How to achieve a lower carbon Winchester District: targets and sample action plans

Appendix 1

Setting and meeting a greenhouse gas emissions target for Winchester District 2016-2022

28 April 2014

This report proposes a target for Winchester District to reduce its greenhouse gas emissions by 40% by 2020 relative to 2004. This means cutting emissions by 25,000 tonnes of CO_2e a year over the 5 years 2016 to 2020.

If the target is met, it will put the District on track to join the Climate Change Act 2008 pathway of an 80% reduction in emissions, relative to 1990, by 2050. This target assumes that the District will meet its current target of a 30% reduction by 2015. Should this not happen, greater cuts will be required.

This report also sets out one way the target can be met. The commercial sector contributes 40% of the District's emissions. A greater contribution to cuts in commercial emissions than is assumed here is entirely plausible.

Introduction

The stability of the Earth's climate depends on a balance being maintained between incoming and outgoing radiation from the sun. The current imbalance that is causing global warming and climate change is being driven by humanity's emissions of greenhouse gases from burning fossil fuels and interference with the natural sinks, such as forests, wetlands and soils.

Winchester Action on Climate Change (WinACC) adopted a target for Winchester District of reducing greenhouse gas emissions in the District. This target was accepted and adopted by Winchester District Strategic Partnership supported by Winchester City Council in February 2009. The target was later re-phrased as 'a 30% cut in emissions by 2015 relative to 2004'. By the end of 2011 an estimated cut of 13% had been achieved as against a hoped for reduction of 18% (Fig.1).[1]

[1] Whitmarsh, R.B. *Greenhouse Gas Emissions in Winchester District: Part III. Estimates and Trends (2005-2011)*. WinACC, August 2013.

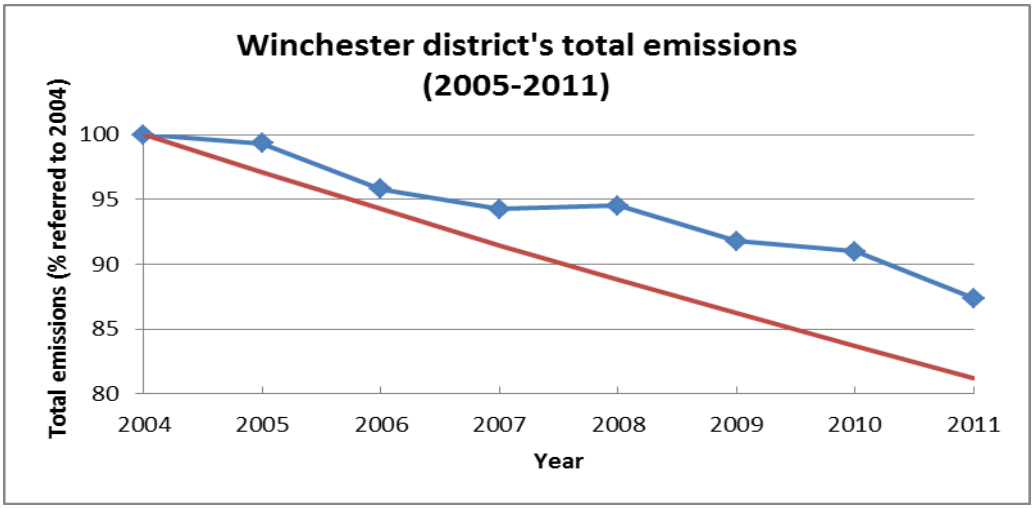

Figure 1. Winchester District's emissions from 2004 until 2011 for selected sectors relative to 2004 (blue line) and Winchester District's target pathway (brown line).[1]

Setting a new target for 2016-2020

It is now time to consider a new target for the five years from the start of 2016 until the end of 2020.

The first target was expressed as a percentage cut in the District's (unspecified) emissions.

