Nottingham City Council

Energy Strategy 2010-2020

April 2010

Nottingham City Council

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1. Foreword by Councillors Graham Chapman and Katrina Bull

This Strategy and the associated Action Plan identifies the key technologies and programmes required to enable Nottingham to play its part in meeting the national and local targets on carbon reduction and low or zero carbon energy generation. The Strategy sets the headline targets and key strategic priorities; the Action Plan details how the City can meet these targets. Implementation of the Strategy will accelerate Nottingham's development as the UK's leading City in low carbon energy security.

It is clear that rising energy and carbon costs over the coming years will create significant risks and significant opportunities in Nottingham. As energy prices rise there will also be secondary impacts with regards to the cost of food, goods and services, inflation, and potentially local economic activity.

Conversely, there is also the potential to generate revenue, economic activity and jobs from investment in, and delivery of, sustainable energy generation, fuel supply, low carbon infrastructure, technology supply chains and energy services.

Significant and sustained investment will be required to achieve the Government's 2020 and 2050 carbon reduction targets and ensure the City's public services, households and economy are protected from the expected energy price inflation of the coming decade.

Investment will be required across all sectors and in all areas of energy use, generation and supply to ensure the necessary improvements in energy efficiency and use of renewables.

As well as increasing energy efficiency and energy generation through the use of technology, we also need positive, practical community wide behaviour change and educational initiatives. We need to support community initiatives wherever possible.

In addressing energy supply and consumption issues, the City will reduce carbon emissions and the impact of fuel poverty. The City has the opportunity to create an energy environment that protects key services, the economy and households from the impacts of declining energy security, rising costs and some inevitable climate change, while meeting carbon reduction targets.

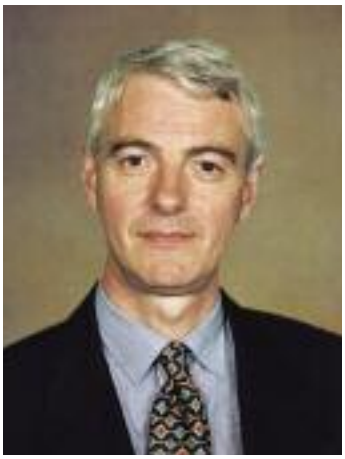
Through adopting a robust Energy Strategy that follows the national Low Carbon Transition Strategy, Nottingham will provide a stable, low carbon energy environment and an attractive place in which to live and do business even in challenging times.

The Strategy also underpins the City's developing profile to attract and support businesses in the emerging low carbon sector with a focus on low carbon building and construction.

For more than a 100 years social and economic development has been set against a background of cheap energy, underpinned by abundant crude oil and natural gas; this is not the world in which we will be operating in future years. Nottingham recognises the major challenge ahead. The aim of the Energy Strategy is to ensure sustained investment of time and money into energy saving and generation measures, to avoid major repercussions for households, businesses and services.

"The challenge is not the technical feasibility of a low-carbon economy but making it happen. Ensuring action will require strong leadership from government and a concerted response from individuals and businesses"[1].

Nottingham as a City is starting the low carbon transition from a leading position. If any city in the UK can meet its part of the Government's national targets, it is Nottingham, but there is still a very long way to go. **Nottingham is however exceptionally well placed to remain the UK's most energy self-sufficient city.**



Cllr Graham Chapman

Cllr Katrina Bull

[1] CCC, 2009. Available at: http://www.theccc.org.uk/

2. Executive Summary

This Strategy provides an overarching framework for the City's plans, programmes and initiatives relating to sustainable energy supply and use to 2020: cutting emissions, maintaining energy security, maximising economic opportunities, and protecting the most vulnerable. The Strategy and the associated action plan will ensure that Nottingham accelerates the development, use and value of its energy resource and energy efficiency potential.

The Strategy responds to a number of key drivers; climate change, peak oil and energy security. These drivers are recognised locally and nationally through policies and challenging targets that need to be delivered within given timescales.

Targets

The Action Plan prioritises the delivery of:

- **A 26% reduction of carbon dioxide emissions against 2005 levels,**
- **20% of the City's own energy generated from low or zero carbon sources**

by the target date of 2020, as set out in the local **Sustainable Community Strategy**[2].

At a national level the Government's Low Carbon Transition Plan[3] and Renewable Energy Strategy[4] in particular provide very challenging targets. The Strategy details how we will meet our proportional 'pro rata per capita' contribution to the national Renewable Energy Strategy targets, which is estimated in the City at:

- **2% (37GWh) generation from small scale sources**
- **12% (342.7GWh) generation from renewable heat sources**

Nottingham's Current Status

Nottingham is starting the low carbon transition from the front, with a considerable lead. Between 2003 and 2006 the City reduced domestic gas consumption by 16%; the greatest fall of all Local Authorities in the East Midlands and of all the Core Cities.

In 2006 we generated 3% of our own heat and power from renewables and waste, making Nottingham the most energy self-sufficient City in the UK.

[2] City of Nottingham Sustainable Community Strategy 2020, Strategic Objective 2, 2020 Headline Targets (page 21). Available at: http://www.nottinghamcity.gov.uk/onenottingham/CHttpHandler.ashx?id=10663&p=0

[3] The UK Low Carbon Transition Plan (2009). Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[4] The UK Renewable Energy Strategy (2009). Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

We also generated 11.45% of our own heat and power from gas CHP (combined heat and power) and renewables. Nottingham is the leading City in the country in distributed energy generation. Generation of 11.45% of our own energy from low or zero carbon sources, against the 20% Sustainable Communities Strategy target is a remarkable achievement and a very strong starting point for the challenge ahead.

Key Actions

To meet the national and local targets for heat and power will be very challenging, even given Nottingham's leading position. This will require the development of all the City's major renewable and low carbon energy resources from large scale biomass to a rapid increase in the uptake of domestic renewable energy systems.

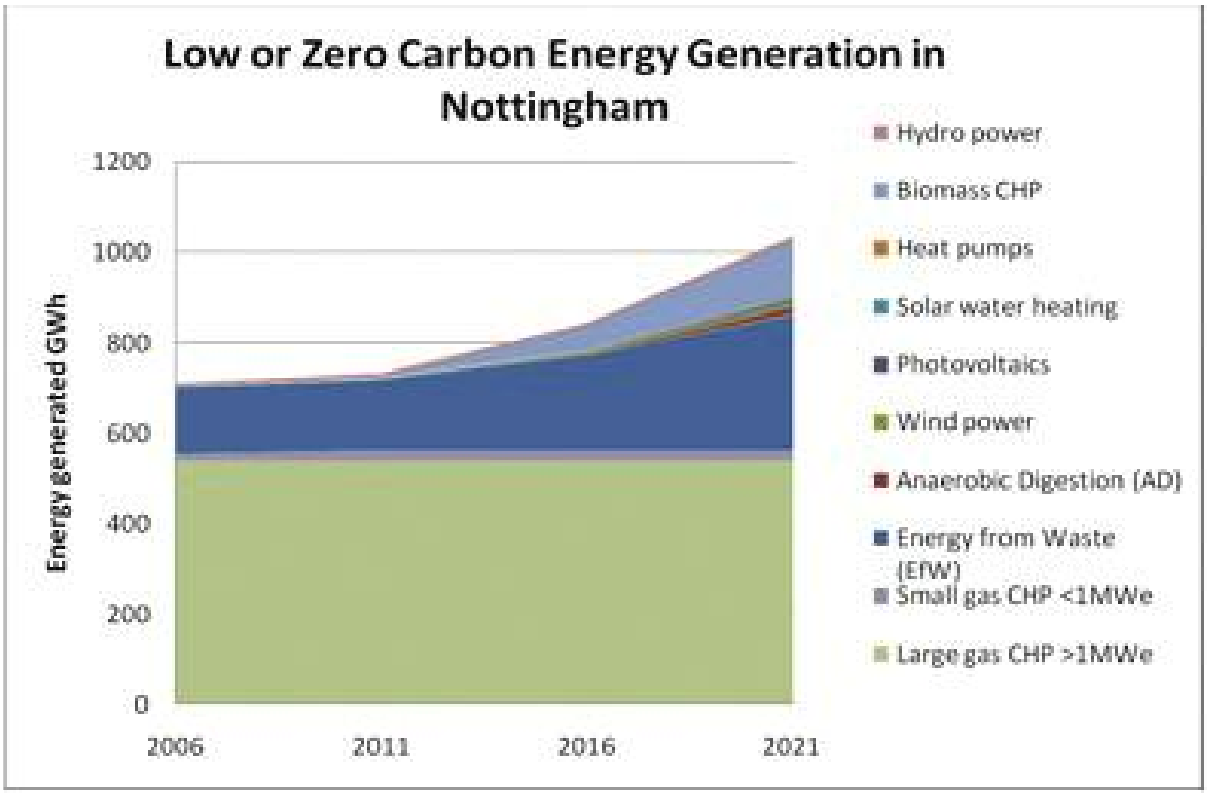


Figure 1: Total targets for energy generation from Low or Zero Carbon sources – including gas CHP

The Action Plan alongside in the Energy Strategy represents a detailed map to achieve our local and national 2020 targets. National targets for small scale electricity generation and renewable heat steer us towards biomass fuel and renewable electricity generation.

In particular, to meet national and local targets for heat and power will require;

- More than doubling the size of the City district heating network
- Development of a local biomass processing and transfer site
- Significant capacity of new biomass CHP plant with associated district heating
- Consideration of a City anaerobic digester.

Alongside energy generation, Nottingham will need to make a significant cut in energy demand to provide a 26% reduction in carbon emissions to 1,329k tonnes CO2 per annum by 2020 as stated in the Sustainable Communities Strategy, but also to enable the achievement of target energy generation (reduction in demand eases proportional generation targets).

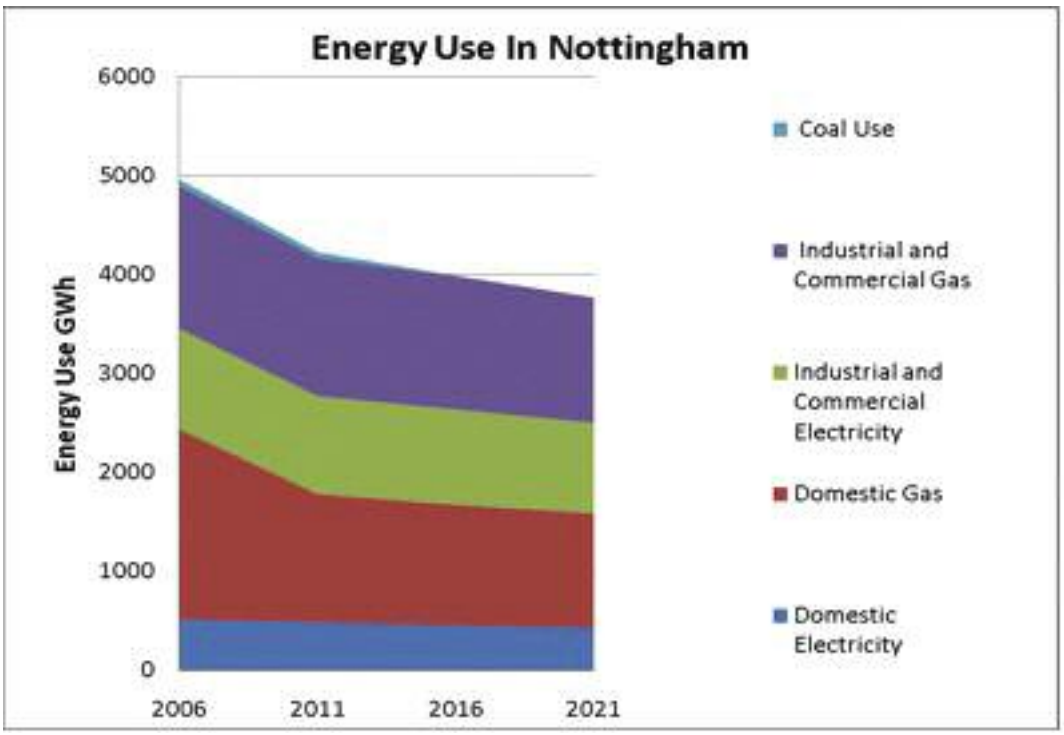


Figure 2: Targets for energy reduction by fuel source

The City Council will lead by example by targeting a 45% reduction in emissions by 2020. The majority of emission cuts will however come from the domestic sector; reducing energy consumption and reducing the impact of fuel price increases. The City will be able to achieve a 37.6% reduction in CO2 emissions from domestic energy efficiency by 2020. This will be achieved through the work of the City Council, Nottingham Energy Partnership and local housing associations working with householders and communities. A 23.4% reduction in CO2 emissions is expected from industrial and commercial sector energy efficiency by 2020.

Significant savings of around 20% also need to be made in transport emissions. A further saving of around 5% will be met from installing all the low or zero energy generation systems detailed in the Strategy. Over all these saving should provide a total reduction of 28.3% by 2020.

The Challenge

Funding for the major energy generation, supply chain and energy efficiency programmes will be the greatest challenge. This Strategy has identified the key strategic objective and numerical targets, the Action Plan details priorities for investment. These priority actions provide the best carbon, energy and financial returns and will provide a focus for development over the next 10 years.

3. Introduction

3.1. Purpose of the Sustainable Energy Strategy

National policy, strategy and targets on energy supply and low carbon transition have all advanced rapidly in the last 12 months[5]. There has been a step change in policies relating to carbon reduction and energy security. This has been underpinned by the interdependent issues of climate change, power supply security and peak oil. There is now a small window of opportunity to meet the parallel global challenges of avoiding dangerous climate change, preparing for peak oil and, against the national picture of potential power supply insecurity towards 2017, ensuring continuity of affordable energy supply in Nottingham.

Nottingham City Council is the only Local Authority in the UK to have adopted a motion recognising the need to respond to the forthcoming impact of Peak Oil[6]. The City is well placed to take fast decisive action at local authority level to protect citizens, whilst ensuring that we continue to reduce our carbon emissions.

The City Council has also recently adopted, though the Sustainable Communities Strategy, two challenging 2020 targets:

- 20% of energy used to be produced within the Greater Nottingham area from renewable or low/zero carbon sources[7];
- 26% reduction in CO2 emissions to 1,329k Tonnes CO2 per annum by 2020[8].

The Energy Strategy details how the City can meet these 2 targets.

Nottingham is also signed up to the European Covenant of Mayors[9] which requires the city to have a sustainable energy strategy and action plan by the end of 2009.

