

The Vale of Glamorgan Council

Cabinet Meeting: 17th December, 2018

Report of the Leader

Carbon Management Plan 2018-22

Purpose of the Report

1. To provide an update on the current Carbon Management Plan (CMP1) and to seek formal approval for the second Carbon Management Plan (CMP2) for the period 2018 - 22, following a review of the first plan, as required by the Council's Corporate Plan.

Recommendations

1. To note the progress made in the first Carbon Management Plan (CMP1).
2. To approve and adopt the second Carbon Management Plan 2018/22 (CMP2) attached as Appendix 1.

Reasons for the Recommendations

1. To ensure that Members are aware of progress with carbon management across the Council.
2. To allow progress to be made in delivering schemes to reduce carbon emissions and to meet targets for carbon reduction.

Background

2. The last Carbon Management Plan was agreed at 4th January 2012 Cabinet and set a target of a 20% reduction over the period of the plan. An actual reduction of 21.3% was achieved.
3. Within well-being outcome '2' of the Corporate Plan "An Environmentally responsible and Prosperous Vale", there are several actions to which the Council is committed. Objective 2 'Promoting Sustainable Development and Protecting our Environment' commits us to the action to "Review and implement the Council's Carbon Management Plan and targets to reduce emissions from street lighting, council vehicles and council buildings."
4. CMP2 indicates how a 12% reduction can be made through schemes that have been developed or identified already.

5. The Environment Act 2016 places a duty on the Welsh Government to ensure net Welsh emissions are 80% lower than the baseline by 2050.
6. Welsh Government has communicated ambitions for the public sector to be carbon neutral by 2030. This is ahead of the remaining sectors in Wales as the public sector is expected to take a leadership role in carbon reduction.

Relevant Issues and Options

7. This Carbon Management Plan has been developed by the Energy section but will be delivered by departments across the Council and progress will be monitored and reported annually to Cabinet.
8. The previous carbon reductions were a product of a Council wide effort with contributions being made from all parts of the Council ranging from Solar Panel installations to Street Lighting alterations.
9. Welsh Government has announced the ambition for the Welsh Public Sector to be carbon neutral by 2030 which exceeds the ambitions set out in the Environment Act.
10. Currently planned projects which reduce energy consumption will deliver a significant proportion of the energy savings in the plan.
11. The currently planned projects will not achieve the ambitions for carbon neutrality therefore it is anticipated that additional schemes will have to be added to the plan in future years.

Resource Implications (Financial and Employment)

12. The first phases of the RE:FIT programme are currently estimated to cost in the region of £1.2 million and this will be funded through the interest free SALIX funding mechanism. SALIX is an interest free loan mechanism financed by Welsh Government which can be used to fund energy reduction projects which meet its payback requirements of 7 years. Repayments are made back into the fund in order for it to continue in future years.
13. The implementation of the plan will be undertaken by the Energy Team in conjunction with the wider property team. If additional resources are required for delivery they will be costed into future proposals.

Sustainability and Climate Change Implications

14. The plan has been designed to deliver a 12% reduction in CO2 emissions over the plan period and suggests ways in which further reductions can be made.

Legal Implications (to Include Human Rights Implications)

15. In order to achieve the targeted energy savings within the timescales set out in the Carbon Management Plan, the Council has utilised the RE:FIT Cymru (ReFit Cymru is a Welsh Government promoted scheme that aims to accelerate the energy efficiency improvement of all public sector buildings in Wales). ReFit Cymru gives Welsh public bodies the opportunity to use a UK framework comprising 16 contractors to improve the energy efficiency of their buildings. Following a procurement exercise a contract has been entered into with Larkfleet Ltd in order to deliver projects with an estimated value of £1.2 million. Authority to enter into this contract was approved by Cabinet on 24th April 2017 (C3539 refers).

Crime and Disorder Implications

16. There are no crime and disorder implications associated with this report.

Equal Opportunities Implications (to include Welsh Language issues)

17. There are no equal opportunities implications associated with this report.

Corporate/Service Objectives

18. Objective '2' An Environmentally responsible and Prosperous Vale, there are several objectives, each containing actions to which the Council is committed. Objective 2 'Promoting Sustainable Development and Protecting our Environment' commits the Council to "Review and implement the Council's Carbon Management Plan and targets to reduce emissions from street lighting, Council vehicles and Council buildings."

Policy Framework and Budget

19. The report is a matter for Executive decision by Cabinet.

Consultation (including Ward Member Consultation)

20. As this is a Council wide Plan, no specific ward member consultation has taken place

Relevant Scrutiny Committee

21. Corporate Performance and Resources

Background Papers

Carbon Management Plan 2018 - 2022

Contact Officer

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Officers Consulted

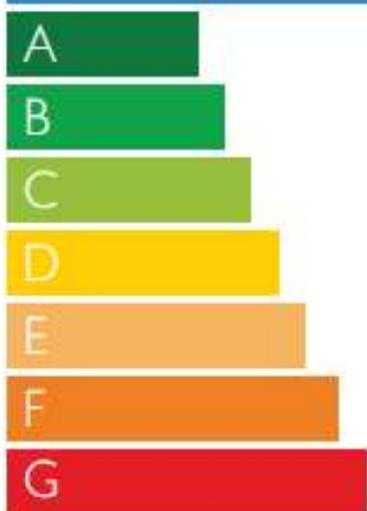
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VALE of GLAMORGAN COUNCIL
OUR CARBON MANAGEMENT PLAN
2018-2021/22



Strong
Communities
with a Bright
Future



Date November 2018

Version Final

Author David Powell

Approval

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Introduction

A carbon management plan is an essential tool for public sector organisations to formulate a measurable and achievable strategy for reducing emissions and provides an opportunity to communicate the current progress and future initiatives.

Awareness of **decarbonisation** or carbon reduction is increasing in all spheres and there is a growing expectation for organizations to demonstrate their commitment to this increasingly significant agenda.

Local and national governments have communicated the priority given to this by introducing ambitious targets which will require organizations to embrace **innovation** and respond in increasingly creative ways. The Welsh Government has an aspiration for public bodies to be carbon neutral by 2030 and has communicated its focus on public sector by stating:

“The Welsh Public Sector must take a leadership role in an area of such significant impact upon our citizens, communities and businesses.”

An action from The Vale of Glamorgan Corporate Management Plan 2016 – 2020 is to review and implement the Council’s Carbon Management Plan and targets to reduce emissions from street lighting, council vehicles and council buildings.

This, our second carbon management plan 2018-21/22 (CMP2), has one key objective:

Objective

To reduce CO2 emissions from street lighting, council vehicles and buildings by 12.5% by 2021/22 from the new baseline established in 2016/17.

Summary



Carbon emissions are one part of a larger environmental picture where a World Wide Fund for Nature (WWF) report from 2016 shows that the population of wild vertebrate animals and *marine life has decreased by 58%* in the period 1970 to 2012. This shocking statistic illustrates how massive environmental changes can happen if things are not given the necessary attention.

Similarly the emission of the odourless and transparent basket of greenhouse gases emitted through the activities of human kind has continued to increase over this period. This Council has been monitoring and trying to reduce the emissions it is in control of associated with its buildings and use of transport for many years, and particular throughout the period of its first Carbon Management Plan and now the second (2018 -21/22).

The strategy for CMP2 is one based on schemes that are already identified and therefore targets in this plan are realistic and achievable. However other opportunities will be considered and included into the plan proposals in the future (if appropriate). Business cases will be developed for any such proposals prior to seeking the relevant approvals to financially commit or progress these.

CMP2 is predicted to deliver a 12.5% reduction in CO2 emissions

There has been learning as a result of the first Carbon Management plan (CMP1), and much of that experience has given valuable insight and guidance in the development of our 2018-21/22 Carbon Management plan (CMP2).

The reduction in CO₂ achieved during CMP1 was 21% against the target of 20%

The decarbonisation targets set will become harder to achieve as the “low hanging fruit” has already been picked during the earlier Carbon Management Plans. The scope of the reduction is expanding into increasingly indirect emissions. This will require the Council to search and adopt increasingly innovative forms of emission reduction technologies and initiatives which will require financial and staff time investment in order to develop the required business case for progression. These initiatives will be identified and individually evaluated by the Property section alongside the relevant service department and finance colleagues.

Future Plans (CMP3 – 2022 to 2025 and CMP4 – 2026 to 2030) are going to be a far greater challenge.

In a major step forward (over the last seven years) all our buildings and street lighting have been powered using renewable electricity derived from the grid and on site installations, further work on demand reduction within our buildings and on site renewables is required which will form the basis of Re:Fit.

The majority of our buildings are heated using gas fired heating systems and our vehicles are Petrol and Diesel internal combustion engines which make up a large percentage of our carbon emissions.



Some of the initiatives currently being considered are

- *How can we convert our vehicles to use alternative fuels such as electric and hydrogen within the next 10 years?*
- *Should we be investing in new renewable energy on a larger scale?*
- *What role do batteries play in buildings?*
- *How do we electrify heat to allow electrical generation and storage systems to drive heat pumps to heat our buildings instead of gas boilers?*
- *Should we look to establish district heating networks in our towns using renewable heat?*

Whilst this document is a Carbon Management Plan for 2018 – 21/22, hopefully it will lay foundations for future plans and proposals

The Environment we find ourselves in



Government funding cuts in recent years have forced local authorities including the Vale of Glamorgan Council to make significant and unprecedented savings.

As a result it has been difficult to justify the funding of energy efficient technologies over other council priorities over recent years however improvements have still been possible.

Looking from a broader perspective the evidence from scientific measurements is telling us that greenhouse gas (such as carbon dioxide, or CO₂)

concentrations in the atmosphere are rising at unprecedented rates to levels never experienced in the time that humans have inhabited the earth. Global temperatures have increased by more than 1°C since pre-industrial levels and if they increase beyond 2°C scientists say that we risk runaway climate change. This position was further reinforced by a special report in October 2018 which the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) issued a special report on the “*impacts of global warming of 1.5°C above pre-industrial levels*” The report made a number of warnings amongst which was:

“A mix of adaptation and mitigation options to limit global warming to 1.5°C, implemented in a participatory and integrated manner, can enable rapid, systemic transitions in urban and rural areas. These are most effective when aligned with economic and sustainable development, and when local and regional governments and decision makers are supported by national governments”

At the start of the Eocene period about 50 million years ago scientists have determined that the temperature of the earth rose by approximately 5°C as a result of a rapid rise in greenhouse gases (which took place over 2000 years), notably carbon dioxide, the precise sources of which they are still trying to determine.

Nevertheless, the warming resulted in the seas of the Arctic regions being as warm as those of the sub tropics. Mass extinctions followed and it took natural processes approximately 100,000 years for the temperatures to return to previous levels. By the end of this century at current emission rates we will have put a similar amount of carbon into the atmosphere as that which caused the warming 50 million years ago.

Despite the financial environment of the past 10 years the Vale of Glamorgan Council has managed to invest in energy efficiency initiatives. We hit our CMP1 carbon reduction target of 20% set back in 2008 and CMP2 takes us from a baseline to a reduction of just over 12% by 2022. This is a significant improvement on historical reductions.

The carbon dioxide emissions that we are responsible for emitting today will stay in the atmosphere for around 100 years. We therefore have a responsibility to reduce that the amount of carbon dioxide we put into the atmosphere for future generations. We need to make a rapid journey towards zero greenhouse gas emissions.

The target for the UK as a whole is to reach zero net emissions by 2050. The Welsh Governments current aspiration is for public bodies in Wales to be carbon neutral by 2030. Their intention is for all our activities and those of our contractors to be included within that target. Whilst public bodies are responsible for a small fraction of overall emissions the Welsh Government see them as exemplars for the wider community.

The target of zero net emissions by 2030 is aligned with the ethos of the Wellbeing of Future Generations (Wales) Act 2015 and the Councils commitment to reduce its impact on the environment, however it does represent a step change in the way we will use and source our energy.

To achieve that target new buildings should aim to be carbon neutral. Retrofitting and adapting existing buildings, whilst the only option for improving the energy performance of existing buildings, is going to be much more expensive in the long run.

As a Local Authority facing continued budget cuts our Carbon Management Plan for 2018 – 21/22 will assist the Council in achieving revenue savings and assist in some way to preserve services. However, it is unlikely that the carbon emission reductions that the Council wishes to make between 2020 and 2030 will be possible without significant investment.

