled by CCC, for example CO<sub>2</sub>e emissions from combustion in owned boilers. (Only scope 1 emissions from buildings shall be considered within this report, as emissions from fleet vehicles are measured within separate reporting).

- Scope 2 CO<sub>2</sub>e emissions are defined as those arising from the generation of purchased electricity consumed by CCC.

- Scope 3 CO<sub>2</sub>e emissions are defined as indirect emissions generated as a consequence of the CCC activities e.g. business travel (excluding use of company vehicles) commuting, and international travel. Scope 3 CO<sub>2</sub>e emissions are excluded from this report.

Figure 1 GHG Protocol Classification of CO<sub>2</sub>e Emissions





## > Introduction

The figures presented in this report are all in terms CO<sub>2</sub>e taking into account emissions of Green House Gases GHGs other than carbon dioxide (CO<sub>2</sub>) (namely, methane and nitrous oxide) during the combustion of the fuel, in the case of natural gas and fuel oil, or during the generation of electricity at UK power stations.

### Report Format

Section 2 considers aspects of governance and monitoring in relation to carbon management and who will have responsibility for delivering the Strategy.

Section 3 presents the drivers of the Carbon Reduction Strategy and a review of the current approach to CO<sub>2</sub>e reduction, including strategic objectives and targets.

Section 4 and 5 presents robust baseline data on CCC energy use and resulting CO<sub>2</sub>e emissions and projections to 2020.

Section 6 presents the financial and CO<sub>2</sub>e evaluation for reduction measures and the cost benefit analysis.

Section 7 is the proposed implementation plan to meet the targets, including considerations of how the plan will be financed and strategic enabling actions that CCC will take.

### City of Cardiff Council Background Information

The City of Cardiff Council (CCC) is the governing body for the city of

Cardiff. CCC is committed to doing all it can, within practical, economic and technical limits to reduce greenhouse gas emissions resulting from its activities. Furthermore it aims to use its role as an exemplar to positively encourage emission reductions in the wider community.

The council owns and operates a number of properties across the county including schools, offices, leisure and housing plus highways and transport (street lighting & traffic signals).

### Summary of Previous Studies

A summary of previous energy/carbon reduction studies are summarised within Appendix A of this Strategy. Carbon Trust:

- Carbon Management Energy Efficiency Report – Phase 1, Lighting Implementation Study

City of Cardiff Council:

- Commercial Buildings Solar Scheme
- School Buildings Solar Scheme
- RE:Fit
- LED Street Lighting Feasibility 2014

### CO<sub>2</sub>e Emission Factors

Table 1 CO<sub>2</sub>e Emission Factors that have been used within this report are based on 2013/14 Guidelines from the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme. This reflects the councils internal reporting.



Figure D - Implementation Plan Utility Cost Projections

Fuel	Carbon Factor	Source
Gas	0.1836 kgCO <sub>2</sub> e/kWh	CRC Energy Efficiency Scheme Order: Table of Conversion Factors 2013/14 – Jan 2014
Electricity	0.5410 kgCO <sub>2</sub> e/kWh	CRC Energy Efficiency Scheme Order: Table of Conversion Factors 2013/14 – Jan 2014

# CARBON REDUCTION STRATEGY

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## > Governance and Progress Monitoring

The City of Cardiff Council is committed to continual improvement of its environmental performance to minimise adverse effects on the environment, following the principles embedded in sustainable development and the Green Dragon environmental management system. The council actively encourages responsible environmental practice by its suppliers, contractors and partners. The Council has a strong commitment to sustainability and carbon saving, most recently committing to it in their previous carbon reduction strategy document. This set challenging targets for reducing its carbon emissions for council buildings and municipal waste by 60% in 2018 (from a 2005-06 baseline).

By creating and adopting a number of initiatives, the council has been consistently reducing their energy consumption since 2005/06. The creation of "carbon management" systems have been of great benefit to the council, enabling sophisticated automatic metering that allowed for the central collection of electronic data as well as a programme of retrofit energy reduction projects. CCC can now provide robust energy information which can be quickly and efficiently analysed and interpreted. The Energy Management team currently provide energy reporting to Directorates and the council's Green Dragon environmental management system.

This incorporates annual energy saving targets for specific buildings (County Hall, City Hall, Wilcox House, Global Link, Cardiff Castle, Pentwyn Leisure Centre, Western Leisure Centre, Central Library, Maindy Pool & Track). The energy saving target is monitored by the council's environmental management steering group on a bi-annual basis and is reported annually in the council's Environmental Statement. This Environmental Statement focuses on CO2 emissions from the whole Council estate, street lighting, fleet transport, grey fleet and staff travel. The Environmental Statement is signed off by the Director of Environment and is available to the public. Carbon Reduction Commitment reporting is undertaken and sent to the Environment Agency on an annual basis for the built estate. This excludes housing and landfill.

The Salix Recycling Fund aims to increase capital investment in energy efficient technologies across the public sector. It is a ring-fenced fund with capital provided by Salix, and matched by the partner Cardiff Council, to be spent on energy saving projects. The financial savings delivered by the projects are returned to the fund allowing further spending on front line services, hence the term 'Recycling Fund'. £200,000 is committed in the council's recycling fund.

There is a budget allocated for energy reduction in schools. Funding for energy reduction initiatives is sought allocated on an adhoc basis. There is currently no internal process for delivery of identified projects.





## > Overview of the Carbon Reduction Strategy



Carbon Management Strategy Drivers

The UK agenda on CO<sub>2</sub>e reduction, as established by the Climate Change Act 2008 and the associated targets to reduce CO<sub>2</sub>e emissions by 34% by 2020 and 80% by 2050 against 1990 levels, are increasingly being reflected in both legislative and fiscal policy. At a pragmatic level the need to reduce CO<sub>2</sub>e emissions will increasingly be required both to reduce costs as fuel prices and associated taxes rise, and to protect the organisations reputation by demonstrating the ability to deliver on the carbon reduction agenda.

### Targets

As highlighted in section 4.1 the current carbon Strategy runs to 2018 with a target of 60% CO<sub>2</sub>e emission reduction from non-domestic buildings and municipal waste from 2008 with figures reported as absolute.

### Reputation

There is a reputational risk if CCC does not take further steps to set and work towards challenging targets, proactively managing its environmental impacts and communicate challenges and achievements to all members, staff and the public.

### Welsh Government Aspirations

In May 2009, the Welsh Government (WG) released the 'One Wales One Planet' report; in it the Government sets ambitious targets to reduce Wales's CO<sub>2</sub>e footprint.

The Climate Change Strategy further details requirements to achieve CO<sub>2</sub>e reduction. The document sets a 3% year on year reduction in CO<sub>2</sub>e from the transport, residential and public sector. The 3% target refers to improvements in Scope 1 and 2 CO<sub>2</sub>e emissions to all buildings under ownership, and to tackle Scope 3 CO<sub>2</sub>e emissions at some unspecified time in the future.

In keeping with its aim to be an exemplar of sustainability performance, the Carbon Reduction Routemap will enable the Council to develop a new Carbon Management Strategy and targets in line with best practice across the public sector.

### Utility Costs

The effects of volatility and increases in utility costs will have a dramatic effect on CCC's future finances. This Strategy details measures to protect CCC from utility cost variations by reducing energy demand, providing security of supply and flexibility of onsite energy generation for new technologies.

Variations in utility costs are outside CCC control and there is considerable uncertainty in future years. The table below provides an indication based on a range of percentage increases.



Table 2 Utility Cost Projections (Based on 2013/14 Utility Costs)

Utility Rate	Current 2013/14	+25% 2020	+ 50% 2025	+75% 2030
Estimated Cost	£10.4 M	£13.1 M	£15.7 M	£18.3 M

# CARBON REDUCTION STRATEGY

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## > Overview of the Carbon Reduction Strategy



### The Carbon Reduction Commitment Energy Efficiency Scheme (CRC EEC)

The Carbon Reduction Commitment (CRC) was updated as part of the UK Government's Spending Review in 2010 and now referred to as the CRC Energy Efficiency Scheme (CRC EEC). The scheme provides a financial incentive to reduce emissions by placing a price on CO<sub>2</sub>e emissions. Annually from April 2012, the council was required to 'buy' CO<sub>2</sub>e allowances for every tonne of CO<sub>2</sub>e forecasted to be emitted as a result of its stationary energy use in the following 12 months.

CRC taxes have recently entered phase 2 and will be charged at £16.40/t CO<sub>2</sub>e

which is expected to rise further in future years. The following table provides estimated financial cost based on a range of projections.

Of particular note is that all energy consumed via passive unmetered supplies will become liable for CRC charges from 2014/15 onwards. This will result in the council's street lighting and traffic signals being included within the scheme, which have significant costs (as added into fields in Table 3 with a \* symbol)

### Planning Guidance

Formerly Wales-wide Planning Guidance required all non-residential buildings to achieve BREEAM 'Very Good' but also the mandatory energy credits for BREEAM 'Excellent' when constructed as a new build, or refurbishment. However with the introduction of the new Part L 2014 regulations, which are devolved from England, alone are deemed sufficiently challenging to remove this guidance. Therefore BREEAM is no longer mandatory, but the regulations themselves will be significantly more challenging than in the past.

CCC currently have limited plans for increasing its portfolio of properties and refurbishment, therefore each

opportunity will be carefully assessed against the new building regulations.

3.2.6 Building Regulations  
Welsh Building Regulations have been devolved from the rest of the UK Building Regulations as of July 31st 2014, and represent a significant improvement over the previous 2010 regulations (typically requiring a reduction in carbon emissions of between 15-20%).

Devolution of Building Regulations in Wales is widely seen as a mechanism to speed up the reduction of carbon emissions in Wales even further and address WG's aspirations for all new buildings to be CO<sub>2</sub>e zero in the future.

