

Report to Cabinet
5 February 2014
Report of Executive head of strategy, people and democracy
Subject Carbon management programme

Item

8

KEY DECISION

Purpose

To consider a new carbon management programme.

Recommendation

To agree the new carbon management programme subject to the agreement of the necessary capital funding and revised corporate plan target for 2014-15.

Corporate and service priorities

The report helps to meet the council priority Value for money services.

Financial implications

The programme will result in projected savings to the council from energy of approximately £1.2 million and potentially additional capital costs of £50,000 which are included in the proposed capital programme for 2014/15.

Ward/s: All wards

Cabinet member: Councillor Stonard – Environment, Transport and Development

Contact officers

Russell O'Keefe, Executive head of strategy, people and democracy 01603 212908

Richard Willson, Environmental strategy manager 01603 212312

Background documents

None

Report

1. The council's original carbon management programme (CMP) has now been completed. This lasted five years and resulted in significant financial savings of £2.8 million to the council and a reduction in the council's carbon footprint of 24% against the original 2007 baseline, or 29% when weather corrected data is used.
2. Weather correction is a formula applied to energy use data to even it out, and make it comparable year on year. This allows for unusually large and sustained fluctuations in temperature due to extended periods of either hot or cold weather, and the corresponding increase in energy which this may result in, due to an increased need for either air conditioning or heating.
3. A range of work has been carried out with services across the council and key partners to determine where carbon reductions can realistically be made and develop the new CMP. All councillors were also asked to send in any ideas they had for carbon reduction.
4. A copy of the new draft CMP for the next five years is included at Annex A.
5. The draft new CMP is due to be considered by Sustainable Development Panel on the 29 January and any recommendations will be reported to Cabinet.
6. Technology is changing all the time and more innovative solutions are being created every month. By trialling some of the newer technologies available it is hoped that significant carbon savings can be made through the new CMP. However, it is important that the council is realistic about what can be achieved over the lifetime of phase 2 of the CMP.
7. The council has already implemented many of the larger potential carbon reduction projects and these have been very successful. However, this level of carbon reduction is not sustainable. Future projects are likely to each deliver lower carbon savings per project, and given the nature of our estate and operations they will be increasingly more complex and difficult to deliver. It is therefore important that the council sets a target for the next 5 years of the CMP which is realistic.
8. Following all the development work carried out to pull together phase 2 of the CMP and looking at current technologies and what future opportunities this may afford it is proposed that the carbon reduction target for the new CMP is set at 11% carbon saving over the next 5 years, or 2.2% per annum. This equates to approximately 984643 kg or 985 tonnes over the 5 year plan, or 197 tonnes of CO₂ per annum.
9. The proposed annual target for 2014/15 is included in the corporate plan report later on the Cabinet agenda as a suggested change to the corporate plan targets to be recommended to Council.

Integrated impact assessment



NORWICH
City Council

Report author to complete

Committee:	Cabinet
Committee date:	5 February 2014
Head of service:	Russell O'Keefe
Report subject:	Carbon management programme
Date assessed:	January 2014
Description:	To consider a new carbon management programme.

	Impact			
Economic (please add an 'x' as appropriate)	Neutral	Positive	Negative	Comments
Finance (value for money)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The programme will result in projected savings to the council from energy of approximately £1.2 million and potentially additional capital costs of £50,000 which are included in the proposed capital programme for 2014/15.
Other departments and services e.g. office facilities, customer contact	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
ICT services	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Economic development	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Financial inclusion	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Social (please add an 'x' as appropriate)	Neutral	Positive	Negative	Comments
Safeguarding children and adults	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<u>S17 crime and disorder act 1998</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Human Rights Act 1998	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Health and well being	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Equality and diversity (please add an 'x' as appropriate)	Neutral	Positive	Negative	Comments
Relations between groups (cohesion)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Eliminating discrimination & harassment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Advancing equality of opportunity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Environmental (please add an 'x' as appropriate)	Neutral	Positive	Negative	Comments
Transportation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Natural and built environment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Waste minimisation & resource use	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pollution	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sustainable procurement	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Energy and climate change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The new CMP will result in an 11% carbon saving over the next 5 years, or 2.2% per annum. This equates to approximately 984643 kg or 985 tonnes over the 5 years.

(Please add an 'x' as appropriate)	Neutral	Positive	Negative	Comments
Risk management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Recommendations from impact assessment	
Positive	
Negative	
Neutral	
Issues	

Norwich City Council

**Carbon Management
Programme
(Draft)**

Phase 2

Contents:

1. Introduction –

- National picture
- Local picture
- Council priority and performance measure

2. Phase 1 achievements –

- Carbon savings
- Financial savings

3. How were the savings made? –

- Energy saving projects
- Behaviour change
- Salix
- Eco Investment fund
- Lean Project

4. What next? Phase 2 -

- Expectations and new targets
- Business as Usual
- Value at Stake

5. How will we achieve this? –

- New opportunities
- Carbon in the community

6. Keeping on track –

- Governance
- Reporting

1.0 Introduction:

Purpose and structure:

- 1.1 Phase 1 of the Carbon Management Programme (CMP) is now complete. This report forms the next phase of the CMP. Firstly it will consider the achievements of phase 1 and what learning we can take forward into the next phase of the CMP. Following that there will be explanation of the proposed targets for phase 2 of the CMP, how these were calculated, what methods we will use to try to reach these targets and how we will monitor and report our progress against them.

The national picture:

- 1.2 The burning of fossil fuels such as gas, oil and coal releases carbon dioxide, a greenhouse gas, into the atmosphere. Climate change scientists overwhelmingly believe this will lead to global warming.
- 1.3 In the UK our direct emissions of CO₂ are thought to be **560 million tonnes** (MtCO₂) a year. To give a little idea of scale, one tonne of carbon dioxide would fill a space the size of Norwich City Council's council chamber.
- 1.4 In response to this the Government produced the 2008 Climate Act which established the world's first legally binding climate change target.

The target is to reduce UK greenhouse gas emissions by at least 80% by 2050 based on the 1990 baseline figure. It is an ambitious target.

If it can be achieved, not only will it massively reduce the UK's carbon footprint, it will also help the UK as a whole to become less reliant on imported fossil fuels and less exposed to higher energy prices in the future.

The local picture:

- 1.5 Norfolk is particularly susceptible to the impacts of climate change, as recognised in the Norfolk Climate Change Strategy – 'Tomorrow's Norfolk: Today's Challenge' *"Climate change is one of the greatest challenges facing Norfolk today. As a low-lying coastal county with a growing population, Norfolk is particularly vulnerable. Higher sea levels, heatwaves, droughts and storms are all more likely as global temperatures rise."*
- 1.6 In response to national targets and the potential impact of climate change in the county, Norwich City council has set the corporate priority to *"reduce the council's carbon emissions through a carbon management programme."*
- 1.7 The success of the CMP is closely monitored and progress is reported annually against the performance measure of making *"a percentage reduction in carbon dioxide emissions from local authority operations"*.

CMP Phase 1 – a baseline:

- 1.8 In 2008 Norwich City Council worked in partnership with the Carbon Trust and 73 other local authorities in a programme to calculate our carbon emissions footprint, to set targets for reducing our carbon emissions, and to formulate a plan to deliver the target. This work culminated in the creation of phase 1 of the CMP for Norwich City Council.
- 1.9 The CMP was finalised and approved by Executive in April 2009. It set out the council's strategy for reducing carbon emissions.
- 1.10 2006/7 baseline emissions were calculated to have come from council buildings, travel/ fuel use, lighting, water consumption and non-domestic waste to landfill, and in 2006/7 to have totalled **11,468** tonnes of CO₂ equivalent (tCO₂e).

NI185 and beyond:

- 1.11 Under the then national indicator NI 185, *Percentage CO₂ reduction from LA operations*, local authorities annually reported their CO₂ reduction from their operations. Although annual reporting against this national indicator is no longer compulsory, it is thought to be best practice and enables local authorities to monitor their ongoing carbon dioxide emissions and act accordingly to reduce them. Figure 1 shows the carbon dioxide or greenhouse gas emissions (GHG) produced by Norwich City Council services.

Figure 1:

GHG emission data for period 1 April 2007 to 31 March 2013						
	Global kg of CO ₂ e					
	2012	2011	2010	2009	2008	2007
Scope 1	3,446,651	3,136,959	3,549,707	n/a*	n/a*	n/a*
Scope 2	4,054,832	4,362,280	4,280,592	n/a*	n/a*	n/a*
Scope 3	1,449,823	1,800,339	1,821,824	n/a*	n/a*	n/a*
Total gross emission			9,652,123	10,485,752	11,025,879	11,468,719

	8,951,306	9,299,578				
Annual % saving	3.75	3.65	7.95	4.90	3.86	

** carbon emissions were not split into scopes prior to 2010.*

Explanation of scopes:

Scope 1 (Direct emissions): Activities owned or controlled by your organisation that release emissions straight into the atmosphere. They are direct emissions.