5 In July 2009, the Department for Energy and Climate Change (DECC) published the UK Low Carbon Transition Plan. This comprehensive plan sets out how the country will meet the cut in emissions set out in the 2009 Budget of 34% on 1990 levels by 2020. It aims to plot the UK's move onto a permanent low carbon footing and to maximise economic opportunities, growth and jobs along the way. Alongside this and on the same date, DECC published the national Renewable Energy Strategy which maps out how the Government will deliver the UK's target of getting 15% of all energy (electricity, heat and transport) from renewables by 2020, and the Department for Transport (DfT) published the Low Carbon Transport Plan which sets out how to reduce carbon emissions from domestic transport by up to 14% over the next decade. All of these key documents are available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

6 Nottingham City Council (NCC) (2008). Motion in the name of Councillor Bull – Forthcoming impact of Peak Oil. Internal minutes of the meeting of the Nottingham City Council, held at the Council House, Nottingham, on Monday 8th December 2008 at 3:15pm, pages 141-143.

7 City of Nottingham Sustainable Community Strategy 2020, Strategic Objective 2, 2020 Headline Targets (page 21). Available at: http://www.nottinghamcity.gov.uk/onenottingham/CHttpHandler.ashx?id=10663&p=0

8 City of Nottingham Sustainable Community Strategy 2020, Strategic Objective 1, 2020 Headline Targets (page 16). Available at: http://www.nottinghamcity.gov.uk/onenottingham/CHttpHandler.ashx?id=10663&p=0

9 The Covenant of Mayors is a commitment by EU signatory towns and cities to go beyond the objectives of EU energy policy in terms of reduction in CO2 emissions through enhanced energy efficiency and cleaner energy production and use. The city of Nottingham became a signatory to the Covenant when the City Council publicly adhered to it on 8th December 2008. Further information at: http://www.eumayors.eu/covenant_cities/city_341/index_en.htm

The timing of the Nottingham Sustainable Energy Strategy, Climate Change Strategy, Waste Strategy and Local Development Framework planning process enable us to respond quickly and effectively to the new national and international policies, setting Nottingham on the path to meeting, and potentially exceeding, its responsibilities and taking a national lead in many areas in relation to carbon and energy.

3.2. Nottingham's achievements

Nottingham is already leading the UK in a number of key energy areas, particularly through the work of the Nottingham Energy Partnership (NEP), EnviroEnergy[10] (the district heating operator) and the forward-thinking energy strategies of major local companies. From 2003-2007 domestic gas consumption in the city fell by 16%; the largest fall of any local authority in the East Midlands and of all the Core Cities. This puts Nottingham in the top 8% of local authorities in the UK for domestic energy efficiency.

Nottingham is by far the most energy self-sufficient city in the UK. The city is also the 8th most energy self-sufficient local authority.

In 2008, the UK as a whole generated 2.7% of non-transport energy from renewables and waste[11]. In 2006, Nottingham City provided almost 155 GWh, just under 3% of non-transport energy consumption, from renewables and waste; largely due to the 'Energy from Waste' plant incinerator at Eastcroft. A further 39.2 GWh of electricity was exported to the national grid from the Beeston weir hydro scheme and the City's gas CHP heat station at Enviroenergy. The second most energy self-sufficient city, Coventry, generated only 0.74% of its own non-transport energy from renewables and waste in 2006 (Coventry has a smaller 'Energy from Waste' plant).

[10] http://www.enviroenergy.co.uk/

[11] Figures taken from: http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

Nottingham City also hosts 38.3MWe of installed gas Combined Heat and Power (CHP) capacity across 4 large and 6 small sites. This represents 51% of the installed CHP capacity in the East Midlands.

In 2006 the City's gas CHP plants generated an estimated 191 GWh of power and 372 GWh of heat. This means that 11.45% of Nottingham's total energy consumption[12] and 14.3% of total electricity consumption was generated within the City in 2006. This energy generation was largely from the Alliance Boots complex, Imperial Tobacco, The Queens Medical Centre (QMC) and the City Enviroenergy heat station. The actual percentage could become even higher, as a considerable amount of power generated in the City is currently exported to the National Grid.

These figures are remarkable; they place Nottingham in a leading position in the UK and make the City a strong competitor with other leading European 'low energy' cities.

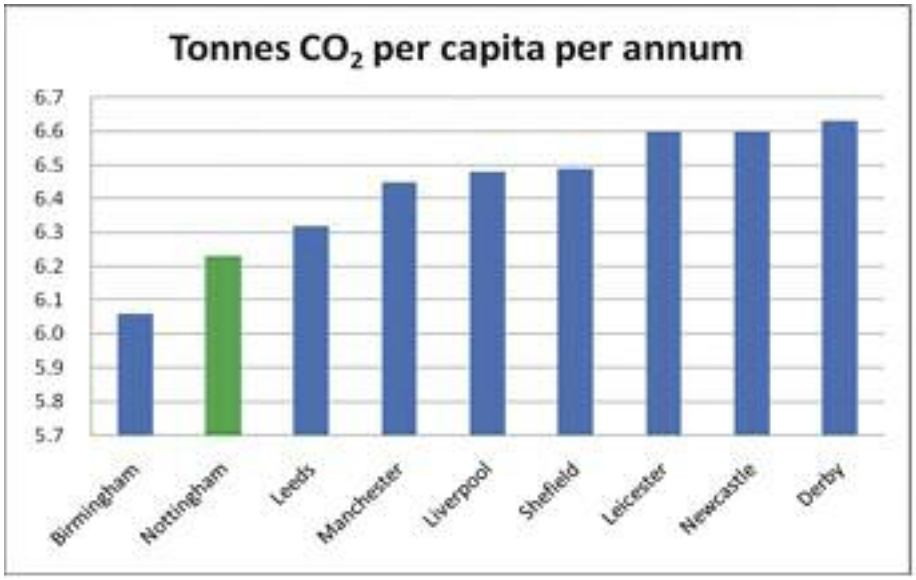
Our leading position is bolstered by the City district heating network; the largest and longest established heat network in the UK. And on top of that our high profile partnerships have enabled significant success in demand reduction, particularly in domestic energy, and are set to continue e.g. Nottingham Warm Zone, Community Energy Saving Programme.

Significant improvements in low carbon transport have also been achieved through implementation of the first two Greater Nottingham Transport Plans, overseen by the Greater Nottingham Transport Partnership. Modern bus fleets, together with the growing city tram network evidence Nottingham's commitment to low carbon transport.

The City Council also worked in partnership to develop the 'Nottingham Declaration on Climate Change'[13], putting the City's name firmly at the heart of the local authority Climate Change agenda.

[12] Total energy consumption includes domestic, industrial and commercial energy, and transport-related energy; this % reflects our progress as a city against the 20% Sustainable Communities Strategy target.
[13] Available at: http://www.energysavingtrust.org.uk/nottingham

Figure 3: The City of Nottingham's average annual CO2 emissions per capita (in green), represented against that of other cities (all emissions measured in tonnes of CO2). Source: Local and Regional CO2 Emissions Estimates for 2005-2007 06/11/2009 AEA technology.



3.3. National and local energy generation targets

The UK's energy policy aims to meet the challenge of reducing carbon emissions as well as providing a secure and safe supply of affordable energy. Renewable energy is seen as one of the key elements of the national strategy. In particular the national strategy will work towards decarbonising the energy supply, which will help to meet long term climate change targets. As part of the EU Climate and Energy package, the UK has committed to sourcing 15% of its energy (both heat and power) from renewable sources by 2020[14].

The target of sourcing 15% of energy from renewable sources nationally needs to take into account the changes to demand for energy. It is expected that even while the population grows, national energy consumption will decrease from 1695 TWh in 2008 to 1590 TWh by 2020, a total fall of 6.2% or a per capita fall of 13.7%[15]. Energy efficiency is therefore also an important part of the overall national, regional and Nottingham City energy policies.

Nationally the renewable energy targets could be achieved from different sectors. The Government has decided to take the following[16] as the lead scenario:

- 30% of electricity demand met by renewables (2% from small-scale sources and 28% from large scale renewables);
- 12% of heat demand from renewables;
- 10% of transport demand from renewables.

If the small scale power and heat targets are apportioned per capita (with a 2008 baseline population), by 2020 Nottingham will need to generate and supply locally around 37 GWh of electricity per annum from small scale renewable generation and 342.7 GWh of heat from renewables. Within Nottingham, already in 2006:

- 8 GWh of our electricity came from small scale sources, such as solar electric systems and the Beeston weir hydro scheme (i.e. 22% of our 'national' target)
- around 127 GWh of our annual heat demand was met by renewables and waste, through the district heating network (i.e. 37% of our 'national' target)

While totalling 56 GWh in 2006, electricity generated from the district heating CHP scheme from renewables and waste is not 'small scale'. Local small scale generation will need to expand rapidly to meet our part of the national 2020 targets.

Nottingham as a City is starting the low carbon transition from a leading position. If any city in the UK can meets its part of the Government's national targets, it is Nottingham, but there is still a very long way to go. **Nottingham is however exceptionally well placed to remain the UK's most energy self-sufficient city.**

[14] The UK Renewable Energy Strategy (2009). Page 10. Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[15] Population projections by the Office for National Statistics (ONS): http://www.statistics.gov.uk

[16] The UK Renewable Energy Strategy (2009). Page 8. Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

The Government has set a series of interim targets and carbon budgets from 2011 to 2018 to ensure the UK is on track to meet the overall 2020 target[17]. Regionally, there are 2011, 2016 and 2021 targets. The City Sustainable Energy Strategy also provides ambitious, practicable targets for each of the 5-year carbon periods to 2021 (set by the Committee on Climate Change, CCC[18], in respect of the national 80% CO2 reduction target and ratified in the 2009 budget up to 2020).

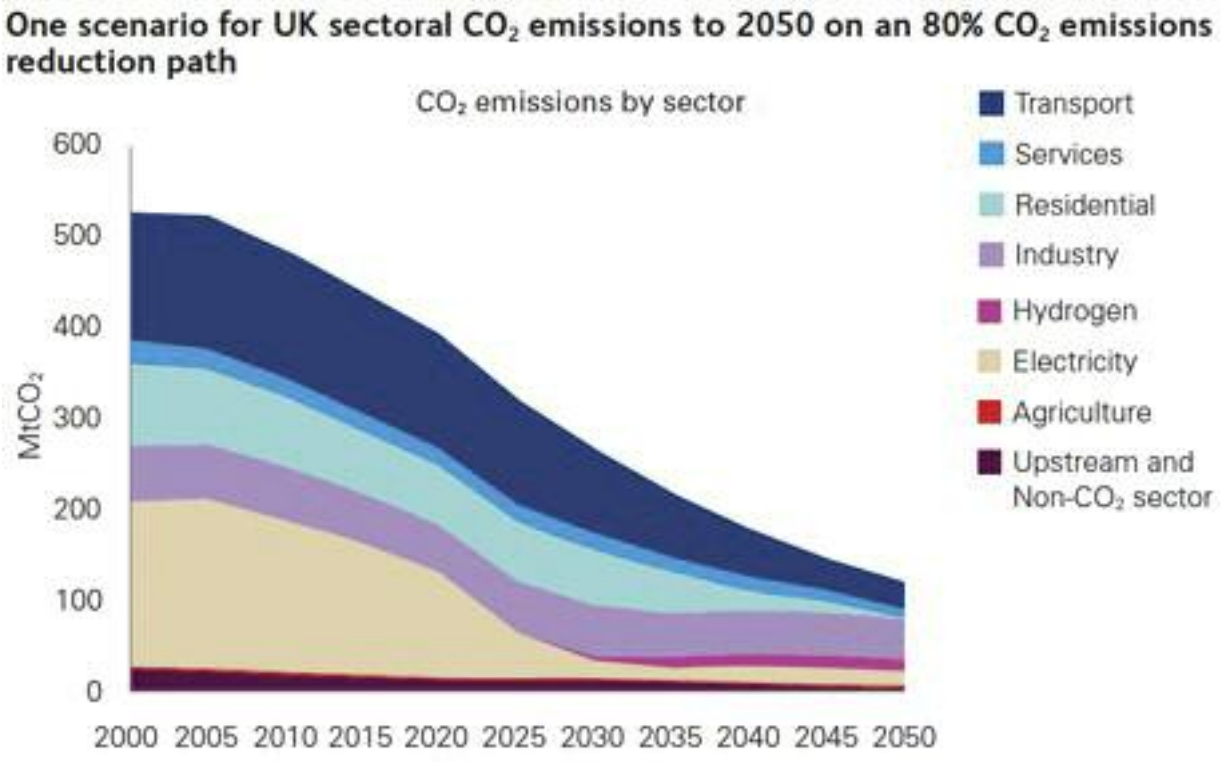


Figure 4: The Nottingham Sustainable Energy Strategy provides a blueprint for how we will realise and maximise the City's energy resources to 2020.

This City-wide Sustainable Energy Strategy will enable Nottingham to take and maintain a leading role in the UK in energy security and carbon reduction.

[17] The UK's Climate Change Act (CCA, 2008) creates a new approach to managing and responding to climate change in the UK. At the heart of the Act is a legally binding target to reduce the UK's greenhouse gas emissions to at least 80 % below 1990 levels by 2050, to be achieved through action at home and abroad. To drive progress towards this target, the Act introduces five year "carbon budgets", which define the emissions pathway to the 2050 target by limiting the total greenhouse gas emissions allowed in each five year period, beginning in 2008. Alongside Budget 2009, the Government announced that it agreed with the Committee on Climate Change (CCC)'s approach on carbon budgets and intended to set the levels of the budgets now for the period 2008-2022. These 'interim' budgets require a reduction in greenhouse gas emissions by at least 34% by 2020, relative to 1990 levels. The first three carbon budgets were designated as 2008-12, 2013-17, and 2018-22. Further details available at: http://www.hm-treasury.gov.uk/bud_bud09_carbon.htm

[18] The Committee on Climate Change (CCC) is an independent body established under the Climate Change Act (CCA, 2008) to advise the UK Government on setting carbon budgets, and to report to Parliament on the progress made in reducing greenhouse gas emissions. Further information at: http://www.theccc.org.uk/

3.4. Social and environmental effects of energy use

3.4.1. Peak oil and energy security

"Energy reserves are concentrated in some of the most unstable parts of the world. That's an issue of national security. There is no crisis but we can never be complacent. As we move out of recession, the global grab for energy will resume in earnest, consumption is predicted to rise, and with it, prices"[19].

"Complete energy independence is an unrealistic goal but there is much we can do to insulate ourselves from the risks, in large part by driving our climate policies even further, quicker. We must be far smarter with the energy we use and invest in home grown energy sources, such as new nuclear and renewables without delay[20]."

By 2025, the UK will be importing 57% of its oil up from 15% in 2010[21]. There has been no appreciable increase in global conventional crude oil output since 2005 despite increases in drilling rig activity (see Figure 5 and 6). The economic crisis over the last 12 months has also reduced global crude oil output and investment in new exploration. This issue has been recognised by Nottingham City Council in the December 2008 motion[22] acknowledging the forthcoming impact of Peak Oil.