Table 3 - CRC EEC Projections (Based on 36,504 tCO<sub>2</sub>e – 2013/14 CO<sub>2</sub>e Emission)

CRC Rate	£12/tCO <sub>2</sub> e 2013/14	£16.4/tCO <sub>2</sub> e* 2014/15	£26/tCO <sub>2</sub> e*	£36/tCO <sub>2</sub> e*
Estimated Cost	£438,044	£811,255	£1,286,137	£1,780,805



## > Energy

### Energy Metering

CCC utilise software that includes metering connections for the majority of utility meters across the estate. This allows utility consumption to be monitored accurately and remotely. The purpose of the SystemsLink software is to collect energy data at individual building level, for display and manipulation by users both on and off site. The system is also used for billing validation purposes.

### Energy Performance and Display Energy Certificates

As part of the UK's compliance to the EU's Energy Performance of Buildings Directive (EPBD), Energy Performance Certificates and Display Energy Certificates are now required to be displayed in all public buildings over

500m<sup>2</sup> floor area. As of January 2015 it will be mandatory to include buildings above 250m<sup>2</sup>. Energy Performance Certificates (EPCs) and Display Energy Certificates (DECs) have been mandatory since October 2008.

EPCs provide the calculated asset energy performance rating of a new building, meaning the performance of the building fabric, plant equipment and lighting. An EPC is required on construction, sale or rent of a building.

DECs provide the measured operational energy rating. They are produced annually using actual energy consumption and are presented with results from previous years. DECs are primarily intended to be displayed within public buildings though they may be displayed in private buildings voluntarily.

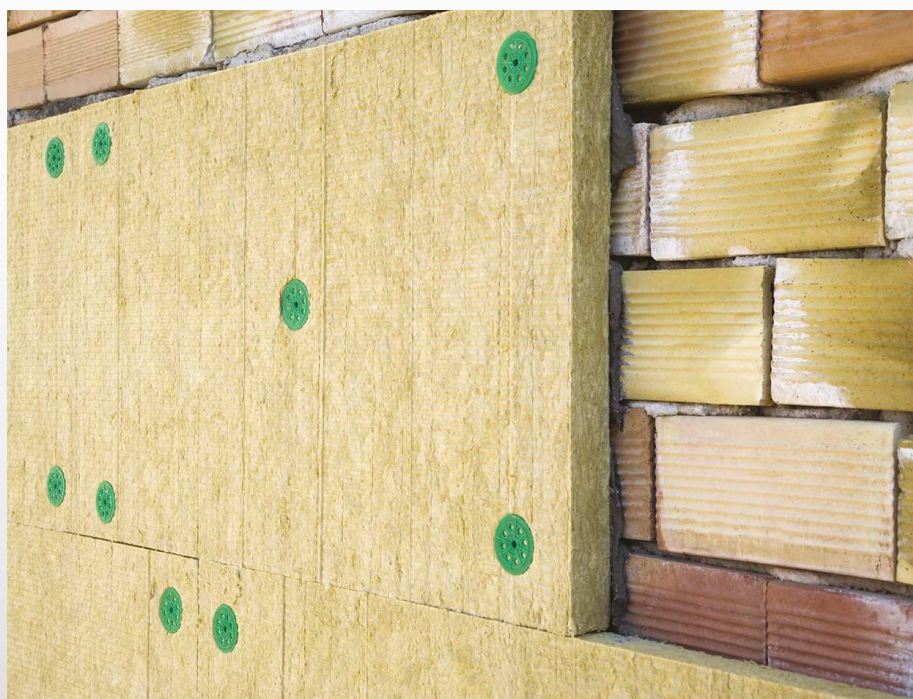
### Planned Maintenance

At present:

- There is a reactive maintenance programme
- Funding is committed to a backlog maintenance programme
- There is a limited medium to long term planned preventive maintenance programme due to budget constraints.

Funding is committed to reactive maintenance all related to health and safety, DDA, other legal compliance and business continuity. There is little resource to reduce energy consumption and improve environmental comfort. Furthermore there are:

- Large elements of reactive maintenance - mostly due to consequence of having so many properties and range of directorates
- Longstanding issues of continuity – i.e. staff movement between buildings/directorates



# CARBON REDUCTION STRATEGY

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## > CO2e Emission Data

### Introduction

This section provides analysis of the energy used by CCC from the financial year 2013/14, and the CO2e emitted from the energy used. The figures for energy used have been converted to CO2e emissions using the Guidelines from the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme so that they will match the councils current internal reporting (refer to section 1.7). The carbon emission baseline has been updated accordingly to these factors so that a fair comparison can be made.

### Energy and Absolute CO2e Emissions

The following issues are highlighted from the data analysis;

- Energy consumption is fairly equal between gas and electricity, however due to higher carbon emissions and utility costs this shows the greater impact of electricity consumption in Figure 3 and Figure 4.



Table 4 CCC Summary 2013/14

	Gas		Electricity		Total
Energy (kWh)	70,596,860	50.1%	70,184,151	49.9%	140,781,010
CO2e (tCO2)	12,962	25.4%	37,970	74.6%	50,931
Utility Costs	£2.6 M	24.7%	£7.9 M	75.3%	£10.4 M

Figure 2 Energy Consumption 2013/14

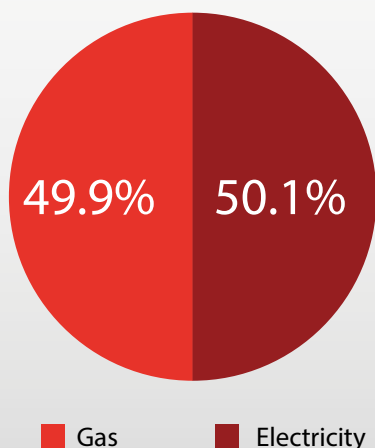


Figure 3 Absolute CO2e Emissions 2013/14

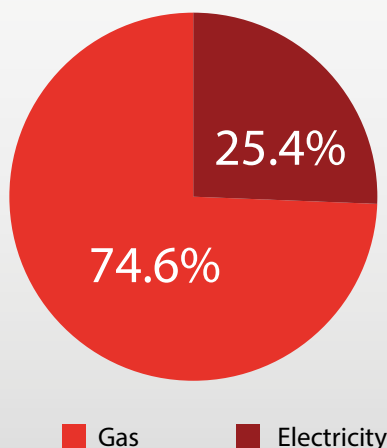
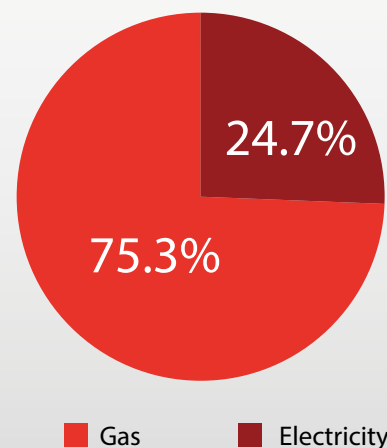


Figure 4 Utility Costs 2013/14







## > CO2e Emission Data

### Current CO2e Emissions

Based on the 2013/14 financial year the total CO2e emissions for the estate are 50,931 tCO2e (see Table 4). It is clear that prioritising carbon reducing measures addressing electricity consumption will yield the greatest carbon emission savings and utility cost savings.

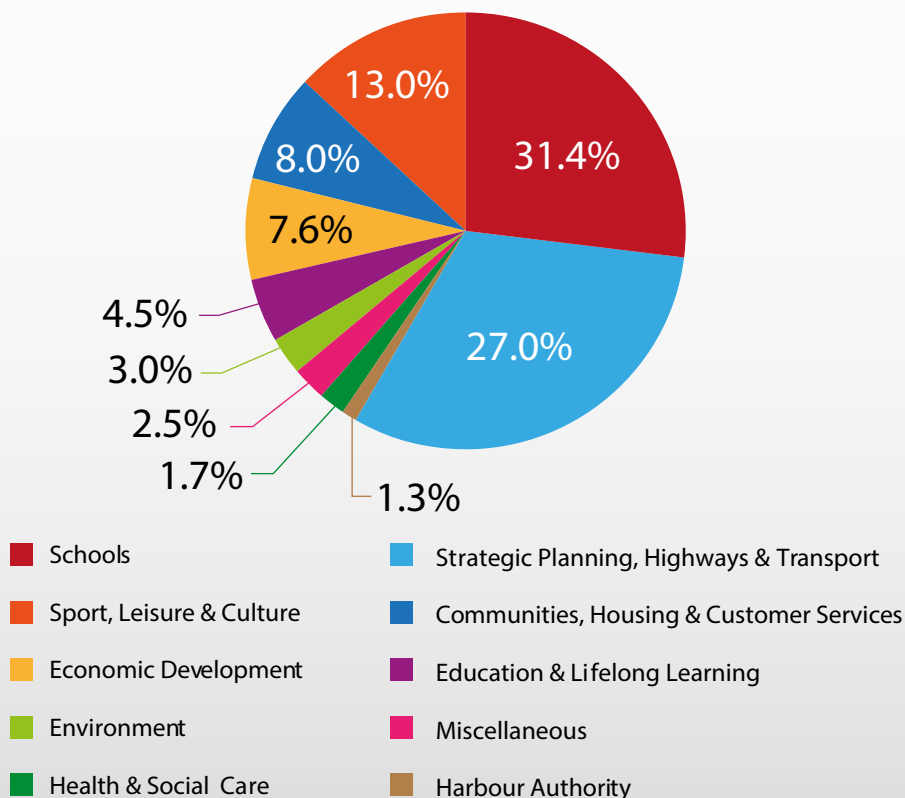
Table 5 and Figure 5 demonstrate that Schools are the biggest carbon consuming directorate, however the top 4 directorates alone cover over 75% of the overall carbon emissions. Active targeting of these directorates will yield the highest carbon savings. It should be noted that CCC employ an Energy Awareness Officer for Schools due to the high energy consumption and future area to concentrate on. The "Miscellaneous" directorate has been created based on summarising the carbon totals for supplies which do not relate to the council's regular directorate structure.