Scope 2 (Energy indirect): Emissions being released into the atmosphere associated with your consumption of purchased electricity, heat, steam and cooling.

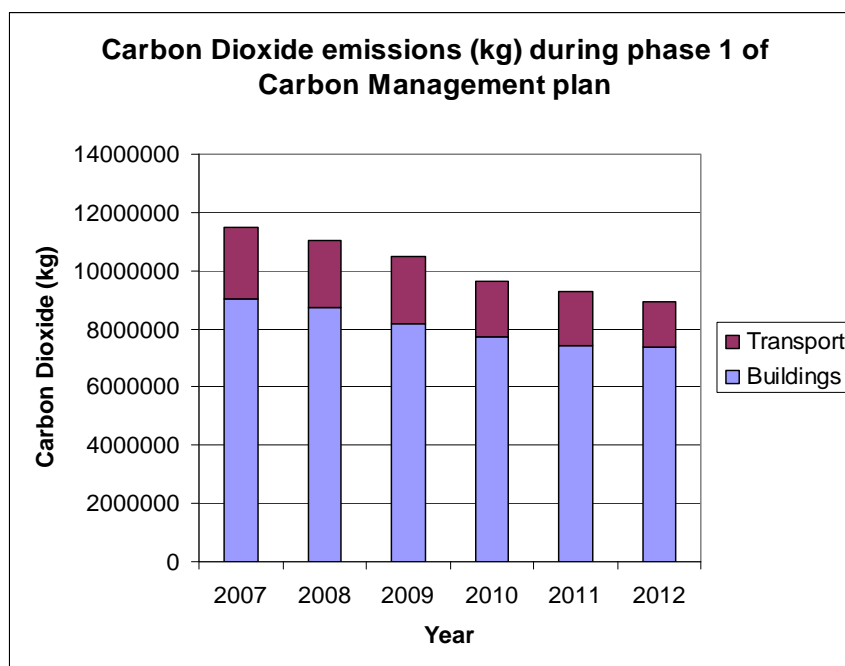
Scope 3 (Other indirect): Emissions that are a consequence of your actions, which occur at sources which you do not own or control and which are not classed as scope 2 emissions.

2.0 Phase 1 - achievements:

Total carbon savings:

- 2.1 In phase 1 of the CMP an ambitious target of a 6% saving every year over the 5 years was set, totalling 30% saving to be made by 2012/13. We achieved a saving of 24% against this target, or 29% when weather corrected data is used.
- 2.2 Weather correction is a formula applied to energy use data to even it out, and make it comparable year on year. This allows for unusually large and sustained fluctuations in temperature due to extended periods of either hot or cold weather, and the corresponding increase in energy which this may result in, due to an increased need for either air conditioning or heating.
- 2.3 At the end of phase 1 of the CMP over 2,500 tonnes of CO₂ emissions had been saved.

Graph 1:

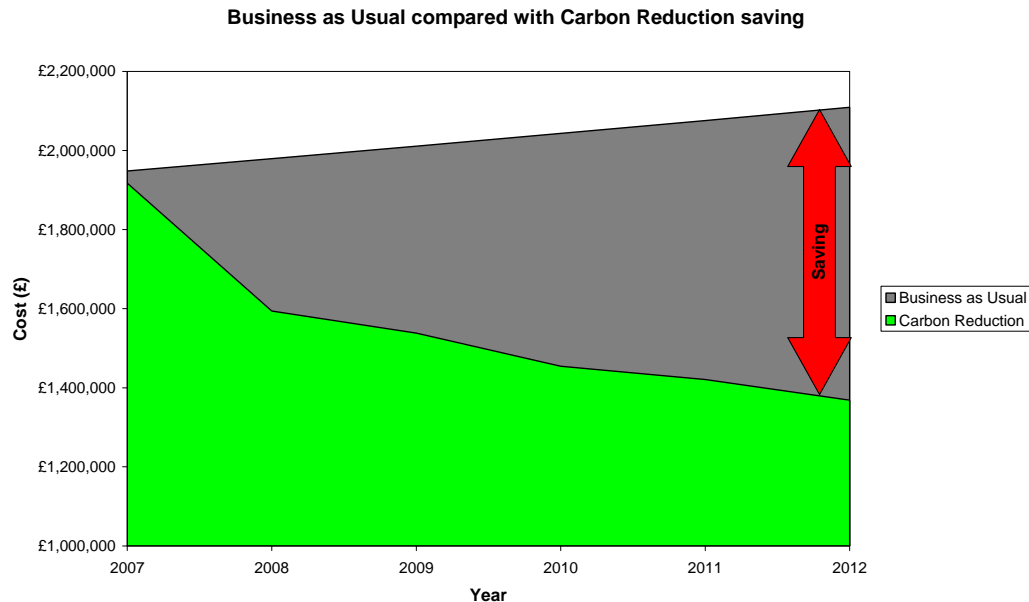


Graph 1 shows the year on year carbon reductions made during the first 5 years of the carbon management plan.

Financial savings:

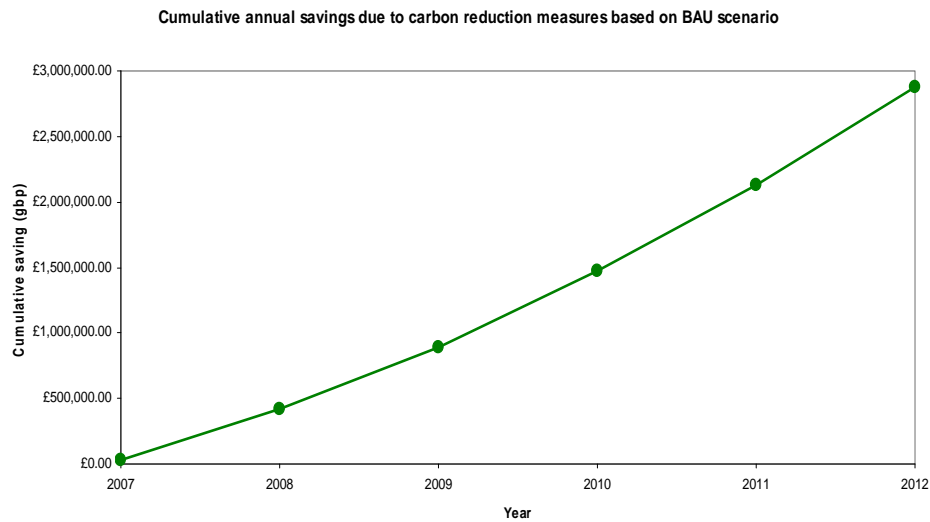
- 2.5 In addition to carbon savings our carbon reduction work has also resulted in significant financial savings amounting to £2.8 million over the course of the five years of the plan. This is based on a conservative business as usual (BAU) percentage of 1.6%. Graphs 2 and 3 give further illustration.

Graph 2:



- 2.6 The lower section of this graph (coloured green) shows that, through a variety of carbon reduction methods, the council, with the help of our contractors, has achieved significant financial savings during phase 1 of the CMP. .
- 2.7 However, the cost of energy has not remained static during this period of time. If we consider, a BAU scenario where we had not implemented any carbon reduction measures, the cost of our energy use would not have remained static over the last 5 years. The top section of this graph is a BAU projection, which allows for a conservative 1.6% increase in the cost of energy per annum.
- 2.8 It's clear to see that by implementing the CMP and not continuing with a BAU scenario, that significant savings have been made. The red arrow on the right indicates a gap of £740,000 worth of savings in year 5 alone.

Graph 3:



- 2.9 Graph 3 shows the cumulative savings made year on year by implementing the measures in the CMP, rather than following the BAU scenario. Based on a 1.6% projected increase in energy costs, the total cumulative savings of £2.8 million have been made over the course of the 5 year carbon management plan.