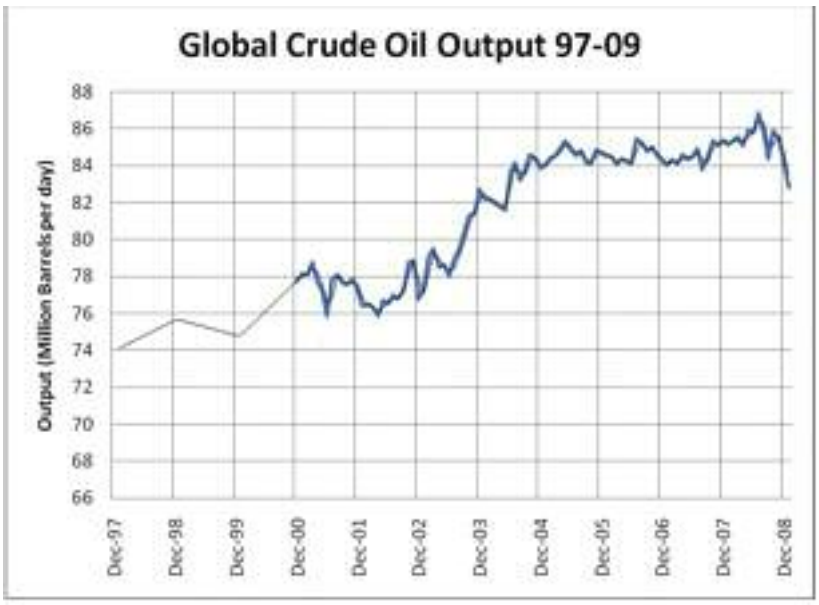


Figure 5: Global crude oil output between 1997 and 2009 (measured in million barrels per day).
Source: EIA, 2009.

[19] DECC (2009). Energy Security: A national challenge in a changing world. Report by Malcolm Wicks MP. Available at: www.decc.gov.uk/en/content/cms/what_we_do/change_energy/int_energy/security/security.aspx
[20] DECC (2009). Energy Security […] Available at: www.decc.gov.uk/en/content/cms/what_we_do/change_energy/int_energy/security/security.aspx
[21] Analytical Annex, Table 19, UK Low Carbon Transition Plan (2009). Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx
[22] Nottingham City Council (NCC) (2008). Motion in the name of Councillor Bull – Forthcoming impact of Peak Oil. Internal minutes of the meeting of the Nottingham City Council, held at the Council House, Nottingham, on Monday 8th December 2008 at 3:15pm, pages 141-143.

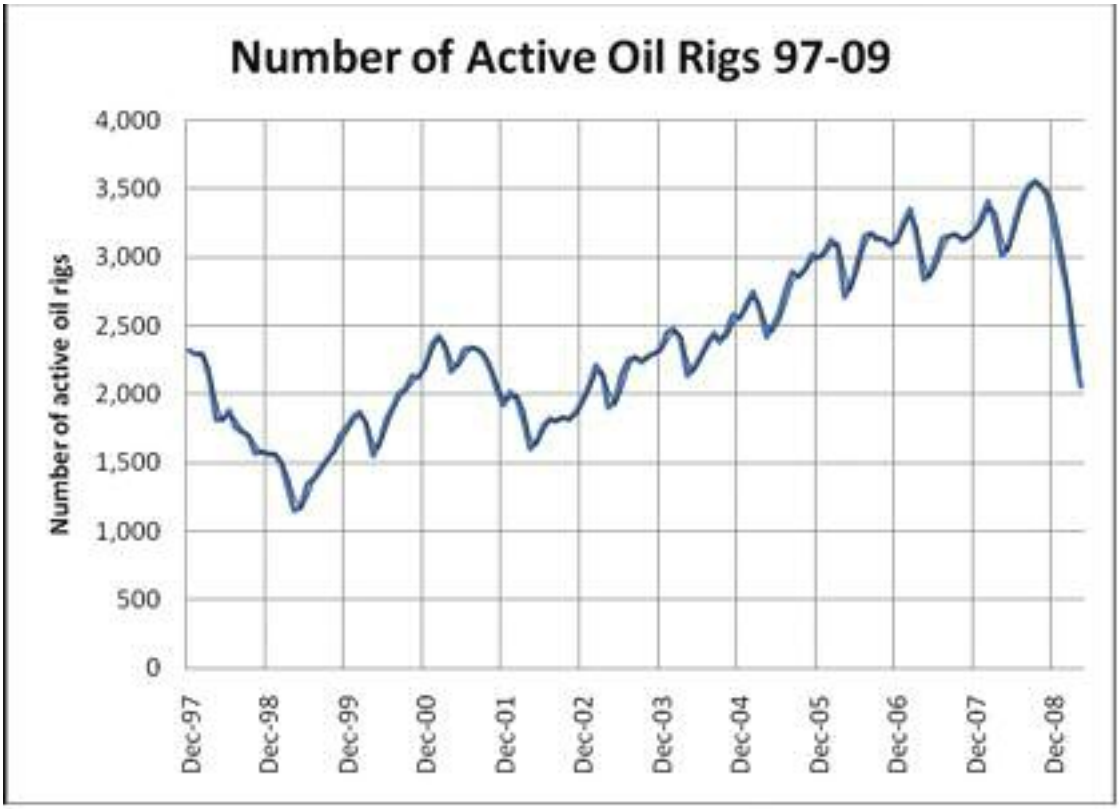


Figure 6: Number of active oil rigs worldwide between 1997 and 2009. Source: EIA, 2009.

The International Energy Agency (IEA) now believe that we will pass geological peak oil for conventional crude oil within 10 years, then all oil, including non conventional sources, within 20 years. The IEA also predict a supply crunch due to industry underinvestment in 5 years with tightening demand and supply pressures pushing up prices from as soon as 2010. It can also be seen from Figure 5[23] that we may already have reached the peak of conventional oil output, given that the amount of crude oil available worldwide has not increased since 2005, despite demand and exploration growth.

Actual global crude oil output is limited by political and economic factors well before geological peak oil is reached. Many credible sources including several governments, independent expert bodies and major oil companies believe we will reach peak oil well in advance of IEA projections. We will see the economic impacts of falling global crude oil supply well before 2020; in reality, with an oil price spike of $147 in 2008, we are already experiencing them.

Spikes in the price of crude oil (see Fig.7), followed by those in energy, food and inflation as experienced in 2008, will become more frequent and more severe, as global oil supply falls and competition for energy resources increases. The IEA has pointed out that any recovery of the global economy will inevitably lead to a recovery in oil demand and consequential steep energy commodity price rises.

As reflected in the Nottingham City Council's Peak Oil motion[24], these impacts will clearly have significant effects on the residents and the economy of Nottingham.

[23] Data from the US Energy Information Administration (EIA): http://www.eia.doe.gov/

[24] Nottingham City Council (NCC) (2008). Motion in the name of Councillor Bull – Forthcoming impact of Peak Oil. Internal minutes of the meeting of the Nottingham City Council, held at the Council House, Nottingham, on Monday 8th December 2008 at 3:15pm, pages 141-143.

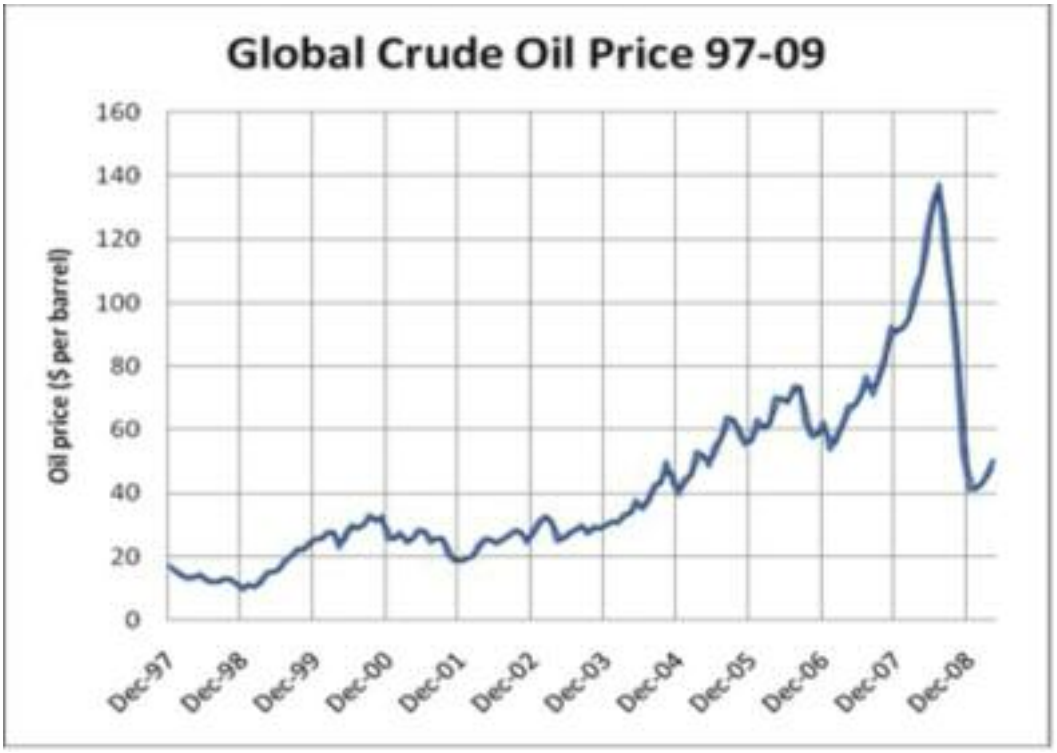


Figure 7: Global crude oil price between 1997 and 2009 (measured in $ per barrel). Source: EIA, 2009.

In the UK, over the coming 15 years, we also face a far heavier reliance on imported gas by 2020. Varying estimates suggest that the UK will be importing 45-80% of its gas[25] up from 31% in 2010. Gas prices and supply security in Europe have proved volatile in recent years with increased friction with Russia, Europe's largest single gas supplier. While the UK has recently increased pipeline connections to access Norwegian gas and has developed new supply agreements and infrastructure to import liquefied natural gas, we will still feel the sting of a cold wind blowing from Russia, if Eastern European gas supply is again restricted.

Peak oil and security of fossil fuel supply represent an urgent cross cutting risk, with social and economic impacts from rising commodity prices, including inflation and potential further economic stagnation. A stable economic environment is essential in the City, while we make the transition to a low carbon economy. This can only be achieved through intense work on energy efficiency, generation and low carbon sector growth.

In terms of security of energy supply, the UK is also facing a potential electricity generation gap, as a significant proportion of the UK's electricity generating capacity needs to be replaced over the next 10 years. This is identified in the supporting documents to the Government Low Carbon Transition Plan[26]. Under EU legislation[27] around one-third of the UK's coal and oil fired power generating capacity will need to be decommissioned by 2020. Several nuclear power stations are also due for decommissioning in the same timeframe.

The intention is to fill this gap by increasing the UK's gas powered generation in the short term and lifting renewable energy capacity from a current 5.5% to 28% over the next 10 years, largely from wind power.

[25] DECC (2009). Energy Security […] Available at: www.decc.gov.uk/en/content/cms/what_we_do/change_energy/int_energy/security/security.aspx
[26] Implementation of the EU 2020 Renewables Target in the UK Electricity Sector. RO Reform, June 2009. Available at: http://www.berr.gov.uk/files/file46778.pdf)
[27] EU Large Combustion Plants Directive (LCPD) (LCPD 2001/80/EC). Available at: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2001/l_309/l_30920011127en00010021.pdf

This intensive investment required to increase the UK's renewable capacity almost five-fold over a 10-year period gives rise to concerns over spare capacity. By 2017 we can expect only 5-10% spare capacity, as opposed to 15% today. Unexpected power station shutdowns could have a more serious impact on the UK grid power supply. If the country cannot build wind capacity at the rates proposed, and the intended plant closures go ahead, then Nottingham, along with the rest of the country would need to plan for a far less reliable power supply from the UK grid.

Nottingham is already the UK's most energy secure City, due to the large district heat and private wire network. Given the uncertain future energy security background, we intend to build on our leading position by increasing the use of private wire power supply, backup generation and distributed power in the City of Nottingham, as a key strategic aim. Private wire power supply should be focussed on supporting key infrastructure and public sector buildings, while homes and businesses will be actively supported to invest in renewable energy technologies, energy efficiency and increasingly be offered connection to the City's district heating network.

3.4.2. Fuel poverty and energy costs

"The era of cheap energy is over"[28]. With peak oil and a heavier reliance on gas powered generation, we can expect further retail energy cost rises over the coming years, above those expected through the need to deliver the UK's low carbon transition. This will impact all fuel types including petrol, diesel, gas, electricity, oil, liquid petroleum gas (LPG) and even wood fuel costs as demand rises for alternatives.

Higher energy prices have had a universal impact but have been particularly severe on low income households in 'hard to heat' homes. These households spend a disproportionate amount of their income on fuel, and are said to be in 'fuel poverty' – a fuel poor household needs to spend more than 10% of its income on fuel in order to heat the home to an adequate standard.

The Governments Fuel Poverty Strategy set a target to eradicate fuel poverty by 2016. The unprecedented increase in the price of energy has put this target in doubt.

The latest '**Annual Report on Fuel Poverty Statistics**' (DECC Oct 2009) includes the following;

* Since the fuel poverty low of 2004, domestic energy prices have risen by 80% between 2004 and 2008, driving the trend in fuel poverty in recent years.
* Projections for England indicate a likely upper bound of around 4.6m households in 2009, up from 2.4m in 2006.

These figures represent a 90% increase in fuel poverty in 3 years, with a 21% fuel poverty rate for England.

[28] John Hutton, Business Secretary - Sept 08

Energy prices have now stabilised. The next price increases will be in response to Government policy and economic recovery. The Government estimates that, taken in isolation (i.e. before the impact of scarcity, competition and energy efficiency measures), the investment outlined in the national Renewable Energy Strategy will increase household electricity costs by 15% and gas costs by 23% by 2020[29]. Non-domestic bills could rise by up to 21%[30].

However, Ofgem's review of Britain's energy markets, Project Discovery[31] takes market factors into account and models 4 different scenarios, of which their worst case scenario admits the possibility of the average annual bill rising from £1,247 in 2009 to £1,995 in 2016, a further 60% increase in domestic fuel bills. The other scenarios point to a more modest 14% to 25% increase above the level of inflation by 2020.

Whichever model proves to be right we cannot escape rising energy cost. We can however minimise the impact through targeted energy efficiency measures and local generation.

The Government response to rising energy prices and fuel poverty is the extension of existing energy efficiency programmes and funding of new schemes.