Table 5 CCC Summary of Carbon Emissions by Directorate 2013/14

Fuel	Total tCO2	Total
Schools	15,970	31.4%
Strategic Planning, Highways & Transport	13,755	27.0%
Sport, Leisure & Culture	6,618	13.0%
Communities, Housing & Customer Services	4,092	8.0%
Economic Development	3,850	7.6%
Education & Lifelong Learning	2,284	4.5%
Environment	1,551	3.0%
Miscellaneous	1,291	2.5%
Health & Social Care	847	1.7%
Harbour Authority	675	1.3%
<b>Total</b>	<b>50,931</b>	

Figure 5 Carbon Emissions by Directorate 2013/14



# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## > CO2e Emission Data

Further analysis of the data in Table 6 highlights that the number one source of carbon emissions is street lighting across the city, followed by County Hall and City Hall.

Figure 6 shows that the Top 3 buildings / meters represent 30%, Top 10; 40% and Top 20; 50% of all CCC carbon emissions. Again, active targeting of these sites is likely to achieve the highest carbon savings.

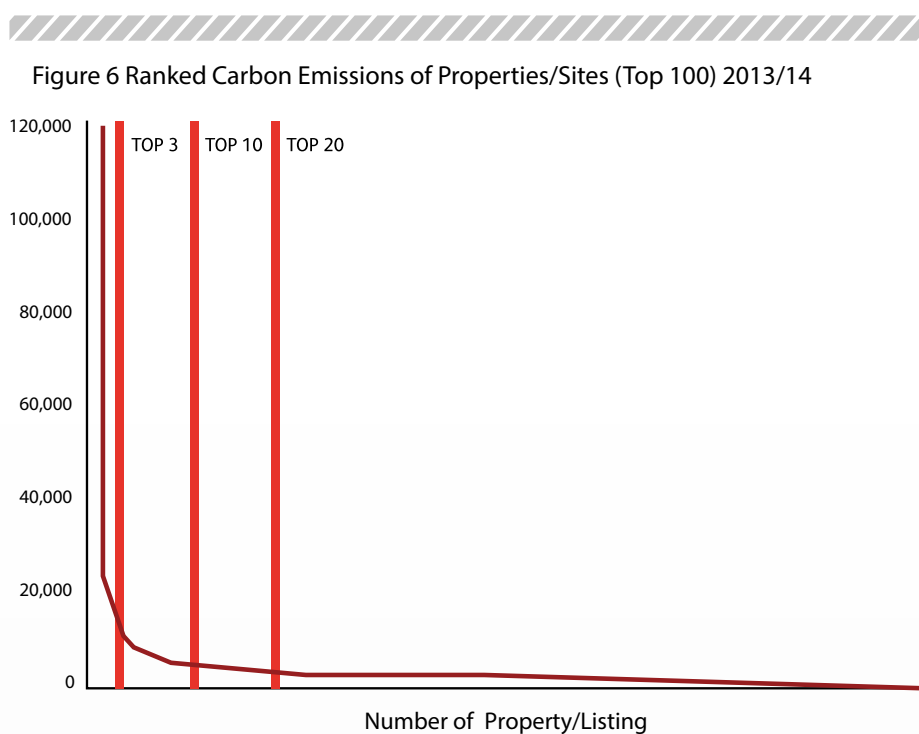


Table 6 Top 10 Carbon Emissions by Site

Site Name	Electricity CO2e (tCO2 )	Gas CO2e (tCO2 )	Total Carbon Emissions (tCO2)	Total
1 Street Lighting (All)	11,836	0	11,836	23.2%
2 County Hall	2,105	287	2,392	4.7%
3 City Hall	661	526	1,187	2.3%
4 Traffic Signals (All)	1,127	0	1,127	2.2%
5 Fitzalan High School	517	376	894	1.8%
6 St David's Concert Hall	573	289	863	1.7%
7 Lamby Way Cleansing Depot	788	22	810	1.6%
8 Cardiff International White Water Centre	679	44	723	1.4%
9 Western Leisure Centre	376	185	561	1.1%
10 Radyr Comprehensive School	355	190	545	1.1%



## > Assessment Against Baseline and Targets

### Scope 1 and 2 CO2e Emission Performance

The CO2e energy emission in 2005/06 from CCC representing building and street lighting was a net 40,800tCO2e/annum. This figure has not been re-profiled to account for updates in CO2e conversion factors as original source calculations are unavailable.

Figure 7 shows the 2005/06 breakdown of carbon emissions for the council. Of particular note is that the majority of emissions were recorded from landfill waste, however the council has more direct control over the emissions from buildings, vehicles and street lighting.

As mentioned in Section 3.2, the current carbon management plan runs to 2018 with 60% target reduction from 2005/06 energy emissions.

CCC should be commended for its approach since the implementation of the original Strategy as the improved standard of smart metering means that emissions can now be calculated with great accuracy. This has held particular importance for CRC's and group utility contracts. Furthermore a number of high profile, high energy schemes such as the White Water Rafting Centre and New Central Library have been added to the portfolio of properties. Therefore it is believed that the 2013/14 carbon emissions data is the most accurate set of figures to re-profile and reassess the council's performance.

### Current Project CO2e Emissions

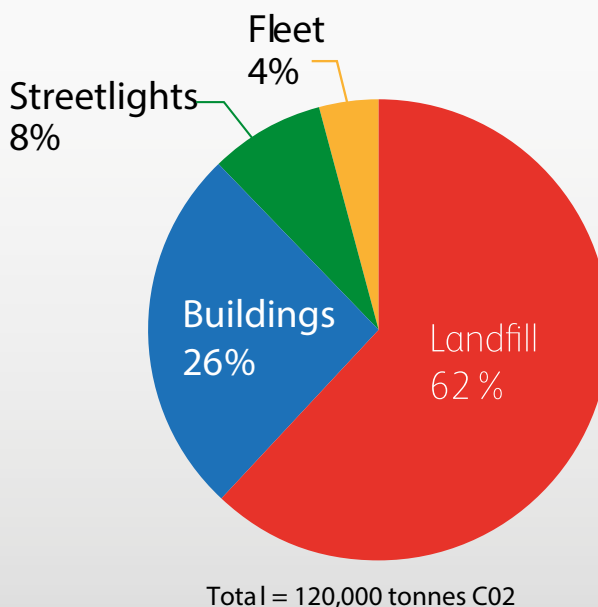
Completed projects will also have an impact on absolute CO2e emissions for the estate. The following list summarises some of the key projects completed/in progress since the 2008 plan:

- LED Lighting Installations
- Building Insulation Programme
- Heating Controls Programme
- Variable Speed Drives – Pumps & Fans
- Lighting Controls in Council Buildings
- IT projects – virtual servers, blade servers, extreme PC's
- Lamby Way Landfill Gas CHP
- In-vessel composting facility
- Automatic Meter Reading
- Voltage Optimisation Installations
- Heating Controls in Demountable Classrooms
- Biomass feasibility/implementation

- Energy Awareness Campaigns
- Detailed Energy Auditing of largest energy consumers
- New Build – Beacon Project
- Low Carbon Building Performance Standard
- Heating Controls Audit
- School Pool Hall Energy Improvements – Pool covers, Ventilation, Heating plant



Figure 7 2005/06 Carbon Reduction Strategy Summary of CO2e (Source: "Cardiff Council 60% Carbon Reduction Strategy")



## > Assessment Against Baseline and Targets

### Electrical Grid Decarbonisation

The effects of decarbonisation of the electrical grid (the assumed reduction of the UK average CO<sub>2</sub>e emissions for electricity over time, as power generation shifts away from fossil fuels towards nuclear power and renewables) will potentially have a dramatic effect on CCC CO<sub>2</sub>e emissions as 80.9% of the CO<sub>2</sub>e emissions are related to electrical consumption. The Government Low Carbon Transition Plan forecasts a 22% reduction in grid electricity CO<sub>2</sub>e emissions by 2020, which would reduce grid electricity CO<sub>2</sub>e emission factor to 0.42198 kgCO<sub>2</sub>e/kWh. Based on 2013/14 consumption and CO<sub>2</sub>e emissions, this would reduce CCC absolute CO<sub>2</sub>e emissions by 8,353 tCO<sub>2</sub>e, equivalent to 16.4% reduction. In the short to medium term, grid decarbonisation is unlikely to assist CCC in achieving its target without further intervention. The power generation of the UK electrical grid is outside the control of CCC and there is considerable uncertainty over the pace at which grid decarbonisation will be achieved.

### Business as Usual Projections

Projecting Business as Usual (BaU) into the future is challenging due to the various factors. The projections include changes in the CO<sub>2</sub>e emissions due to current projects (as detailed in Figure 6). Furthermore, the BaU includes 2% year on year increase in CO<sub>2</sub>e emissions due to increased electrical load from new equipment and energy intensive activities. This is based on historic increases in energy use without intervention to reduce energy consumption.

### New Developments

There are at least two new developments currently being planned that will see the estate grow:

- Splott Hub (this is replacing an existing facility)
- Eastern High School

Currently these developments have been excluded from the BaU projections.

The projections will be updated for any plans for further new developments as this will directly impact on the associated emissions from the estate.

### BaU Projection Summary

Figure 8 and Figure 9 provide projections of absolute CO<sub>2</sub>e emissions of the Estate to illustrate the impact and the challenges it poses to CCC in meeting the target of 35% by 2022.