3.0 How were the savings made?

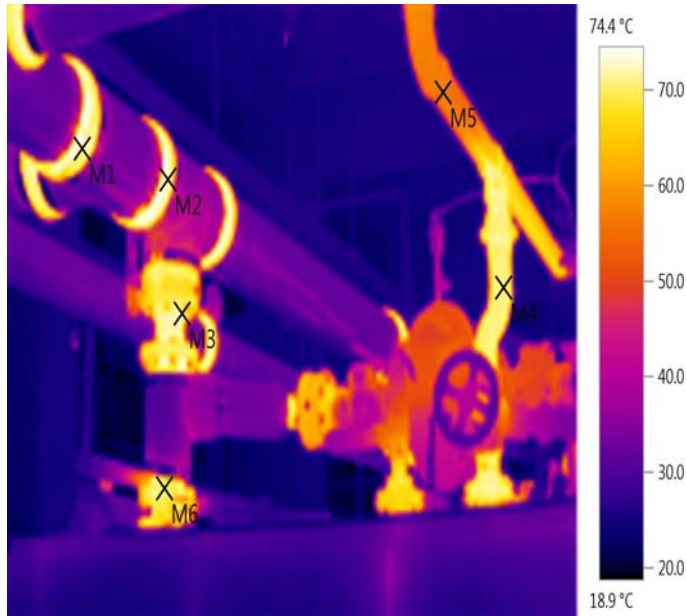
Energy saving projects:

- 3.1 Significant carbon and financial savings were made through a wide range of energy reduction projects over the course of the last 5 years of phase 1 of the CMP. These included:
- server virtualisation
 - pc powerdown software
 - introduction of electric vehicles into the council's fleet
 - installation of a 36kw solar panel array on city hall
 - motorised pool cover at Riverside Leisure centre
 - voltage optimisation.
- 3.2 There follows a fuller description of several of the projects. A comprehensive list of all Salix funded projects can be found in Appendix A.

Boiler Valve Insulation – City Hall and St Andrews Hall:

- 3.3 The first picture shows a significant amount of heat and energy being lost through the valves and flanges (coloured yellow) in the boiler rooms at City Hall and St Andrews Hall.

Before Valve Insulation:



- 3.4 The second picture shows the pipes after insulation jackets were fitted. The jackets are velcro fastened and easy to remove for annual maintenance. At City Hall 250 valves were insulated. This project was funded via Salix funding. The project cost £9300 in total and is achieving savings of over £3300 per year, which equates to a 2.7 year payback.

After Valve Insulation:



Photovoltaic cells on City Hall:

- 3.5 In March 2012 the installation of a 36kw pv array was completed on the roof of City Hall. Since then the panels have performed well producing over £6,500 in free electricity to City Hall, which averages out at around £488 per month. In addition to this we have also realised over £8,000 in Feed in Tariff.
- 3.6 The electricity produced by the panels counts favorably against government targets in our annual carbon footprint report. In addition to the reduction in electricity costs, the reduction in carbon emissions and the additional income created by the feed-in tariff, the pv array raises general awareness of renewable technology in the wider area.

Before pv panels



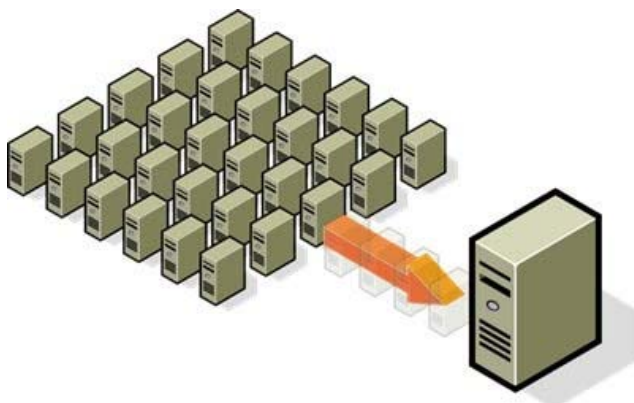
After – 36kw pv array in place



Server Virtualisation:

- 3.7 This is the most recent carbon reduction project to be installed at City Hall. Server virtualisation works by partitioning one physical server into multiple virtual servers. Each of these virtual servers can run its own operating system and applications, and perform as if it were an individual server.
- 3.8 Through consolidating in this way, the number of physical servers can be greatly reduced. This brings benefits such as reduced floor space, power consumption and air conditioning costs.
- 3.9 Because this project is new we don't have the first year's figures, however, based on virtualising 30 servers there is a projected saving of 210,000 (two hundred and ten thousand) kWh/annum.
- 3.10 With electricity at a cost of 12 pence/ kWh that is a projected saving of £25,000 per annum, and a projected payback on this project of 4.7 years.

Many servers consolidated into one:



- 3.11 It required a varied team of officers and contractors working across services to see the projects through to successful implementation.

St Andrew's Multi-Storey Car Park:



- 3.12 395 units in St Andrews Multi-Storey Car Park have been changed over to more energy efficient LED units. The load has been reduced by 31% and the light output has been maintained. This project saves over £13,000 a year and has a 3.91 year payback.

Electric cars:

- 3.13 Following the fleet review carried out with the Energy Saving Trust in 2011 Norwich City Council led the way nationally by introducing 4 Citroen C0 electric cars into our pool fleet. These have proved popular with staff. They have a good range for cross city driving, have zero petrol or diesel consumption and are therefore cheaper to run than conventional vehicles.



Behaviour change:

- 3.14 All of the energy saving projects were underpinned by the introduction of a staff behaviour change programme, One Small Steps. Staff were encouraged through a communications campaign to follow the small steps towards reducing their personal impact on carbon emissions. Regular competitions were held to raise the profile of this work. A campaign poster can be found in Appendix C.
- 3.15 In addition to our internal campaign we have also introduced the annual Eco Awards. The Eco Awards are a competition opened out to schools, community groups and businesses in the city to showcase eco projects which they have been involved in that year. The Eco Awards are supported by the Evening News and help to raise the profile of environmentally sound work being carried out in the city.



Salix funding:

- 3.16 As a result of the approval of phase 1 of the CMP the council applied for and received Salix loan funding of £200,000. This is an interest free loan to be invested in energy efficiency works. In addition the council has match funded this sum using £200,000 of the council's own 'invest to save' funding.
- 3.17 We have been able to invest £365,000 in more than 30 projects which have helped to underpin the carbon emissions savings we have achieved over the five year lifetime of the CMP phase 1. We have worked with a variety of local and national companies to install these projects.
- 3.18 Some projects have made sufficient savings to pay-back the Salix loan and now continue to recoup savings for the council in energy efficiency savings. This money is recycled back into the Salix fund for future energy efficiency works.



Eco Investment Fund:

- 3.19 The criteria for a project being eligible for Salix funding is quite stringent which meant that some projects were not compliant often because they did not achieve the 5 year payback required by Salix. To assist with this the council has the Eco Investment fund which allows Salix funding to be supplemented where payback on an energy reduction project is over 5 years. It also allows investment in technologies which do not meet the Salix criteria.

The LEAN project:

- 3.20 In 2010 a LEAN review was carried out of the billing process for the council's energy bills. As a result of the LEAN review it has reduced costs for the council. All sites are now able to benefit from the bulk-buy prices, the process for ad-hoc billing is more efficient and all bills are dealt with electronically, rather than paper copy. Ongoing work continues to make the process more efficient.

Norfolk Climate Change Taskforce:

- 3.21 Officers from across the seven district councils in Norfolk meet on a regular basis to discuss best-practice work on delivering the priorities identified in the Norfolk Climate Change Strategy. Norwich City Council is an active member of this group.

4.0 What next? Phase 2

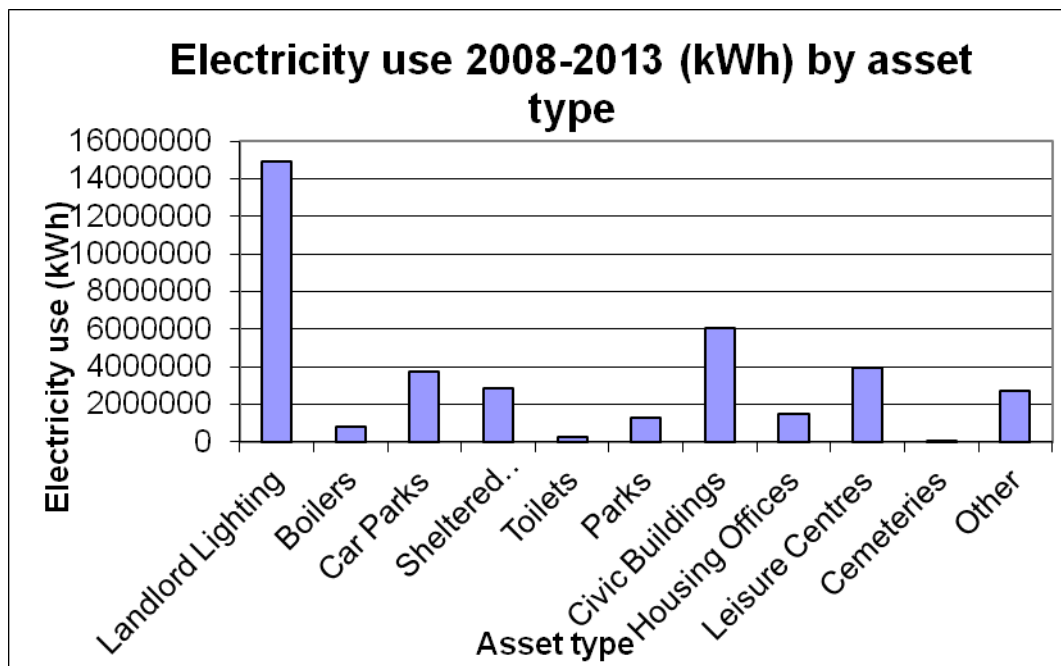
Expectations and new targets:

- 4.1 Phase 2 of the CMP find us in a better position than we were previously as we now have 5 years of energy data to learn from, and a much clearer idea of energy use across the council's diverse range of assets.
- 4.2 In setting targets for the next phase of the CMP we have drawn upon this data as a guide to where we can most effectively concentrate our resources. A range of work has been carried out with services across the council and key partners to determine where carbon reductions can realistically be made. All councillors were also asked to send in any ideas they had for carbon reduction.
- 4.3 Technology is changing all the time and more innovative solutions are being created every month. We hope that by trialling some of the newer technologies available to be able to continue to make significant carbon savings. However, it is important that we are realistic about what we can achieve over the lifetime of phase 2 of the CMP.
- 4.4 We are aware that many of the larger projects have already been implemented and are performing well, delivering large carbon reductions. However, this level of carbon reduction is not sustainable and much of the 'low-hanging fruit' has already been gathered.
- 4.5 Future projects are likely to each deliver lower carbon savings per project, and given the nature of our estate and operations they will be increasingly more complex and difficult to deliver. It is therefore important that we set a target for the next 5 years which is realistic.
- 4.6 Following all the development work carried out on phase 2 of the CMP and looking at current technologies and what future opportunities this may afford it is proposed that the carbon reduction target for phase 2 of the CMP is set at 11% carbon saving over the next 5 years, or 2.2% per annum. This equates to approximately 984643 kg or 985 tonnes over the 5 year plan, or 197 tonnes of CO₂ per annum. The proposed annual target for 2014/15 will need to be considered by Council as part of considering the corporate plan alongside the budget.
- 4.7 The following gives more detail about how this proposed percentage reduction was calculated.

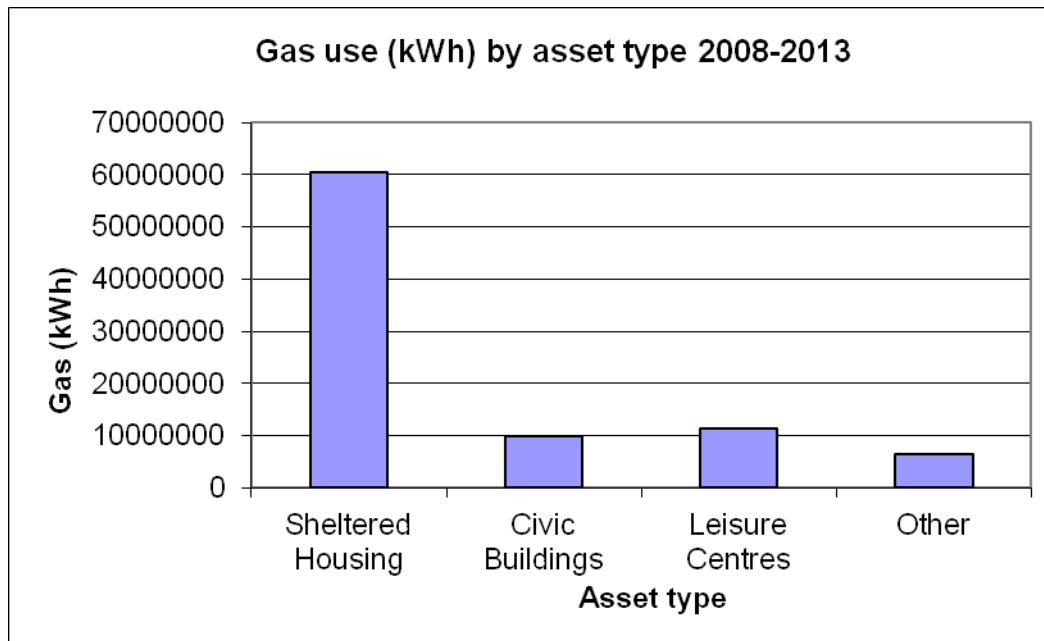
How the proposed target was calculated:

Stage One – Data gathering:

- 4.8 It was recognised early in this process that a raft of data and anecdotal evidence would be available regarding energy use across the councils assets; the challenge would be making sense of the available data in a way that was meaningful and would enable a 'challenging, yet realistic' carbon reduction target to be set for phase 2 of the CMP.
- 4.9 As part of this process all councillors and staff were invited to contribute their ideas to reduce energy use. No restrictions were given with regards to cost or payback and all ideas were welcomed and considered.
- 4.10 The Environmental Strategy team interrogated all the energy use data for the council's estate collated over the first five years of the programme, and considered energy use by asset type. This gave a clearer idea of which assets were the largest users of gas or electricity and provided some context for the second phase of the CMP. Graphs 4 and 5 indicate energy use by asset type for gas and electricity respectively.



Graph 4: Electricity use (kWh) by asset type – CMP phase 1



Graph 5: Gas use (kWh) by asset type – CMP phase 1

4.11 The team worked closely with staff across services and key partners. They also met with services who manage assets where high consumption had been identified to try to understand the energy need and whether this could be met in a more energy efficient way. Regular meetings were held with staff from across a variety of services to discuss the viability and potential risks of future projects.

4.12 During the first phase of the CMP staff from Norwich Property Services (NPS) were instrumental in delivering energy saving projects, and they were involved in discussions about viability of phase 2 energy saving projects. Teams from across the council will continue to work collaboratively with NPS to successfully deliver the next phase of the CMP.

Stage Two – Quantification:

4.13 Once all the ideas had been collated and worked through the Environmental Strategy team were better able to quantify the potential energy savings which might be realised through implementation of various projects.

4.14 Meetings were then held with the staff who would be responsible for delivering the energy savings. They were invited to undertake an ease and effect exercise where they risk assessed each potential project for ease of implementation and benefits to be realised, against the resourcing implications. Figure 4 is an example of the ease and effect matrix.

- 4.15 Following the completion of this exercise for each project the responsible officer completed a project sheet which detailed the cost of the project, the risks, the benefits and the funding available. Figure 5 is an example of a completed project sheet.
- 4.16 Once project sheets for each project were completed the Environmental Strategy team were better able to quantify the potential number of tonnes of carbon dioxide that would be saved by each project. Much of this data is available via our work with Salix Finance. Salix encourages the sharing of data for energy reduction projects amongst other Salix members.
- 4.17 Once the potential carbon dioxide savings for each project were calculated the data was put through a marginal abatement cost curve (MACC) tool. The tool was created by the Carbon Trust during Phase 1 of the CMP, when a similar exercise was carried out. The purpose of the tool is to rank each project according to its cost effectiveness per tonne of carbon dioxide saved and create a graph. Graph 6 shows the graph for the CMP phase 2 projects. Projects on the left hand side of the curve are the most cost effective to implement per tonne of carbon dioxide saved.
- 4.18 Finally each project was risk assessed and accorded a Red/Amber/Green (RAG) status based on the likelihood of delivery versus payback.

Figure 4 - Ease and Effect Risk Matrix

Effect factors:

- Carbon savings
- £ Savings

1	2	3
4	5	6
7	8	9

Ease factors:

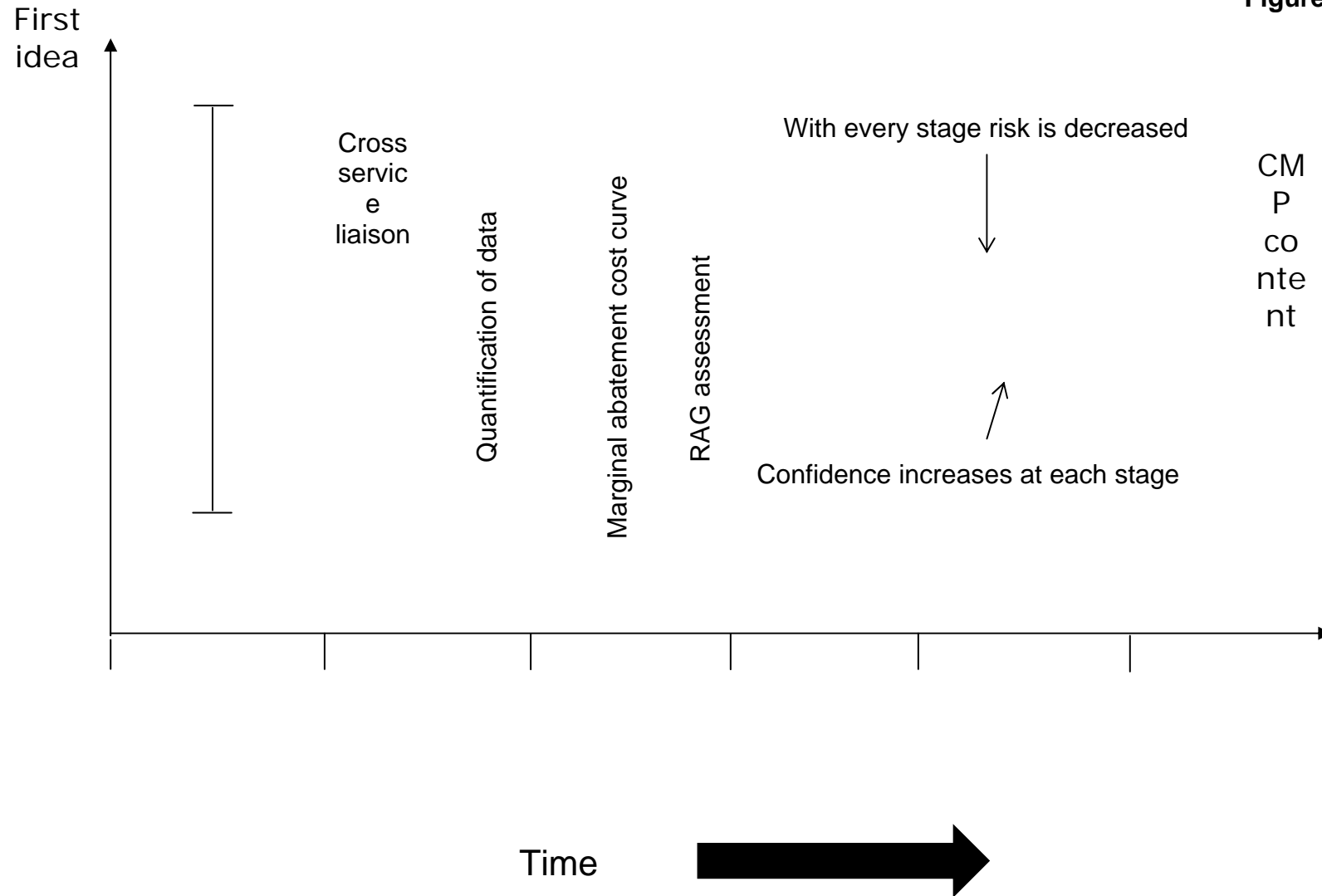
- Cost (capital and revenue)
- Cost (staff time)
- Staff support
- Technical

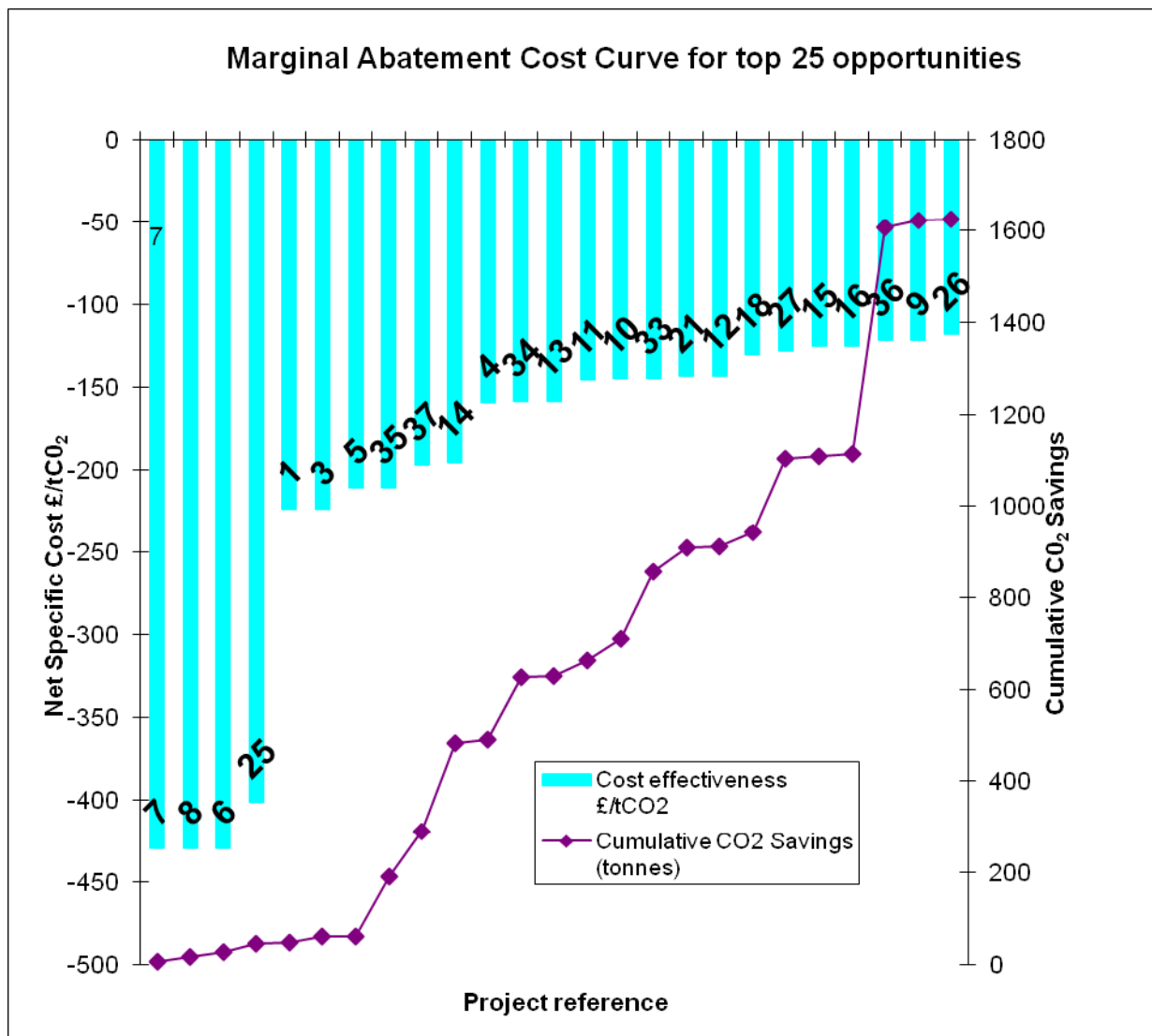
Figure 5 - Example project sheet:

Project Ref:	NCC 029 Server Optimisation – phase 2
Owner	<i>LGSS + NCC Contract management</i>
Department	<i>LGSS</i>
Description	Server optimisation methods and tools enhance the availability and overall performance of servers in a data centre or within an enterprise environment. Server optimisation processes can include measures such as physical hardware consolidation and server virtualization. Server optimisation tools allow administrators to optimise the way business-critical data is processed and distributed on the network.
Benefits	<ul style="list-style-type: none"> • <i>Financial savings: £ 12,500 per year</i> • <i>Payback period: 4 – 5 years</i> • <i>CO₂ Emissions reduction: 54 tonnes of CO₂/Yr</i> • <i>6% target</i>
Funding	<ul style="list-style-type: none"> • <i>Project cost: £50,000</i> • <i>Operational costs: None</i> • <i>ECO Investment and SALIX</i>
Resources	<ul style="list-style-type: none"> • <i>NPS to co-ordinate</i>
Ensuring Success	<ul style="list-style-type: none"> • <i>Needs to be agreed and a work programme created</i>
Measuring Success	<ul style="list-style-type: none"> • <i>Before and After monitoring of electricity use</i>
Timing	<ul style="list-style-type: none"> • <i>2016</i>
Notes	

Confidence range

Figure 6





Graph 6 - Marginal Abatement Cost Curve

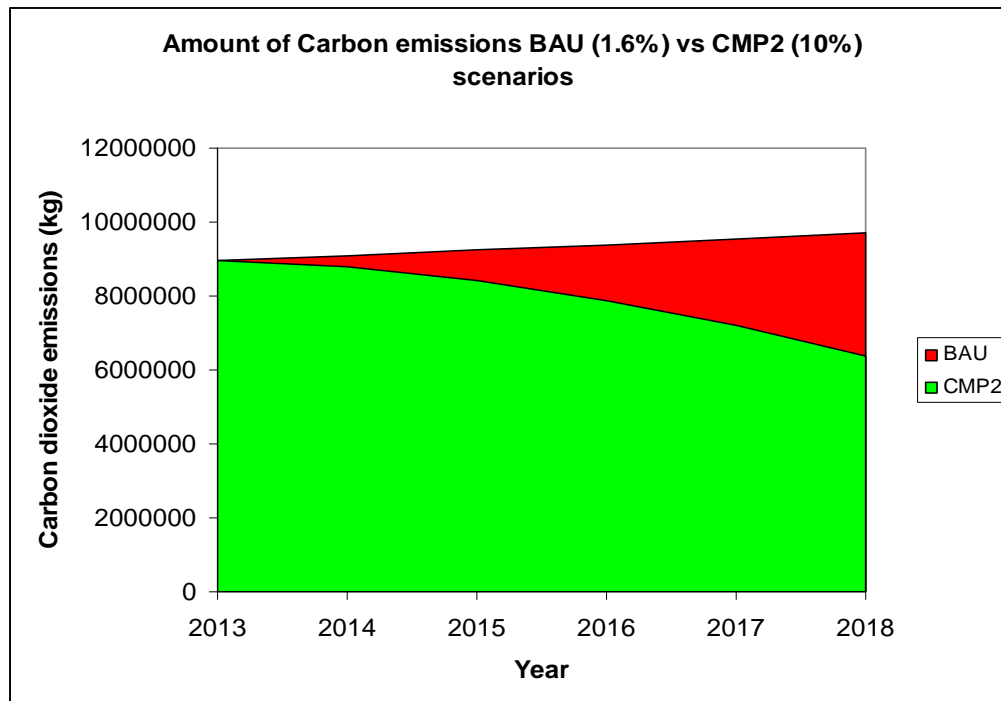
Summary:

- 4.19 Each layer of quantification has filtered out projects to the point where those projects are left make the best use of available resources and promise to deliver significant carbon savings. Figure 4 gives a graphical representation of this process. Following the completion of this rigorous process we can be confident of meeting our target over the second phase of the CMP.
- 4.20 In addition, where new technologies allow and new opportunities arise we will seek to implement additional projects wherever viable. The following section consider potential cost savings to be made if we are successful in achieving the proposed 11% reduction in energy use over the next 5 years.

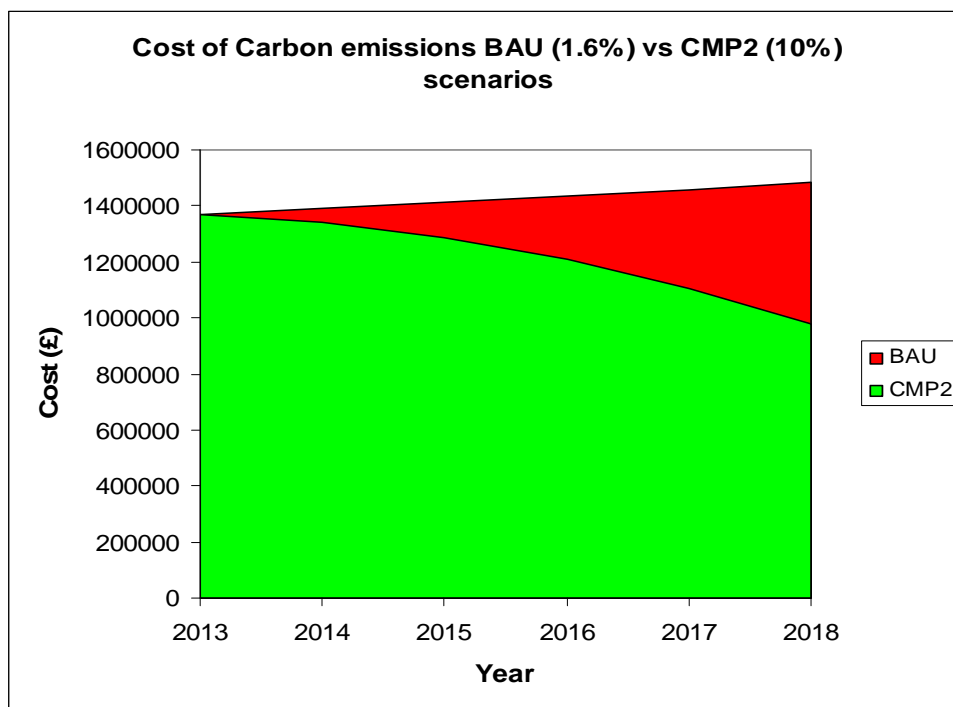
Carbon and Cost Savings:

Business as Usual

- 4.21 Graphs 7 and 8 show what might happen to our carbon emissions and the corresponding cost if we did nothing or continued with BAU. The red section, assumed a conservative BAU of 1.6% per annum. The graphs also show what we hope to achieve over the 5 year life of phase 2 of the CMP during energy efficiencies (the green section), by achieving a 2% annual reduction in CO₂.



Graph 7 - Carbon reductions - BAU scenario vs the CMP phase 2

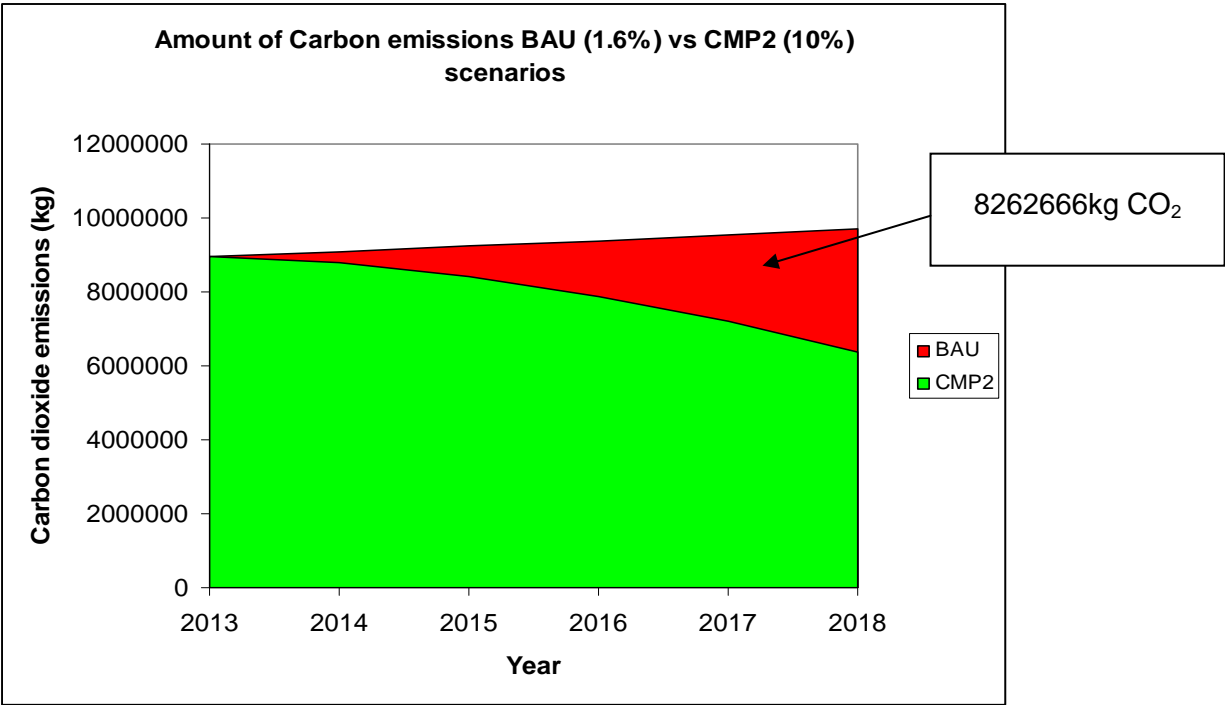


Graph 8 - Cost reductions – BAU scenario vs the CMP phase 2

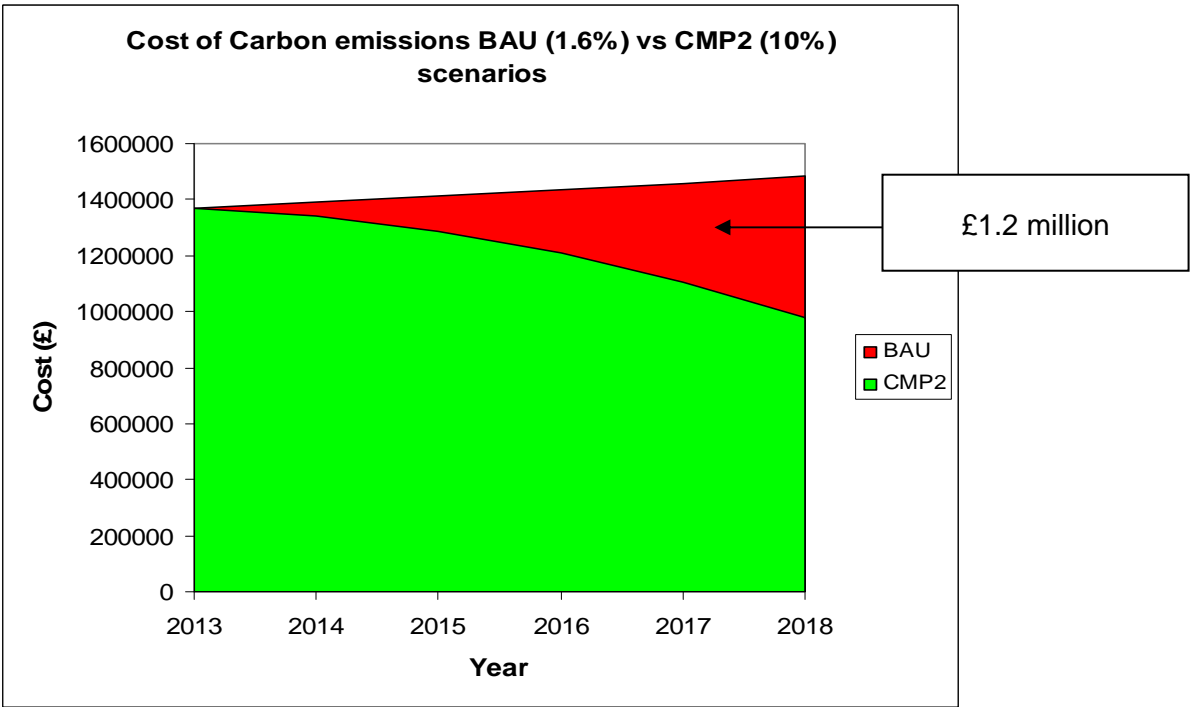
Value at stake:

From the BAU information we are able to extrapolate the value at stake figure for the plan. On Graphs 9 and 10 this figure is represented by the red area. It represents cumulatively how much carbon or money will be saved by implementing CMP phase 2, as opposed to the continuing with a BAU scenario.