The major existing schemes (CERT – Carbon Emissions Reduction Target - and Warm Front) are targeted to the basic measures of cavity wall and loft insulation, with heating repairs and improvements for the most vulnerable. The basic measures will be completed by 2015.

A major problem remains with existing solid wall properties as identified in the Government's Household Energy Management Strategy. This strategy outlines the need to insulate 7 million homes by 2020 with expensive solid wall insulation (i.e. more than 10 times the cost of cavity wall insulation). There has been much discussion on how to identify methods of funding for much more costly measures including for microgeneration.

Nottingham has maximised national funding opportunities for domestic energy efficiency work through the development of local programmes, and we will continue to develop funded programmes wherever possible:

- The Greater Nottingham Healthy Housing Service has concentrated on the fuel poor over the last 10 years,
- Nottingham Warm Zone offers the best prices in the East Midlands for insulation,
- Other projects under consideration include a major solid wall insulation programme and a pilot to test methods of financing renewables and insulation in the private sector.

[29] The UK Renewable Energy Strategy (2009). Page 19, Section 5.2. Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx
[30] The UK Renewable Energy Strategy (2009). Page 184, Section 7. Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx
[31] Available at: http://www.ofgem.gov.uk/markets/whlmkts/discovery/Documents1/Discovery_Scenarios_ConDoc_FINAL.pdf

Rising energy prices impact on all sectors. The importance of energy issues in relation to Nottingham's public buildings in particular, as essential social infrastructure, should not be underestimated. Not all communities will be well equipped financially or socially to adapt to climatic and energy cost changes, however it is essential that key public services are not also eroded by rising costs, at times when they may be needed most.

As well as offering energy saving measures to every household in Nottingham, the City Council will show leadership in demonstrating carbon reduction, energy self-reliance and sustainability within its own buildings and operations.

3.4.3. Climate change mitigation

Climate change mitigation refers to actions that reduce our contribution to the causes of climate change. This means reducing our emissions of greenhouse gases (GHGs), such as carbon dioxide (CO2), through energy efficiency and using alternative forms of transport and energy[32].

It is now widely accepted amongst the scientific community that if the world continues emitting greenhouse gases due to human activity at today's levels, then average global temperatures could rise by 4°C by as early as 2060 and up to 6°C by the end of this century[33]. Alongside frequent and unpredictable extreme weather events, these temperature rises will bring severe and permanent changes to regional climates with impacts on global economies and socio-political instability; resulting in growing conflicts, public health related deaths and migration of peoples. It is important to note that early action could prevent some of the worst excesses of climate change.

To avoid the most dangerous impacts of climate change, **average global temperatures must rise by no more than 2°C , and that means that global emissions must start falling before 2020 and then fall to at least 50% below 1990 levels by 2050.**

In recognition of the above, the UK has committed to cut its own greenhouse gas emissions by 34% from 1990 levels by 2020[35], and potentially by 42% if other countries play their part at the global climate negotiations. The UK will make an above average contribution within the EU,

[32] http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=73&Itemid=186

[33] United Nations Environment Programme (UNEP) (2009). Climate Change Science Compendium. Available at: http://www.unep.org/compendium2009/

[34] At the G8 summit held in L'Aquila, Italy, in July 2009, world leaders agreed that the increase in global average temperatures should not exceed 2 degrees Celsius over pre-industrial levels by 2020. http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=593&ArticleID=6245&l=en

[35] Climate Change Act, 2008.

reflecting our relatively high income and by 2050 cut CO2 emissions by 80%. This commitment has resulted in the Government setting detailed carbon budgets nationally and, effectively, for large organisations, through the Climate Change Act[36].

The City of Nottingham will have to play its part in achieving these challenging cuts, to be fed directly into the national picture. Action to reduce CO2 emissions at local level will also help to reduce fossil fuel reliance and enhance energy security, create new economic opportunities and bring wider environmental benefits.

The direct and indirect dangers of climate change cannot be overestimated[37]. The window of opportunity to take effective action to avoid catastrophic climate change is rapidly closing. The consequences of inaction will endanger the livelihoods of current generations, and condemn generations to come to an uncertain future of widespread human adversity, ecological disasters and political, social and economic instability.

3.4.4. Climate change adaptation

Despite efforts to avoid dangerous climate change, the levels of greenhouse gases in the atmosphere are already sufficient to guarantee some level of climate change. Indeed we are already locked into around 40 years of unavoidable change[38].

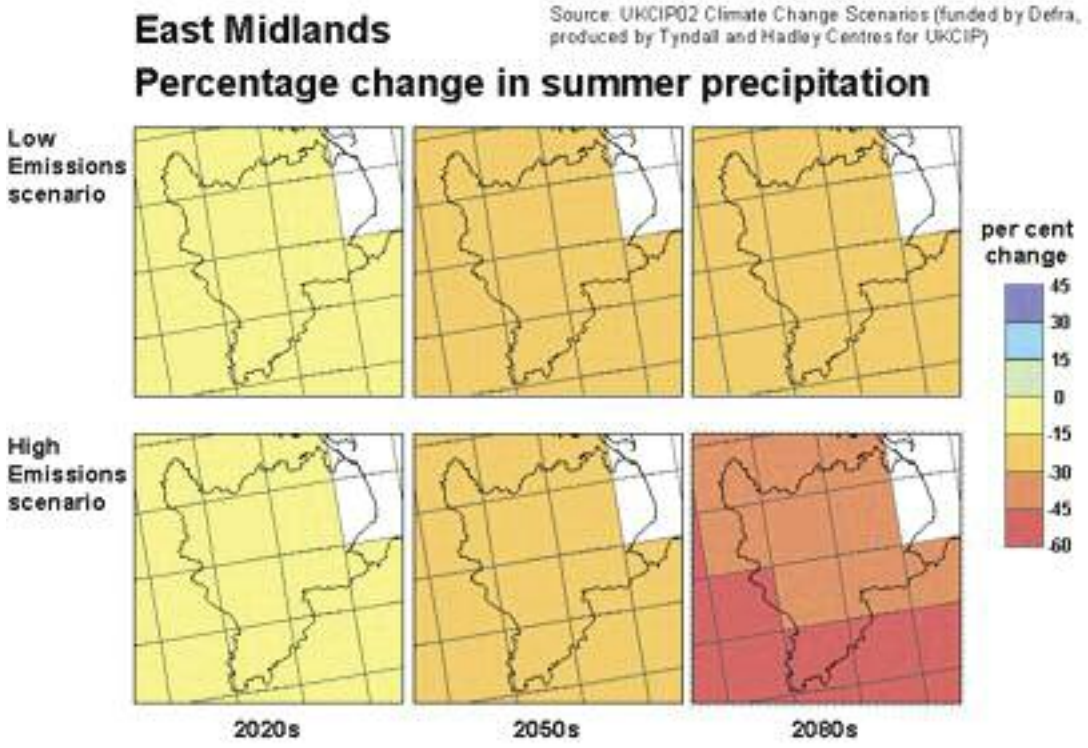
The UK Climate Impacts Change Programme (UKCIP)[39] has predicted that the East Midlands will continue to get warmer, wetter and windier, with more storms and flooding in the winter and more droughts in the summer. This could have some very severe consequences for the city of Nottingham e.g. increased temperatures, evaporation and changing rainfall patterns would mean less water available from the River Trent and Derwent valley reservoir system, exacerbated by an increased likelihood of summer droughts and higher water demand for irrigation.

[36] Further details available at: http://www.hm-treasury.gov.uk/bud_bud09_carbon.htm

[37] In 2006, the Stern Review concluded that the costs of uncontrolled climate change could be in the range of 5% to 20% of global gross domestic product (GDP) per year, averaged over time.

[38] United Nations Environment Programme (UNEP) (2009). Climate Change Science Compendium. Available at: http://www.unep.org/compendium2009/

[39] http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=353&Itemid=408


East Midlands
Source: UKCIP02 Climate Change Scenarios (funded by Defra, produced by Tyndall and Hadley Centres for UKCIP)
Percentage change in summer precipitation
Low Emissions scenario
High Emissions scenario
per cent change
45
30
15
0
-15
-30
-45
-60
2020s
2050s
2080s

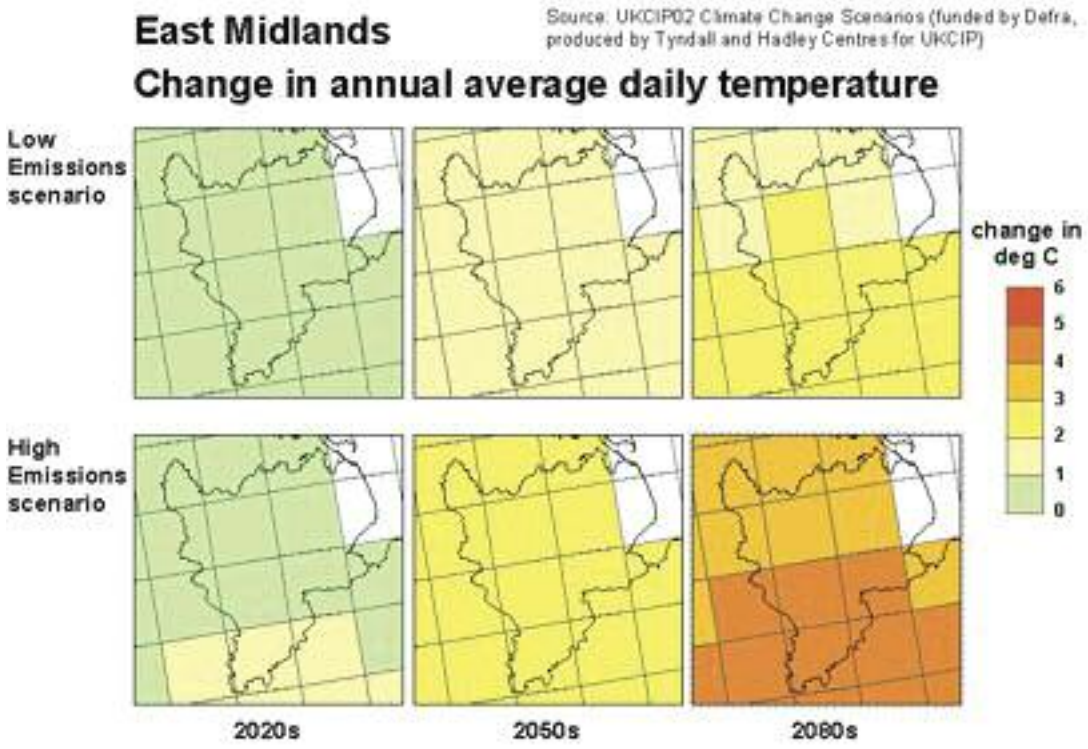

East Midlands
Source: UKCIP02 Climate Change Scenarios (funded by Defra, produced by Tyndall and Hadley Centres for UKCIP)
Change in annual average daily temperature
Low Emissions scenario
High Emissions scenario
change in deg C
6
5
4
3
2
1
0
2020s
2050s
2080s

Figure 9

The actions we take now, if sufficient, will ensure that towards the end of the next 40 years the climate may start to stabilise. However we will still have to adapt to cope with some level of change, which could potentially affect all systems that support our current lifestyle and on which we directly depend, such as water supply, agriculture and farming, manufacturing, industry, transport, health provision, tourism and recreation, etc.

In terms of delivery of a City-wide Energy Strategy, we need to consider if the actions proposed will work in a hotter, wetter, windier and all-in-all more unpredictable environment.

Buildings constructed now cannot be built to the average climate of the last 20 years; they must be built to the next 20 years' climate. This will, for example, require the capacity for comfort cooling to be considered in schools, health centres and offices.

Having to retrofit cooling later will increase energy consumption, running costs and carbon emissions in the City and would not be as efficient as having designed buildings and systems that would require minimum cooling from the start.

The above highlights the urgent need to place adaptation at the heart of the planning, design and building processes for new infrastructure, across all areas; from the national picture via the Building Regulations, to the regional and local levels via the planning and strategic regeneration frameworks, and through to the various capital investment programmes to deliver development.

4. Vision and aims for energy in Nottingham

4.1. Energy vision for Nottingham

To make sure Nottingham is a future-proof city, including:

- A city insulated against **high energy prices**.
- **Secure, low carbon energy supply and services** available for business, public and domestic sector.
- A city **prepared for climate change and peak oil**.
- A city **leading on growth in low carbon jobs, industries, services and training**.
- A city **exemplar of integrated low carbon heat, power and transport**.
- An **exemplar of neighbourhood community energy solutions**.
- A **smart city where energy flows are planned, mapped and monitored**.

These key energy ambitions will reinforce and help to deliver the long-term vision of the Nottingham Sustainable Community Strategy *(p.9, Nottingham's Long Term Vision, SCS, 2009)*.

"We will do this by being radical, bold and daring to be different".

4.2. Scope of the Strategy

Setting SMART[40] targets and identifying key strategic objectives, programmes and technologies to meet those targets across:

- Low or zero carbon energy generation;
- Domestic energy efficiency;
- Education and behaviour change;
- Business and public sector energy efficiency;
- Growth in energy and energy services sector economic activity and employment
- Transport energy.

4.3. Aims of the Strategy

Aim 1 – Reduce energy use in public sector infrastructure.
Aim 2 – Reduce energy use in domestic properties and tackle fuel poverty.
Aim 3 – Support increased energy efficiency in city businesses.
Aim 4 – Develop alternative energy sources, supply chains and services.
Aim 5 – Support low carbon transport infrastructure.
Aim 6 – Create local jobs and opportunities in energy sector businesses.
Aim 7 – Develop strong external & community partnerships.
Aim 8 – Support local community energy initiatives.

[40] SMART: Specific, Measureable, Attainable, Realistic and Timely.

4.4. Strategic objectives

There are a number of key strategic objectives that are essential to ensure the delivery of the aims of the Sustainable Energy Strategy:

1. The city's unique strength in energy self-sufficiency will be used to promote Nottingham in the UK and Europe as the first choice for location of sustainable energy related and green tech business, innovation and growth.

2. Major capital investments detailed within the Energy Strategy and its associated Action Plan to be assessed for delivery through innovative partnerships, including with Enviroenergy, the City's Energy Services Co (ESCO) and district heating provider. This will enable Enviroenergy to build a mixed portfolio of generation and income for continuous re-investment in energy efficiency and generation in Nottingham.

3. To develop the City's installed low or zero carbon energy generation and distribution capacity in line with the detailed targets in the Sustainable Energy Strategy.

4. To reduce local authority, domestic and 'industrial and commercial' energy consumption in Nottingham in line with the detailed targets.

5. NCC will work to ensure local planning policy, and local authority capital procurement supports the timely delivery of the Sustainable Energy Strategy, through developing and setting rigorous, evidenced, local targets for carbon and energy sustainability in new development.