Figure 8 BaU CO<sub>2</sub>e Emission Projections

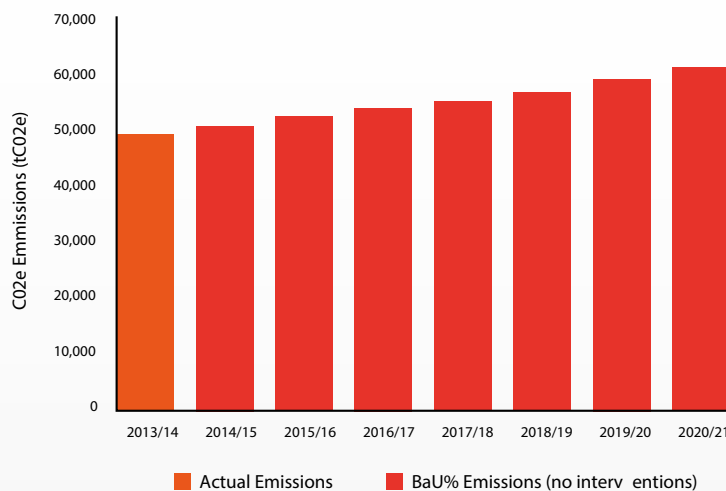
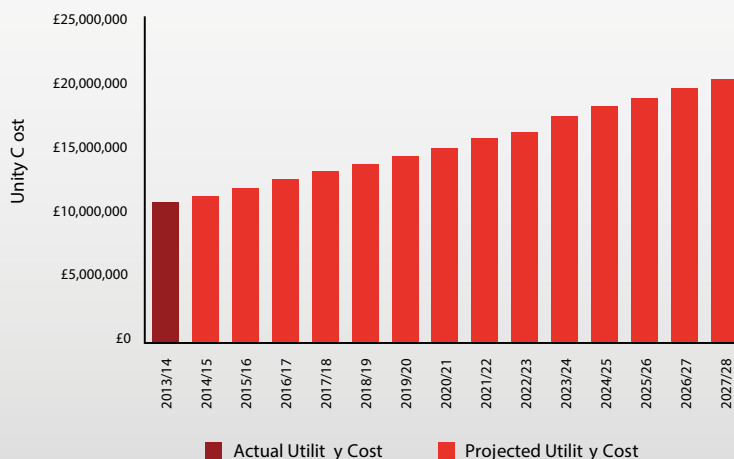


Figure 9 BaU Utility Cost Projections



# > Financial and CO2e Reduction Option Evaluation

## Introduction

An energy hierarchy with clear stages will be followed to provide a structured approach to reduce energy consumption and CO2e emissions.

Minimizing energy consumption for buildings can be accommodated by driving down energy demand through passive building design and operation techniques prior to focusing on energy efficient plant and controls, in doing so challenging existing conditions and solutions.

Simple solutions are often best as complex initiatives are not easily understood by the building's users consequently having little impact. A holistic approach will be adopted to lower energy consumption by incorporating consequential improvements to buildings prior to installing energy saving measures and utilising renewable technology options.

The options considered within this section are split into demand side and supply side initiatives;

- Demand side initiatives reduce the demand for energy in the CCC's facilities, and
- Supply side initiatives to reduce the carbon intensity of the energy used.

The list is not exhaustive and will be developed during the life of this Carbon Reduction Routemap.

## Estate/Building Level Strategy

The following section deals with targeted measures that could impact upon the top 5 carbon emitting properties as presented in Table 6. It is hoped that this strategy could be applied to further sites to identify areas to focus on.

## 1 – Street Lighting

Street lighting is covered in a separate report and covers the replacement of current high energy lighting on the council's strategic routes only. Considerable savings are possible with replacement of high efficiency LED fittings and the installation of dimming equipment. Once operational they are estimated to provide savings of 3,451 tCO2e each year representing a saving of 6.8% per annum of the overall estate.



Figure 10 Energy Hierarchy



## > Financial and CO2e Reduction Option Evaluation



### 2 – County Hall

County Hall is the largest single property on the estate and has significant energy consumption for gas and electricity. Furthermore analysis of the server room loads indicates they are responsible for a constant 70kW electrical baseload. This is approximately 14% of the overall carbon emissions. This can be seen in Figure 11.

Analysis of the performance of the building against standard CIBSE

benchmarks indicates the consumption of natural gas is much better than the benchmark, whereas the electricity is much worse as shown in Table 7. Further analysis has not been possible as limited sub metering is non-existent .



Figure 8 BaU CO2e Emission Projections

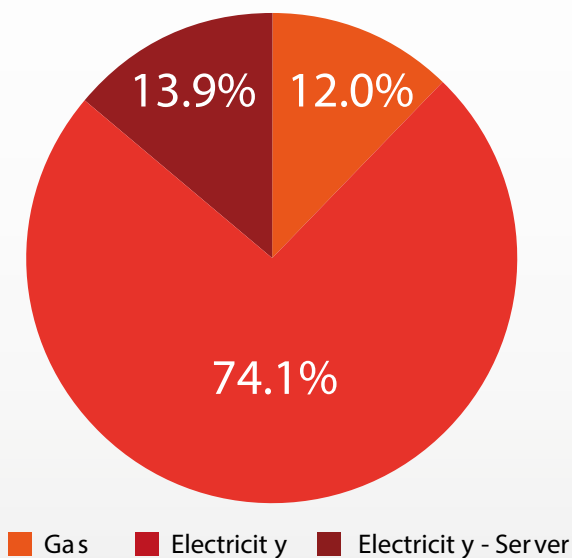


Table 7 County Hall Performance Against CIBSE Benchmark

	County Hall kWh/m2	CIBSE Benchmark kWh/m2	Performance
Gas	62.2	120	51.9%
Electricity	155.1	95	163.3%





## > Financial and CO2e Reduction Option Evaluation



### 3 – City Hall

City hall is a large Edwardian building completed in 1904, and contains several grand halls and council chambers. The building contains many open and closed plan offices with 300 regular occupants. Figure 12 shows there is a fairly even split between carbon emissions for gas and electricity.

Table 8 demonstrates the flaws behind current benchmarking standards as it appears the building has good

performance against current CIBSE benchmarks, however considering the age and usage it is quite challenging to fit against a standard benchmark (“office” has been used as the current DEC).

Therefore it is recommended that the most ideal measurement of performance would be to look at the historical trend in carbon emissions for the building in order to generate potential areas of savings.

Figure 8 BaU CO2e Emission Projections

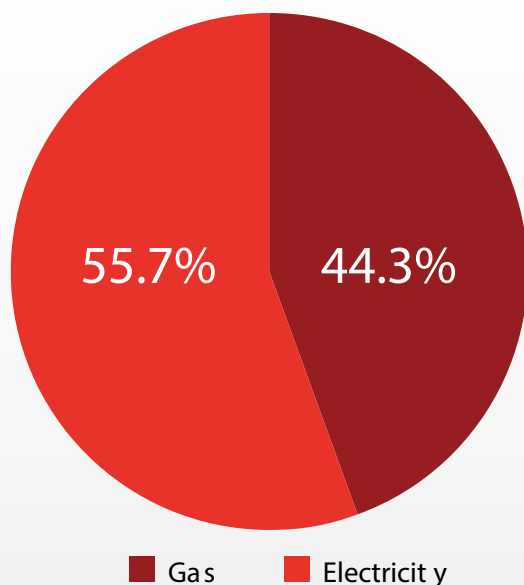


Table 8 City Hall Performance Against CIBSE Benchmark

	City Hall kWh/m2	CIBSE Benchmark kWh/m2	Performance
Gas	114.3	120	95.2%
Electricity	48.7	95	51.3%

## > Financial and CO2e Reduction Option Evaluation

### 4 – Traffic Signals

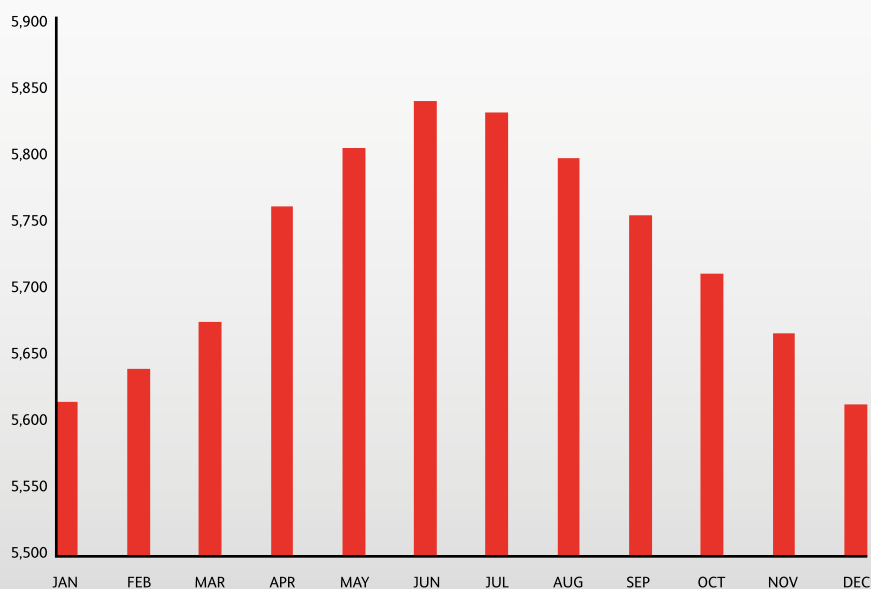
Traffic signals play a vital role in the county's infrastructure in helping aid traffic movement. Currently the energy consumption is recorded via passive meter, and therefore like the street lighting has been exempt from CRC charges. This will change from 2014/15 onwards and add significant charges for CCC.

As it is passively metered, limited information is available on what is supplied via this connection. However analysis of the monthly data in Figure 13 demonstrates that energy consumption actually appears to rise in the summer months. This has been confirmed with the signals team that this is due to signals needing to be brighter during the day, and hence with more natural light in summer it results in the profile as shown.