Graph 9:



Graph 9: Value at stake in CO₂e



Graph 10: Value at stake in £

5.0 How will we achieve this?

- 5.1 Following the risk assessment and quantification process, detailed previously, the Environmental Strategy team will continue to lead on the implementation of projects working across services and in collaboration with our partner NPS. NPS will be allocated carbon reduction targets as part of their performance monitoring in this phase of the CMP. Already plans are in place to begin to deliver some of the newly assessed projects. In addition the team will seek to find new opportunities and investigate new technologies as and when they become available. We regularly liaise with colleagues on potential applications of newly available technologies.
- 5.2 Much of the funding for carbon reduction projects will continue to come from Salix funding. However, being eligible for Salix funding can be dependent on achieving quick paybacks on technology. Where this is not possible the team will use the 'Eco Investment fund' to supplement Salix finance. It is proposed that the Eco Investment fund will be increased by £50,000 as part of the capital programme. We will also continue to seek out new funding streams for projects.
- 5.3 A description of the projects that will help deliver the targets is contained within the annex

Carbon in the Community:

- 5.4 This programme is designed to reduce carbon emissions from council operations only. However, the council has plans via our Environmental Strategy and Housing Energy Conservation Act (HECA) report (2013) to assist households in the city to save both energy and carbon. This report can be found in full here:

<http://www.norwich.gov.uk/CommitteeMeetings/Cabinet/Document%20Library/34/REPCabinet09HomEnergyConservationAct20130320.pdf>

- 5.5 Figure 7 shows per capita carbon emissions in Norwich between 2005 and 2010. Over this period the population of Norwich has steadily increased, whilst at the same time the general trend for CO₂ emissions has been to decrease. This could be due in part to an increase in methods to improve energy efficiency or, as the fuel poverty figures suggest, due to an increase in fuel poverty, meaning that demand for fuel has dropped as more households struggle to afford to heat their homes.

Figure 7:

LA Region Name	Year	Industry and Commercial	Domestic	Road Transport	Grand Total	('000s, mid-year estimate)	Per Capita Emissions (t)
Norwich	2005	439.4	285.3	131.4	856.1	126.6	6.8
	2006	445.3	285.3	130.5	861.1	129.2	6.7
	2007	410.2	275.6	131.2	817.0	132.6	6.2
	2008	391.9	269.5	126.5	787.8	137.3	5.7
	2009	345.4	242.4	122.7	710.5	140.1	5.1
	2010	353.6	261.9	122.1	737.7	143.5	5.1

- 5.6 Since the start of phase 1 of the CMP both Carbon Emissions Reduction Target (CERT) and Community Energy Saving Programme (CESP) funding have ceased to exist. However, we hope that both the Green Deal and ECO funding will offer the council and the wider city opportunities to build upon its energy saving work, and particularly enable us to work with the vulnerable sectors of society to install energy efficiency measures such as loft, cavity wall and solid wall insulation.
- 5.7 Under the terms of the ECO funding some residents will qualify for free measures. We are currently in the process of selecting a preferred provider of Green Deal and ECO services for the city for the next two years. It is difficult to predict what the take-up of these services will be, but we will work closely with them to promote free and subsidised energy saving installations wherever possible. We hope this will have the effect of both reducing carbon emissions for the city, and also enabling some of the most vulnerable to have warmer homes.

6.0 Keeping on track:

- 6.1 In order to ensure that we are best able to achieve the new carbon reduction target we will have the following monitoring and governance arrangements in place:
- 6.2 Overall responsibility for the CMP on Cabinet rests with the Cabinet member for Environment, Development and Transport. They will receive regular progress reports as the programme is taken forward.
- 6.3 At an officer level the programme is sponsored on the Corporate Leadership Team (CLT) by the Executive Head of Strategy, People and Democracy. They chair a Carbon Management Programme Team which meets to provide programme oversight and overall management of the CMP. The programme team consists of senior representatives from the following service areas and partners who are key to its delivery:
 - Finance
 - Procurement
 - Norwich Property Services
 - City Development
 - Citywide Services
 - Housing
 - Service Improvement
 - LGSS ICT
 - Environmental Strategy
- 6.4 The programme is then managed on a day to day basis by the Environmental Strategy Manager supported by their team.
- 6.5 The CMP will be delivered by officers from across a range of services, contractors and partners.

Formal Performance Reporting:

- 6.6 Progress against the proposed annual reduction target will be reported to Scrutiny and Cabinet as part of the council's regular performance reporting and to Sustainable Development Panel (SDP) in the Autumn of each year, following the publication of the council's annual carbon footprint report.

Appendix A –Salix projects:

Title	Project Type	Technical Cost	Annual kWhr Saved	Annual £ Savings	Annual CO2 Saved (t)	Payback Yrs
Smart Lighting Project	Lighting - Upgrades	6724.12	14571	1821.38	7.93	4.2
PC Powerdown	Computers and IT	21765.19	135000	10800	73.44	2.3
Pilling Park Air Conditioning Replacement	Cooling	1664	9000	1125	4.9	1.7
Voltage reduction - City Hall	Voltage Management	43706.06	119669	9573.52	65.1	5.3
Blackfriars Hall - Chandelier light	Lighting - Upgrades	96	1971	157.68	1.07	0.7
Norman centre vending machines	Time Switches	20.97	3811	381.1	2.08	0.1
Smart Lighting Computer Room	Lighting - Upgrades	1020	2104	263	1.15	4.5
Water Cooler Timers	Time Switches	34.18	2234	279.25	1.17	0.1
City Hall - Save it EZ T5 lighting (stage 1)	Lighting - Upgrades	8940.3	18000	2250	9.79	4.6
City Hall - Save it EZ T5 lighting (stage 2)	Lighting - Upgrades	10135.17	32946	3294.6	17.96	4.7
St Andrews multi storey car park lighting upgrade	LED lighting	42002.1	209973	13123.31	110.15	4.9
St Andrews multi storey car park lighting upgrade	LED lighting	42002.1	209973	13123.31	110.15	4.9
Catton AHO - save it easy T5	Lighting - Upgrades	1679.7	3812	381.2	2.08	6.8
Lakenham AHO - Save it EZ T5	Lighting - Upgrades	1031.76	3070	307	1.67	5.2
Pilling Park Save it EZ	Lighting - Upgrades	1177.02	3332	266.56	1.82	5.1
Norman Centre - Save it EZ phase 1	Lighting - Upgrades	4442.61	12428	1242.8	6.78	5.5
Automated pool cover at Riverside LC	Swimming	40460.94	293583	11645.78	106.34	5.3
Automated pool cover at Riverside LC	Swimming	40460.94	293583	11645.78	106.34	5.3
Riverside Leisure Centre - voltage optimisation	Voltage Management	24132.41	97076	6601.17	52.93	4.2
IT Virtualisation	Computers and IT	17400	73846	9230.75	38.74	2.2
Norman Centre LED lighting	LED lighting	2500	5102	637.75	2.65	4.5
Bullard Road AHO loft insulation	Insulation - Building Fabric	1449	3105	372.6	1.63	4.5
Air vent insulation	Insulation - Pipework	700	15728	314.56	2.89	2.6
Boiler Valve Insulation - City Hall	Insulation - Pipework	7790	112476	2755.66	20.65	3.3
Boiler Valve Insulation - St Andrews Hall	Insulation - Pipework	1545	24616	603.09	4.52	2.9
IT Cooling	Cooling	37200	87500	10937.5	45.53	3.9
Logic BMS	Building Management Systems	8800	91089	2003.96	16.72	5.1
Logic BMS	Building Management Systems	8800	91089	2003.96	16.72	5.1
LED Parking	LED Lighting	725	1185	148.12	0.62	5.6
LED NCC Surface Car Parks	LED Lighting	4600	7400	925	3.85	5.7
Swimming pool vending machines	Time Switches	50	7622	952.75	3.97	0.1
Riverside LED Lighting	LED Lighting	6500	10500	1312.5	5.46	5.7
LED Lighting of Riverside Swimming Pool	LED Lighting	41250	63469	6346.9	33.03	7.5
City hall staff canteen lighting sensors	Lighting - Controls	637	1350	182.25	0.65	4
		431441.57		127009.79	880.48	