Carbon reduction needs to be taken seriously, not only for the air quality issues that burning fossil fuels cause us today, but for the survival of our children and future generations as the effects of climate change become more extreme.

Our Targets

Links to National and UK Objectives

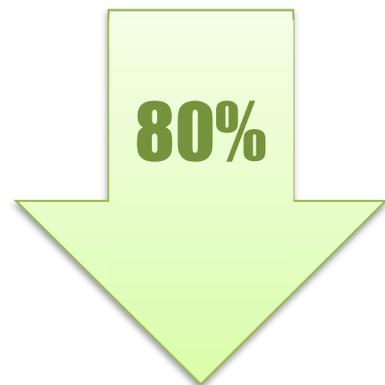
The Vale of Glamorgan Corporate Plan 2016 – 2020 demonstrates the links between the values it promotes (and its well-being objectives) with key Welsh Government legislation, namely the Well-being of Future Generations (Wales) Act 2015.

The Well-being of Future Generations (Wales) Act has seven well-being goals. Environmental protection features within these objectives; in particular future prosperity is linked to the sustainable use of resources and acting to address climate change.

The Environment (Wales) Act 2016

Following on from the Well-Being of Future Generations act the The Environment (Wales) Act 2016 sets out the approach to help Wales reduce its carbon emissions.

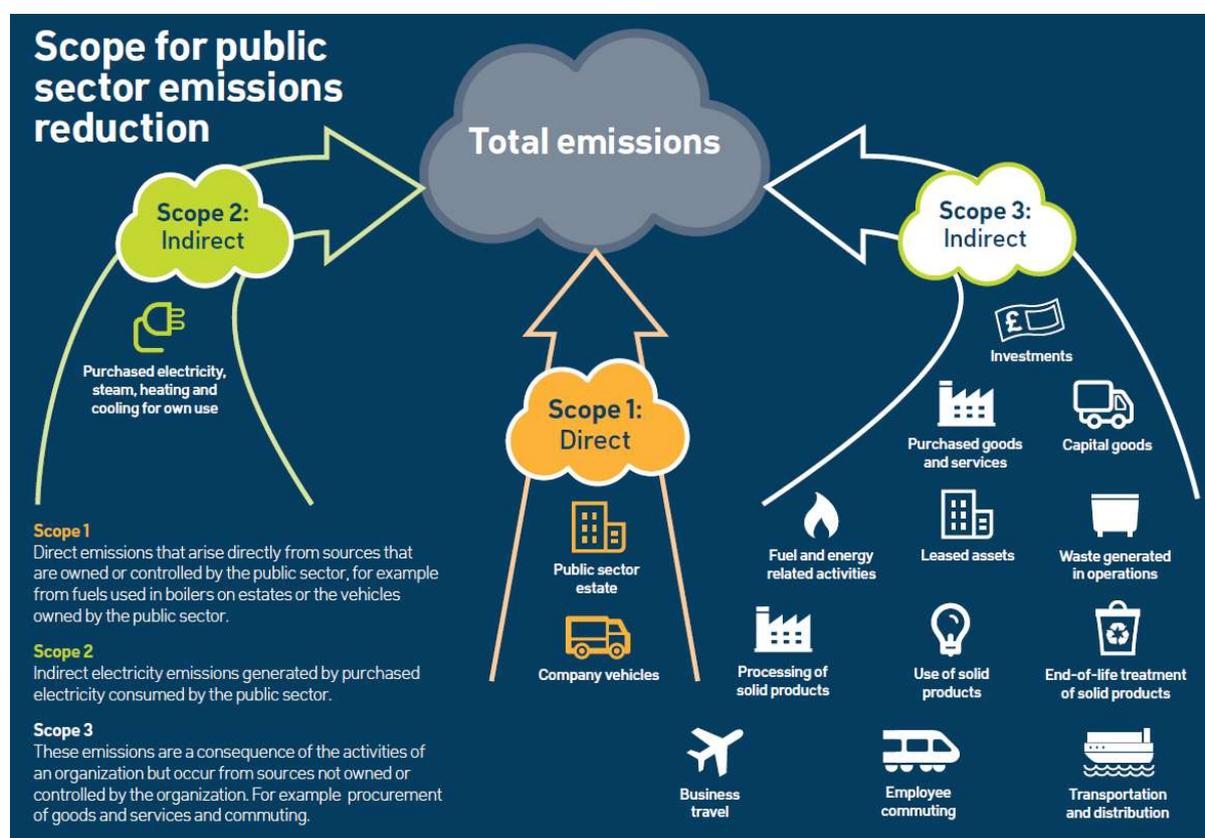
The [Environment \(Wales\) Act](#) 2016 places a duty on the Welsh Ministers to ensure that in 2050 net Welsh emissions are at least 80% lower than the baseline set in legislation. This will be achieved through the setting of interim targets for 2020, 2030 and 2040 and 5 yearly carbon budgets up until to 2050. This is vital within the context of our existing UK and EU obligations and sets a clear pathway for decarbonization. It also provides certainty and clarity for business and investment.



Public Sector Decarbonization

In response to the Environment (Wales) Act (2016) The Cabinet Secretary for Environment and Rural Affairs set the ambition for the Welsh Public Sector to be carbon neutral by 2030. A call for evidence and consultation on the exact impact of this to all public bodies ran until September 2017, a summary of responses was published in 2018.

The Welsh Public Sector must take a leadership role in an area of such significant impact upon our citizens, communities and businesses. For example, the Welsh Government is committed to further developing the low carbon economy in Wales and by driving decarbonisation in the Public Sector in Wales it will provide an important and consistent policy signal for investors and businesses.



The carbon neutrality aspiration referred to above would apply to buildings, transport and purchases. To get to that position by 2030 would substantially reduce the impact on the environment of public bodies; however, the detail on how the transition is proposed and what will be included has not yet been made clear at the time of presenting this plan. [Appendix 4](#) Shows the potential trajectory of reductions that would achieve zero emissions by 2030. The reductions are far greater than have been achieved to date and many more resources would be required to reach that target.

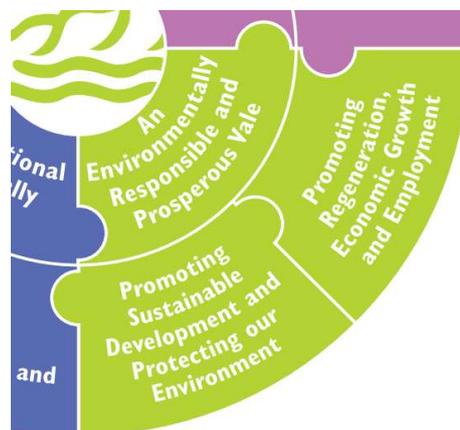
Vale of Glamorgan Council Objectives

The Council's Corporate Plan shows four well-being objectives interlinking with those of the Welsh Government.

The well-being objectives are:

- **An inclusive and Safe Vale** - Director of Environment and Housing
- **An Environmentally Responsible and Prosperous Vale** - Managing Director
- **An Aspirational and Culturally Vibrant Vale** - Director of Learning and Skills
- **An Active and Healthy Vale** - Director of Social Services

And within objective '2' An Environmentally and Prosperous Vale, there are several objectives, each containing actions to which the Council is committed. Objective 2 'Promoting Sustainable Development and Protecting our Environment' commits us to the action to "Review and implement the Council's Carbon Management Plan and targets to reduce emissions from street lighting, council vehicles and council buildings."

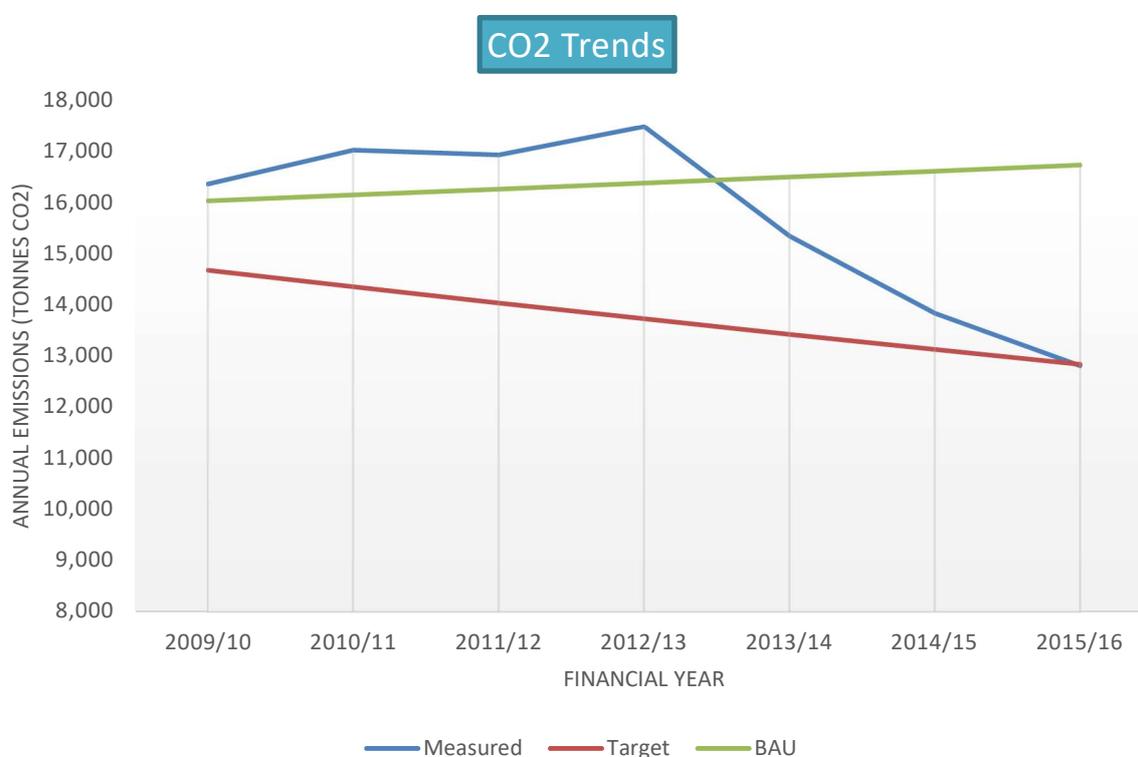


How are We Doing? Our Performance

There are three indicators which are officially collected by the Welsh Government, they are:

CO₂ Reduction

CMP/153 [Percentage change (reduction) in carbon dioxide emissions in the non-domestic public building stock.]



The graph below shows our carbon emissions over the period of CMP1

- The **Green** Business as Usual (BAU) demonstrates what would happen if we “Did nothing” over that period.
- The **Red** line shows the CO₂ reduction target.
- The **Blue** Measured line shows what happened to the emissions that we measure over the period (with the peak in emissions reflecting harsh winters with more gas consumed).

The above chart demonstrates that the Council is heading in the right direction and that emissions are reducing at the required rate to date.

Display Energy Certificates (DECs)

CMP/006 [The percentage change in the average Display Energy Certificate (DEC) score within local authority public buildings over 1,000 square metres.]

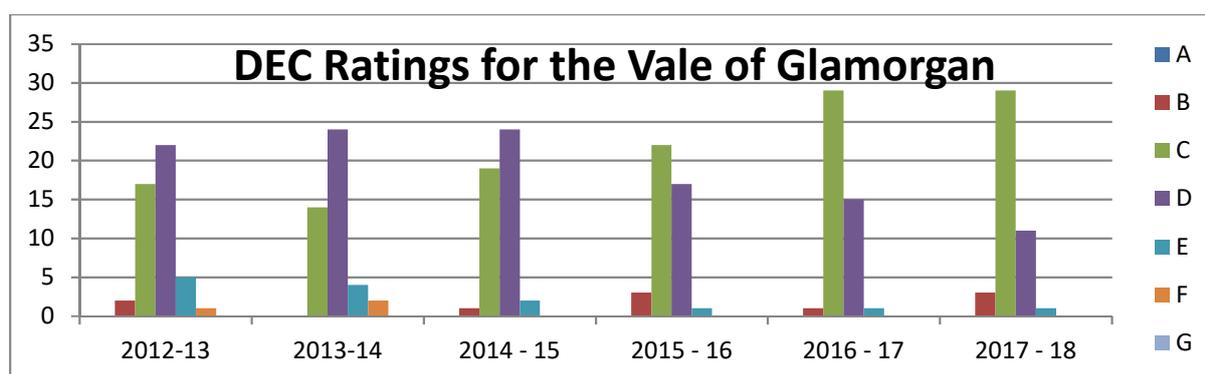
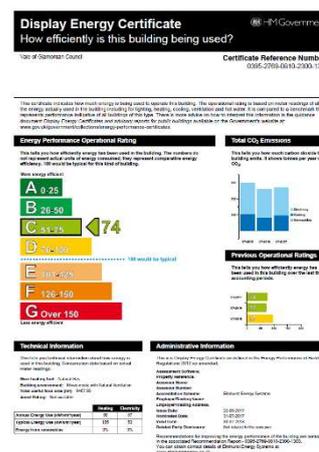
DECs are displayed as energy ratings in the entrance of all our Public Buildings over 1000m² in size.