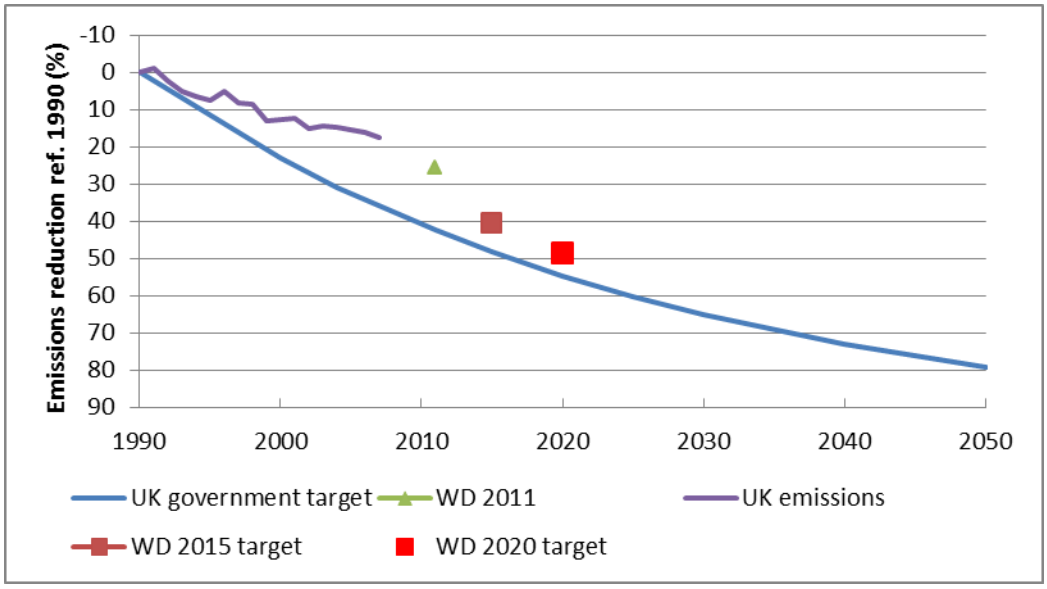

Figure 2. Actual (purple line and green triangle) and target (blue curve and squares) emissions for the UK and Winchester District expressed as percentage cuts relative to 1990.

WinACC has extended the target to 2020 with the same constant annual reduction rate of 3.2%. The new target is a 40% reduction by 2020 (ref. 2004). This closely aligns with the UK's national target of an 80% cut by 2050 (ref.1990) in the Climate Change Act 2008 (Fig.2).

This means an annual cut of 25,000 tonnes CO_2 between 2016 and 2020, assuming that the 2015 target is met. 25 kt is about 2.3% of WD's annual emissions in 2011 (the latest year available) and corresponds to just over 200 kg CO_2 per person each year.

The mismatch between the District's actual emissions in 2011 (green triangle in Fig.2) and the targets (squares and blue curve), shows that it is very likely that a larger annual reduction in emissions will be necessary if the District is to come close to the government's target trajectory by 2020. A clearer picture should emerge in June 2015 when the results to the end of 2013 will become available.

A variety of actions are needed to meet the 2020 target that together will produce results each year that add up to the savings required. The general public is unlikely to appreciate what a tonne of CO_2e represents in terms of their own annual emissions. So a further step is to present sub-targets, mentioned in campaigns in the different emissions sectors, which are expressed in everyday units such as kilowatt.hours (which appear on electricity and gas bills) and miles driven.

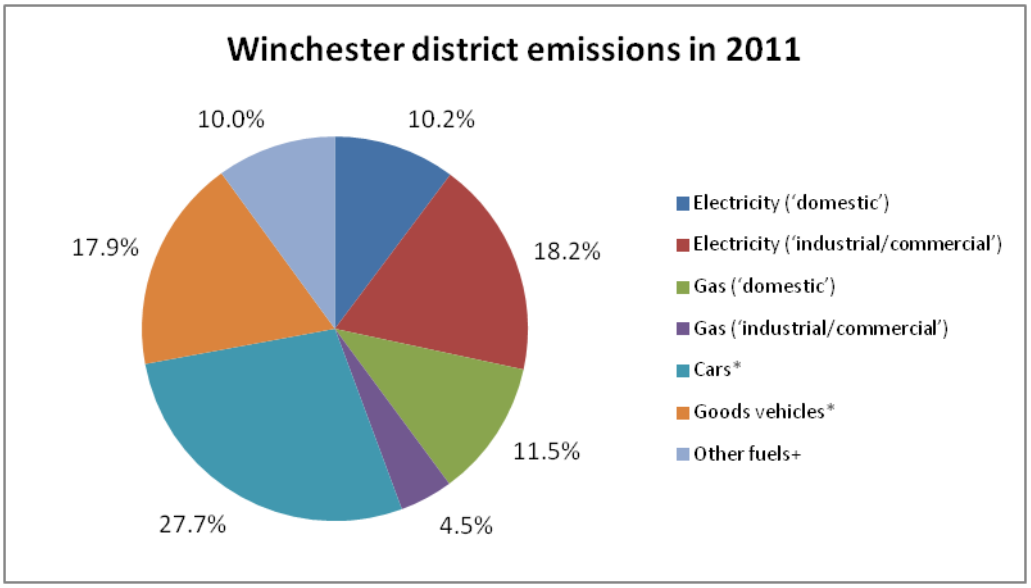

Figure 3. Pie diagram of estimated emissions of CO2e in the seven principal sectors of Winchester District for 2011. Total emissions from these sources are estimated to be 1,107 thousand tonnes CO2e.

Some estimates of emissions reductions to meet the 2020 target

Ideas to reduce emissions in the 5-year period 2016-2020 were explored in the sectors of domestic, commercial and public buildings (electricity and gas consumption) and road vehicles (fuels used by cars and goods vehicles). Statistics for these sectors are readily available from DECC and are published annually (albeit 15-18 months after the end of the relevant year). The relative contributions of these sectors alone in 2011 is shown in Fig.3 (ref.1).

The commercial sector, by its use of energy in buildings and road vehicles, accounts for around 40% of the District's measurable emissions. This sector, in particular, needs to make a concerted and more effective effort than in the recent past if it is to contribute proportionately to reducing the District's emissions in the years to come.

Savings were estimated on an annual basis and are summarised in the following tables.

Domestic buildings

Take-up of the Green Deal in the District by August 2013 was slight (1,094 households insulated out of 46,000).[2] More domestic energy-saving could include items in the table below (although home insulation may raise comfort but not lead to significant emissions savings). The Renewable Heat Incentive (RHI) should complement the Green Deal. The RHI benefit the almost 10,000, mainly rural, properties without mains gas supplies and encourage the addition of solar water pre-heating to urban properties.