6. To develop resource and maintain a prioritised Action Plan and delivery management structure including key partners and technical experts to deliver the Strategy, with an annual review cycle for the Action Plan and review cycles aligned with national carbon budgeting periods for the Strategy.

7. To set transport related carbon emissions reduction and technology targets in the forthcoming 3rd Local Transport Plan which are aligned with the Energy Strategy and aim to exceed the national Low Carbon Transition Plan targets by 2020. At this stage an indicative target of 20% reduction is recommended.

8. To work closely in partnership with business, universities and technology partners to ensure Nottingham accelerates the process and maximises the impact of demand led innovation in energy technology and management within the city

9. The City and partners will support the development of local and grass roots organisations seeking to enable their communities to reduce carbon footprints, energy bills and adapt to inevitable climate change and peak oil.

4.5. Achieving the aims and delivering the objectives

Table 1: Summary of the key targets for energy efficiency to 2020. Aims 1 to 4 and their associated targets focus on energy efficiency. A figure of 20% from transport reductions has been allowed for in relation to Aim 5. The statutory target will need to be committed to via the preparation and adoption of the 3rd Local Transport Plan.

Table 1: Summary of Nottingham Sustainable Energy Strategy's key targets 1-7 for energy efficiency, 2006 to 2020.

SES Target No.	Consumption Target	2006 (GWh)	Tonnes CO2	2011 (GWh)	Tonnes CO2	2016 (GWh)	Tonnes CO2	2021 (GWh)	Tonnes CO2 [41]
1	City Council Electricity	45.5	24,923	39.4	21,580	31.6	17,295	28.40	12,212
2	City Council Gas	112	23,078	101	20,798	76.5	15,767	68.9	14,189
3	Domestic Electricity	522.5	286,330	490	268,520	459.7	251,916	435.5	187,265
4	Domestic Gas	1,919.0	395,314	1,296.1	267,003	1,218.9	251,085	1,157.1	238,354
5	Non-domestic Elec. (inc. City Council) [42]	1,007.9	552,329	982.7	538,520	957.5	524,710	907.1	390,053
6	Non-domestic Gas (inc. City Council) [42]	1,447.4	298,164	1,399.6	288,318	1,351.8	278,471	1,269.3	261,476
7	Coal	57.53	18927.37	57.53	18927.37	0.00	0.00	0.00	0.00
	Oil	231	64,680	231	64,680	231	64,680	231	64,680
	Total	5,185	1,615,745	4,457	1,445,967	4,219	1,370,862	4,000	1,128,402
	% saving on 2006	0.0%	0.0%	14.0%	10.5%	18.6%	15.2%	22.9%	30.2%
	Nottingham City transport energy use	1,397.20	377,940	TBC	TBC	TBC	TBC	1,117.70	302,352
	% saving	0%	0%	TBC	TBC	TBC	TBC	20%	20%
	Grand Total	6,583	1,993,685	TBC	TBC	TBC	TBC	5,118	1,430,754

[41] Assumes electricity grid intensity has fallen to 0.43kg CO2e/kWh (the current grid marginal factor) with large scale roll out of renewables, nuclear and CCGT.

42 Nottingham City 'industrial and commercial' figures include 'Nottingham City Council'.

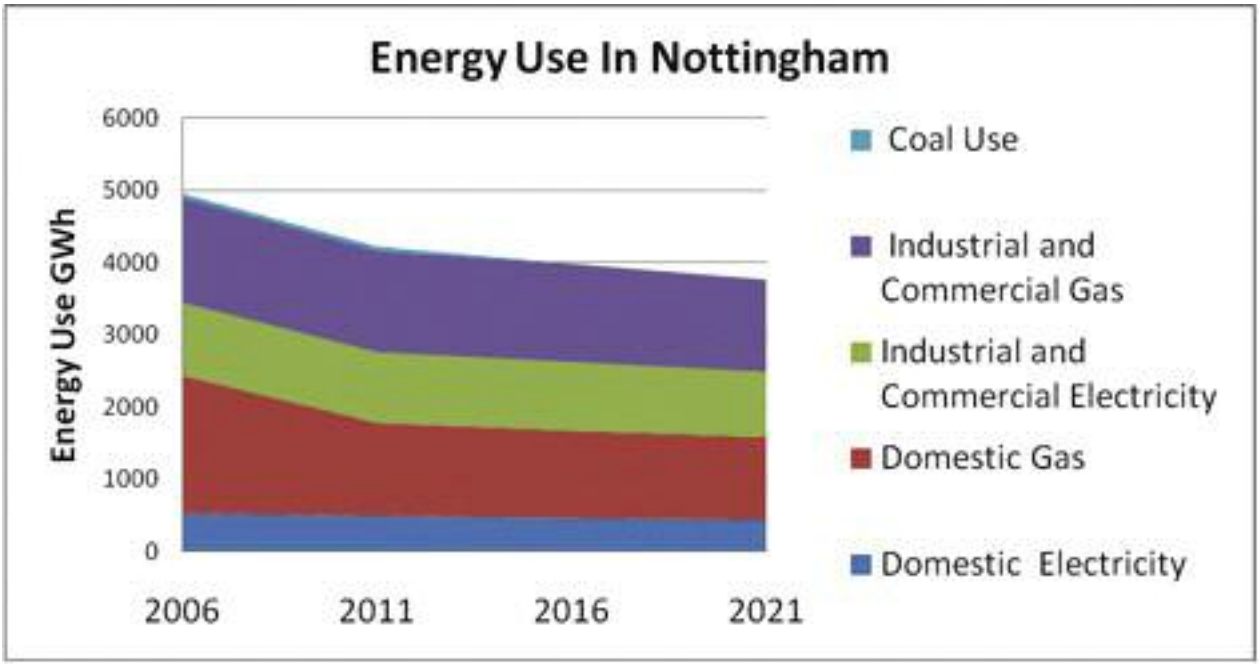


Figure 10: Targets for energy reduction by fuel source

Note

If the indicative 2020 20% reduction target for transport CO2 emissions in Aim 5 and the 30.2% target for CO2 emissions implied within targets 3, 4, 5, 6, 7 and 8 are delivered, the City will be able to reduce its emissions to 1,431Kt CO2 per annum, a 21% reduction on the Sustainable Communities Strategy 2005 baseline (1810Kt); the SCS target is a 26% saving on 2005 to 1,329Kt CO2 per annum by 2020.

Additional carbon savings of around 6.2% on the SCS 2005 baseline will be associated with increasing the amount of low carbon energy installed. This will enable the City to reach a 27% carbon saving against SCS 2005 baseline; this would represent a 33% saving against the 2006 energy strategy baseline. This is possible as not all city emissions sources were counted in the 2005 SCS baseline.

AIM 1: REDUCE ENERGY USE IN PUBLIC SECTOR INFRASTRUCTURE

Strategic Objective 4: To reduce local authority, domestic and 'industrial and commercial' energy consumption in Nottingham in line with the detailed targets.

With rising energy prices, a tighter public purse and a need to show strong community leadership in carbon reduction, it is essential that public sector buildings and services become lean, clean energy users.

National Government and the wider public sector are expected to lead the way in carbon reduction and energy saving. Targets have been set to reduce the carbon emissions from the whole Government's own estate by 30% by 2020[43].

Ensuring the security of affordable, reliable low carbon energy supplies for key public services such as health, fire, police and schools is essential.

Many local public services now fall under the Governments' mandatory Carbon Reduction Commitment (CRC)[44]. Nottingham City Council is a full participant in the CRC carbon trading mechanism and will have its performance shown on a league table annually.

[43] Sustainable Operations in the Government Estate (SOGI) targets. Available at: http://www.defra.gov.uk/sustainable/government/gov/estates/index.htm

[44] The CRC Energy Efficiency Scheme (formerly known as the Carbon Reduction Commitment) is the UK's mandatory climate change and energy saving scheme, due to start in April 2010. It is central to the UK's strategy for improving energy efficiency and reducing carbon dioxide (CO2) emissions, as set out in the Climate Change Act 2008. It has been designed to raise awareness in large organisations, especially at senior level, and encourage changes in behaviour and infrastructure. The scheme amended title serves to better reflect the CRC's focus on increasing energy efficiency, and is designed to tackle CO2 emissions not already covered by Climate Change Agreements and the EU Emissions Trading Scheme. The scheme will cover large public and private sector organisations, who are responsible for about 10% of the UK's emissions. This will affect around 20,000 organisations such as schools, large NHS trusts and local authorities.
Further information available at: http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/crc.aspx

The City Council also has a duty to report on national indicator 185 (NI185) which represents the local authority's own emissions[45].

➢ Target 1: Reduction in electricity use from City Council's own estate.

➢ Target 2: Reduction in gas use from City Council's own estate.

Both Targets 1 and 2 are reflected in the City Council's internal Local Authority Carbon Management Plan (LACM), and are summarised in the following table:

Table 2: NCC's electricity and gas consumption for 2006 and predicted/targeted for future years. Source: NCC.

Year	1. Nottingham City Council's Electricity consumption (GWh)	2. Nottingham City Council's Gas consumption (GWh)
2006	45.48	112.03
2011	39.38	100.96
2016	31.56	76.54
2021	28.40	68.88

[45] National Indicator NI 185: CO2 reduction from local authority operations: http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/loc_reg_dev/ni185_186/ni185_186.aspx

AIM 2: REDUCE ENERGY USE IN DOMESTIC PROPERTIES AND TACKLE FUEL POVERTY

Strategic Objective 4: To reduce local authority, domestic and 'industrial and commercial' energy consumption in Nottingham in line with the detailed targets.

Between 2003 and 2007 Nottingham's domestic gas consumption fell by 16%, one of the largest falls in domestic gas consumption of any local authority in the UK and the largest fall for a local authority in the in the East Midlands. Nottingham is currently in the top 8% of local authorities for domestic energy efficiency improvement.

Electricity use in the city fell by 3.48%, a little less than the UK average of 4.5%.

In 2006 domestic energy consumption represented 36% of Nottingham's total energy use.

In 2007 average energy use in the city's domestic properties was 16,488kWh gas and 4,119kWh electricity per annum. This is significantly lower than the national and regional averages[46]. This is due in part to the success of long running energy efficiency programmes such as those run by Nottingham City Homes and the Greater Nottingham Healthy Housing Service (GNHHS); the latter funded by City and County NHS and delivered by the Nottingham Energy Partnership.

The most cost effective way of saving energy and carbon is through physical energy efficiency measures supported by behaviour change and education.

➢ Target 3: Reduction in domestic electricity consumption by 2021.

➢ Target 4: Reduction in domestic gas consumption by 2021.

[46] 2007 national average of 17,530kWhs gas and 4,832kWhs electricity, and regional average of 17,823kWhs gas and 4,602kWhs electricity.

Savings from 2006 to the end of 2011 are based on the current and planned programmes being delivered in Nottingham by NEP, including the WarmZone, CESP[47] and GNHSS. Savings post-2011 are extrapolated from the supporting documents for the national Heat and Energy Saving Strategy consultation[48] (and using a per capita proportional allocation for savings of 0.47% based on 2008 City population versus UK 2008 population).

Table 3: Nottingham's domestic electricity and gas consumption for 2006 and predicted/targeted for future years. Source: NEP, 2009.

	3. Nottingham's domestic electricity consumption (GWh)	Average electricity consumption per household (MWh)	4. Nottingham's domestic gas consumption (GWh)	Average gas consumption per household (MWh)
2006	522.5	3.95	1,919	17.03
2011	490	3.82	1,296	10.12
2016	459.7	3.46	1,219	9.16
2021	435.5	3.16	1,157	8.38

These targets represent a 20% reduction in power consumption per household and a 51% reduction in gas consumption per household by 2020.

Reduced energy consumption will fall into 3 main areas within the action plan:

- Energy efficient new build
- Energy efficient retrofit
- Behaviour change

[47] On 11/09/08 the Prime Minister announced a package of initiatives designed to help people to reduce their fuel bills whilst also ensuring that the most vulnerable receive help this winter. One element of this package was the Community Energy Saving Programme. In early 2009, the Government publicly consulted on policy proposals for CESP, and then re-published on 10/07/09 its response to the consultation on 30/06/09. The scheme basically aims to deliver around £350m of energy efficiency packages in domestic properties across the whole of the UK.
The Community Energy Saving Programme (CESP). Relevant documents, including the Government's response to the consultation on CESP policy proposals and background to the programme, are available at:
http://www.decc.gov.uk/en/content/cms/consultations/open/cesp/cesp.aspx

[48] http://hes.decc.gov.uk/download?filename=hes-partial-ia-delivery-mechanisms-for-supplier-obligation-20090128.pdf pages 20-21.

AIM 3: SUPPORT INCREASED ENERGY EFFICIENCY IN CITY BUSINESSES

Strategic Objective 4: To reduce local authority, domestic and 'industrial and commercial' energy consumption in Nottingham in line with the detailed targets.

In 2006 industrial and commercial energy consumption represented 43% of Nottingham's total energy use.

The most cost effective way in which to save energy and carbon is through physical energy efficiency improvements backed up by behaviour change. The City has found it difficult to successfully engage with business and industry around energy efficiency. This is clearly evidenced by our below average performance in reducing industrial and commercial gas use and increasing electricity consumption in this sector.

Analysis of the DEFRA data on local authority area energy consumption[49] shows that in 2007 1,447GWh of gas, 27.9% less than in 2003, and 948.2GWh of electricity, 10.7% more than in 2003, were consumed by commercial and industrial activity in Nottingham city.

Between 2003 and 2007 commercial and industrial gas use per customer fell by 10.6%. This is less than the UK average fall of 12.7%. In the same period electricity use per customer increased by 9.8%; a little less than the UK wide increase of 11.2%.

- **Target 5: Reduction in industrial and commercial electricity consumption by 2021.**

- **Target 6: Reduction in industrial and commercial gas consumption by 2021.**

- **Target 7: Reduction in industrial and commercial coal consumption by 2021.**

[49] Available at http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx

Table 4: Nottingham's commercial and industrial electricity and gas consumption for 2006 and predicted/targeted for future years. *Source: UK Low Carbon Transition Plan, 2009*.

	5. Commercial and Industrial electricity use (GWhs)	6. Commercial and Industrial gas use (GWhs)	7. Commercial and Industrial coal use (GWhs)
2006	1007.9	1447.4	57GWh
2011	982.7	1399.6	57GWh
2016	957.5	1351.8	0
2021	907.1	1269.3	0

Gas and electricity targets are extrapolated from the Analytical Annex of the UK Low Carbon Transition Plan (pgs. 69-71), which implies reductions in non-domestic gas use in medium consumers of 6.6% by 2015, 12.3% by 2020 and reductions in non-domestic power consumption of 5% by 2015, 10% by 2020.