They are a visual representation of how efficient the building is, the score (A-G) is calculated from the consumption of fuel in the building.

For the Vale of Glamorgan this meant that many schools, libraries, offices and other buildings required a DEC and an initial assessment report (AR) valid for 7 years or sooner if the organization sees fit

The UK regulation were amended in 2012, to account for buildings with smaller floor areas ,500 m² and then 250 m² with those certificates were valid for 10 years.

Energy Performance certificates (EPCs) look very similar but only measure the efficiency of the building construction. DECs take into account the actual consumption of the building therefore providing a better measure on an ongoing basis.



The table and graph show a steady improvement over the years with a definite shift from a majority of D grades in 2012-13 to C grades in 2017-18.

For both CMP/006 and CMP/153 our target is for a 3% annual reduction.

Carbon Reduction Commitment Scheme

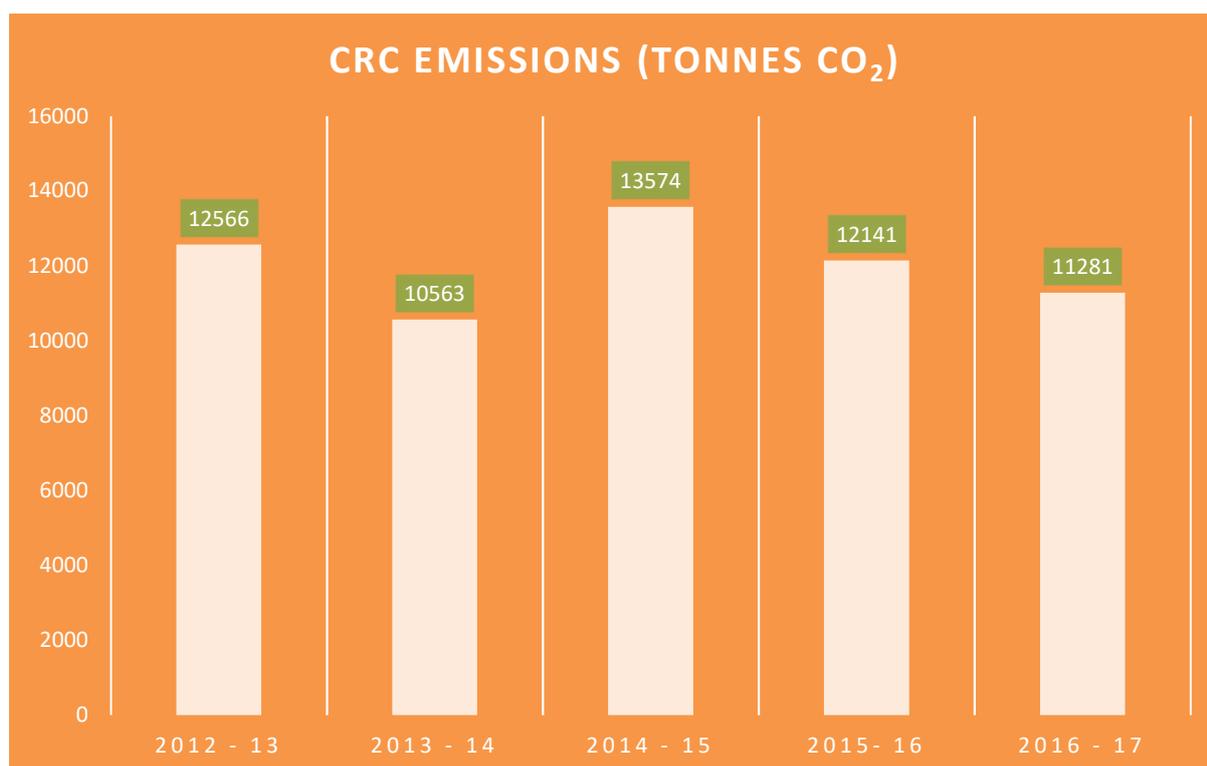
[FS/A005] and on our progress in delivering our Carbon Management Plan (FS/A008).

The CRC Energy Efficiency Scheme (also referred to as the 'CRC scheme' or 'CRC') is a mandatory carbon emissions reporting and pricing scheme to cover large public and private sector organisations in the UK, that use more than 6,000MWh per year of electricity and have at least one half-hourly meter settled on the half-hourly electricity market.

The Council falls within that definition and therefore has to report annually according to the rules of the Carbon Reduction Commitment (CRC) Scheme which has been active since 2010 and is now in its second phase.

The scheme has no targets but incentivises emissions to be reduced from buildings as each tonne of associated carbon dioxide emissions is taxed to the tune of approximately £17, depending on the year of emission.

This second phase is due to end after the 2018/19 consumption year. At the time of preparing this plan it is not known what will replace it.



How has the Council achieved the reductions so far?

Solar Photovoltaic Panels (PV)

Solar panel electricity systems also known as PV, capture the sun's energy using photovoltaic cells and convert it into electricity which is fed into the building on which it is mounted or if not needed fed into the National grid for others to use. The cells don't need direct sunlight to work and can still generate on cloudy days.



PV systems have three main ways of generating income or saving money:

- **Generation.** The Feed in Tariff (FIT) scheme is a Government subsidy which it pays the owner of the panels for every unit of electricity generated. This subsidy is set to end in 2019.
- **Reduce.** If the system is connected to a user the electricity generated can be used in the system which reduces the electricity that is purchased from the grid.
- **Export.** The energy that is not used by the building can be sold back to the grid for others to use.

Solar Panels have been successfully installed at a number of sites around the County including:

- Cowbridge Comprehensive School. The school is using 96% of the electricity generated by the system which in 2017 resulted in a **£5,363 saving** for the school.
- The Alps Depot uses 97% of the power generated by the larger 100kW system which results in a saving of **£12,250**.
- Wick and Marcross CIW Primary School – 30kW.
- Cadoxton Sports Centre – 11kW.
- Civic Offices – 50kW further data for the usage can be seen in Appendix 6.

Street Lighting

In October 2014 the Vale of Glamorgan Council Cabinet took the decision to implement

“a number of changes in the Council's street lighting arrangements aimed at significantly reducing future costs and energy consumption.”

LED Street Lights



The Council has begun installing new LED streetlights in all residential streets as part of a £1.4 million investment project that will benefit the environment by reducing Co2 emissions and energy costs.

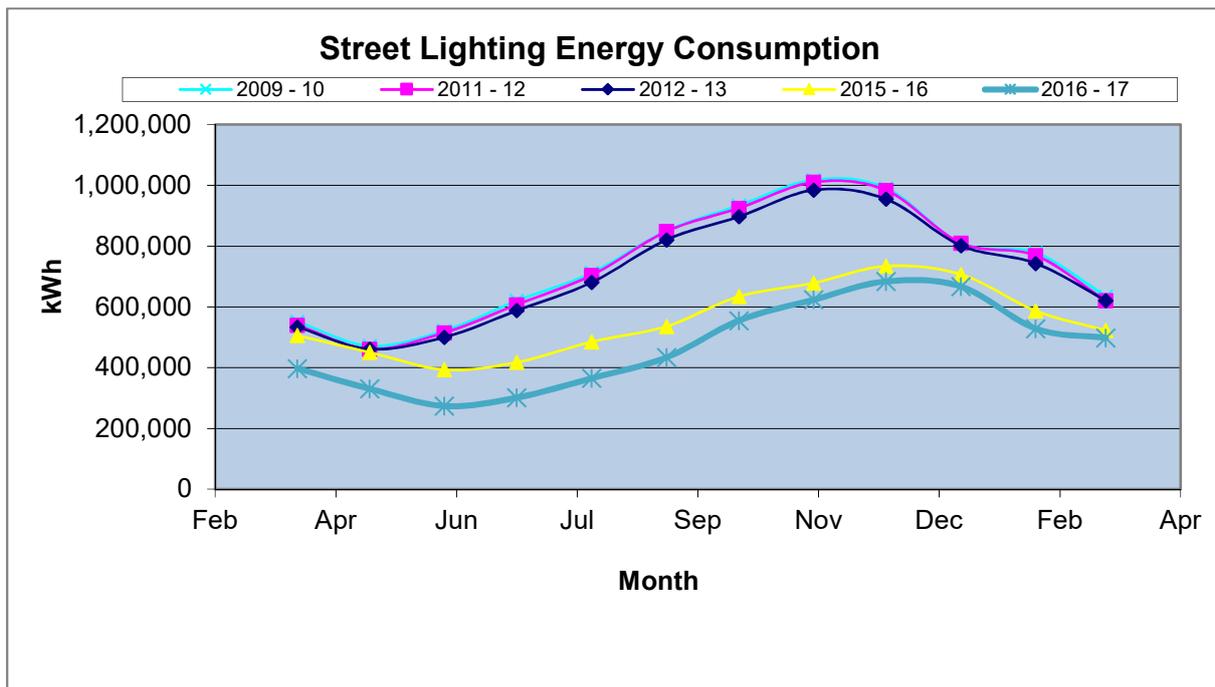
Over 5,000 conventional street lighting lanterns will be replaced by more efficient LED alternatives, which will be dimmed by 50 per cent between midnight and 6am, meaning increased illumination times and an end to part-night lighting in these areas.

The lamps that were switched to LED lights have a much longer lifespan and require less maintenance than the traditional sodium lamps, they are highly energy efficient, reduce carbon emissions and cost less than a quarter of conventional lighting in energy consumption.

Part-night Lighting in the Vale

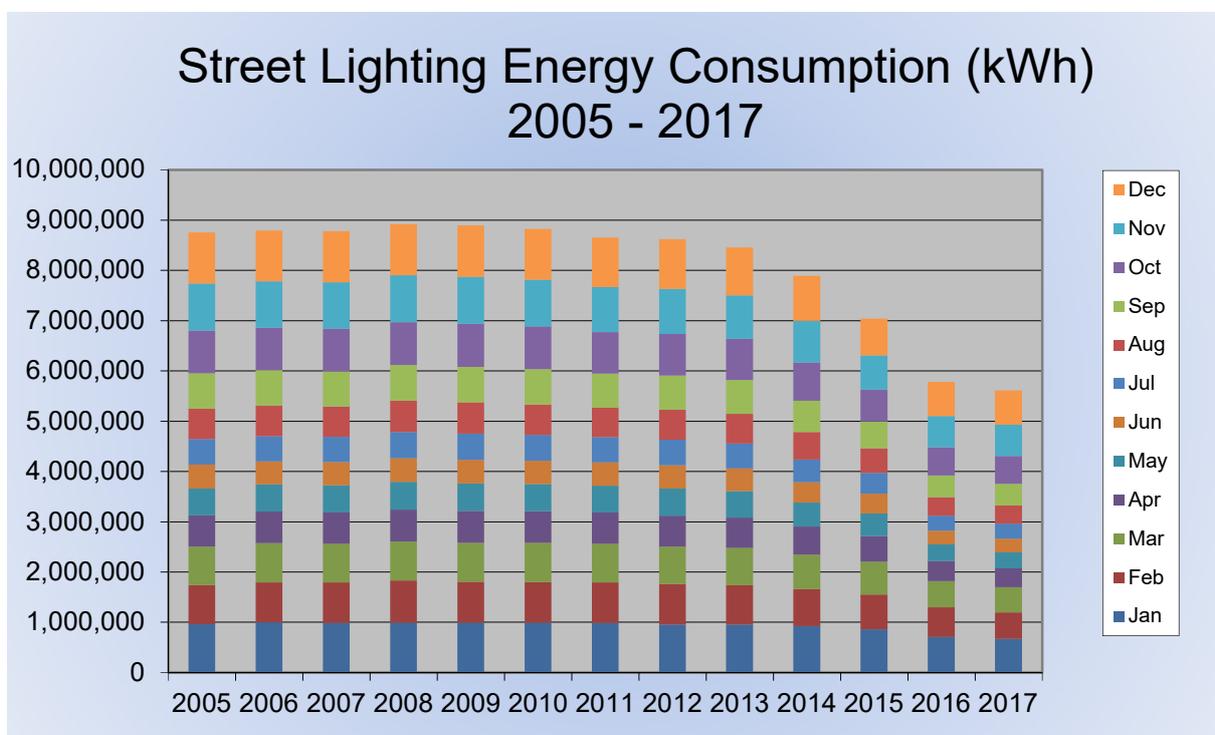
70% of the Council's existing non LED lighting stock will be turned off from around midnight to 6.00am to make essential savings on energy consumption and carbon emissions.