Table 1. Potential annual savings from domestic buildings

Item	Sub-sector	Tonnes CO_2e	Notes
1	4000 homes change to condensing boiler saving 20% gas	2,145	Don't know how many homes out of 37,260 on mains gas, already have condensing boilers. Relatively expensive.
2a	Home insulation - 2000 lofts (from scratch)	557	Don't know how many homes out of 46,000 presently have no loft insulation
2b	Home insulation - 4000 lofts (top up)	152	Don't know how many homes out of 46,000 presently have some loft insulation
3	Home insulation – 3000 cavity walls insulated	1,394	Don't know how many homes out of 46,000 already have cavity wall insulation
4	8000 turn down thermostat by 1°C	2,480	Or more (could set to 17°C). Needs a campaign. Cheap/free thermal underwear?
5	Install smart gas and electricity meters in all homes by 2020; 20% each year	800	Assume 2% saving for 20% of domestic consumers each year i.e. 100% after 5 years
6	Install voltage optimisation	208	Assume 2% of homes save 10% each year i.e. fitted to 10% of homes after 5 years
7	Cool Communities savings (will include some transport savings too)	1,500	Assume 1000 homes save 1.5 tonnes. Potentially can save 2.5 tonnes but used 1.5 tonnes to

[2] Appendix 10 in http://documents.hants.gov.uk/climate-change/InsulateHampshireFinalReport2013.pdf

			minimise double counting
8	3500 homes replace all halogen downlighters with LED alternatives	468	e.g. ceiling lights in kitchens
9	Solar thermal (domestic hot water)	69	250 homes fitted each year
10	WCC homes (social housing) insulated	1,000	Rough estimate
11	PV panels on WCC homes (social housing)	59	Assume only 750 homes fitted out by 2020
Total		**10,832**	

We do not know how many private homes have already been insulated and to what standard (items 1-3). No assumptions have been made about the installation of PV panels on the roofs of private homes.

Commercial buildings

Table 2. Potential annual savings from commercial buildings

Item	Sub-sector	Tonnes CO_2e	Notes
1	Install PV on roofs. 20 sites each at 200kWp	1,116	Electricity used on site reduces meter readings (and emissions)
2	10% of businesses install voltage optimisation	2,470	Assume businesses save 10% electricity per year
Total		**3,586**	

Savings in other sub-sectors such as biomass burning boilers, ground source heat pumps and solar thermal water heating have not been estimated here.

We have insufficient information about the energy consumption of commercial buildings to make confident estimates of their potential for saving energy. Not only is such information expected to be largely 'commercial-in-confidence' but also the sector is not homogeneous. It includes shops, offices, supermarkets, hotels, warehouses etc. Fig. 4 shows the variable energy consumption by different types of commercial (and public) buildings.

PV electricity can be used on-site, in working hours. Voltage optimisation[3] is a 'no brainer' for many commercial organisations.

[3] **Voltage optimisation** is a term given to the systematic controlled reduction in the voltages received by an energy consumer to reduce energy use, power demand and reactive power demand. While some voltage 'optimisation' devices have a fixed voltage adjustment, others electronically regulate the voltage automatically. Voltage optimisation systems are typically installed in series with the mains electrical supply to a building, allowing all its electrical equipment to benefit from an optimised supply.

There are certainly many other areas where energy can be saved in commercial buildings. These will include lighting, refrigeration, IT equipment and heating.