The coal target is dependent on fuel switching at the City Hospital energy centre which currently burns around 8000 tonnes of coal per annum; making up 1% of the City's carbon footprint.

AIM 4: DEVELOP ALTERNATIVE ENERGY SOURCES, SUPPLY CHAINS AND SERVICES

Nottingham is already the UK's most energy self-sufficient city, by a considerable margin. We generate 11.45% of the all the energy we consume within the city from low or zero carbon sources.

- 2.98% of the energy we consume is generated from renewables and waste.

- The city is also the 8th most energy self-sufficient local authority in the UK.

The city's leading position in the UK in local distributed power generation must be celebrated and will become central to Nottingham's future development.

Strategic Objective 1: The city's unique strength in energy self-sufficiency will be used to promote Nottingham in the UK and Europe as the first choice for location of sustainable energy related and green tech business, innovation and growth.

The Government has set out a commitment to deliver 15% of final energy consumption from renewables by 2020. The lead scenario for meeting this entails over 30% (117 TWh) of electricity being generated by renewables in 2020; 28% from large scale, mainly wind power and bio-energy, and 2% (7.8TWh) from small-scale generation. 12% of heat demand (72 TWh) will also need to be met from renewables.

If the national small-scale and heat targets are apportioned to the city per capita (Nottingham represents 0.47% of the UK 2008 population) by 2020 Nottingham will need to generate and supply around 37GWh of electricity per annum, from small-scale generation. By 2020 we will also need to generate and supply 342.7GWh of heat from renewables. Nottingham also has a challenging target through the local Sustainable Communities Strategy of '20% of energy used to be produced within the Greater Nottingham area from renewable or low/zero carbon sources'[50].

[50] City of Nottingham Sustainable Community Strategy 2020, Strategic Objective 2, 2020 Headline Targets (page 21). Available at: http://www.nottinghamcity.gov.uk/onenottingham/CHttpHandler.ashx?id=10663&p=0

Our large district heating network already supplies around 145GWh of heat locally, 127GWh of which comes from renewables and waste. Further expansion, along with a significant expansion of biomass heat and power and increasing use of solar water heating, will help us achieve our proportional obligations with regards to heat.

The City already supplies around 20GWh of electricity locally from the heat and power network. There is the capacity to potentially expand this to 60GWh currently and more with the development of the 3rd line at the Eastcroft incinerator. This system is however too large to qualify as a contributor to the national targets for small-scale electricity generation. Hence, these targets will need to be met through other smaller installations including wind, hydropower, photovoltaics and/or biomass combined heat and power (CHP) units as detailed below.

Strategic Objective 5: NCC will work to ensure local planning policy, and local authority capital procurement supports the timely delivery of the Sustainable Energy Strategy, through developing and setting rigorous, evidenced, local targets for carbon and energy sustainability in new development.

With the targets detailed above, the expected expansion of the incinerator and an increase in the energy available for use in district heating, we can expect Nottingham to maintain its leading position as the UK's most energy self-sufficient city over the coming years.

All of the City's top level targets are possible; however they will require the development of all of the City's renewable energy resources, a 73% increase in the size of our district heating scheme and the importing of a significant volume of biomass.

A summary for the technology targets is detailed in Table 5. While it is clear that the main priority for the city needs to be the expansion of the district heating network, Ernst and Young were commissioned to evaluate which of the other leading large scale opportunities should also be given priority, in terms of carbon savings and value for money.

From this work and NEP's recent 'Tree Station' study[51], it is clear that the development of the city's woody biomass resources and a significant growth in local biomass CHP plant are both essential to meeting the targets within the Energy Strategy.

Strategic Objective 2: Major capital investments detailed within the Energy Strategy and its action plan to be assessed for delivery through innovative partnerships, including with Enviroenergy, the City's ESCO and district heating provider. This will enable Enviroenergy to build a mixed portfolio of generation and income for continuous re-investment in energy efficiency and generation in Nottingham.

Strategic Objective 3: To develop the City's installed low or zero carbon energy generation and distribution capacity in line with the detailed targets in the Nottingham Sustainable Energy Strategy.

Strategic Objective 8: To work closely in partnership with business, universities and technology partners to ensure Nottingham accelerates the process and maximises the impact of demand led innovation in energy technology and management within the City.

[51] NEP (2009). Nottingham TreeStation: A Research report on the analysis of the energy potential, processing options and possible end use of waste woody biomass arising from the city of Nottingham. A report for Nottingham Energy Partnership (NEP), prepared by ReNU Ltd et al. Available at: http://www.nottenergy.com/renewable-energy/biomass

Table 5: Summary of energy technology targets. Note: all figures presented in GWh.

Technology	Heat produced			Small Scale Power (<10MWe)			Large Scale Power (>10MWe)		
Year	2011	2016	2021	2011	2016	2021	2011	2016	2021
Energy from Waste (EfW)	127	150	220	0	0	0	30	60	80
Anaerobic Digestion (AD)			9.72			6.23			
Wind power	0	0	0	0.63	3.7	9.8	0	0	0
Photovoltaics	0	0	0	0.29	1.17	4.61	0	0	0
Solar water heating	1.14	3.25	7.72	0	0	0	0	0	0
Heat pumps	0.5	2	4.5	0	0	0	0	0	0
Biomass CHP	3	45.4	100.7	0	0	0	0	8.6	19.1
Hydro power	0	0	0	7.8	7.8	11	0	0	0
Total Renewables	131.64	200.7	342.6	8.7	12.7	31.6	30.0	68.6	99.1
National target			72,000			7,800			
Apportioned local target @0.47%			342.7			37			
Large gas CHP >1MWe	356.35	356.35	356.35				182.7	182.7	182.7
Small gas CHP <1MWe	15.61	15.61	15.61	8.04	8.04	8.04			
Total Low or zero carbon generation (GWh)	**503.86**	**572.62**	**714.61**	**16.76**	**20.71**	**39.68**	**212.66**	**251.26**	**281.76**
Total energy used in 2020 from table 1	5118	20% by							
2020 Sustainable Communities Strategy target for low or zero carbon generation	1023.6	20%							
2020 Sustainable Energy Strategy target 1,036.1	20.2%								

It can be seen from Table 5 that for us to come close to our per capita contribution to the national small-scale electricity generation targets, we will need to install all the energy generation technologies detailed in this Energy Strategy and more. These are challenging targets. To ensure that we also meet both the 2020 Sustainable Communities Strategy target for low or zero carbon energy generation, and our per capita proportion of the national 2020 targets for renewable heat generation, we will need to increase the capacity of the city's district heat network by 73%, develop the 3rd line at the Eastcroft incinerator and ensure a significant and rapid expansion in biomass heat. This will require importing large volumes of biomass into the City and the development of a significant capacity of biomass heat or heat and power plant, with district heating.

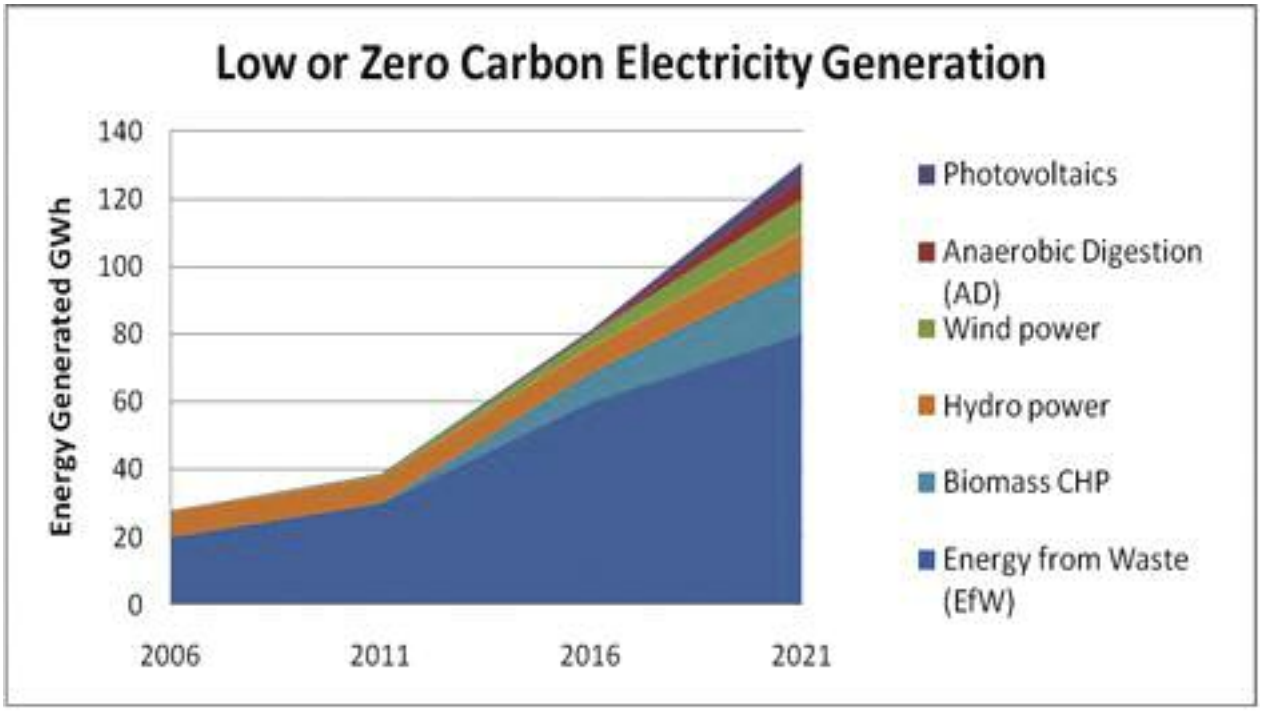


Figure 11: Targets for electricity generation from Low or Zero Carbon sources - excluding gas CHP

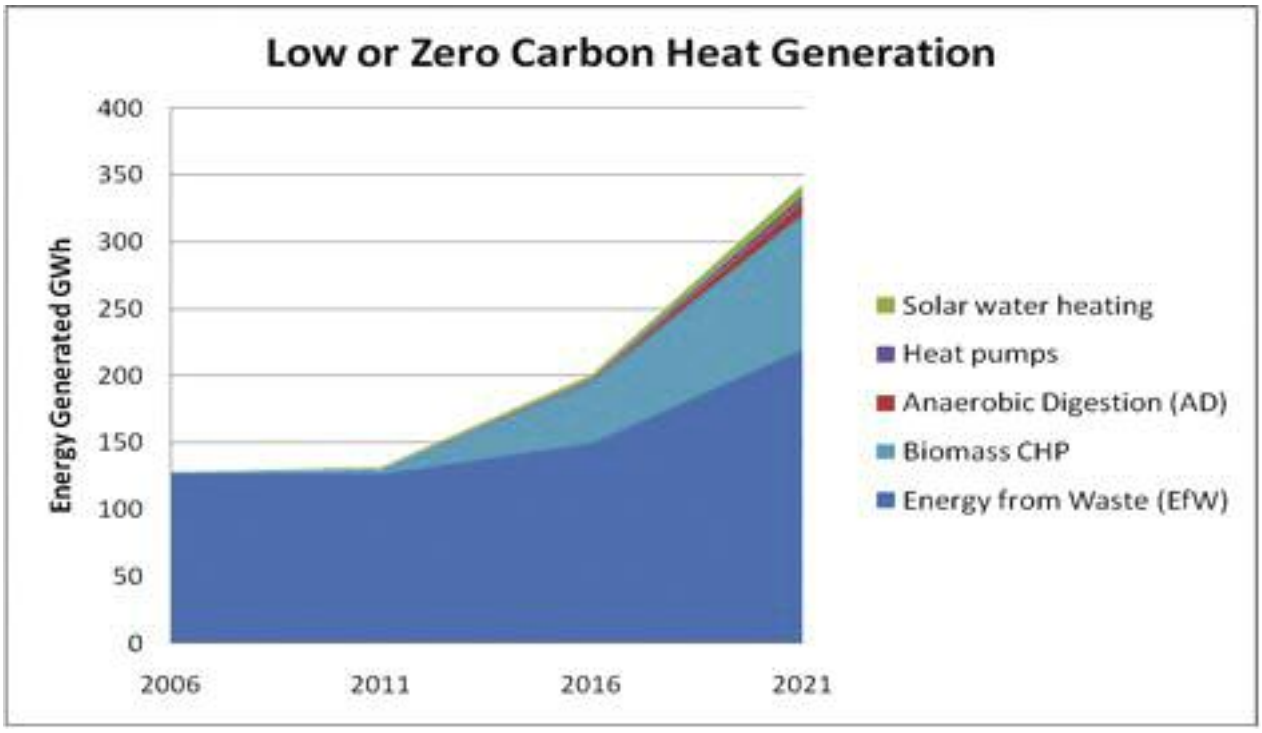


Figure 12: Targets for heat generation from Low or Zero Carbon sources - excluding gas CHP

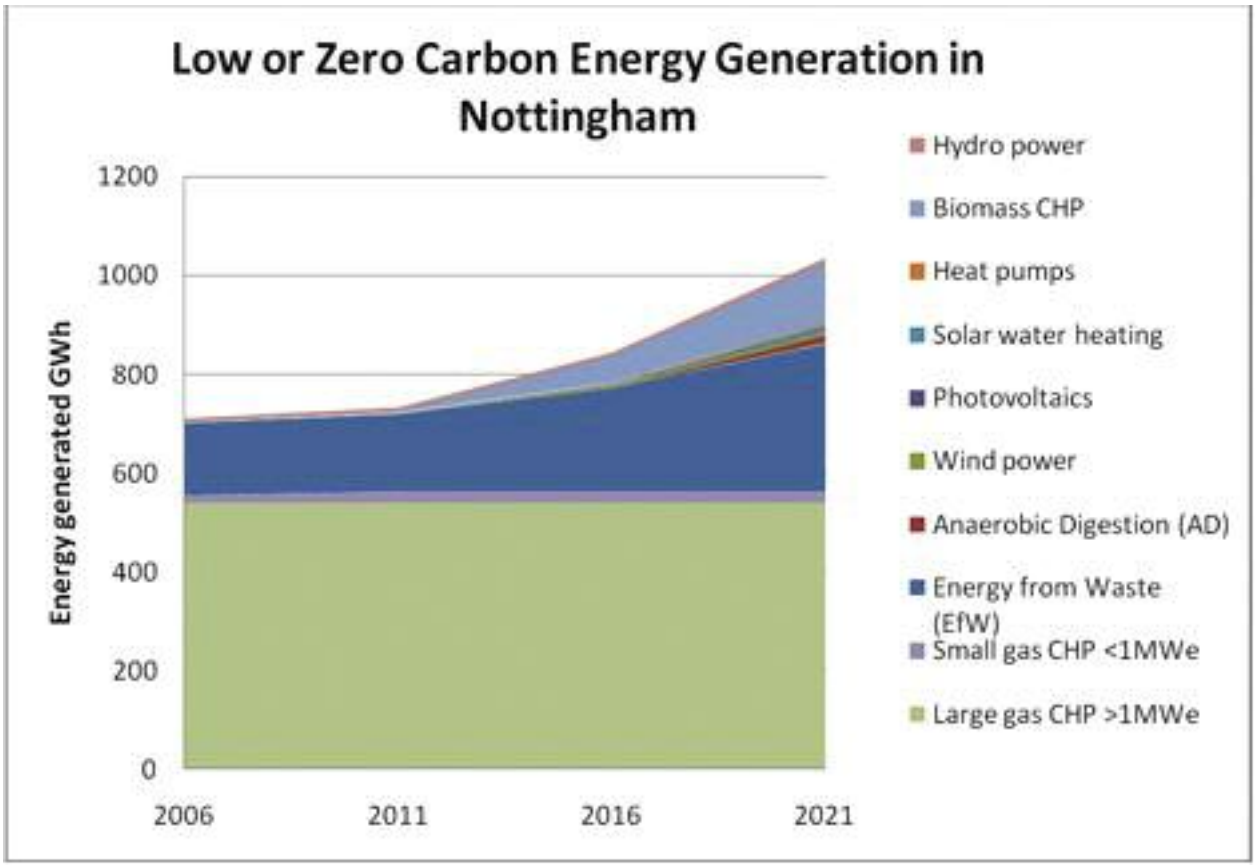


Figure 13: Total targets for energy generation from Low or Zero Carbon sources – including gas CHP

Assessment matrix for large scale technologies

The expansion of the district heating network, a rapid expansion in large biomass plant and increased use of Enviroenergy generated electricity locally are key strategic priorities alongside the likely addition of the 3rd line at Eastcroft incinerator. A number of specific energy generating technologies were scored in terms of carbon saved and energy generated for investment to establish strategic priorities.