It is anticipated that part-night lighting will save some £371,862.71 in energy costs and 1,338 tonnes of CO₂ emissions per annum.



Reduced Consumption

As a result of these actions the amount of electricity consumed fell in 2015 and continues to fall as the changes are implemented.



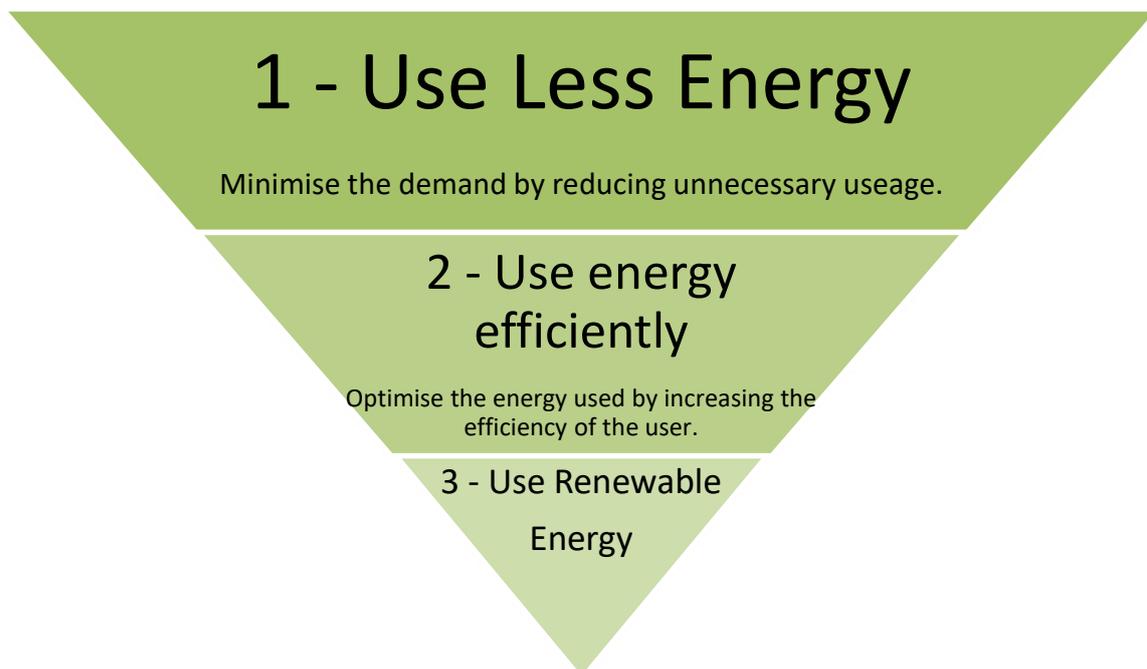
Carbon Management Plan CMP2

Reduction Targets and Timeline

The Council's second Carbon Management Plan covers the period between 2018 and 2021/22 and builds on the success of the first plan. It will look at new areas to explore for savings (see Appendix 8 for initiatives and budgets that will help achieve these reductions). In summary these savings will be delivered by:

- Re:fit Phase 1 and 2. Reducing demand and installing renewable energy generation.
- Residential Street Lighting upgraded to dimmable LED lamps
- Trunk Road upgrade of lamps to LED
- Capital Investment in maintenance of Heating and Electrical Systems within our buildings

The principle of the approach to reducing energy demand is shown in the Energy hierarchy below.



How will the reductions be implemented?

- Re:fit Cymru
- The Salix Recycling Fund
- The Energy Commission Reinvestment Fund (ECRF)
- Schools of the 21st Century
- Capital Maintenance funds
- Demand Reduction

Re:Fit Cymru

Re:fit Cymru is a framework for Energy Conservation Retrofits within Public Sector buildings in Wales. It allows public bodies to include multiple buildings and saving measures within a single OJEU procured Energy Performance Contracting framework providing energy reduction and alternative energy schemes which have scale and can be expedited within months.

Our current estimation is that Re:fit Cymru will reduce our annual CO₂ emissions by 708 tonnes by 2020. The principle of the process is that the private sector is engaged to identify and deliver energy savings around the estate. The measures can be funded either directly from the Council or using Salix with the repayments for any debt coming from the energy savings of the scheme which are guaranteed by the engaged contractor.

Re:fit Cymru was established in 2016. It utilises a Greater London Authorities framework which aims to utilise interest free borrowing to produce guaranteed savings (for both energy and water), which are then used to repay the loan. The Council resolved to participate in Re:fit Cymru at a Cabinet meeting of 24th April 2017 ([Cabinet Report Link](#)). With a core of schools signing up to participate, along with the Council's Corporate portfolio of buildings the Re:fit tender was issued on the 18th December 2017 via the Sell2Wales website. The service provider was selected in March 2018 and phase 1 of the works is planned to commence during 2018. The key characteristics of Re:fit are:

- Any projects or amalgamation of projects must satisfy an overall 7 year or less simple payback based on the savings
- The repayments can be spread over 10 years so that some savings are made from day one.
- The funding for the works under Re:fit will be from an interest free Salix Energy Efficiency Loan, from the Salix recycling fund, and potentially from Council capital funds if a combined funding approach is acceptable and beneficial.

- The savings from projects (or groups of projects) are included in a monitoring and verification (M&V) programme
- The savings are guaranteed by the service provider, with the M&V programme designed to minimise the risk of conflict in determining the savings being achieved.

Salix Fund

Salix is funded by the Welsh Government and the Scottish Government and was established in 2004 as an independent, publicly funded company, dedicated to providing the public sector with loans for energy efficiency projects. It provides interest-free Government funding to the public sector to improve their energy efficiency, reduce carbon emissions and lower energy bills.



The Salix recycling fund has served Council energy efficiency improvement well with over £900,000 being invested in energy efficiency improvements since 2009. The future intention is that Re:fit will utilise this funding (approximately £200,000 has been available for works each year in the past).

Following Cabinet approval in January 2018 the street lighting section successfully bid for a Salix Energy Efficiency Loan (interest free) to upgrade nearly 4,000 conventional street lamps to their LED equivalent. The upgrade will incorporate an addressable central management system (CMS) allowing on/off and/or dimming schemes to be applied to individual street lamps. This loan was for approximately £1.9 million, and the work is due to be completed by 2020. More information can be found in appendix 6.

Energy Commission Reinvestment Fund (ECRF)

An additional charge was included in the unit rate for electricity and gas from the time that automatic meter reading (AMR) facilities were installed back in 2010. Those tariffs covered the cost of AMR with some to spare. After a number of years that surplus became enough to justify the setting up of the Energy Commission Re-Investment Fund (ECRF). The setting up of this fund was approved via a cabinet report on 26th January 2015.

As repayments are made into the fund new investments will be made predominantly into renewable technology and blended with the other funding mechanisms in order to maximise returns on schemes.

Schools of the 21st Century



We have built new schools within the Vale of Glamorgan under the Band A 21st Century Schools initiative. However, further work needs to be done to improve the energy efficiency levels within these schools. In early 2018 work has been completed updating the employers requirements with a view to using lessons learnt to try to improve this situation for Band B 21st Century Schools projects.

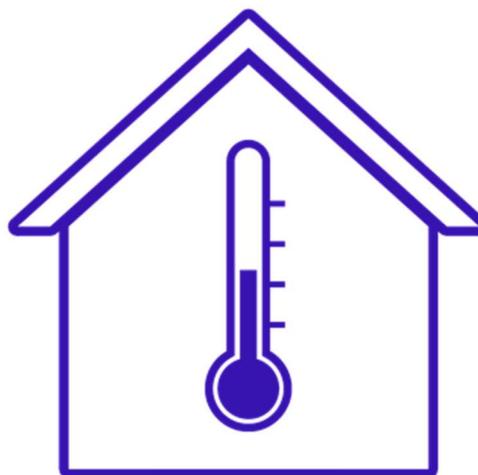
Capital Maintenance Funding

Each year the Council allocates funding for the maintenance of its building assets. A programme is developed which is based on the condition, safety and legislative requirements of the estate with the most urgent items receiving priority funding. Some of these improvement works have an impact upon the energy efficiency of the estate.

This funding can be blended with the other sources named above to increase the carbon reduction element of any installations undertaken.

Demand Reduction

Changing the behaviour of colleagues is a key strategy which has the potential to unlock up to 10% savings according to The Carbon Trust and the Energy Saving Trust. Examples of good housekeeping are; turning down a radiator instead of simply opening the window wide, or switching off the lights in rooms that are unoccupied. The messages encouraging good housekeeping need to be refreshed regularly otherwise that 10% saving can easily reduce.



For the vast majority of people, the good housekeeping approach needs to be subtle. Preaching is not an effective technique, nudging behaviour in the right direction is more effective. For instance saving power through reduced use of lifts in buildings could be wrapped up in a health promotion encouraging people to use the stairs.

Several efforts and schemes have been adopted to engage with primary schools and to promote better housekeeping and energy awareness over the years. The latest was through engagement with school eco committees through which schools were encouraged to participate in a ‘switch off’ fortnight, where a special effort was made by staff and pupils to switch off equipment, and lighting when and where it was not required. Profile consumption data was used to feed back the savings achieved. The highest reduction for that fortnight was 32% with an average reduction of 13% for the schools that participated. Other similar exercises have shown that the reduction achieved can continue after the event as equipment that was running unnecessarily does not get switched back on after the event, and perhaps habits improve too.

Carbon Management Action Plan

Objective: To reduce CO₂ emissions from street lighting, Council vehicles and buildings by 12.5% by 2021/22 from a baseline established in 2016/17

Action / Project	Target	Anticipated Completion Date	Progress/Outcome
A1. To deliver phase 1 and II of Re:fit.(22 potential buildings)	36 Tonne CO ₂ reduction for the 2018/19 period and beyond	30/09/2019	Internal Council approval to proceed with Re:fit is in place (2017), Tender documentation has been prepared (2017) and tender reviewed. Contractor now appointed and first surveys completed. Work delivery is likely to start in July /Aug 2018. savings from works in 2018 will contribute to 2018-19 savings
A2. Complete conversion of residential street lamps to LED	631 Tonne CO ₂ reduction for the 2018/19 period	30/6/2018	Works are due to be completed by the end of 2018. Annual reductions of 779 Tonnes to be realised once the LED fittings are in for a complete year. This task is being managed by Visible services and Housing (Street lighting)

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Action / Project	Target	Anticipated Completion Date	Progress/Outcome
A3.. Convert trunk road street lighting to LED	226 Tonnes CO ₂ reduction during 2019 – 20 period	31/3/2020	A business case was prepared for a successful SALIX loan application in January 2018. Tender documentation due to be issued by the end of March 2019 with the installation of LED lamps being completed by March 2020. Commissioning will then take place and the full carbon dioxide emission savings of 603 Tonnes per annum of the project will be delivered in the 2020-21 year and beyond. This task is being managed by Visible Services and Housing (Street Lighting)
A4. Promotion of Re:fit Phase III	20 buildings or more are signed up to Re:fit phase III	31/3/19	Phase I and II of Re:fit comprises of our corporate buildings and 11 schools. If Re:fit phase III is to go ahead then 15 or more additional schools will have signed up for phase III. Phase III will not go ahead if insufficient schools sign up to Re:Fit Cymru.
A5. Provide Feedback to Building Users	Develop new 'dashboards' and bespoke reports	31/3/20	The Energy Team have been delivering monthly 'out of hours' gas reports for a number of years, but due to developments in the 'Energy Manager' software that we use we have the opportunity to provide building users with better web based feedback screens. We also have the ability to develop 'Smart Spaces' so that deviations from the norm are picked up and emailed to building users within a week of deviation (data is provided to VOG on a weekly basis) . Dashboards will be available to end users before 31/3/2019.