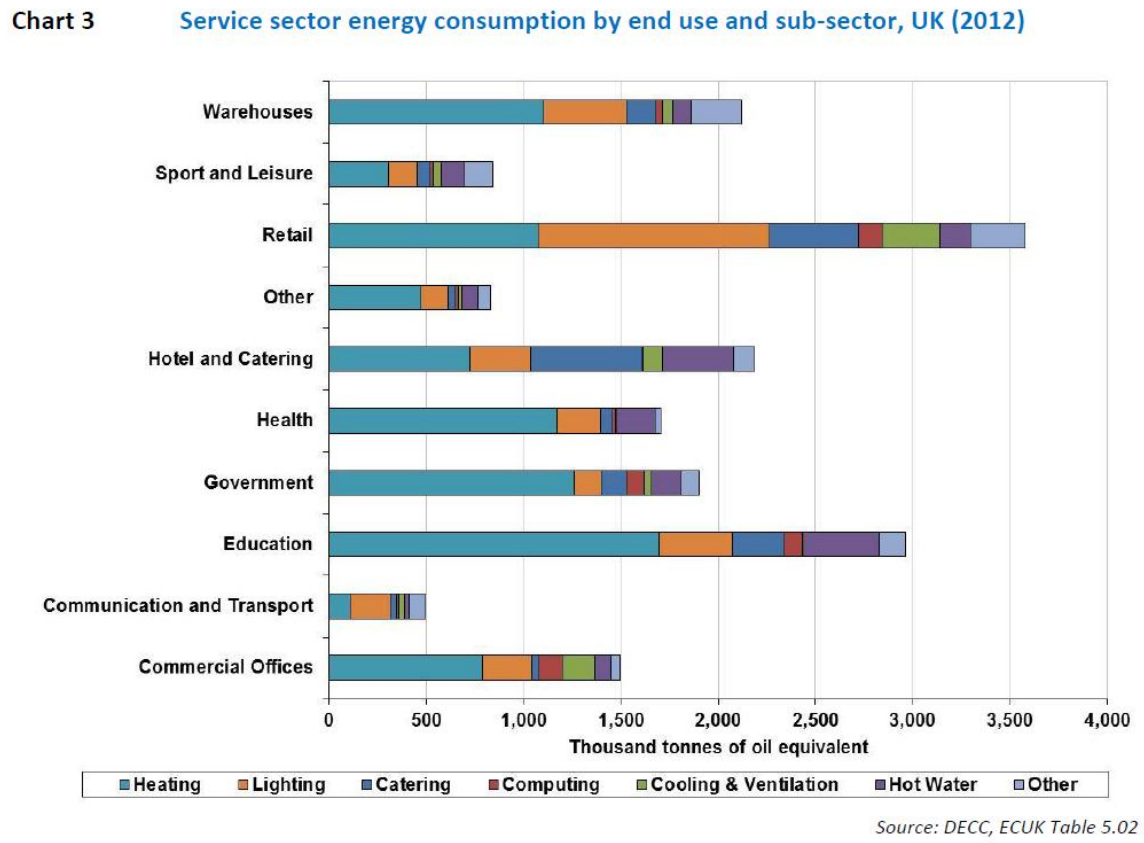

Figure 4. Breakdown of energy consumption across the UK's service sector.

Public buildings

Table 3. Potential annual savings from public buildings

Item	Sub-sector	Tonnes CO_2e	Notes
1	CHP scheme A in Winchester	547	average saving 2016-2020
2	Assume new Leisure Centre has 20% of current emissions from 2017	245	average saving 2016-2020
Total		**792**	

Public buildings, like commercial premises, will have varying patterns of energy use (Fig.4).

Under a programme run by the CT during 2002-2012 free government-funded opportunity assessments (OAs) were obtained by WCC for a number of their buildings, e.g. River Park Leisure Centre, and for the Theatre Royal. It might be useful to re-visit these OAs as a basis on which to make decisions about future savings.

Winchester Town's CHP Scheme A (hospital, prison and university) 30% emissions[4] saving is estimated from Display Energy Certificates (DECs).[5]

Non-commercial vehicles

Information about car ownership, annual mileages and the sizes and efficiencies of engines in private vehicles in Winchester District is available. Manufacturers' figures for average miles per gallon have been uplifted by 15%, as recommended by Defra[6], to account for real world conditions (acceleration, braking, gradients etc.). In 2011 there were 63,487 cars in the District with average uplifted emissions of 196 g CO_2e/km and an average annual mileage of 9,100 miles.[7]

Table 4. Potential annual savings from private cars

Item	Sub-sector	Tonnes CO_2e	Notes
1	4000 cars save 1000 miles per year (20 miles per week) and maintain saving in all subsequent years	1,251	20,000 cars (32%) cut mileage by 1000 miles by 2020
2	Reduce number of cars in 2- or 3-car households. 2-car reduce by 5% and 3-car by 7.5% each year	1,740	3725 + 1682 cars off the road; 5.5% of total. Assumes removed vehicle leads to 50% cut in associated mileage
3	Average car emissions decline as EU regulations bite	2,069	Assume normal turnover. Emissions are gradually reducing by EU regulations
4	Ecodriving[8] cars, adopted by 5000 drivers/year saving 12.5% of emissions	1,779	25,000 car drivers adopt Ecodriving
Total		**6,839**	

The savings from items 1, 2 and 4 may be optimistic. The largest reduction (item 3, 30%) will come from EU regulations which force manufacturers to produce less polluting cars.

[4] http://www.districtenergy.org/blog/2012/12/07/winchester-uk-moves-district-heating-project-forward-after-proposal-banning-wind-farms/

[5] [5] http://www.cse.org.uk/pages/resources/open-data#display_energy_certificate_data

[6] Page 23, para.52 in Defra/DECC (2011). 2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting: Methodology paper for emissions factors. London, Defra/DECC: pp.102.

[7] Whitmarsh R.B., 2012. Vehicles registered within Winchester District (2008-2011) and their carbon dioxide emissions.

[8] Eco-driving involves driving in a more efficient way in order to improve fuel economy. Examples of eco-driving techniques include driving at an appropriate speed, not over-revving, ensuring tyres are correctly inflated, removing roof racks and reducing unnecessary weight.

It will be necessary to apply a carrot-and-stick approach to private vehicles.

Commercial vehicles

In 2011 there were 34,583 light goods vehicles in the District with average uplifted emissions of 221 g CO_2e/km and an average annual mileage in excess of 13,350 miles. 93% of WD's vehicle emissions are from cars and LGVs. Savings from HGVs and buses are not estimated because they form only 0.6% of all vehicles.[7]

Table 5. Potential annual savings from commercial vehicles

Item	Sub-sector	Tonnes CO_2e	Notes
1	2200 vans save 1500 miles per year (30 miles per week) and maintain saving in all subsequent years	1,166	11,000 vans (32%) cut mileage by 1500 miles by 2020
2	Average van emissions decline as EU regulations bite	0	Assume normal turnover. Emissions are gradually reducing by EU regulations but van emissions in WD (2005-2011) did not decrease
3	Ecodriving vans, adopted by 3000 drivers/year saving 12.5% emissions	1,769	15,000 van drivers adopt ecodriving.
Total		**2,935**	

No emissions reduction is assigned to light goods vehicles because between 2005 and 2011 emissions from goods vehicles in the District increased by 1.7%. EU regulations will act to force these emissions downwards but it is not clear that there will be a net decrease in 2016-2020.