However further investigation into the profile is warranted as the profile is created artificially for the energy company. Whereas comparison with other metered traffic signals data indicates a flatter profile for the year. Furthermore switching to higher efficiency signals (such as LED) could lead to further savings.



Figure 13 Traffic Signal Energy Consumption per Day 2013/14 (normalised)







## > Financial and CO2e Reduction Option Evaluation



### 5 – Fitzalan High School

Fitzalan high school is the 5th highest carbon emitter within the estate and fairly represents the performance of a number of schools across the county. Due to the age of the building stock and central boilers, most school buildings typically tend to be around the standard CIBSE benchmark performance for natural gas consumption, which is the case here.

Electrically the benchmark is significantly exceeded, and in the majority of

cases this is usually due to increasing technological demands of the school, such as a requirement for more ICT equipment.

The performance of the building is clearly visible in Table 9 and Figure 14. Further investigation into sub metering and energy auditing is recommended in order to assess where potential savings may be found.

Figure 14 Fitzalan High School CO2e 2013/14

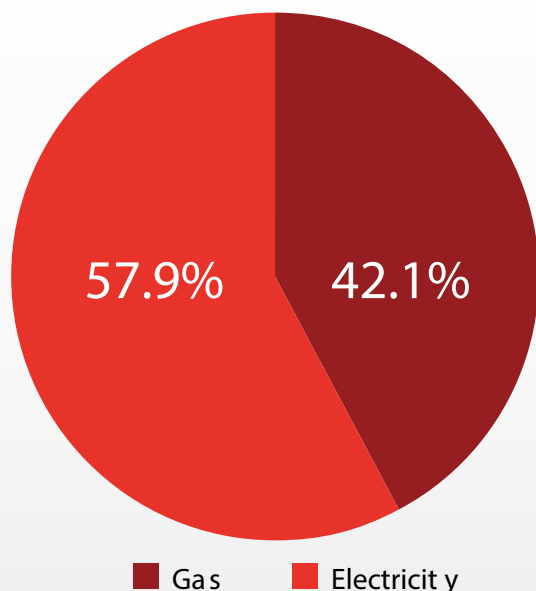


Table 9 Fitzalan High School Performance against CIBSE Benchmarks

	Fitzalan High School kWh/m2	CIBSE Benchmark kWh/m2	Performance
Gas	137.9	150	91.9%
Electricity	64.3	40	160.8%

## › Demand Side Initiatives

### Good Housekeeping

Completing Good Housekeeping initiatives will be prioritised to minimise energy consumption prior to focusing on Invest to Save measures.

Brief descriptions of what initiatives would involve is as follows:

- Carbon Culture

- Energy awareness – current material is excellent, but staff engagement is noted as limiting. New initiatives to be adopted to encourage staff awareness and accountability

- Improved accountability between directorate heads – use data gathered within this report to show overall context and encourage improvement
  - Communication with users – can often feel like users are struggling to comprehend data, why not present success stories
  - Office equipment policies – cut down on individual fridges, portable electric heaters and personal fans

- Targeting of Metering Consumption
  - CCC has setup robust IT solutions to monitor energy consumption data across our sites in real time. The next step will be to analyse this data on a regular basis and identify properties not performing as well as they can.

- IT “Switch Off”

- Proposed scheme to deploy software to all council PC equipment to ensure they automatically shut down outside office hours.
- There will be some cost to this scheme, but it is hoped that it could be grouped into existing IT budgets



Implementing Good Housekeeping initiatives should be absorbed within current operational budgets but require human intervention to realise CO2e savings. Indirect costs including resourcing and raising awareness are excluded from the cost of implementation of initiatives but fundamental to achieve successful impact.

Targeting and monitoring monthly utility information will focus attention on Good Housekeeping. Small power equipment use in the buildings should be rationalised and energy awareness campaigns should prioritise this through implementation of competitions and user feedback.

A Good Practice Case Study for Applying Monitoring and Targeting System is included within Appendix C to demonstrate opportunities and results.

Table 10 Good Housekeeping Initiatives

Good Housekeeping Initiatives (Applies to all buildings unless noted)	Cost Saving [£/year]	CO2e Savings [tCO2e/annum]	CO2e Savings [%/annum]	Electrical Savings [kWh/year]	Gas Savings [kWh/year]	Capital Cost [£]	CO2e Savings per £ [tCO2/£]	Payback [Years]
Carbon Culture Platform	£681,200	3,297	6.5%	5,614,732	1,411,937	-	-	Immediate
Targeting metering consumption	£392,100	1,908	3.7%	2,807,366	2,117,906	-	-	Immediate
IT Switch Off	£153,600	741	1.5%	1,369,680	0	-	-	Immediate
<b>Total</b>	<b>£1,226,900</b>	<b>5,945</b>	<b>11.7%</b>	<b>13,321,621</b>	<b>3,529,843</b>	<b>-</b>	<b>-</b>	<b>Immediate</b>



## > Invest to Save Initiatives

### Energy Efficiency Invest to Save Initiatives

This section of the report presents a series of Invest to Save initiatives which could be undertaken for the buildings. These initiatives would see the buildings realise economical operational energy savings as well as carbon emission savings.

The invest to save initiatives are based on CCC provided report info, including:

- RE:FIT
- Building Controls Programme
- Waste to Energy
- LED Lighting Refurbishment
- Street Lighting Scheme

### Future District Heating Scheme

During the reporting period initial proposals for a citywide energy from waste district heating scheme were received. Currently the plant is under construction and is expected to be active from November 2014, with a surplus thermal load of 20MW expected.

Council properties being considered for the network are:

- County Hall
- New Central Library
- Old Central Library
- St Davids
- New Theatre

Details on the system costs are limited at present, but CCC will review the scheme as more detail becomes available. Costs are typically 10% below natural gas, although they are expected to closely follow increasing cost trends with energy prices into the future. Carbon savings are unknown currently, but on similar schemes around the UK (such as Sheffield) the carbon saving over natural gas is around 25% which would represent a significant reduction if adopted at these properties.

Financial and carbon savings could be made long term by utilising the scheme. Furthermore practical considerations to take are:

- Planned future uses of the properties
- Location of current boilers and servicing strategy within each building

- Available plant space
- Routing of new pipework within each building
- Supply from existing boiler back into the grid

### Backlog Maintenance Invest to Save Initiatives

It is highlighted that backlog maintenance investment would not be financed or managed through the carbon management plan as these works have prolonged payback periods, but are required to maintain business continuity of the estate. Completion of backlog maintenance will allow opportunities for energy efficiency improvements which will be reflected in a reduction of the estate absolute CO<sub>2</sub>e emissions.

Table 11 Energy Efficiency Invest to Save Initiatives

Good Housekeeping Initiatives (Applies to all buildings unless noted)	Cost Saving [£/year]	CO <sub>2</sub> e Savings [tCO <sub>2</sub> e/annum]	CO <sub>2</sub> e Savings [%/annum]	Electrical Savings [kWh/year]	Gas Savings [kWh/year]	Capital Cost [£]	CO <sub>2</sub> e Savings per £ [tCO <sub>2</sub> e/£]	Payback [Years]
RE:FIT	£362,100	1,765	3.5%	2,420,673	2,482,919	£2,063,408	0.0009	5.7
Building Controls Programme	£1,332,400	6,491	12.7%	9,123,940	8,471,623	£3,000,000	0.0022	2.3
Waste to Energy	£58,600	295	0.6%	0	1,604,432	£360,000	0.0008	6.1
LED Lighting Refurbishment	£293,300	1,415	2.8%	2,615,953	0	£5,096,369	0.0003	17.4
Street Lighting Scheme	£715,400	3,451	6.8%	6,379,685	0	£7,128,000	0.0005	10.0
<b>Total</b>	<b>£2,761,900</b>	<b>13,418</b>	<b>26.3%</b>	<b>20,540,251</b>	<b>12,558,974</b>	<b>£17,647,777</b>	<b>0.0008</b>	<b>6.4</b>

# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## > Supply Side Initiatives

### Existing Infrastructure

Currently there are no plans to modify or develop the existing infrastructure around the sites.

### Renewable Technologies

The following section provides a brief overview of renewable technologies that could be considered for further detailed feasibility for CCC. It is recommended that Good Housekeeping and Invest to Save Initiatives are implemented prior to focusing on Renewable Technologies.

- PV panels could be integrated into existing systems and benefit from Feed in Tariff (FiTs) to generate income for annual electrical generation.

\*Please note payback periods for PV are dependent on funding streams (and include interest from borrowing – as per the standalone reports).

### Design & Asset Management

Design & asset management has been assumed based on several schemes (which shall not be named for security purposes). Estimated savings are estimated to be in the region of 7.6% of the overall estate.

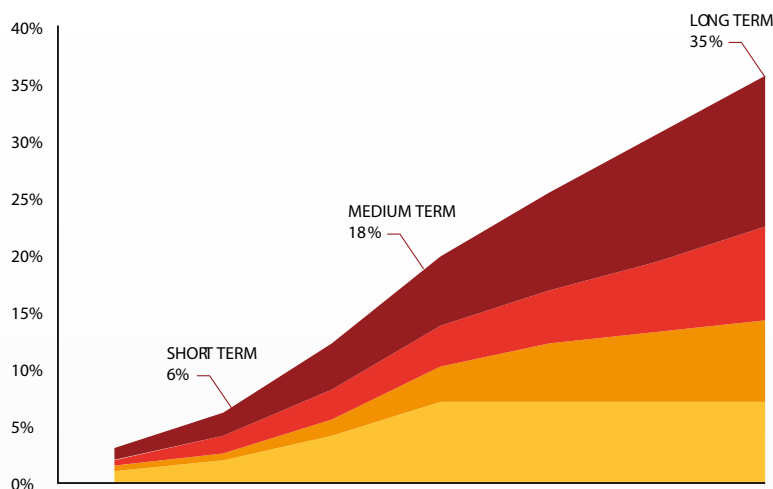
This figure only includes the rationalisation property, it does not include the addition of new property and target projections which will be updated for any plans of new developments. This will directly impact on the associated emissions from the estate.