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Action / Project	Target	Anticipated Completion Date	Progress/Outcome
A6 Billing validation	Identify billing errors within days of receiving electronic bills if and when they exist	31/3/2019	The electronic billing system now allows us to see precisely the detail on how each supply is being billed. This gives the energy section the ability to check tariff rates against the contracts, and meter readings against those being read by site staff, or provided by the automatic meter reading facilities.
A7 Encourage more schools to move to electronic billing	Increase the percentage of schools using the electronic billing facility	31/3/2021	The development of an interface with Oracle took place in late 2016/ early 2017 and electronic billing (in the form of EDI files) for gas (Corona Energy) and electricity (EDF Energy) began from April 2017. All corporate buildings and 50% of primary schools began participating from April 2017, with over 90% participating by April 2019 and as the system is seen to work well it is hoped that more will participate.
A8 Fine tuning of heating controls using the 963 Trend supervisor	Create a log of improvements/adjustments so that energy consumption and effectiveness of adjustments can be determined	31/3/2021	The details of all our heating controllers bar the most recent two additions have been added to the Trend 963 database. More time can now be devoted to studying whether the controls can be adjusted.
A9 Determine a practical size for the SALIX recycling fund post Re:fit	Agree a practical fund size for the future	31/3/2021	The recycling fund will be used to fund the first part of Re:fit, once the fund is exhausted a separate loan application will be made to Salix to complete Re:Fit. As loan repayments are made into the recycling fund these monies will be used to fund future projects after the completion of Re:fit. At this point a decision will be made on the appropriate size of the recycling fund.

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Action / Project	Target	Anticipated Completion Date	Progress/Outcome
<p>A10 Introduce electronic billing for water supplies</p>	<p>Water bills to be paid electronically for all corporate sites and for schools that have elected to do so.</p>	<p>1/1/2019</p>	<p>The Energy Team has been working with Welsh Water since 2016 with the support of the National Procurement Service to investigate where improvements can be made in the delivery of the service to local authorities in Wales. This has culminated with the development of an electronic billing system with VOGC as the pilot for this system. The first actual test files were delivered to the Council in June 2018. Welsh water carried out adjustments during the summer 2018 and have since October 2018 gone “live” with VOG.</p>
<p>A11 Submit Carbon Reduction Commitment (CRC) figures</p>	<p>Figures to be submitted to the Environment Agency before the end of July each year until phase II ends in 2019</p>	<p>31/7/18 and 31/7/19</p>	<p>The UK Government have set out the rises in the climate change levy for non domestic customers which in England will replace the CRC after phase II. In Wales the government are to announce their plans for the replacement of the CRC scheme although the CCL tariffs will also apply to non domestic energy supplies in Wales.</p>

Closing the Gap - Meeting Welsh and UK Objectives



The currently programmed and consented parts of CMP2 fall short of the respective Welsh Government and UK Government anticipated 2030 and 2050 targets. Appendix 4 shows the sort of reductions that are required to meet the aspirational target of the Welsh Government of a carbon neutral public sector by 2030.

A factor which is hard to predict is the rate at which grid supplied energy is decarbonising. [Appendix 5](#) shows how the conversion factors have been changing, the result is that between 2010 and 2018 there has been a 30% reduction. This is due to the effect of solar farms, wind farms and other forms of renewable energy that are now contributing to the national grid. Also contributing to this drop are gas fired and nuclear power stations over coal fired power stations. It is hoped that the grid will continue to decarbonise at the same rate as before as that will assist the Council in meeting the targets.

However the amount of carbon dioxide that is produced through the use of natural gas has not changed at 0.184 kg CO₂/kWh. If the Council are to reach the target, then we will either have to 'offset' the gas we are using or stop using gas and heat our building via another technology.

The current alternative is not without its problems. The current alternative is Heat pumps which use hydrofluorocarbons (HFCs) which have a significantly larger CO₂ impact on the atmosphere and are very persistent.

Technical, financial and behaviour change issues need to be overcome if the aspirations of the Welsh Government are to be achieved. This Council would need substantial allocation of resources to meet this target. The Welsh Government will need to engage local authorities at the highest levels to assist in making the necessary changes.

Schemes and investment would be required to implement CMP2

There are three components to our emissions at the moment:

Electricity use, gas use and liquid fuel use.

Appendix 9 shows pictorially the sorts of technologies and measures that the Council will have to consider as pressure increases for it to become Carbon Neutral. The measures noted below are currently unfunded and will require thorough analysis before a business case is created for their installation or implementation.

Renewable Energy

The installation of renewable energy has reduced in recent years due to the reduction of the Feed in Tariff (FIT) and other subsidies. The cost of the technology is falling however the rate of deployment has slowed, business cases for the installation are now less financially lucrative than before following the reduction and removal of subsidies with the focus now on sizing correctly.

Solar

Opportunities for further “building mounted” solar installations around the estate will be explored alongside the possibility of ground mounted solar on a variety of scales.

To generate an annual amount of 32,958 MWh of electricity the Council would require about 35,556 kW pk of solar PV installed. It is estimated (based on the known areas of buildings) that about 5,000 kWpk of solar PV could be installed on our roofs. This leaves 30,556 kWpk of solar PV needing to be installed somewhere other than roofs.

This sort of capacity would require 142 acres of land. Review meetings were held with Green Growth Wales and our landowning Directorates, however this level of non-strategic land in the Council's ownership not already identified for a specific purposes was unable to be identified.

Wind

On shore wind subsidies were reduced substantially in previous years making the business case for their installation significantly less attractive. Previous analysis of this technology has not yielded any results to date. As a flatter coastal area the Council may have future opportunities that could be analysed in financial and planning terms and developed if viable.

Hydro Power

Surveys to date have not yielded any financially viable projects to date but development in “low head” technology schemes may suit the area better than traditional schemes.

Battery Storage

Battery storage is developing at pace and will form a part of the energy supply mix in the future in buildings, when coupled with renewables they further increase the efficiency of the system by storing energy that would have previously been exported to the grid and making it available for use at the point of generation. Building all these factors together then the overall cost for setting the Council up to run on solar photovoltaics would be approximately £53 million.

Electric Vehicles

The gradual switch to electric powered vehicles from using petrol and diesel is underway and gaining momentum. The government is currently incentivising both the purchase of electric vehicles and the installation of vehicle charge points in an attempt to expand the infrastructure required to charge the new types of vehicles.

The products available on the market currently are mainly passenger cars but there are developments in small commercial vehicles and buses also. The cost of the vehicles is still comparatively high in contrast to petrol and diesel cars however this is somewhat offset by lower running costs. Opportunities for the adoption of this form of transport will be monitored alongside our colleagues in the fleet management team.

Hydrogen

The use of Hydrogen as a storage of energy is currently in its infancy, the future of the gas as a fuel for vehicles and buildings is not yet known. A number of vehicle manufacturers are developing vehicles which use the gas but currently the production methods are inefficient meaning that although the only by-product is water vapour the reality is that the production of the gas has required a significant amount of electricity to produce. There are currently a number of trials ongoing in the UK with filling stations being located in Wales and a trial of a small fleet running in South East Wales.

Anaerobic Digestion

Anaerobic Digestion or AD is a process which derives methane from biological matter such as food waste and plant waste. It is widely used by waste disposal firms who have large plants fed by local authority and commercial waste collections, however it can be done on a variety of scales.

The process has two outputs:

- Methane this can be used to either put back into the gas grid or used as fuel for an engine which can generate electricity and heat for consumption locally.
- Digestate which is a fertilizer that can be used by farmers for crop production.

Plant biodiversity in our verges is decreasing across the UK, partially because of the nitrous oxide emissions from diesel vehicles providing nitrogen nutrients to dominant plant species which are out growing and smothering some of the less robust species. By collecting verge side cuttings the less robust plants will have a chance to get to the soil and establish themselves once more.

This sort of regime is apparently taking place in Germany and France. A study in the UK has established that about 10 Tonnes of cuttings per hectare of verge could be collected. It has been estimated that the Vale of Glamorgan may have just under 400 miles of roadways, many with verges (based on the length of verges in a number of sample areas of areas of the Vale). Further assumptions and calculation gives an overall verge area of 29 hectares of verges. These would provide 290 Tonnes of biomass which would provide roughly 86,000 kWh of energy via an anaerobic digester.

We currently use 16,000 MWh of gas, so whilst a worthy addition, anaerobic digestion of our verge cuttings will not reduce our reliance on fossil fuel gas.

Heat Networks / Micro grids

The Council was recently successful in securing funding to explore the possibility of developing a heat network to connect its assets in Barry. The work which will conclude in 2019 will advise us if a scheme in Barry is worth progressing.

Heat networks are not a new concept and have been widely used in Scandinavian countries and other cities such as Sheffield in the UK. The principle is that heat generators are connected with heat user via a large underground network of pipes.

The initiative is growing in momentum and can be linked with small electricity grids which also look to connect up renewable generators and users on a private network.

Carbon Offsetting

It is not yet clear how the Welsh Government interprets the conditions that a Local Authority would have to meet in order to be considered 'Carbon Neutral'.

However, the Carbon Positive project that Natural Resources Wales (NRW) have embarked on has been held up as a leading example. In the case of NRW, they, like local authorities, have buildings that are net emitters of carbon dioxide, but the natural resources that they have across Wales such as forests and peat bogs that sequester carbon dioxide from the atmosphere more than offset those emissions.

It could be that the Welsh Government will expect public bodies that do not have natural resources that are sequestering carbon dioxide to purchase carbon 'credits' from fellow public bodies such as NRW. At the moment we don't know.

Alternative Heating Strategies

Reducing consumption of fossil fuels is key to reducing carbon emissions. We could remove the need to heat our new buildings by adopting Passivhaus building standards. Experts say costs of new build would increase by approximately 10%, but would have substantially lower running costs as a result.

Alternatively, or in addition, we could turn to heat pumps to heat our buildings, air source and ground source. Installing heat pumps driven by grid electricity would not give us the result we want. We require a renewable source of electricity that can provide all the electricity we want to heat (via the heat pumps) and light our buildings. We also want enough of this renewable electricity to charge our fleet of electric cars.

Electricity to light and power our buildings	25,000 MWh	Current usage (approx.)
Electricity to drive our heat pumps and negate our use of fossil fuel gas	5,333 MWh	Note that the 16,000 MWh of gas is reduced to 5,333 MWh electricity because of the coefficient of performance assumed to be 3.
Electricity to charge electric vehicles	2,624 MWh	less than the 7,800 MWh currently delivered via the fuel oil and diesel to our council vehicles because the internal combustion engine is far less efficient than the electric motor.
Total Electricity requirement becomes	32,958 MWh	

This is a considerable amount of money, but on the basis that we currently pay around £4 million for gas and electricity then changing to solar and converting to heat pumps would have a simple payback of 14 years after which time we could enjoy free energy up until the end of the installations life.

Conclusion

CMP1 was a success and hit the Council's target of a 20% (21.3% achieved) drop in emissions between the base year 2005-6 and the final year 2015 – 16.

This was achieved using a variety of tools (e.g. through Salix finance) that were not available in 2008 and using technologies which did not exist (e.g. LED Lighting) or technologies that were uneconomic at the time (e.g. solar PV). The internal drivers that influenced the approach to reducing consumption of street lighting didn't exist in 2008. Several buildings were disposed of and a number of the old inefficient schools were replaced through the 21st Century schools programme.

Due to these factors and other initiatives the CMP1 targets were met. The small Energy Team within the Council played its part but it is obvious that success came through actions across the whole Council.

The next four year period takes us from the 2016/17 baseline to 2021 there are a number of technologies and research available now that were not developed for CMP1 which are now able to be utilised. RE:FIT delivery began this year with the first schemes in the process of being delivered. The majority of street lights will have been converted to LED by the conclusion of CMP2. These factors make the accuracy of saving predictions far more reliable.