Summary of savings

The tables above are summarised in Table 6 which demonstrates that a target of saving 25,000 tonnes CO_2e per year is feasible.

Table 6. Summary of emissions savings by sector

Sector	Annual emissions savings (kt CO_2e)
Domestic buildings	10,832
Commercial buildings	3,586
Public buildings	792

Private cars	6,839
Commercial vehicles	2,935
Total	**24,984**

Emissions are best reduced first by reducing demand, second by using energy more efficiently and finally by generating low-carbon renewable energy. This sequence also reflects costs; reducing demand can in fact be cost-free. Table 7 summarises the suggestions using this approach, and also suggests other measures which can contribute but which are hard to quantify.

Undoubtedly there will be other ways, not considered here, to save on greenhouse gas emissions within the District.

Implementation of savings

It is easy to identify savings that can be made, much harder to implement them. On the other hand, the future cost of not taking action now is likely to be greater than the cost of action now. Some investments in energy efficiency will pay for themselves within a few years.

The savings suggested here need campaigns, training and information. 'Motivation will have to be accompanied by effective communication about what actions will have the biggest pay-offs. Furthermore, financial obstacles will have to be addressed.'[9] These activities are beyond this scope of this document.

Conclusion

There are many opportunities to reduce the measurable greenhouse emissions in Winchester District. These reductions will be achieved fully only with leadership from Winchester City councillors, MPs, managers of large businesses and the public sector, and even local developers.

[9] Dietz, T. "Understanding Environmentally Significant Consumption." *Proceedings of the National Academy of Sciences* 111, no. 14 (April 8, 2014): 5067–68. doi:10.1073/pnas.1403169111.

Table 7. Suggested ways to cut greenhouse gas emissions in the domestic, commercial and transport sectors. See key to colours at foot of table.

Sector	**Reduce demand**	**Use energy more efficiently**	**Generate renewable energy for direct consumption**
Domestic (existing buildings)	Turn down room thermostat by at least 1°C	Replace old boiler with condensing gas boiler	Fit solar HW panel
	Wear warmer clothes	Insulate cavity wall	
	Turn down HW cylinder thermostat to ca. 60°C	Insulate solid wall	
	Avoid using air conditioning	Insulate loft (total or top up)	
	Switch off lights in empty rooms	Improve window insulation plus curtains and external doors	
	Switch off all appliances at the wall	Exclude drafts	
	Switch off external lights at night or fit PIR sensor	Fit TRVs	
	Take showers not baths	Install 2-channel CH programmer where appropriate	
	Plant deciduous trees/shrubs to provide summer shading	Replace all halogen bulbs with LEDs	
	Join Cool Communities	Install voltage optimisation	

	Insert smart meters (mandatory by 2020)	Programme smart meters to control appliances	
Domestic (new build)	Meet at least LA Planning requirements; aim for at least Code level 5	Include Combined Heat and Power (CHP)	
		Use passive solar heating	
Commercial (existing buildings)	Turn down room air thermostat(s) by at least 1°C	Install most efficient fridges, night blinds, LED lighting, heat recovery	Install PV on roofs or facades if electricity can be used on site
	Staff wear warmer clothes	Replace CFLs by LEDs and T5s with PIR sensors and dimming control	
	Turn down HW cylinder or other HW supply thermostat to ca. 60°C	Install Building Management System (BMS)	
	Avoid using air conditioning	Install solar shading	
	Switch off lights at night	Install voltage optimisation	
	Switch off IT equipment at night	Improve window insulation	
	Install PIR sensors for night lighting and in store rooms, stair wells etc.	Close all external doors	

	Energy efficient hand-dryers		
Commercial (new building)	Meet 'zero carbon' regulations from 2019	Install Building Management System (BMS)	Install PV on roofs or facades if electricity can be used on site
	Install PIR sensors for lighting	Install solar shading	
		Use passive solar heating	
Domestic transport	Walk, cycle or use public transport instead of driving	Buy a more efficient car when you need to replace current car	
	Reduce annual mileage	Ecodrive	
	Reduce number of cars per household	Buy a second-hand car	
	Expand Winchester Park & Ride and make free. Apply congestion charge to fund it		
	Points-based system for parking permits with a charge for higher emitters		

Commercial transport	Reduce annual mileage	Ecodrive	
	Reduce number of vehicles	Ensure delivery vehicles start off with a full load	
	Reduce frequency of deliveries	Buy smaller more fuel efficient vehicles	
KEY			
	Quantifiable items that will contribute substantially to reducing carbon footprint of measures considered here		
	Items that will contribute to reducing carbon footprint of measures considered here in a minor, or hard to estimate, way (e.g. see Cool Communities handbook)		
	Items too uncertain to quantify		

Appendix 2

Setting a target for local generation of renewable energy in Winchester District

Renewable Energy Action Group, Winchester Action on Climate Change (WinACC)

April 2014

This report proposes targets for the local generation of renewable energy within Winchester District for the period to 2030. We demonstrate that it is practical to generate 30% of our non-transport energy locally from renewables by 2030, with consequent benefits to the economy, environment and jobs.
A practical profile for this generation is proposed, based on existing technologies and resources and well within the technically available resources of the District.
However, if we are to achieve these targets it will require explicit commitment and forward planning, since the lead time for some of the projects is considerable.