Table 6: Total CO2e saving potential (t CO2e p.a.) from each technology. Please note that the capital cost per lifetime (£/t CO2e) of photovoltaics has been calculated excluding the Feed-In-Tariffs (FITs) structure which would bring the cost per lifetime down considerably.

	Capital cost per lifetime t CO2 (£/t CO2e)	Total CO2e saving (t CO2e p.a)	Pre-tax project return (%)	Council return (free cash equity IRR %)	Council pure equity requirement (£000)
Biomass CHP	26	5755	21.8	36.4	604
Hydro	36	1305	36.8	64.2	185
Wind	79	2434	9.6	12.2	771
Solar PV	459	482	4.2	2.5	2105
Biomass Aggregation	3	6276	48	92.6	70

Ernst and Young's evaluation:

- Overall, the projects producing the best returns appear to be the biomass aggregation, biomass CHP and hydro projects.

- The biomass projects also seem to provide the largest CO2 savings available to the Council out of the projects considered.

- The returns identified for the biomass projects and hydro would be likely to be of interest to private developers and investors.

- The wind project provides returns which are likely to be below those required by the private sector. However, this is largely dependent upon the wind-speed, which appears to be low. Further investigation may show a higher wind-speed on site which would increase energy yields and therefore increase the overall returns.

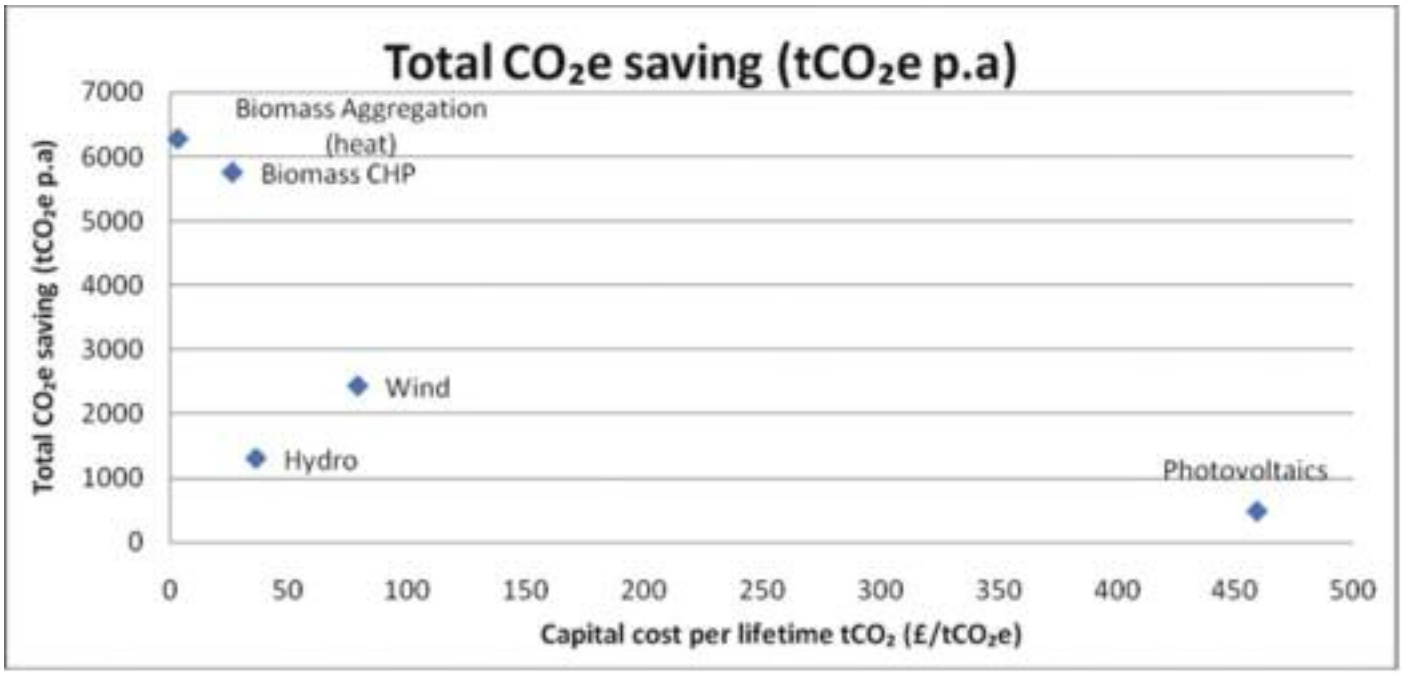


Figure 14: Calculations exclude Feed in Tariffs

Ernst and Young's conclusions:

- The financial modelling exercise suggests that the biomass projects and hydro project appear to provide sufficient returns and should be investigated further.

- We understand that the biomass aggregation and hydro projects are further advanced and therefore it would appear sensible to progress these initially.

- The biomass CHP is likely to require a housing or commercial development to provide a heat load and therefore may need to be followed at a later stage. It could, however, provide a large customer for the biomass aggregation project.

Energy from Waste District Heating Network

➢ Target 8: Increased electricity and heat generated from waste.

Table 7: Electricity and heat generation from the Nottingham Energy-from-Waste (EfW) plant.

	GWh electricity from waste	GWh heat from waste
2006	20	127
2011	30	127
2016	60	150
2021	80	220

Heat targets are based on the development of a 3rd line at the Eastcroft incinerator, the upgrading of the plant at the London Road heat station to provide increased CHP and gas backup capacity and the expansion of the district heating network to distribute all the arising heat to new and established developments around the South and East of the city.

Electricity targets are based on an increasing use of Enviroenergy generated electricity being used locally through private wire contracts.

It is clear that incineration is not a true renewable energy source. Around 30% of the energy arising from incineration is due to burning plastics and a proportion of the biomass that is burnt could be recycled or composted.

With a changing waste stream and peak oil approaching, plastics will increase in value and will potentially make up a smaller and smaller fraction of residual wastes.

While not the lowest carbon energy source, Energy from Waste, with combined heat and power (CHP) and district heating, does represent a very significant carbon saving versus natural gas and mains electricity supply. This will help to dramatically reduce the City's carbon emissions. Local energy generation will also increase the City's energy self-sufficiency. Over time it may also be possible to diversify the heat sources used in the enlarged district network to include more renewables.

Anaerobic Digestion

The City generates around 30,000 tonnes of food and garden waste per annum; this could be used to fuel a City AD plant generating up to 4.2GWh of biogas annually. This would give the potential for a generation of 6.23GWh of renewable electricity and 9.72GWh renewable heat. And with increasing fertilizer costs, production of usable compost would be a potentially valuable additional benefit.

While there are significant waste management cost implications in collection and disposal of green waste, the development and analysis of the potential for a City AD plant needs to be a priority. Only with this plant as well as the other elements detailed in the Energy Strategy will Nottingham be able to meet its part of the national targets for 2020 and the Sustainable Communities Strategy target, particularly the targets for small scale renewable electricity.

If sited appropriately, generating biogas could be of use in supporting local gas intensive businesses to reduce their carbon emissions and increase local energy supply and price security.

Wind

➢ Target 9: Increased electricity generation from wind.

This is based on 3 X 1.3MW turbines and 1 X 330kW turbine on the Meadows Embankment, plus 20 X 5kW turbines in the City. Preliminary work by NEP has established the possible location of these turbines at sites situated along the wind corridor of the River Trent.

Table 8: Electricity generation from wind

	GWh electricity from large wind	GWh electricity from small wind	Total GWh
2006	0	0	0
2011	0.6	0.03	0.63
2016	3.6	0.1	3.7
2021	9.6	0.2	9.8

Photovoltaics

By 2009 0.27MWe of PV had been installed in Nottingham city, whereas by 2008, 0.64MWe had been installed across the whole of the East Midlands region[52]. It can be fairly assumed that Nottingham is leading the region in installed PV capacity with 42% of the total East Midlands installed capacity within the city and many more installations planned or underway.

PVs are capital intensive, however the technology will be required to take a significant role in meeting the City's small scale renewable electricity targets.

The 2008 Faber Maunsell study[53] suggest a regional target for microgeneration based on Feed-In-Tariffs (FITs)[54], Building Regulations and new build rates. The regional target suggested for 2020 is an annual output of 65MWhe from microgeneration. In Nottingham, PVs are the only suitable market ready microgeneration renewable energy technology able to make any considerable contribution. A 65GWhe target pro rata per capita (based on 2001 census data for Nottingham and the East Midlands) gives the city a 3.9GWhe 2020 microgeneration target. This is a target of around 3,060 typical domestic PV systems by 2020.

[52] The East Midlands Regional Assembly (EMRA) (2009). Reviewing Renewable Energy and Energy Efficiency Targets for the East Midlands. Report for EMRA produced by Faber Maunsell. Available at: http://www.emra.gov.uk/files/reviewing-renewable-and-energy-efficiency-targets.pdf

[53] Available at: http://www.emra.gov.uk/files/reviewing-renewable-and-energy-efficiency-targets.pdf

[54] The Energy Act 2008 provides broad enabling powers for the introduction of feed-in tariffs (FITs) for small-scale low-carbon electricity generation, up to a maximum limit of 5 megawatts (MW) capacity - 50 kilowatts (kW) in the case of fossil-fuelled CHP. The FITs will be introduced through changes to electricity distribution and supply licences.

These provisions are intended to encourage the uptake of small-scale low-carbon energy technologies while the Renewables Obligation (RO) continues to be the main support mechanism for large-scale renewables deployment. FITs guarantee a price for a fixed period for electricity generated using small-scale low carbon technologies. The increased certainty that this will provide should encourage individual households, communities, businesses, schools, hospitals, local authorities, universities and a host of other organisations to consider installing small-scale low carbon electricity generation technologies.

The Renewable Electricity Financial Incentives Consultation, launched on 15 July by DECC, sets out how the Government intends the FITs scheme to work, including the proposed tariff levels. These proposals have been developed with input from stakeholders including energy industry trade associations, energy suppliers, Ofgem and NGOs, and the consultation constitutes a more formal opportunity for all interested parties to have their say on the details of the FITs mechanism. DECC's website on Feed-in-Tariffs (FITs) available at: http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/feedin_tarriff/feedin_tarriff.aspx

FITs will provide valuable support to the technology, however to realise the rapid take up required, households and businesses, particularly in more deprived wards, will need support in accessing the upfront capital either through grant or zero interest loan funding, and access to informed independent advice and guidance on property suitability and installation costs and possibly support from a local ESCo[55] or leasing agreement in spreading the costs of systems in energy bills.

There are 10,000 new homes planned in the City over the next 10 years, and after 2016 these will all have to be zero carbon[56]. The City is also consulting through the Local Development Framework process on a 20% Merton rule on domestic dwellings[57].

Advanced thermal efficiency will dramatically reduce emissions from new-build heating post-2016; to offset electricity emissions some electricity generating technology will need to be included in all post 2016 dwellings. Photovoltaics represent one of the lowest cost and widest applicable methods of achieving a 20% rule on energy efficient dwellings and zero carbon post-2016.

➢ Target 10: Increased electricity generation from photovoltaics (PV).

[55] Energy Services Company (ESCO or ESCo): A company that offers to reduce a client's energy costs, often by capitalizing the upfront expenditures and sharing the resulting future cost savings with the client. ESCos may offer any of the following services: financing, design & installation, project management, education services, equipment leasing, maintenance, and verification & auditing. They originally established a foothold under the regulated utility structures by helping large organisations reduce energy consumption. Also known as energy efficiency service providers, ESCOs are important to sustainability in that they enable companies that normally could not afford the upfront investment costs, to become more efficient, more profitable, and reduce their environmental footprint, by taking a different view on acceptable rates of return and risk than other companies, and enhancing a project's flexibility. The precise role and responsibilities of an ESCo are tailored to meet the needs of the specific project or initiative. In general, ESCo's are used to deliver the following objectives: CO2 reduction; renewable energy projects; energy efficiency services; energy advisory, and tackling fuel poverty.

[56] The UK Low Carbon Transition Plan (2009). Page 11. Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[57] NCC (2009). Nottingham City Council Greater Nottingham Aligned Core Strategy Issues & Options paper June 2009. Page 111, Section 3.10.3. Available at: http://www.nottinghamcity.gov.uk/CHttpHandler.ashx?id=9535&p=0

This is split between domestic PVs, and non-domestic PVs on public sector buildings, businesses, schools and community facilities, and commercial PV arrays on large car parks or 'PV farms'.