Old and defunct plant and equipment will be replaced with newer more efficient electrical and mechanical systems in the maintenance programme. With all these individual programmes and actions in place we stand every chance of achieving our 15.8% reduction target by 2021-22.

However, to achieve the target reduction the most important thing is for the whole Council to embrace this effort, get involved and take pride in achieving these reductions.

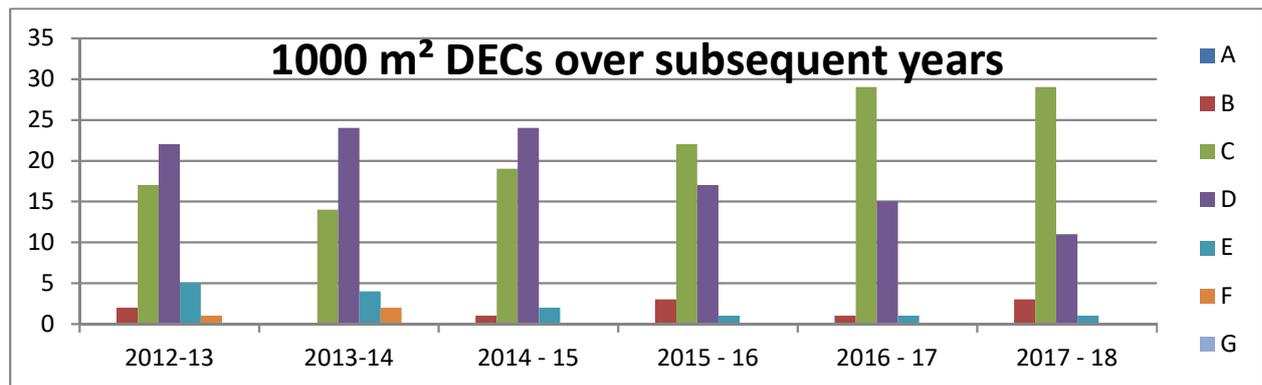
Finally as future Carbon Management Plans approach savings will become increasingly harder to achieve as resources continue to reduce, more innovative methods of reduction will need to be employed.

Appendix 1

Display Energy Certificate Ratings Over The Years

Note A is best rating, G is the lowest.

Vale of Glamorgan Council Public Building DEC Grades since 2012						
Grade	2012-13	2013-14	2014 - 15	2015 - 16	2016 - 17	2017 - 18
A	0	0	0	0	0	0
B	2	0	1	3	1	3
C	17	14	19	22	29	29
D	22	24	24	17	15	11
E	5	4	2	1	1	1
F	1	2	0	0	0	0
G	0	0	0	0	0	0



Appendix 2

Consumption monitoring

All of the building energy consumption data that has been collected is stored on an energy management database called 'Energy Manager' and this platform was developed and is maintained by a company called 'SystemsLink'. The information held by the Council is synchronised with the Systemslink servers, giving all Vale of Glamorgan budget holders the ability to view and report on the consumption and cost of energy for their buildings on line.

This is something that has been encouraged over the years, 166 users have so far been given access to the system and since June 2017 40 users have actively used the system. With the move towards more electronic billing then this way of viewing bills is going to be the preferred method for budget holders to keep track of their energy use and costs. Discussions on electronic billing for water supplies took place in 2017 and Welsh Water has confirmed that they will only be providing a consolidated electronic bill. Individual invoices will not be produced. Budget holders will have to view their water consumption billing details via the Systemslink web site, or restrict the information at their disposal by viewing the invoice cost details only, from Oracle.

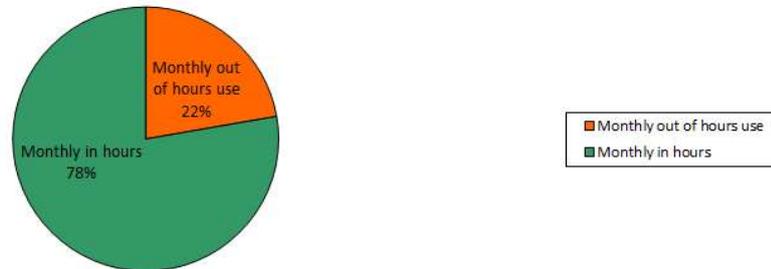
The amount of feedback available to those who want it via the Systemslink web site is comprehensive. Users can also record their own meter readings and keep track of consumption that way.

In addition to this end user prompted feedback, the energy section has regularly been sending our "Out of Hours" gas consumption reports each winter month.

Using the recording consumption of gas for each half hour these reports compare expected consumption with the actual consumption based on what the energy section expects the building occupation pattern to be.

So for instance if gas is used over a half term holiday period then this may be flagged up as out of hours gas use. The reports quantify the cost of this out of hours use. With the feedback that end users give the energy section it is clear that these reports are viewed by many.

Out of Hours Gas Use



More and better Reporting

The current Display Energy Certificate rating for a building is shown on Systemslink, along with a comparison of electricity and gas consumption across the latest month with that of the previous year. There is also a footprint report for both gas and electricity highlighting the periods during each day over the past month when consumption was more or less intense.

It is not the purpose of this plan to explain in detail the information that is available, other than to say that it is comprehensive. More detail can be found here [link](#)

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When logging onto Systemlink this is the type of report that the user first sees:



This is how a typical gas bill is represented on the Systemslink Website.

Invoice Details						
Site Name:	Civic Offices					
Site Code:	13471					
Address:	Holton Road, Barry, Vale Of Glamorgan, CF63 4RU					
Utility:	Gas	Tax Date:	10/01/2018			
Supplier:	Corona Energy	Estimate	No			
MPR:	775902	Read:				
Period:	01/12/2017 - 01/01/2018					
Invoice Number:	12718117					
Metered Charges						
Present	Previous	Correction Factor	Calorific Value	kWh	p/kWh	Cost(£)
533716	524140	1.04	39.20	108474	1.967	2,133.58
Totals				108474		2,133.58
Other Charges						
Charge	Units	Cost Rate	Cost(£)			
Climate Change Levy		0.198 p/kWh	214.78			
Fixed			618.14			
Other Charges			-0.01			
Sub Total						2,966.49
VAT @ 20.0%						593.30
Total Cost						3,559.79

 Print

In the coming three years we will be promoting the SystemsLink website more and along with the necessity of end users to use it to view their billing data, there is a great opportunity for end users to start understanding their building energy use more and in so doing potentially improve energy good housekeeping.

Drop in Street Lighting Energy Consumption over the CMP1 period

Street Lighting Energy Reductions		
Calendar Year	Consumption (kWh)	% Change
2008	8,916,925	0
2009	8,889,755	-0.3%
2010	8,818,455	-1.1%
2011	8,649,305	-3.0%
2012	8,616,973	-3.4%
2013	8,452,575	-5.2%
2014	7,887,310	-11.5%
2015	7,038,987	-21.1%
2016	5,781,363	-35.2%

Appendix 3 – 2008 Carbon Management Plan (CMP1) Target and Result

Year	Target % Reduction	BAU Emissions (T CO ₂)	Target (T CO ₂)	Achieved (T CO ₂)	% Reduction
2005/06	1	16,264	16,264		
2008/09	2.8%	16,387	15,817	Not available	
2009/10	5.4%	16,510	15,382	Not available	
2010/11	8.0%	16,635	14,959	Not available	
2011/12	10.6%	16,760	14,547	Not available	
2012/13	13.0%	16,887	14,147	Not available	
2013/14	15.4%	17,015	13,758	Not available	
2014/15	17.7%	17,143	13,380	Not available	
2015/16	20.0%	17,273	13,012	12,804	21.3%

Appendix 4 – possible reduction trajectory to hit zero emissions from buildings and transport by 2030.

Year	Emissions	% Decrease in Emissions
2018	100.0	8.3%
2019	91.7	9.1%
2020	83.3	10.0%
2021	75.0	11.1%
2022	66.7	12.5%
2023	58.3	14.3%
2024	50.0	16.7%
2025	41.7	20.0%
2026	33.3	25.0%
2027	25.0	33.3%
2028	16.7	50.0%
2029	8.3	100.0%
2030	0.0	

Appendix 5 – CRC Carbon Dioxide conversion factors for grid supplied electricity

Electricity Conversion Factors for CRC – Carbon Reduction
Commitment

Period	Factor (kg CO ₂ /kWh)
Phase 1 - 2010 to 2013	0.5410
Phase 2 - 2014-15	0.5331
Phase 2 - 2015-16	0.49636
Phase 2 - 2016-17	0.44662
Phase 2 - 2017-18	0.38146

Note that the predictions on carbon dioxide reductions have not relied on the changes (or predicted changes) in conversion factors. A conversion factor of 0.541 kg CO₂/kWh has been used for electricity used and a conversion factor of 0.185 kg CO₂/kWh has been used for gas use for the calculations within this report.

Appendix 6 – Lessons learnt from the first Carbon Management Plan 2008 - 16

Many authorities in the UK produced Carbon Management Plans during the 1990s and 2000s. The Vale of Glamorgan Council was one of the forward thinking authorities with high level support to get better control of its carbon emissions. Regular meetings took place lead principally by the then Director of Economic and Environmental Regeneration attended by Operational Managers across the authority in the form of a Carbon Management Working Group. The Council had historically worked with the Carbon Trust during previous years, taking advantage of energy surveys and other services they offered. In 2007 the Carbon Trust offered support and a template approach to forming a Carbon Management Plan which the Council accepted. In a series of stakeholder sessions involving essentially the members of the Carbon management Plan working group

How Did We Perform Against Our 2008 Plan Target?

Our target in 2008 (CMP1) was for a 20% reduction by 2015/16 compared to a 2005/6 emission baseline, and if we use the same conversion factors that we did in 2008 then our overall reduction in carbon emissions was 21.3%

The base year that we used in 2008 was the 2005-6 year, a time when only 12 of our meters out of 500 or so meters provided readings to us automatically. All the other meters had to be read manually. So the quality of the data we have today is much more reliable than that in 2005-6. Similarly the data we have on fleet fuel consumption is more robust (and hence we show that the emissions from our fleet is greater than in 2005, something that may not be true).

During the period since 2008 the conversion factor for gas/kg CO₂ produced has remained virtually unchanged (at around 0.185) the value for electricity to kg CO₂ produced has gone up from the 0.430 used in 2008 to 0.541 at the beginning of the CRC scheme (2010-11) down to 0.446 kg CO₂/kWh in 2016-17.

With the 2016-17 conversion factors virtually identical during last year when compared with the 2008 conversion factors it is reasonable to use the 2008 conversion factors for the analysis, thus giving a truer result of reductions achieved through our own actions, as opposed to taking advantage of the benefits resulting from additional wind farms and solar installations contributing carbon emission free electricity to the grid.

	Carbon Reduction Targets set in 2008 were met
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What Measures Did We Install?

Listing every change that happened between 2008 and 2016 is not practical but some of the main changes are:

60 buildings (or parts of buildings) had building management systems installed and were also connected to a heating control network allowing remote connection (mainly funded via capital investment). The Salix ring fenced fund set up in 2009 (originally set at £450,000 and increased in 2011 to £600,000) had by the end of 2015 invested £919,752 in energy saving projects. 76 projects had been completed ranging from cavity wall insulation, LED lighting upgrades to heating conversions from oil to gas.

Two or three boiler houses have been upgraded each year since 2008 via a capital funded rolling maintenance programme. In virtually every case opportunities have been taken to improve the controls, insulation levels of boiler house pipework and the boiler efficiency (condensing boilers are installed by default).

Similarly buildings have been rewired on a rolling capital maintenance programme across the period. In earlier years antiquated lighting systems were replaced with T8 fluorescent tubes with improved controls and high frequency control gear, whilst in later years T5 lamps have been used and most recently LED.

Improvements to street lighting have taken place since 2008. Salix invested £152,000 between 2011 and 2013 in dimmable ballasts for residential street lights. These were timed to reduce the light output for 8 hours per day reducing energy use during that period by 31% for the lamps in question. Later actions taken by the street lighting division included the replacement of residential SON lamps with LED and installing new ballasts capable of shutting off lamps fully between certain hours (approx. midnight through to 6 a.m.). Later the regime was modified to night time dimming. Over the period of the first Carbon Management Plan the drop in street lighting energy consumption was over 35%. For more detail see Appendix 3.