Introduction

In order to constrain man-made global warming, mankind needs to reduce greenhouse gas emissions as fast as it can and at the latest by 80% in 2050[10]. This is an enormous challenge and can only be addressed through a large number of diverse initiatives. Doing more, and doing it earlier, helps to reduce the level of risk. It would be hard to do too much.

Whilst energy efficiency is important, it cannot deliver enough to address the problem: Renewable energy generation is needed. In addition to setting a target for reduction of greenhouse gas emissions and for efficiency savings, Winchester District should work towards achieving a target level of renewable energy which is generated locally, within the District.

Global warming will only be controlled if responsibility is taken at all levels. This plan for local generation of renewable energy complements national and international efforts. It is consistent with the latest IPCC advice and builds on the recent advice to Local Authorities by the Government's Committee on Climate Change (CCC)[11] regarding their responsibility for delivering renewable and decentralised energy projects.

Currently there is almost no renewable energy generation in Winchester District, yet there are significant local natural resources for low carbon energy which could contribute to the overall targets. For instance, in Winchester District we have good resources for generation from wind, solar, wood fuel and anaerobic digestion. Each community has its own characteristic natural resources and should contribute to the overall target accordingly (and also directly benefit from such local projects). Local generation also has the benefit of creating jobs, keeping revenues local and supporting the local economy.

[10] Compared to 1990

[11] "How local authorities can reduce emissions and manage climate risk". Committee on Climate Change, 17 May 2012. www.theccc.org.uk

Local generation can also enable more efficient use of resources. Electricity is easy to transmit but with traditional, centralised generation at least 50% of the energy is wasted as heat, doubling the resulting greenhouse gas emissions. Yet more than half our energy is used for heating[12]. Local electricity generation and district heating enables more efficient energy conversion, alternative fuels, simpler systems and the parallel use of heat that is otherwise wasted. Renewable fuels (from sustainable wood, anaerobic digestion, etc) can come from local sources with lower transport costs. Other renewables (wind, PV etc) provide clean electricity directly.

This detailed plan shows how 30% of the (non-transport) energy for Winchester District could be locally generated from renewable sources by 2030.

The target

The WinACC Renewable Energy Action Group on 12 February 2014 recommends:

- No target for 2015 because planning permission and construction take several years for large scale renewable generation facilities. However the vision and foundations for future development must be laid now.
- By end of 2020, 15% of energy consumption to be generated within the District from renewable sources. This is the existing UK national target[13, 14]. (The existing combined EU target of 20% is preferred but this is not credible given our disproportionally low starting point)
- By end of 2025, 25% of energy consumption to come from local renewable sources (this is also the existing target for decentralising energy for London[15]).
- By end of 2030, 30% of energy consumption to come from local renewable sources (this reflects the EU recommended target per country for 2030, not yet formally ratified, of 27%[16].)

The total non-road-transport energy consumption[17] in Winchester District[18] in 2011 was 1735 GWh, which is our baseline[19, 20]. Based on this rationale, the renewable generation targets for the District as a proportion of the baseline are as follows:

Table 1: Winchester District Energy Targets from Renewables

Baseline: Non-transport	Share from renewables 2013	Target for renewables 2020	Target for renewables 2025	Target for renewables 2030	Realistic technical potential (with

[12] 47% of total energy (77% of non-transport energy) is used for heat. "Estimates of heat use in the United Kingdom in 2012", DECC, Sept 2013.

[13] DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23rd April 2009

[14] EU: The 2020 climate and energy package. http://ec.europa.eu/clima/policies/package/index_en.htm

[15] Greater London Authority: https://www.london.gov.uk/priorities/environment/tackling-climate-change/energy-supply

[16] EU: 2030 framework for climate and energy policies. http://ec.europa.eu/clima/policies/2030/index_en.htm

[17] For practical reasons we propose that transport energy is excluded from targets for local generation, even though this constitutes about half of our energy use. Transport does need to be addressed but technically it requires work at a national level. However there is a strong "justice" argument that the targets we set should be doubled in order to cover transport.

[18] Total annual energy consumption for WD excluding road transport is given by DECC figures as 3549GWh less 1814GWh road transport = 1735GWh (from https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2010). Of this, 780GWh is gas and 650GWh is electricity.)

[19] Energy efficiency measures may reduce overall demand over time, making targets more accessible. However these targets are a bare minimum and such gains are hard to predict so no adjustment has been made.

[20] If we include transport energy the targets are doubled. Thus we cannot just rely on other regions to provide renewable power: the challenge is too big. Each region must play its part.

energy use 2013					current technology)
100%	1.8%	15%	25%	30%	85%
1735 GWh	32GWh	260 GWh	434 GWh	520 GWh	1500 GWh

The future energy use figures have not been adjusted for future reductions due to energy efficiency because there is not yet sufficient evidence that overall reductions are taking place, and any excess renewable generation is needed to help offset transport emissions.