### Financial and Carbon Reduction Option Evaluation Summary

Savings are demonstrated graphically to highlight the possible CO<sub>2</sub>e reduction initiatives for the buildings that could be implemented for the existing estate in Figure 15.



Figure 15 CO<sub>2</sub>e Reduction Initiatives



	2016	2017	2018	2019	2020	2021	2022
Invest To Save	1.00%	2.00%	4.00%	6.00%	8.50%	11.00%	13.00%
Design & Asset Management	0.50%	1.50%	2.50%	3.50%	4.50%	6.00%	8.00%
Renewables	0.50%	0.50%	1.50%	3.50%	5.00%	6.00%	7.00%
Good Housekeeping	1.00%	2.00%	4.00%	7.00%	7.00%	7.00%	7.00%



Table 12 Renewables Technologies Summary

	Cost Saving [£/year]	CO <sub>2</sub> e Savings [tCO <sub>2</sub> e/annum]	CO <sub>2</sub> e Savings [%/annum]	Electrical Savings [kWh/year]	Cost [£]	CO <sub>2</sub> e Savings per £ [tCO <sub>2</sub> /£]
	£1,046,600	5,049	9.9%	9,333,147	£13 M	0.0004
(vi) Commercial Non-Schools Buildings Solar PV	£491,800	2,373	4.7%	4,385,641	£7M	0.0003
	£1,538,400	7,422	14.6%	13,718,788	£20M	0.0004



## > Supply Side Initiatives

### Recommended Path

As shown in Figure 15 from all of the projects considered within the Strategy there is a potential saving of 32% from 2013/14 carbon emissions for the built estate and city infrastructure (street lighting, traffic lighting etc). The implementation plan will consist of the following:

- 7 year plan to run from 2015/16 until 2022
- Single phase
- Absolute target of 35%
- Equivalent to 5% per year average saving target



### Implementation Timeline

The following targets will be followed:

Short Term	2017	6%	Focus on implementing Good Housekeeping measures and develop invest to save initiatives funding and implement some small scale invest to save initiatives.
Medium Term	2019	18%	Complete invest to save initiatives, allocating 18% of the more readily achievable target savings in the medium term with the remainder in the long term.
Long Term	2022	35%	Target the remaining invest to save initiatives, and allocate budget to implementation of renewable energy generation on the built estate.

# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## > Implementation Strategy

### Implementation Strategy Summary

This section details how the implementation plan will need to be financed to achieve CO<sub>2</sub>e emissions reduction, including strategic enabling actions required to complete the plan.

### Financing The Strategy

The projection below highlights how the absolute reduction in CO<sub>2</sub> emissions could be attained through CO<sub>2</sub> emissions reduction interventions. This will reduce utility costs and carbon taxes and protect CCC from risk of increasing fuel prices and associated taxes rise, while protecting institutional reputation by delivering on the carbon reduction agenda.

Currently, the extent to which CO<sub>2</sub>e reduction can be implemented is constrained by the annual budget available for such measures. It is recommended that in order to achieve this target budget allocation should be set as a minimum of £2.4M (excluding VAT and professional fees) until 2022. The budget allocation should cover the intervention measures highlighted within this report.

The following targets are recommended:

- Short Term (2017) – focus on implementing Good Housekeeping measures and develop invest to save initiatives funding.
- Medium Term (2019) – Complete invest to save initiatives. It would be advisable to allocate 18% of the more readily

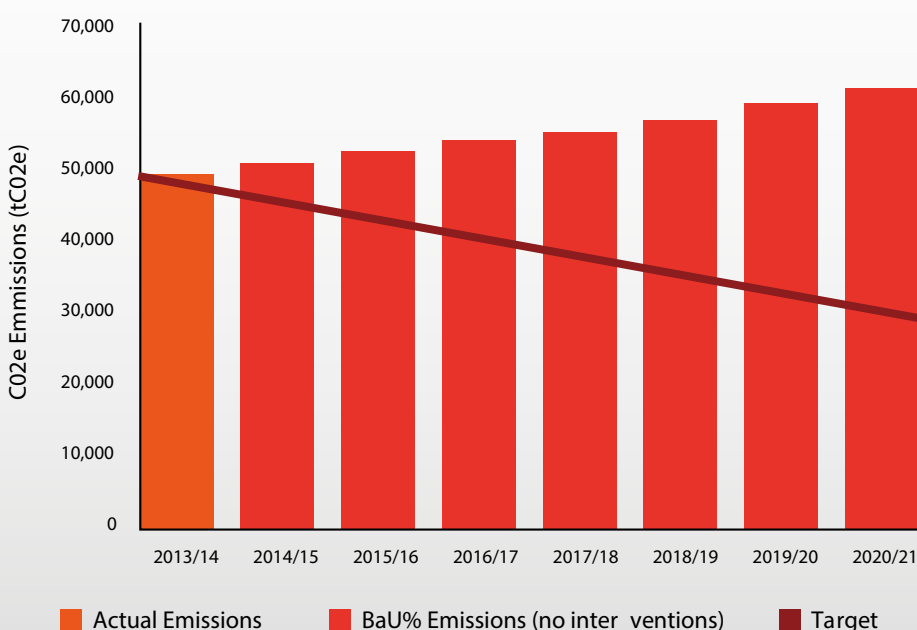
achievable target savings in the medium term with the remainder in the long term.

- Long Term (2022) - Target the remaining 14% on the invest to save initiatives, and allocate budget to renewable energy.

The capital cost of the interventions exclude inflation/other cost increases during the period. If these initiatives are addressed the following business case would be demonstrated;

- Total utility cost value at stake estimated £4.8M/annum
- Good Housekeeping 3,565 tCO<sub>2</sub>e (7%) CO<sub>2</sub>e emissions reduction - (no cost/ absorbed within current budget)
- Invest to Save 6,621 tCO<sub>2</sub>e (13%) CO<sub>2</sub>e emissions reduction - £6.6M cost
- Renewable Technologies 3,565 tCO<sub>2</sub>e (7%) CO<sub>2</sub>e emissions reduction - £9.5M cost
- Design & Asset Management 4,075 tCO<sub>2</sub>e (8%) CO<sub>2</sub>e emissions reduction.

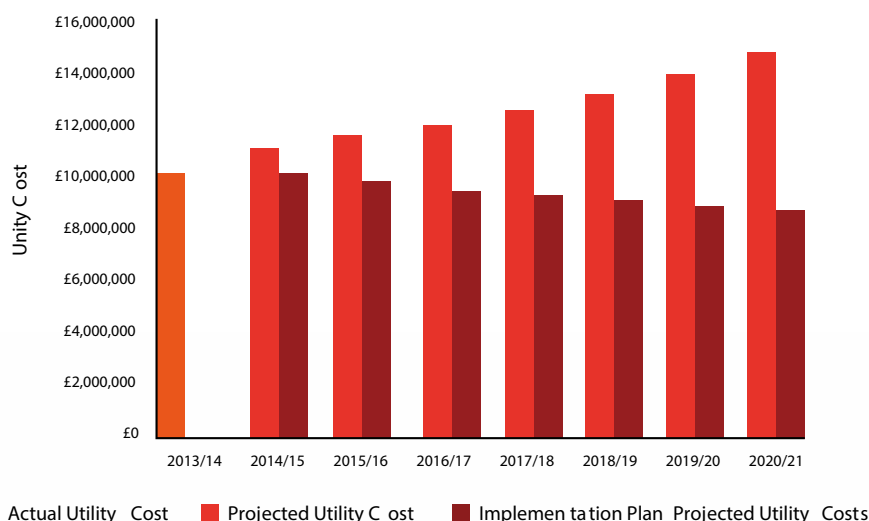
Figure 16 Implementation Strategy CO<sub>2</sub>e Emission Projections





## > Implementation Strategy

Figure 17 Implementation Roadmap Utility Cost Projections – Scenario A



It is recommended that the finance budget should be ring fenced for sustainability items to ensure initiatives can be funded. Due to timescales of opportunities to complete initiatives, it is further recommended that finance reserves rather than losses should be utilised to ensure funds are available at key periods during the year.

### Strategic Enabling Actions

A number of strategic actions will be required in order to implement CO2e reduction opportunities.

### Behaviour Change & User Engagement

Significant opportunities to reduce energy use through behaviour change are highlighted within this report. Critical success for any successful behaviour change intervention is ensuring CO2e reduction is a key priority for all through a network of champions. This is likely

to have a far greater impact than if the message were to be conveyed by an external group and would require regular updating to inform the users and public use of the buildings.

Marketing campaigns and details within member/staff inductions are recommended to rejuvenate interest, increase awareness and education.

### Procurement

The focus of procurement should be developed for life cycle costs for projects and procurement of equipment including minimum energy efficiency ratings. It is recommended that this is initiated with policies for white goods to ensure minimum energy ratings are achieved.

In general Capital Expenditure (CAPEX) is often considered a major weighting during procurements. However experience has shown the most energy efficient projects will often have a higher CAPEX but over the expected lifespan of the

project will often be the cheapest. The Council acknowledges that Life Cycle Cost needs to be given higher consideration to facilitate carbon reduction.

### Monitoring and Feedback

Automatic Monitoring and Targeting (AMT) is one of the most cost-effective measures for energy demand reduction. However, AMT will only make savings if action is taken in response to exception reports, and in response to progress reports identifying a deviation from targets.