Appendix B – RAG – Project Quantification Sheets

Project ref	Opportunity/project	Funding	Capital Costs (£)	Project start year	Predicted year of first energy savings	ACTUAL year of first energy savings	Lifetime of project from start year (years)	Emissions Source 1	Amount saved emissions source 1	Emissions Source 2	Amount saved Emissions Source 2	Total KWh, tonnes or m3 saving in yr 1	£ Gross Savings in yr 1	CO2 savings in yr 1 (tonnes)
NCC001	One Small Step Campaign	Environmental Strategy	£0	2013	2013	2013	10	Electricity (grid)	6000	Natural gas	20,000	26,000	£ 1,150	7
NCC002	Water cooler removal	Environmental Strategy	£0	2013	2013	2013	25	Electricity (grid)	2000			2,000	£ 250	1
NCC003	New fleet	Contract Refresh	£0	2013	2013	2013	5	Diesel	35,000			35,000	£ 3,827	9
NCC004	Electrical Fleet	Contract Refresh	£0	2013	2013	2013	5	Diesel	28,000			28,000	£ 3,062	7
NCC005	PC Monitor Switch Over	Contract Refresh	£0	2013	2014	2014	10	Electricity (grid)	6000			6,000	£ 750	3
NCC006	Printer Auto Shutdown	Contract Refresh	£0	2013	2014	2014	10	Electricity (grid)				-	£ -	-
NCC007	New PC's	Contract Refresh	£0	2013	2014	2014	10	Electricity (grid)	19456			19,456	£ 2,432	10
NCC008	Replacement Waste Fleet	Contract Refresh	£0	2013	2014	2014	5	Diesel	40000			40,000	£ 4,374	10
NCC009	IT Cooling City Hall	SALIX 2013	£42,780	2014	2014	2014	15	Electricity (grid)	87,500			87,500	£ 10,938	47
NCC010	Plant Room Jackets and insulation sheltered housing	SALIX 2014	£50,000	2014	2014	2014	15	Natural gas	260000			260,000	£ 5,200	48
NCC011	BMS Sheltered Trial	SALIX 2014	£1,250	2014	2014	2014	15	Natural gas	45,000			45,000	£ 900	8
NCC012	Anglia water	Environmental Strategy	£600	2014	2014	2014	15	Water	50,000			50,000	£ -	20
NCC013	Eco Driver Training	Environmental Strategy	£2,500	2014	2014	2014	15	Diesel	80,000			80,000	£ 8,748	20
NCC014	Endotherm Sheltered Trial	SALIX 2014	£750	2014	2014	2014	15	Natural gas	30,000			30,000	£ 600	6
NCC015	Billing issues programme	Procurement	£0	2014	2014	2014	15	Electricity (grid)	100,000	Natural gas	500,000	600,000	£ 22,500	146
NCC016	Fleet Refresh	Contract Refresh	£0	2017	2017	2014	5	Diesel	100,000			100,000	£ 10,935	25
			£97,880											368
NCC017	BMS Optimisation	ECO Investment	£25,000	2013	2013	2013	15	Natural gas	25,000			25,000	£ 500	5
NCC018	Miller Hall	Capital/SALIX Sport England	£20,000	2014	2014	2014	25	Electricity (grid)	25000	Natural gas	20,000	45,000	£ 3,525	17
NCC019	LED Riverside	SALIX	£31,000	2014	2014	2014	15	Electricity (grid)	64,000			64,000	£ 8,000	34
NCC020	St Andrews Hall PIR	Capital/SALIX Sport England	£500	2014	2014	2014	15	Electricity (grid)	1,000			1,000	£ 125	1
NCC021	LED Surface CP's replacement	New Capital	£55,000	2014	2014	2014	15	Electricity (grid)	362,000			362,000	£ 45,250	194
NCC022	LED Riverside walk	New Capital	£6,500	2014	2014	2014	15	Electricity (grid)	10,500			10,500	£ 1,313	6

NCC023	LED Church lighting	SALIX/ECO Investment	£6,500	2014	2014	2014	15	Electricity (grid)	10500			10,500	£ 1,313	6
NCC024	Quattro Seal	SALIX	£4,500	2014	2014	2014	15	Natural gas	20,000			20,000	£ 400	4
NCC025	Canteen PIR	SALIX	£250	2014	2014	2014	20	Electricity (grid)	1,000			1,000		
NCC026	Endotherm Sheltered	SALIX	£20,000	2015	2015	2015	20	Natural gas	250,000			250,000	£ 5,000	46
NCC027	Server Optimisation 2	SALIX/ECO Investment	£50,000	2016	2016	2015	15	Electricity (grid)	100,000			100,000	£ 12,500	54
NCC028	BMS Sheltered Programme	New Capital	£15,000	2015	2015	2015	15	Natural gas	450,000			450,000	£ 9,000	83
NCC029	LLL LED Trail	New Capital	£100,000	2015	2015	2015	15	Electricity (grid)	250,000			250,000	£ 31,250	134
NCC030	1/3 let at City Hall	No cost	£0	2015	2015	2015	15	Electricity (grid)	150,000	Natural gas	100,000	250,000	£ 20,750	99
NCC031	PIR Landlord lighting (trial)	New Capital	£1,000	2014	2014	2014	15	Electricity (grid)	1,500			1,500	£ 188	1
NCC032	New Internal Glazing	New Capital		2014	2014									

£335,250

683

NCC033	The Norman Centre VO	New Capital	£30,000	2014	2014	2014	15	Electricity (grid)	30,000			30,000	£ 3,750	16
NCC034	ST Andrews LED undercroft	Capital	£2,000	2015	2015	2015	15	Electricity (grid)	5,000			5,000	£ 625	3
NCC035	St Giles Multi-story VO	New Capital	£35,000	2015	2015	2015	15	Electricity (grid)	60,000			60,000	£ 7,500	32
NCC036	Micro-generation	New Capital	£125,000	2015	2015	2015	15	Electricity (grid)	100,000			100,000	£ 12,500	54
NCC037	LLL White light and Dimming on existing fittings	New Capital	£180,000	2015	2015	2015	15	Electricity (grid)	300,000			300,000	£ 37,500	161
NCC038	New CCTV Office	No cost	£0	2016	2016	2016	25	Electricity (grid)	243,270			243,270	£ 30,409	131
NCC039	New Parking Services Office	No cost	£0	2016	2016	2016	25	Electricity (grid)	193,910	Natural gas	2,096,052	2,289,962	£ 66,160	492
NCC040	VSD's District Heating	SALIX	£80,000	2015	2015	2015	25	Electricity (grid)	100,000			100,000	£ 12,500	54
NCC041	Endotherm + Flush +Clean City Hall	SALIX	£3,000	2014	2014	2014	25	Natural gas	71,844			71,844	£ 1,437	13
NCC042	Modify Air Handling Units	SALIX	£2,000	2014	2014	2014	10	Electricity (grid)	5,000			5,000	£ 625	3
NCC043	City Hall Heating Controls	SALIX	£2,000	2015	2015	2015	10	Natural gas	200,000			200,000	£ 4,000	37
NCC044	Room 106 Insulation	SALIX	£300,000	2015	2015	2015	25	Natural gas	10,000			10,000	£ 200	2
NCC045	PV on LLL Communal Areas	New Capital	£750,000	2015	2015	2015	25	Electricity (grid)	250,000			250,000	£ 31,250	134
NCC046	New District Heating Systems	New Capital	£40,000	2017	2017	2017	25	Natural gas	500,000			500,000	£ 10,000	92
NCC047	Double Glaze Common Areas	New Capital	£10,000	2017	2017	2017	25	Natural gas	100,000			100,000	£ 2,000	18
NCC048	Interal Glaze City Hall	New Capital	£10,000	2017	2017	2017	25	Natural gas				-	£ -	-
NCC049	Solar Hot Water Sheltered Housing	New Capital	£750,000	2016	2016	2016	25	Natural gas	2,500,000			2,500,000	£ 50,000	462
NCC050	Light Sen Christmas lights	SALIX	£10,000	2014	2014	2014	10	Electricity (grid)	10,000			10,000	£ 1,250	5

[illegible]

Appendix C – One Small Step Campaign Poster