The most challenging target is for 2020. Current infrastructure and planning decisions will determine whether or not this can be achieved. Some key structural elements have already slipped away: for instance the significant opportunities for integrating renewables and district heat at Barton Farm and at Pitt Manor. With every missed opportunity the task gets harder.

How to meet the targets

Having determined the overall targets, we need to determine how we will achieve them and to demonstrate that the plan is workable. What mix(es) of renewable sources, appropriate to the geography of the district and to Hampshire, will enable these targets to be met?

At present we import nearly all our energy from other parts of the UK and from abroad. There is almost no local generation. Winchester District should generate more electricity and heat locally because:

- Local, renewable generation creates local jobs and value and recycles the money in the local economy.
- the supply is more resilient
- more effective use can be made of the energy sources
- most installations will bring direct financial contributions to local communities and to the local authorities
- it is fairer that we all share locally the benefits and down-sides of energy, just as we dispose locally of our own waste, foul water and sewage.

If we are to generate a fair share of our energy locally and reap the benefits, then towns, villages and residents need to choose what sort of generation they would prefer in their area. The plan below shows how the targets can be achieved through a mixture of wind farms, solar farms, roof-top solar, anaerobic digestion, intelligent waste incineration, wood fuel and district heat schemes.

The target could be addressed in a number of ways and will require a portfolio of solutions. Below we show one practical mix, built from the bottom up, which approaches the recommended targets, and compare this to the technically feasible capacity for each technology[21]. Detailed build-up of these figures is provided in the appendix. Note that, unlike energy efficiencies, the lead time for implementing renewable generation schemes can be long. We must define the plan and start the process now.

Table 2: Summary of proposed targets for share of energy use by locally generated renewables to 2030

Renewable generation technology	**% Share from renewables 2013**	**Identified % renewables share 2020**	**Identified % renewables share 2025**	**Identified % renewables share 2030**	**Identified % technical potential**
Anaerobic Digestion	0	1.6	3.3	3.3	9.9
Landfill Gas	0	0.9	1.4	1.4	1.4
Biofuels	0	1.9	4.0	6.4	20.2
Solar PV	0.6	5.8	11.1	11.2	28.8
Solar thermal	0	0.1	0.3	0.3	1.3
Municipal Waste	1.2	1.2	2.5	3.7	4.0

[21] Based on the ESD's Renewable Energy Study for Winchester District Development Framework (Dec 2008) and other data.

Wind	0	2.4	3.7	3.7	18.7
Identified share %	**1.8%**	**14.1%**	**26.3%**	**30.2%**	**84.3%**
Target share %		**15%**	**25%**	**30%**	

A detailed build up of these figures is attached in the appendix.

For each renewable technology there is a different profile of constraints, requirements, timescales and performance. The important message is that the targets are practical, and that they are governed by choices rather than by capability. An underlying requirement is for access to appropriate sites for the facilities. Fortunately the local authorities have a large and diverse estate which can be helpful in addressing the more challenging earlier phases of the plan and in demonstrating a lead.

How to measure progress against the target

We want to measure achievement against the targets by using statistics readily available from Government, rather than collect our own statistics. Current Government statistics enable us to capture total relevant energy consumption by district but unfortunately data on renewable energy generation at district level is not yet available and has to be collated from various individual sources including FIT and RHI registers, renewables databases and planning records. A consistent process will be used to track this.

Notes and definitions

The target for 2020 was proposed to be 20% but this has had to be reduced to 15% because Winchester District starts from such a disproportionally low level: effectively zero.

When estimating the renewable energy available from a source, we use the realistic output delivered, not the installed capacity. We have used DECC's experience-based load factors for each generating technology. So, for example, in Hampshire a single 2 Megawatt peak wind turbine operates at 25% load factor and delivers on average 0.5 Megawatts of electricity, providing 4.4GWh of energy each year. A 5 Megawatt peak Solar Farm operates at 10% load factor, requires about 35 acres and also produces 4.4GWh of energy each year.

The identifiable annual renewable energy generation in the district in 2013 was 32GWh. This has been collated from various available DECC/Ofgem records and planning consents[22], since central government statistics do not yet provide data on renewables generation down to district level.

The local targets proposed here exclude transport energy even though this represents half of the energy use of the district.[23] They should therefore be seen as a minimum.

It is likely that the proportion of our energy delivered through electricity will increase as new technologies (heat pumps, electric vehicles, storage technologies etc) broaden the application of renewable power. This accentuates the need for efficient, low carbon generation of electricity. Fossil fuels will continue to be a part of the generating mix but should in future be consumed locally in such a way that the waste heat can also be recovered and used.

Large scale energy storage technologies will become available during this period. These increase the value and resilience of renewables (wind, solar) by converting more intermittent energy sources into firm capacity. In practice there are many reasons why any particular renewable project may not materialise. For this reason it is important that a project pipeline is developed for each technology of at least twice the expected requirement.