The success of an automated metering system is dependent on the quality of the information and processes implemented to act on the information received. The following recommendations will be prioritised;

- Ensure meters are installed correctly with consistent signal.
- Maximise software capabilities.
- Develop Metering Protocol to ensure that all metering information for new/refurbishment projects are in accordance with software requirements.
- Lessons learnt from current installation need to be developed and documented.
- Protocol will also need to be developed from building level to tackle major energy consumers within the building and development of metering tree(s).

Additional metering without intervention will not reduce energy consumption and year on year reduction will be challenging without focus on reducing energy consumption.

# CARBON REDUCTION STRATEGY

THE CITY OF CARDIFF COUNCIL

## > Implementation Strategy

### Maintenance Contracts

CCC has a number of contracts in place with maintenance contractors. It is recommended that all of these contracts should be reviewed to ensure that part of the CCC scope involves highlighting opportunities for additional energy efficiency improvements, both within and outside our core discipline, and ensuring that these are reported back to the Energy Team and other relevant teams. Opportunities to rationalise use of small power equipment could be addressed and enforced through the PAT testing system.

### Repairs and Maintenance Activities

CCC's Facilities Management (FM) have a programme of on-going planned repair and replacement works, covering items such as replacement of boilers that have reached the end of their working life. There is an opportunity for the FM team to review whether the proposed performance or specification of the replacement items could be enhanced. Life cycle cost could be integrated into evaluation and not only CAPEX.





## › Cooling Policy

Management of carbon emissions is central to the aims of The City of Cardiff Council's carbon reduction strategy.

Air conditioned buildings typically use twice as much energy as naturally ventilated buildings as additional energy is required for the refrigeration of air and to power the pumps and fans that circulate the cooled air through the building.

Providing cooling has a significant impact on the environment and is expensive both in terms of capital and running costs, as well as greatly increasing carbon emissions. It is the policy of the Council to avoid comfort air conditioning where fresh air, odour removal and the limitation of high temperatures can be accomplished by natural ventilation.

### Procedure for Cooling

Building users shall be responsible for:

- Passive ventilation – opening windows and ensuring free flow of air where appropriate
- Wearing suitable clothing in hot and cold weather
- Reporting any faults with ventilation and areas where there is overheating

The following notes will help to maintain temperatures in the summer months whether passive or mechanical cooling is provided:

- The heating and cooling systems in a space must never operate at the same time

- All windows and doors must be kept closed in air-conditioned areas
- Use opening windows and doors to try create a through-flow of fresh air – where appropriate (i.e. do not compromise the building fire strategy)
- Adjust blinds to keep out direct sunlight
- Appropriately use high/low level windows, grilles or trickle vents to ensure beneficial airflow is created – on the forecast hottest days priority should be given to opening the windows early in the day.
- The need for cooling can be reduced by switching off electrical equipment and lighting when not needed
- Do not use a supplementary heater to compensate for an overcool room
- Use personal fans appropriately (i.e. Council owned fans) – it should be noted that personal fans do not cool spaces – they heat them up due to the fan motor, however they have perceived cooling effects due to the flow of air on skin.

Where cooling is installed the

following criteria should be observed

- System designed to maintain an internal temperature of a minimum of 22°C and shall be activated at 25°C.
- System controlled via the Council's Building Energy Management System (BEMS) and interlinked with the heating to avoid both systems being in conflict with one another.



## › Refurbishment and Design Policy

### Regulations

The City of Cardiff Council will conform to all requirements of the building regulations regarding new build and refurbishment projects and ensure that all agents acting on our behalf do the same. Regulations provide the basic legislative requirements for energy performance. It is often more appropriate to measure standards using benchmarking systems. The Council aims to exceed the regulatory standards where possible.

### Approach to Design

The City of Cardiff Council has a defined approach to design which is laid out in the following sections to ensure energy use is a key consideration.

- Evaluate the main criteria and drivers for the refurbishment or new build such as implementing a good working environment, improved space utilisation etc.
- Estimate how energy will be used in the building type including a thorough assessment of the equipment and small power that will be installed
- Consider how the use of the building may change in the future
- Minimise energy demand through choice of fabric, shape and configuration of a building
- The importance of air tightness
- Efficient building services
- Whole life assessment

- Sustainable Procurement

- Use of renewable technologies where appropriate
- Consider the operation of the building and post occupancy assessments.

### Energy Performance

Within each new building or refurbishment project the Council shall consider energy performance in use of the premises and act to provide the most efficient solutions based on the building requirements.

Energy Performance Indicators such as kWh/m<sup>2</sup>/yr are used as energy consumption benchmarks, furthermore it is recommended energy consumption is estimated via CIBSE TM:54.

Targets will be put in place for all new build and refurbishment projects. Targets for refurbishment projects will depend on the scope of the works. For example, any lighting project should include targets for maximum lighting energy and maximum lux levels.

### Electric Heating

Direct electrical space heating should be precluded for all Council buildings with the exception of:-

- Temporary buildings (e.g. demountables on hire for <2 year period.)
- Small extensions that comprise one or two Individual rooms attached to or within an occupied building that is otherwise unheated.
- Sites that have sufficient electrical capacity and/or no gas available.

### Commissioning

A holistic approach to commissioning should be taken to ensure that the whole building is commissioned, not just individual items of equipment. A commissioning plan should be developed at design stage to ensure that necessary metering and monitoring is installed to allow the required commissioning process to be assessed.

The commissioning process should be agreed at the commencement of the process and shall occur at stages throughout the project as elements of the project are completed, not just at the end of the project. Seasonal commissioning should be implemented as standard to ensure efficient year round operation.

### Post Occupancy Surveys

The reassessment of buildings once occupied is a key step in understanding how the effective actions taken in designing or refurbishing the building have been. Reviewing buildings to ensure that they continue to perform as predicted and that they are updated, or adapted, as circumstances change is one area of best practice which the Council intends to develop further.

### Use of Resources

As some materials become scarcer, it is important to minimise their use. Those tendering for contracts should be asked to prioritise the use of materials that have no scarcity (for example, FSC timber) and to identify any high risk materials, for which a risk management plan would be required.





## › Refurbishment and Design Policy

Amounts of energy and water used during construction shall also be required to be minimised and monitored during the construction process. Those tendering for contracts should be asked to establish what priority organisations they would give this.

### Sub-metering

New build projects shall comply with Part L of the building regulations which enforces the installation of sub meters as part of the construction. Refurbishment projects shall ensure that where appropriate, sub meters are installed to aid the long term performance of the building.

### Sustainability In Use

Consideration shall be given not just to the environmental impact of the construction itself, but of the building once it is in use. By installing facilities that are more energy and water efficient, such as low flush toilets, and biomass boilers, the environmental impact of the building once it is inhabited can be minimised.

FACILITY	EFFICIENCY DEVICE	RESOURCE USE AFFECTED	IMPACT
TAPS	Outlet devices, e.g. sprays and aerators	Water (and energy)	Up to 80 % reduction
	Flow regulators	Water (and energy)	Reduce the water flow to 3.5, 5 or 6 litres/min
	Cartridges (in single lever mixer taps)	Water (and energy)	32 % less water than a standard tap when in full flow and 72 % less when in low flow
WCS	Dual flush	Water	Up to 50 % less water per flush
	Leak-free siphon	Water	Prevents loss through leakage
	Delayed action inlet valve	Water	Saves 25 %
	Rain/grey water recycling	Water	100 % reduction of fresh water use
URINALS	Waterless	Water	100 % reduction
LIGHTING	LEDs	Energy	90 % less than incandescents
	Intelligent lighting system that uses natural light e.g. sun tubes	Energy	Varied
	Motion sensors	Energy	Can be 50 % or more (varies by room use)
	Light sensors	Energy	Can be up to 50 %
HEATING	Thermostatic radiator valves	Energy	25 % of heating bill
	Combined Heat and Power	Energy	Minimum 10 % energy savings





## › Energy Policy

In order to achieve the long term objectives and annual targets the City of Cardiff Council will:

### Energy Management

- Monitor and Target energy savings for individual buildings
- Conduct Building Energy Audits to identify and quantify potential energy saving measures
- Develop an annual programme of energy saving measures justified by projected financial savings/carbon reductions emissions.
- Coordinate with Council's Green Dragon Environmental Standard

### Energy Budget

- Set and track annual energy budgets
- Recharge energy costs to companies operating within Council premises

### Energy Procurement

- Endeavour to procure energy from green, clean or renewable resources, by balancing cost and environmental impacts through the procurement process.

### Maintenance Programmes

- Aim to have maintenance programmes in place to meet or exceed legal compliance
- Develop plans for the improvement and up rating of the building services site infrastructure.

### New Developments/Major Refurbishment Works

- Promote energy efficient design in all new build and refurbishment works
- Ensure refurbishment and new build projects meet requirements of the Energy Policy
- Ensure procurement rules fall into line with Energy Policy so that conflicts of technologies/manufacturers are reduced

### Energy Awareness

- Market the value of energy efficiency and good energy performance across the Council via the "Carbon Culture" web platform
- Provide energy management training to staff who are critical in the process of managing energy consumption within the Council
- Maintain a programme of staff energy awareness and regular publicity campaigns targeting improvements in good energy housekeeping by means of a network of Energy Co-ordinators in all Departments and Buildings.





## › Heating Policy

The City of Cardiff Council aims to ensure everyone who uses their buildings are comfortable and able to undertake their roles effectively, whilst being conscious of energy consumption.

By implementing this policy Cardiff Council commits to providing suitable thermal comfort to its building users thereby reducing on-going energy cost, consumption and carbon emissions.

### Recommended Temperatures

It is Cardiff Council's policy to ensure that buildings are conditioned to their designated internal temperature during core occupancy time; these range from 16°C-24°C. This is in line with the Health and Safety Executive's guidance. Cardiff Council will heat spaces to a maximum of 21°C and cool spaces to a minimum of 21°C.