The installation of automatic meter reading systems (AMR) was rolled out through 2010 allowing the gathering of consumption for each half hour of the day throughout the year. This gave the energy team the ability to produce new reports for building managers. One such report being the “out of hours gas report” which informs building managers just how much gas has been used at periods that it would not be expected to be used (e.g. in the middle of the night or perhaps on a Sunday) and how much it has cost them. This process highlighted cases where things were going badly wrong and controls were sometimes adjusted or fixed resulting in savings.

The 21st century schools building programme has resulted in the replacement of buildings that achieved ‘D’s and ‘E’s with buildings that are currently achieving ‘C’s. The new schools have been highly specified and a condition of the Welsh government funding was for the buildings to be rated BREEAM “Excellent”. The Energy Performance Rating of an ‘A’ was also required.

The Council has installed several photo-voltaic (PV) electricity generating systems since 2011, over twelve sites with a total peak capacity of 388 kW. These generated over a year in the region of 12,500 kWh, which is approximately 0.1% of the electricity we drew from the mains to power our buildings, or 0.03% of the total energy used by the Council.

What Worked and Didn’t Work?

In 2008 the Energy Section was limited to one member of staff “the Energy Manager”. The Energy Manager was located within ‘Private Sector Housing’. Between 2005 and 2007 and the majority of works delivered by the energy section were for the domestic housing sector, with a large programme of insulation works undertaken. These works were mainly funded via government generated schemes.

In 2007 a decision was made to relocate the Energy Manager position to the Property Section. This put the Energy Manager alongside the mechanical and electrical design engineers and the Council’s architects. For energy improvements in Council buildings this was a good thing. The cross fertilisation of ideas resulted in energy efficiency improvements that may never have happened, and the cooperation

of the Facilities Management team to adopt Salix (see below) projects and to try new energy efficiency measures has been very positive.

The Council decided in 2009 to apply for the Salix recycling fund. The scheme was made generally available to Welsh Local Authorities. A consultant shadowed the Council's Energy Manager to assess the capacity for delivering measures via such a fund. The recommendation was that without additional staff it would not be possible to deliver enough projects. The fund was set up so that an administration charge (up to 15%) could be built into each delivered project such that this would fund a member of staff. This resulted in the creation of the Carbon Management Assistant post. Through that post over 70 projects were delivered during the 2009 – 2017 period.

What Could We Have Improved?

 Energy Management Matrix						
Level	Energy Policy	Organising	Training	Performance Measurement	Communication	Investment
4	Energy Policy, Action Plan and regular reviews have active commitment of top management	Fully integrated into senior management structure with clear accountability for energy consumption	Appropriate and comprehensive staff training tailored to identified needs, with evaluation	Comprehensive performance measurement against targets with effective management reporting	Extensive communication of energy issues within and outside of organisation	Resources routinely committed to energy efficiency in support of organisational objectives
3	Formal policy but no active commitment from top management	Clear line management accountability for consumption and responsibility for improvement	Energy training targeted at major users following training needs analysis	Weekly performance measurement for each process, unit, or building	Regular staff briefings, performance reporting and energy promotion	Same appraisal criteria used for energy efficiency as for other cost reduction projects
2	Un-adopted policy	Some delegation of responsibility but line management and authority unclear	Ad-hoc internal training for selected people as required	Monthly monitoring by fuel type	Some use of organisational communication mechanisms to promote energy efficiency	Low or medium cost measures considered if short payback period
1	An unwritten set of guidelines	Informal, mostly focused on energy supply	Technical staff occasionally attend specialist courses	Invoice checking only	Ad-hoc informal contacts used to promote energy efficiency	Only low or no cost measures taken
0	No explicit energy policy	No delegation of responsibility for managing energy	No energy related staff training provided	No measurement of energy costs or consumptions	No communication or promotion of energy issues	No investment in improving energy efficiency

The Energy Management Matrix above highlights in pink an estimate of where this authority is at the moment. The Council aspires to reach level 4 in each area and this would improve energy management within the Authority. Input and enthusiasm at the highest and lowest levels within the Council will be required to achieve this.

During the period 2019-20 a new energy policy or standard will be developed and reported during the annual plan update. The standard could contain such items as heating standards and heating and lighting specifications for new builds and refurbishment projects all with the goal of reducing energy consumption. The standards will then be introduced in a graduated manner starting with a limited number of less contentious guidelines in order to ensure adoption. The policy will be further developed once a consensus is agreed on future policy additions.

Case Studies

Case Study 1 - The Civic Offices boiler replacement

Project Knowledge – Boiler Replacement at Civic Offices by The Vale of Glamorgan Council



BEFORE

- 4 Hoval GS 960 EX boilers with rated input of 372 kW and output of 281 kW
- 75.5% max. full load efficiency, however likelihood of 60% seasonal efficiency with age over 30 years
- The boilers required several repairs and replacement parts for them were scarce

AFTER

- 4 Strebel S-CB 180 fully modulating and condensing room sealed boilers, new control panel and Trend excite heating controller
- Salix funding £77,000 (58% of project value)
- 278,357 kWh annual saving (34%)
- £9,630/year savings
- 8 years payback on Salix funding requested



[Project completion date – September 2013](#)

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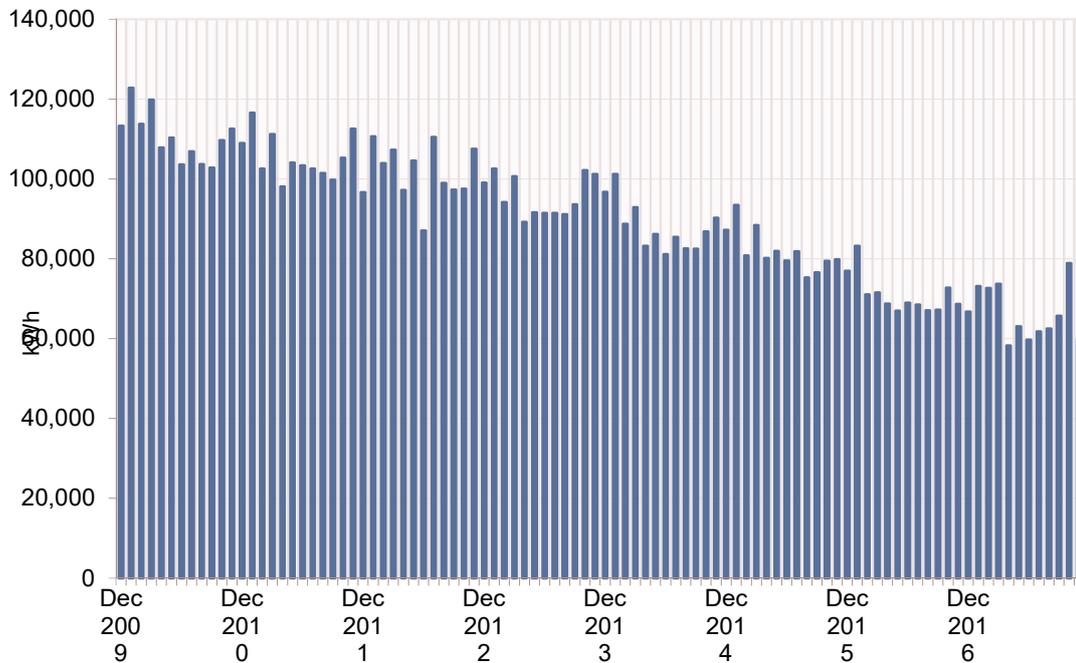
SALIX
SOLVING ENERGY EFFICIENCY FINANCE IN THE PUBLIC SECTOR

This case study was for the boiler replacement project partially funded through the Salix Energy Efficiency Loan Scheme (SEELS). The Civic Offices has had numerous other energy efficiency improvements carried out since 2007:

- Cavity Wall Insulation – October 2007 ,Carbon Bead Insulation in all the cavity walls of the building
- Voltage Optimisation – August 2009. 5% reduction in electricity use
- Heating controls – Trend heating controller linked to the computer network installed in 2008.
- LED Lighting in test corridors and within toilets – May 2012
- Boiler replacement, separation of hot water system and addition of solar thermal (2013)
- Insulation of flat roofs – 2011 through to 2016.
- Solar PV 25 kW in 2012 and 25 kW in 2015.
- New Server Room with indirect free cooling - 2015

All these improvements have resulted in a 40% drop in emissions associated with gas and electricity use at the Civic Offices. The reduction in electricity taken from the grid over the past 8 years

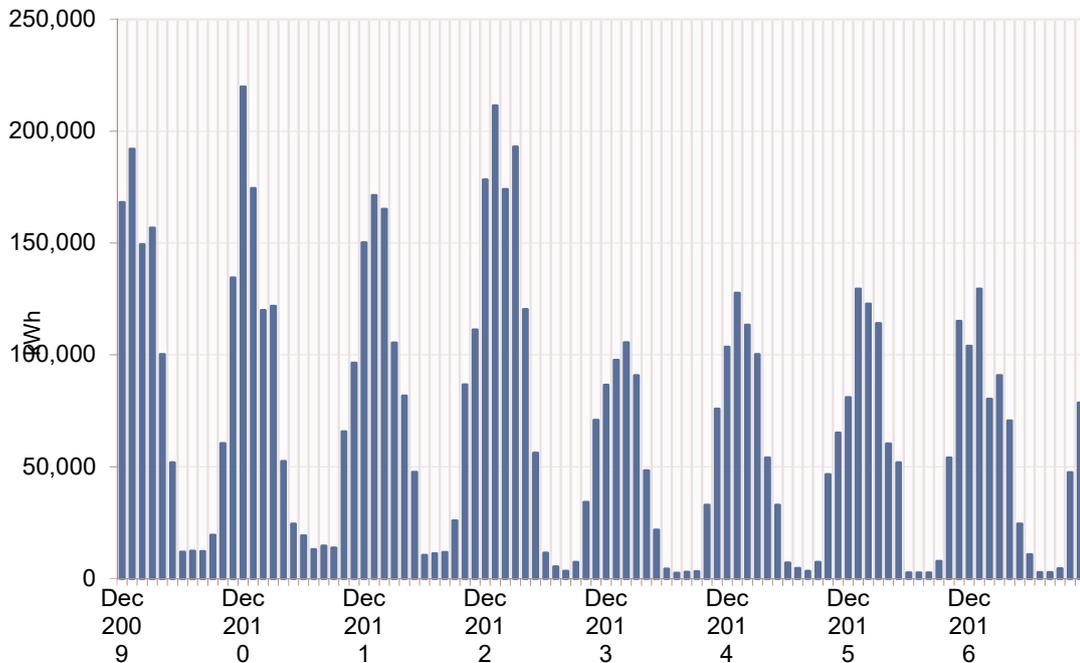
Civic Offices



Electricity
K07 D01082 Civic Offices Only
Civic Offices Green Cabinet East Elevation

Month	2009 - 10 kWh	2010 - 11 kWh	2011 - 12 kWh	2012 - 13 kWh	2013 - 14 kWh	2014 - 15 kWh	2015 - 16 kWh	2016 - 17 kWh
Dec	113,239	108,962	96,583	99,054	96,720	87,183	76,933	66,696
Jan	122,766	116,492	110,617	102,556	101,210	93,429	83,216	73,134
Feb	113,691	102,505	103,890	94,170	88,692	80,830	71,031	72,628
Mar	119,825	111,190	107,288	100,648	92,845	88,354	71,533	73,702
Apr	107,780	98,083	97,142	89,166	83,173	80,120	68,727	58,212
May	110,331	104,040	104,560	91,601	86,133	81,888	66,941	63,058
Jun	103,609	103,315	87,033	91,388	81,109	79,541	68,936	59,716
Jul	106,855	102,506	110,457	91,435	85,445	81,830	68,510	61,790
Aug	103,619	101,446	98,926	91,067	82,544	75,245	67,054	62,487
Sep	102,809	99,700	97,226	93,615	82,480	76,592	67,240	65,711
Oct	109,688	105,253	97,528	102,116	86,812	79,397	72,720	78,885
Nov	112,550	112,497	107,480	101,174	90,221	79,835	68,620	59,660
Total	1,326,761	1,265,989	1,218,730	1,147,990	1,057,385	984,245	851,460	795,680

Civic Offices Gas Consumption over the past 8 years



Gas M0250D811510B7 Civic Offices

Month	2009 - 10 kWh	2010 - 11 kWh	2011 - 12 kWh	2012 - 13 kWh	2013 - 14 kWh	2014 - 15 kWh	2015 - 16 kWh	2016 - 17 kWh
Dec	168,103	219,822	150,222	178,285	86,512	103,420	80,946	103,965
Jan	191,936	174,409	171,347	211,419	97,620	127,655	129,519	129,455
Feb	149,258	119,958	165,213	173,952	105,454	113,315	122,728	80,187
Mar	156,767	121,728	105,286	192,966	90,731	100,188	114,019	90,719
Apr	100,191	52,427	81,681	120,328	48,208	53,999	60,186	70,486
May	51,745	24,381	47,537	56,093	21,662	32,795	51,827	24,352
Jun	11,832	19,093	10,336	11,342	4,275	6,967	2,484	10,670
Jul	12,332	12,988	11,094	5,289	2,457	4,538	2,567	2,747
Aug	12,094	14,507	11,754	3,300	2,854	3,334	2,550	2,729
Sep	19,341	13,744	25,889	7,196	3,169	7,306	7,698	4,416
Oct	60,314	65,623	86,606	34,049	32,841	46,476	53,947	47,435
Nov	134,517	96,392	111,237	70,803	75,742	65,068	115,064	78,521
Total	1,068,431	935,073	978,201	1,065,021	571,523	665,061	743,536	645,683

Case Study 2 - Cavity Wall Insulation at Barry Boys Comprehensive

Barry Comprehensive School in the Vale of Glamorgan was built in the 1960s and has 1,300 students. They used their Salix 100% interest-free loan of £15,170 to reduce their energy costs per pupil by over £6 per annum by improving their heating efficiency. This is how they did it.