[22] Data collected from Ofgem Renewables and CHP Register (for FIT, ROC and Accredited (Renewables) Generating Stations) (https://www.renewablesandchp.ofgem.gov.uk/Default.aspx), Restats register of planning consents (https://restats.decc.gov.uk/cms/planning-database) and from local knowledge.

[23] Road transport would double the targets. In addition the DECC data on local energy use also does not capture air or marine transport, so these have not been able to be allocated (even though the district has high levels of purchase of imported "stuff" and enjoys a higher than average use of air travel).

Appendix: Proposed targets for share of energy use by locally generated renewables to 2030

Renewables targets calculations: Total energy less road transport					**Winchester District**			Prepared by Richard Ritchie											
Energy usage targets based on % of total energy less road transport				2013 Baseline (GWh) Operational renewables generation			2020 target profile 15% renewables (GWh)			2025 target profile 25% renewables (GWh)			2030 target profile 30% renewables (GWh)			2030 Technical potential from ESD and other reports			
				1735			260			434			521						
Renewable technology type	Typical Size per unit	Load factor	Typical Energy per unit per year MWh	Total Number	Energy (GWh pa)	(yy% of total energy)	Total Number	Energy (GWh pa)	(yy% of total energy)	Total Number	Energy (GWh pa)	(yy% of total energy)	Total Number	Energy (GWh pa)	(yy% of total energy)	Total Number	Energy (GWh pa)	(yy% of total energy)	
Anaerobic Digestion– 1MWe each at 63% giving 5GWh pa	1MWe	63%	5670	0	0.0	0	5	28.4	1.6%	10	56.7	3.3%	10	56.7	3.3%		172.0	9.9%	Typically 25,000 tonnes pa for 1MWe plant producing 5GWh pa. May also be CHP.
Landfill Gas	1.5MWe	60%	8100	0	0.0	0	2	16.2	0.9%	3	24.3	1.4%	3	24.3	1.4%	3	24.3	1.4%	
Biofuel for heating (wood) – Institution scale. Typical school: Primary 100MWh pa, Secondary 350MWh pa.	200kWp	10%	180	Data still being collected			120	21.6	1.2%	250	45.0	2.6%	350	63.0	3.6%		350.0	20.2%	Biofuel especially sustainable local wood has the biggest potential impact including on Jobs. ESD estimated a technical energy potential double this figure, based on inclusion of other wood reserves, straw and managed crops. FC estimates a sustainable Hampshire supply available from residual wood of at least 170,000 tonnes pa = 350GWh pa.
Biofuel used for district Heat with storage. Assume 3MWp each at higher load factor than domestic	3MWp	15%	4050	0	0.0	0	3	12.2	0.7%	6	24.3	1.4%	12	48.6	2.8%				
Hydro – 7kW each. Max 10 sites	7kW	30%	18.9	1	0.0	0.0%	5	0.1	0.0%	9	0.2	0.0%	9	0.2	0.0%	10	0.2	0.0%	
Solar farms – typically 10MWp each covering approx 70 acres	10MWp	10%	9000	1	5.4	0.3%	10	90.0	5.2%	20	180.0	10.4%	20	180.0	10.4%	50	450.0	25.9%	May be fewer and larger. Potential imited by available sites. 59MW more already under construction in 2014 on 3 sites: Funtley (10), Bishops Sutton (12), Southwick (37).
Solar large roofs e.g. industrial buildings, supermarkets, schools – typically 50kWp and 500m2	50kWp	10%	45	37	0.9	0.1%	100	4.5	0.3%	150	6.8	0.4%	200	9.0	0.5%	500	22.5	1.3%	FIT optimal at 50kWp. Potential limited by available sites.
Domestic PV – 3kWp typical	3kWp	10%	2.7	1275	4.2	0.2%	2000	5.4	0.3%	2000	5.4	0.3%	2000	5.4	0.3%	10000	27.0	1.6%	Total 48,285 homes in district
(Domestic) Solar Hot water	4m2		1.5	No data			1000	1.5	0.1%	3000	5.0	0.3%	4000	6.0	0.3%	15,000	22.5	1.3%	
MSW Waste to power – 8MWe each (Assume 50% renewables)	8MWe	30%	21600	1	21.6	1.2%	1	21.6	1.2%	2	43.2	2.5%	3	64.8	3.7%		70.0	4.0%	Technical capacity large but requires redesign of waste distribution and sorting, plus district heat and/or CHP. Technical potential probably much higher but politically intractible.
Large Wind– 4.5GWh pa from each turbine	2MWp	25%	4500	0	0.0	0	7	31.5	1.8%	7	31.5	1.8%	7	31.5	1.8%	72	324.0	18.7%	Technical potential limited by suitable sites. Potential shared between medium and large turbines. May of best sites fall in SD Nat Park, resulting in low projections.
Medium Wind– Approx 1GWh pa from each turbine.	500kWp	25%	1125	0	0.0	0	10	11.3	0.6%	30	33.8	1.9%	30	33.8	1.9%	300			
Other technologies: to be defined																			New forms of storage will increase value of solar and wind. Other technologies will become viable.
TOTAL of proposed target installations					**32**	**1.8%**		**244**	**14.1%**		**456**	**26.3%**		**523**	**30.2%**		**1462**	**84.3%**	
Target								**260**	**15.0%**		**434**	**25.0%**		**521**	**30.0%**				