Please note that not all buildings are serviced in the same manner, and as Cardiff is considered a temperate climate many buildings do not require mechanical cooling, instead relying on passive ventilation such as openable windows. Care should be taken to ensure the passive ventilation strategy compliments the heating strategy through the winter period. Typically this will mean keeping windows closed in winter.

### Heating Schedules

The majority of Cardiff Council buildings are controlled by a Building Energy Management System (BEMS). These are programmed by Energy Management to operate flexible heating time periods to match differing occupancy patterns. Outside of core occupation times, all buildings default to a frost protection setting with temperatures set between 10 and 12°C.

Heating time schedules are agreed with the Estates Managers, Facilities Managers or Site Responsible Officers of the buildings to achieve the best balance between the need to provide comfortable working conditions and the requirement to conserve energy.

Requests for alternate heating/cooling schedules should be made through the Facilities Management Service Desk and approved by Energy Management.

### Out of Hours Heating

In general, Cardiff Council does not provide out of hours (weekend/evening) heating for its schools and offices. However, out of hours heating can be requested through Energy Management who will assist in accommodating the need.

### Holiday Period Heating

During public holidays (including school holidays within schools) heating time schedules will default to frost protection. Alterations to these defaults can be requested through each building's Estate Manager.

### Prohibited Equipment

Electric space heaters and portable air conditioning are strictly prohibited. These units can interfere with building controls calibration, which can result in under/overheating of spaces. Any exceptions must be approved in writing by the Facilities Management Operational Manager.



## › Heating Policy

### Temperature Ranges:

The following temperatures should be adopted for the heating season (September to May with an outside temperature threshold of 14°C)

- All other public buildings (not covered below) including offices 19°C (Fuel & Electricity (Heating) (Control) (Amendment) Order 1980)
- Classrooms 18°C (The Education (School Premises) Regulations 1999)
- Special needs classrooms 21°C (The Education (School Premises) Regulations 1999)
- Classrooms for nursery children 21°C (The Education (School Premises) Regulations 1999)
- Low activity areas in schools 21°C (The Education (School Premises) Regulations 1999)
- Corridors and sports halls in schools 15°C (The Education (School Premises) Regulations 1999)
- Gymnasium 16°C (Carbon Trust Guidelines)
- There are no guidelines for residential homes, hostels and general accommodation but the Council will aim for 22°C as a standard temperature

### Swimming Pools

Swimming pools consume significant amounts of energy but a balance has to be made between energy consumption and swimmer comfort. Therefore the following temperature ranges are recommended by the Institute of Sports and Recreation Management ISRM and Pool Water Treatment Advisory Group:

#### Water Temperature:

- Competitive swimming, diving, fitness swimming, training 27°C ±1°C
- Recreational swimming, adult teaching 28°C ±1°C
- Leisure waters 29°C ±1°C
- Children's teaching 30°C ±1°C
- Babies, young children, disabled and infirm 31°C ±1°C
- Hydrotherapy 30°C to 35°C
- Spa Pools 30°C to 40°C

#### Air Temperature:

The air temperature of the pool hall should normally be maintained at the same level as the water temperature or no more than 1°C above or below, however it is recommended that air temperatures over 30°C should generally be avoided



## › IT Policy

### Procurement Policy

This policy outlines the procedures that must be in place to achieve benefits to the IT staff and users and to ensure the purchase, delivery and installation of IT equipment is coordinated successfully.

### Software and Hardware Purchasing Guidelines:

The IT Department is the sole authority for placing orders for IT software and hardware on behalf of the Council. All IT related purchases require approval and relevant authorisation prior to requisition. All IT related hardware and software will be specified by the IT department. Hardware and software cannot be purchased without approval by the IT department.

### Desktop / Laptop Provision

The council shall not over specify equipment. High-spec PCs with large screens and fast processors use more energy and therefore running costs shall always be part of the decision making. All new equipment shall have robust energy saving features meeting at least energy star performance specifications. Purchasing guidelines are to be reviewed annually, and updated if necessary.

When hardware needs to be replaced due to operational needs, newer more energy-efficient varieties are to be investigated before purchasing. Regular energy auditing is recommended for desktop PCs and

monitors, so that less energy intensive models can be used as replacements. Of particular note is the replacement of older LCD monitors with less energy intensive LED monitors.

There is a trend towards multi-monitor setup (typically 2 monitors) in many offices as it has been shown to improve productivity, and this will increase energy consumption if implemented. In all cases the most energy efficient option shall be evaluated and taken, for example a single widescreen monitor may be able to deliver the same productivity benefit of having 2 monitors, but consume less energy overall.

### Desktop / Laptop End of Life

When replacing equipment, particularly PCs and laptops, rather than disposal of the equipment for recycling the council will seek to operate a scheme where the equipment can be sold to members of staff in exchange for a charity donation. Equipment shall be wiped of all sensitive data, which is already a standard end of life procedure, and it will be clear to staff that there would be no further IT support.

### Turn off and power down

The council shall seek to minimise the amount of time equipment is switched on when not required. At its most basic this will involve adjusting the appropriate settings in software/hardware when the devices are first procured. Ongoing

maintenance shall ensure these settings are still being adhered to. Automatic power down software shall be rolled out across the council, to ensure non-essential workstation's are switched off outside of typical operating hours.

### Server Room Environment

Cooling, power and UPS provision is controlled centrally via the Building Management System. Only members of maintenance staff are allowed to alter settings on any such equipment. The recommended server room temperature cooling setpoint shall be 26°C, with provision to extend this further in line with manufacturer's recommendations.

Server rooms shall be inspected periodically to ensure efficient flow of cool air throughout the room, and the elimination of 'hot spots' shall be prioritised.





## › Lighting Policy

### Internal Lighting

Staff at all levels shall be involved in making savings and this shall be achieved by notification at staff briefings, placing stickers above light switches and posters around the building. Cleaning staff shall be advised to turn off unnecessary lights, as they are often the last people to leave a building.

Lighting is essential for providing a pleasant and productive working environment so it is important to keep windows, skylights and light fittings clean. Staff shall report failing lamps and so that the FM team can replace them promptly. This will help maintain the desired light output and, in turn, provide a safer working environment. Controls are to be kept in good working order by ensuring timers are set to match occupancy hours and that occupancy sensors are clean.

Daylight is the only freely available light source. Well controlled daylight should provide a space with the best possible lighting effect, greater user comfort and with zero cost or CO2 emissions.

The council shall upgrade any standard incandescent lamps to energy saving compact fluorescent (CFL) lamps or LEDs, which consume less energy and last much longer. Blackened, flickering, dim or failed tubes shall be replaced with triphosphor coated fittings, which provides a more natural, brighter light

for the whole life of the tube.

Where possible LEDs shall be implemented before high fluorescent lighting is installed, and available solutions shall be evaluated on an annual basis (due to rapid change in technology/capital costs).

Lighting shall be controlled in each space to avoid any lighting being left on unnecessarily. The automatic lighting controls should include the following methods and be commissioned correctly to give the maximum benefit from the systems.

- Movement sensor – occupancy control
- Time clock – timed schedule
- Light sensor – daylight linking.

Lighting levels and daylight factor shall be designed in line with CIBSE Lighting Guide (no.7) for offices and other lighting guides where appropriate.







## › Small Power Policy

The Council shall ensure that members of staff do not use their own equipment (in particularly personal fans, fridges, electric heaters and kettles) within council buildings. There are potential safety issues if personal equipment is used because the equipment would not have a Portable Appliance Test (PAT) certificate and energy consumption will be unrecorded. This policy empowers FM / Estate Managers and Site Responsible Officers to confiscate personal electric equipment unnecessarily consuming energy in a premises. Any exceptions must be approved in writing by the Facilities Management Operational Manager.

Typically personal fans and electric heaters are introduced by staff due to perceived lack of environmental control within their workspace. Further guidance is provided in the heating and cooling policy documents, but in general staff shall be directed to speak to their local FM team, Estate Managers or Site Responsible Officer to advise if there are temperature issues which shall allow the council to react appropriately.

In place of kettles and fridges the council shall provide kitchenettes with appropriately controlled (i.e. time clock controlled) water boilers/chillers, and efficient white goods (such as fridges/freezers). Where possible time switches shall be adopted on all small equipment to ensure equipment is switched off outside of typical hours and weekends.

In replacement of end of life equipment/white goods, the council shall adopt a policy of replacement procurement of goods with a minimum of 'A' rating.

The council shall incorporate standby mode control in lifts within their larger buildings. The addition of PIR presence detectors shall ensure fans and lighting within the lift cars shall be switched off when the lift car is unoccupied for long periods of time.

IT equipment is considered separately in the IT policy documentation.





## › Utility Procurement Policy

The City of Cardiff Council recognises the significant impact made upon the environment, local community and economy derived from the way in which it procures utility services, and therefore will comply with the requirements for the EC Utilities Directive (EC 2004/17) in the fair selection of utility providers.

The City of Cardiff Council procure electricity and gas through the Welsh Purchasing Consortium contract. Procuring on such a large basis encourages best value. Additional benefits include ensuring compliance through the Carbon Reduction Commitment (CRC), improved data accuracy for reporting and centralised bill validation.

All new supplies will be added to these corporate contract and pre-existing supplies currently off contract will continue to be migrated. The council will endeavour to obtain the best available utility rates for its properties, and consider procurement of 'green' electricity wherever possible.

As the council have pulsed energy meters to the majority of its properties, and utility data available on an hourly basis, this data will be used to obtain the most accurate quotes from utility providers.

On new build and refurbishment projects robust estimates of annual peak, minimum and total consumption shall be produced by the

design team to assist the council in seeking the most accurate quotes from utility providers. Estimates shall be created in accordance with CIBSE TM:54 and assessment of similar estate properties where applicable.