Project overview

Barry Comprehensive School used a Salix loan to insulate the school building. They wanted to create a more comfortable learning environment and save energy and costs. The school decided to utilise Salix funding to ensure they could improve insulation throughout areas of the school. The new insulation will help to deliver estimated savings of almost 20% on their heating costs. The project will be repaid from the savings in less than 2 years.



The cavity wall insulation work at Barry Boys Comprehensive School was one of the first projects that the newly created Salix recycling fund did in 2009. The reduction in gas use was clear after the first winter. Validation of projects became much easier with the introduction of automatic meter reading from 2010 on. The figures contained in the case study were based on the predictions of the savings that the insulation would achieve.

Salix will help you:

Learn how you can benefit from Salix energy-efficiency knowledge

Use our range of case studies to help you write a strong business case

Find out about how to significantly reduce annual energy costs

Start to use our straightforward loan application process

Barry Comprehensive School's Business Case

Barry Comprehensive School was looking for an effective way to drive down energy consumption. The energy efficient lighting achieved this by lowering the cost per pupil by over £6 per annum. The establishment of the Salix Loans Programme, funded by the Welsh Government, has made these changes possible. The Salix Loans Programme is available to all schools within Wales and there is no maximum application limit that each school can apply for.

Six Salix indicators

Total loan value
£15,170

Annual £ savings
£8,860

Annual savings tonnes of CO₂
38

Lifetime £ savings
£265,798

Lifetime savings tonnes of CO₂
1,143

Project payback
1.7 years

Case Study 3 - Installation of a Combined Heat and Power Unit at Barry Leisure Centre

Vale of Glamorgan Council used a £136,000 loan from Salix to install a combined heat and power unit within Barry Leisure Centre and reduce carbon emissions from the centre by over 25%.

Project overview

Vale of Glamorgan Council used a Salix Energy Efficiency Loan to replace a combined heat and power unit that was no longer working at Barry Leisure Centre. The project cost £135,870 in total and was completed in February 2012. The predicted financial savings were just over £20,400 per year.



This loan was a SEELS loan as opposed to a recycling fund investment. The combined heat and power (CHP) unit has operated reliably in the centre ever since producing on average saving of 63 Tonnes CO₂ emissions and after maintenance has been paid, saving around £27,000 for the leisure centre (based on typical electricity and gas tariffs)

PV SYSTEMS



The second Civic Offices 25 kW PV scheme raised the panels off the deck and angled them in order that they would be 'self-cleaning' and be slightly more efficient than the 25 kW system installed on the western roof in 2012. Below the same panels viewed from a southerly elevation.



Appendix 7

Street Lighting Improvement Programme (as expected at the time of Salix Loan Application)

The project has been identified to have a 24-month programme to implement the procurement and installation of the required infrastructure to achieve project completion. This will involve several distinct phases and deliverables as set out below with the programme commencement date identified as 1st April 2018 subject to Salix loan approval.

1. Detailed design of LED lanterns: Programme period 0 to 6 months.
2. Procure supply and install street lighting columns: Programme period 0 to 12 months
3. Procurement of LED lanterns & CMS system: Programme period 6 to 12 months
4. Procurement of LED installation contract: Programme period 9 to 12 months
5. Installation of LED lanterns: Programme period 12 to 18 months
6. Initialise and set-up CMS: Programme period 18 to 24 months

All phases include a minimum 25% timescale contingency. It is anticipated that the lead-in time for supply and delivery of LED street lighting lanterns following successful award of contract will be 8 to 10 weeks. For procurement activities involving the appointment of consultants or installer / contractors, the lead-in period is projected at 4 to 6 weeks.

Table 1: Key Project Milestones

Steps taken / to be taken	Process	Start date	End date	Include no. of days Contingency
<u>Project Approval</u>	Estates/finance approval	N/A	N/A	
	Board/councillors approval		22/01/2018	
<u>Tender</u>	Project design time	01/04/2018	31/04/2019	30 days
	Project out to tender	31/08/2018	31/03/2019	30 days
	Contract awarded		19/04/2019	30 days
	Cool off period	19/04/2019	10/05/2019	30 days
<u>Order</u>	Order Placed		15/04/2019	
<u>Delivery</u>	Equipment Delivery		21/06/2019	
<u>Project on site</u>	Starting project installation	24/06/2019	20/12/2019	30 days
<u>Project completion</u>	Project complete onsite		20/12/2019	
	Commissioning	06/01/2020	31/03/2020	30 days
	Invoicing	29/07/2019	31/03/2020	
	Send completion certificate to Salix		31/03/2020	
	Returning loan agreement		31/03/2020	

Appendix 8
CMP2 Carbon Dioxide Reduction Targets and Timescales

See next page:

2018 - 19

Description	Re:fit - Phase 1	Street Lighting (Residential to LED) - Completion due June 2018. Budget of £1.2m agreed and programme option 3 chosen. Cabinet Minute C3198, 6th June 2016.	Street Lighting Trunk Road lighting to LED - installation work to commence in 2019	Capital Maintenance St Joseph’s Boiler replacement, St Richard Gwynne Burner Replacement, Peterston Super Ely Roof Replacement,	Overall
Anticipated Financial Savings	£41,393.23	£118,692.60			
Implementation Cost (Estimated)	£280,000.00	£1.2m	£2.3m	Tendering in process	
Budget Source	Combination of SERS and SEELS. Expression of interest for SEELs funding submitted early 2018. Contractor prepares actual SEELs bid for phase 1	£1.2m already allocated for this work. Referenced above	Salix loan application approved at beginning of 2018 for £1.9m with remaining budget internally (See Cabinet report 22nd Jan 2018)	Capital Programme agreed by cabinet spring 2018	
Carbon Saving expected from measure	71.7 Tonnes	631.0 Tonnes	0.0 Tonnes	11.6 Tonnes	714.4 Tonnes
Worst Scenario Carbon Saving anticipated.	35.9 Tonnes	631.0 Tonnes	0.0 Tonnes	11.6 Tonnes	678.5 Tonnes



See next page:

2018 - 19

Description	Re:fit - Phase 1	Street Lighting (Residential to LED) - Completion due June 2018. Budget of £1.2m agreed and programme option 3 chosen. Cabinet Minute C3198, 6th June 2016.	Street Lighting Trunk Road lighting to LED - installation work to commence in 2019	Capital Maintenance St Joseph’s Boiler replacement, St Richard Gwynne Burner Replacement, Peterston Super Ely Roof Replacement,	Overall
Risk Factors	This figure is based on buildings that have been surveyed and are expected to be completed in 18 -19, savings for the rest of the buildings. Estimated that only 50% will be achieved through potential delays in project delivery	Minimal risk - works nearly completed	Neutral Risk, Salix loan approved and potential drop in the cost of fittings (which would be good) by 2019	Reduction based on historical drop in energy consumption after installation of measures	



2019 - 20

Description	Re:fit Phase 2	Street Lighting (Residential to LED full benefits now realised)	Street Lighting Trunk Road lighting to LED - installation 75% of benefits realised this year	Capital Maintenance Programme (1 school boiler house upgrade and 1 school rewire minimum) Potential schemes not named here	Total Reduction in CO ₂	Overall % Reduction
Anticipated Financial Savings	£42,635.03					
Implementation Cost (Estimated)						
Budget Source	As explained for 2018 – 19	Only 65 residential lamps awaiting LED upgrade (6 th Sept 2018)	As explained for 2018 – 19	Even with reduced budget a boiler house upgrade each year is planned		
Carbon Saving expected from measure (Cumulative)	143.5 Tonnes	779.0 Tonnes	452.4 Tonnes	28.6 Tonnes	1,403.5 Tonnes	11.2%
Worst Scenario Carbon Saving anticipated (Cumulative)	71.7 Tonnes	779.0 Tonnes	226.2 Tonnes	28.6 Tonnes	1,105.6 Tonnes	
Risk Factors	Phase 1 gets completed but phase II if delayed	Minimal risk - unmetered supply, reduction should match the original proposal.	There is an element of uncertainty as tendering, evaluation and contractor appointment has to happen prior to the installation commencement	Choice of building and/or plant room may be different to the one chosen for this prediction. However this will not have a major impact on the overall figures	Carbon Reduction savings due to measures may reduce as the grid is decarbonised but this won't matter as overall carbon emissions will be even lower.	

2020 - 21

Description	Re:fit	Street Lighting (Residential to LED full benefits now realised)	Street Lighting Trunk Road lighting to LED - Full benefits realised this year	Capital Maintenance Programme (1 school boiler house upgrade and 1 school rewire minimum) Potential schemes not named here	Total Reduction in CO ₂	Overall % Reduction
Anticipated Financial Savings	£43,876.82					
Implementation Cost (Estimated)						
Budget Source						
Carbon Saving expected from measure (Cumulative)	143.5 Tonnes	779.0 Tonnes	603.1 Tonnes	43.1 Tonnes	1,568.7 Tonnes	12.5%
Worst Scenario Carbon Saving anticipated (Cumulative)	143.5 Tonnes	779.0 Tonnes	452.4 Tonnes	43.1 Tonnes	1,417.9 Tonnes	
Risk Factors	Phases I and II of Refit are completed but there is no sign up for phase III.	It is expected that all works will be complete by this point and full savings delivered.	It is expected that all works will be complete by this point and full savings delivered. An allowance is made for project delays giving the lower figure	Choice of building and/or plant room may be different to the one chosen for this prediction. However, this will not have a major impact on the overall figures	Carbon Reduction savings due to measures may reduce as the grid is decarbonised but this won't matter as overall carbon emissions will be even lower.	

2021 - 22

Description	Re:fit	Street Lighting (Residential to LED full benefits now realised)	Street Lighting Trunk Road lighting to LED - installation Full benefits realised this year	Capital Maintenance Programme (1 school boiler house upgrade and 1 school rewire minimum) Potential schemes not named here	Total Reduction in CO ₂	Overall % Reduction
Anticipated Financial Savings	£45,118.62					
Implementation Cost (Estimated)						
Budget Source				Capital Maintenance Programme		
Carbon Saving expected from measure (Cumulative)	143.5 Tonnes	779.0 Tonnes	603.1 Tonnes	46.5 Tonnes	1,572.1 Tonnes	12.5%
Worst Scenario Carbon Saving anticipated (Cumulative)	143.5 Tonnes	779.0 Tonnes	603.1 Tonnes	46.5 Tonnes	1,572.1 Tonnes	
Risk Factors	As Previous	It is expected that all works will be complete by this point and full savings delivered.	It is expected that all works will be complete by this point and full savings delivered.	Choice of building and/or plant room may be different to the one chosen for this prediction. However this will not have a major impact on the overall figures	Carbon Reduction savings due to measures may reduce as the grid is decarbonised but this won't matter as overall carbon emissions will be even lower.	