Table 9: Electricity generation from PV

	GWh electricity from domestic PV	No of systems	GWh electricity from non-domestic PV	No of systems	GWh from commercial PVs	No of systems	Total GWh
2009	0.01	27	0.1	10	0	0	0.11
2011	0.09	75	0.2	20	0	0	0.29
2016	0.6	500	0.5	50	0.07	1	1.17
2021	3.6	3000	0.8	80	0.21	3	4.61

Solar water heating (SWH) / Solar thermal

The large proportion of the city's heat targets will be met through the district heating network and biomass heat; that said, there is an exceptionally important role to be played by solar water heating, in terms of total heat output. SWH ensures that buildings that cannot access the district heating system are able to access zero carbon heat for hot water. **Solar water heating represents the lowest cost and widest applicable method of achieving a 20% Merton Rule on energy efficient dwellings.**

The legally binding national 80% carbon cut by 2050 infers that all UK dwellings, new build and existing will need to be almost or totally zero carbon by then[58]. All new build after 2016 will have to be 'zero carbon'. Within the city, this will only be possible with the inclusion of solar water heating on the majority of dwellings.

The 2008 Faber Maunsell study[59] suggest a regional target based on a Renewable Heat Incentive (now due to commence in 2011), Building Regulations and new build rates. The regional target suggested for 2020 is an annual microgeneration heat output of 122GWht. In Nottingham solar water heating is the leading market-ready thermal microgeneration technology and simplest to retrofit. A 122GWht target pro rata per capita (based on 2001 census data for Nottingham and the East Midlands) gives the city a 7.32GWht 2020 target. If met by solar water heating alone this would represent a target of almost 6000 typical domestic systems by 2020.

There are already active installers in the city, and inclusion of tough targets and mechanisms to enable them will increase economic activity and employment in this sector.

[58] "By 2050, the UK will need to have cut its greenhouse gas emissions by four-fifths overall. Looking across the options available, that means we will need to radically reduce demand for energy and decarbonise the energy we use in our homes almost totally by 2050. Our homes need to become much more energy efficient and we need to produce more of our heat and electricity from low carbon sources, such as ground and air-source heat pumps and solar power" (UK Low Carbon Transition Plan, 2009. Page 86).

[59] "Three quarters of the energy we use in our homes is for heating our rooms and water, most of which comes from gas-fired boilers. Together this accounts for 13% of the UK's greenhouse gas emissions, and by 2050 emissions from homes need to be almost zero by using energy more efficiently and using more low carbon energy. The plan to 2020 will cut emissions from homes by 29% on 2008 levels, introduce further measures to protect the most vulnerable, and improve the security of our gas supplies, a third of which is used in our homes. Two thirds of the homes we will live in by 2050 have already been built, so we will need to make our existing homes much more energy efficient and heat and power them from low carbon sources" (UK Low Carbon Transition Plan, 2009. Page 10).
Available at: http://www.emra.gov.uk/files/reviewing-renewable-and-energy-efficiency-targets.pdf

➢ Target 11: Heat generation from solar water heating[60].

Installed systems in 2011 is an estimate based on pro rata 2008 national figure plus 3 years growth

Table 10: Heat generation from solar water heating

	GWh heat from domestic SWH	No of systems	GWh heat from non-domestic SWH	No of systems	Total GWh
2006	0.08	65	0	0	0.08
2011	0.441	400	0.7	5	1.14
2016	1.85	1500	1.4	10	3.25
2021	4.92	4000	2.8	20	7.72

Heat Pumps

Heat pumps use grid or private wire electricity to draw heat from the ground, air or water. Ground and water sourced heat pumps are particularly useful in buildings that will require cooling as they can also offer this with minimal additional cost.

Heat pumps are far simpler and cheaper to fit at build stage and also offer a valuable level of adaptation to future hotter temperatures expected with climate change.

The office development for Spirita at Raleigh Square in Nottingham houses one of the first non-domestic ground heat pump systems in the country to provide both heating and cooling. There are 10 domestic ground systems installed in a social housing development on Broxtowe Estate (again by Spirita) and a large water sourced system, using the Trent, installed in the River Crescent development.

[60] Numbers of microgeneration units installed in England, Wales, Scotland, and Northern Ireland - Final Report For BERR 17/11/2008.

A building designed for low carbon using heat pumps could actually exhibit a falling carbon footprint over time, as national policies adjust the UKs power generation mix. Further increased energy security and lower bills can be realised at a later date with retrofitted onsite electricity generation e.g. PVs.

The canal and river in Nottingham are ideal sources for water sourced heat pumps. The River Trent is warmed by the waste heat from Radcliffe-on-Soar power plant and even the canal is warmed slightly by waste heat from the London Road heat station. The warmer water in both the River Trent and the canal would increase the efficiency of any heat pump system using these as a source. The river water is already used by the River Crescent development [61] as a heat source for their swimming pool.

Air sourced heat pumps are currently only suitable if used to replace electric heating in off-gas grid developments, such as high rise flats. Nottingham City Homes are currently running trials to test the viability of air source heat pumps for their tenants in a number high rise flats in the City. There are around 17,000 domestic properties in the City with an electricity supply but no gas meter; 4,600 of these are on the heat network. This leaves around 12,400 that may be suitable for air sourced heat pumps.

➢ Target 12: Heat harvested from heat pumps.

Table 11: heat generation from heat pumps

	GWh heat from domestic heat pumps	Number of system	GWh heat from non-domestic	heat pumps Number of systems	Total GWh
2006	0.125	10	0.26	1	0.4
2011	0.163	13	0.33	2	0.5
2016	0.75	60	1.3	5	2
2021	1.87	150	2.6	10	4.5

[61] Trent Park Developments, developers of the River Crescent complex. More details available at: http://www.trentpark.co.uk/

Biomass

Biomass alongside the expansion of the EfW district heating network is central to Nottingham achieving its national targets for renewable heat and the 20% Sustainable Communities Strategy target for low or zero carbon energy.

Work has been carried out by NEP, funded by Greater Nottingham Partnership (GNP) and the East Midlands Development Agency (EMDA), to establish the level of sustainable local supply available for clean biomass and the most efficient route to processing this. All biomass has associated carbon emissions and costs related to transportation and processing. Locally sourced clean wood has the lowest carbon intensity.

Creating a local processing and supply chain, using locally sourced waste wood, will increase energy supply and cost security in Nottingham, whilst also reducing carbon emissions if used in a City based energy plant. With a good return on investment in economic and carbon saving terms and the clear benefit to local energy security. This project and the construction of the first biomass CHP plant are incorporated into the Strategic Priorities.

Work carried out by Ernst and Young to establish the priorities for local investment in carbon reduction identified the development of a local biomass processing site and a biomass CHP plant as offering the most cost effective carbon savings of all the technologies evaluated.

The 16,000 tonnes of biomass available within the City from urban wood waste will however only represent around 23% of the biomass required to meet our local and national targets. A significant volume of woodchip or other biomass will need to be imported into the City and used to fuel large scale combined heat and power plant.

Moving this volume of biomass into the city will require consideration of delivery logistics to and within the City and appropriate storage sites. Connections to the river, rail and canal for the movement of bulk dry masses will need to be assessed.

The canal and river are both suitable potential delivery routes for this type of freight[62].

➢ Target 13: Heat and electricity generation from woody biomass.

Table 12: Heat and electricity generation from biomass

	GWh heat from biomass	GWh elec. from biomass	Total GWh
2006	0.74	0	0.74
2011	3	0	3
2016	45.4	8.6	54
2021	100.7	19.1	119.8

(Based on figures from the Nottingham Tree Station report[63])

[62] Moving freight the green way on the River Trent, 2009, British Waterways and EMDA.

[63] NEP (2009). Nottingham TreeStation: A Research report on the analysis of the energy potential, processing options and possible end use of waste woody biomass arising from the city of Nottingham. A report for Nottingham Energy Partnership (NEP), prepared by ReNU Ltd et al. Available at: http://www.nottenergy.com/renewable-energy/biomass

Hydropower

Beeston Weir is currently the only developed hydropower site within the City and at 1.68MW is the largest hydro power station in the East Midlands however there is scope to develop Holme Sluices to add additional capacity.

➢ Target 14: Electricity generation from hydro power.

Table 13: Elec. Generation from Hydropower

	GWh electricity from hydro
2006	7.8
2011	7.8
2016	11
2021	11

CHP

While not a renewable energy source, Gas CHP is an established small and large scale energy generation technology and an emerging microgeneration technology. Fuel cell CHP is also close to market.

As of 2006 in Nottingham there was 38.3MWe of installed CHP across 10 sites. This includes the 14.4MWe Gas CHP district heating backup at the London Road heat station, 15MWe at Boots main site, 4.9MWe at the QMC and 4MWe at Imperial Tobacco plus 6 other small sites[64]. This total represents 51% of the entire East Midlands installed CHP capacity.

While the use of natural gas CHP is appropriate in new large developments, and permitted to contribute to low or zero carbon targets in planning policy, the City will not set targets for this technology. In the UK, over the coming 15 years, we face a far heavier reliance on imported gas. By 2020, varying estimates suggest that the UK will be importing 45-80% of its gas[65] up from 31% in 2010.

Gas is easier to deliver and use within a City, but increasing insecurity in gas supply with falling output from the North Sea and an increased dependence on imported gas makes further increases in Nottingham's reliance on gas for power, as well as for heat, a potentially risky step.

Whilst Gas CHP offers more energy security in terms of continuity of power supply, the expected falling carbon intensity of grid electricity over the coming years will mean that the carbon saving potential of natural gas CHP will become more and more marginal.

There are also other reasons for not setting a Gas CHP target for the City.

Nottingham already has a very large installed gas CHP capacity providing heat and power to many of the city's large employers and backup for the City district heating network. As an interim measure Gas CHP with district heating is a step towards a low carbon energy supply; it is more efficient and lower carbon to generate electricity close to the point of use than using grid power. However there are still considerable carbon emissions associated with burning natural gas.

[64] The European Co-generation Directive defines small-scale CHP as all units with an electrical capacity of less than 1 MW.

[65] Energy Security: A national challenge in a changing world 2009, Malcolm Wicks MP

To 2020 the challenging national targets for renewable heat will require a rapid expansion in renewable fuel supply and installed renewable heat capacity. This cannot be met through increased Gas CHP capacity. The focus for low carbon heat supply within the City Energy Strategy thus needs to be placed on energy from biomass and waste.

Nottingham has an opportunity now to take a leap forward beyond gas. This will only happen if we are quick to develop infrastructure and partnerships to ensure we have access to the necessary biomass resources to provide for the City's heat and power demands.

Gas CHP is an interim measure on the road towards sustainable low carbon energy infrastructure.

Gas CHP will still have a role as backup capacity for biomass and Energy from Waste. It will also play a role as technology develops with new fuel cell and small CHP units in specific high heat load applications such as nursing homes, swimming pools and schools. These installations will however not be promoted through the Energy Strategy with targets and are expected to rise in number naturally though pressure from the national Building Regulations and the City's Merton rule.

Bio-fuels

There are no targets for energy generating biofuel technologies, such as biodiesel CHP, bioethanol or pure plant oil as the carbon savings and sustainability of these energy sources except in transport applications are at the moment highly questionable.

These fuel sources are not eligible to contribute towards developers' Merton Rule obligations except in specific unusual circumstances, detailed within the City Merton Rule guidelines.

With the advent of second generation biofuels and improved carbon accounting practices it may become relevant to include these technologies in a later revision.

AIM 5: SUPPORT LOW CARBON TRANSPORT INFRASTRUCTURE.

The Government's Renewable Energy Strategy has stated an aim that 10% of transport energy should be met by renewables by 2020[66].

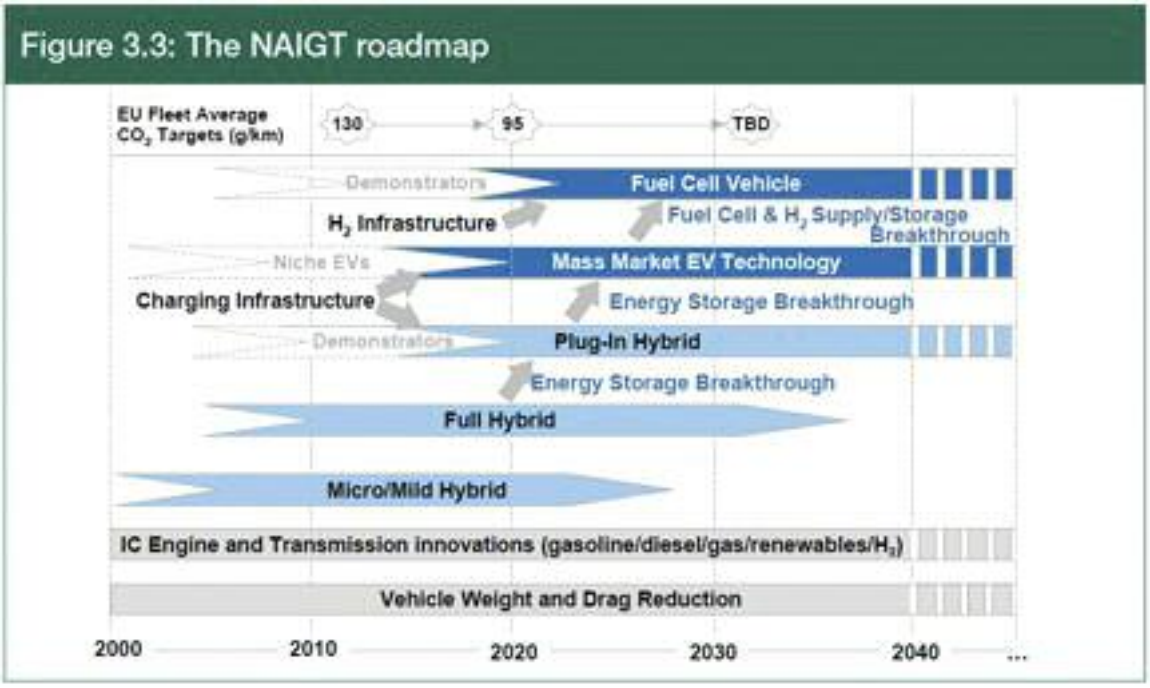


Figure 15: Carbon Reduction Strategy for Transport. ***Source: DfT, 2009.***

International and national legislation, through the EU[67] and the Renewable Transport Fuels Obligation[68] is increasing the proportion of biofuels in the fuel supply whilst a lot is expected in terms of efficiency from research and innovation into vehicle technology.

The publication of the Department for Transport's Carbon Reduction Strategy for Transport alongside the Low Carbon Transition Strategy sets the themes for future transport solutions in the UK. It can be seen from Figure 8, that there is a significant reliance on an increased role for electric and plug-in hybrid vehicles. Local infrastructure and policy needs to be developed to support recharging electric vehicles.

[66] The UK Renewable Energy Strategy (2009). Page 8. Available at: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[67] Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport. Available at: http://europa.eu/legislation_summaries/internal_market/single_market_for_goods/motor_vehicles/interactions_industry_policies/l21061_en.htm

[68] The Renewable Transport Fuel Obligation Programme will, from April 2008, place an obligation on fuel suppliers to ensure that a certain percentage of their aggregate sales is made up of biofuels. The effect of this will be to require 5% of all UK fuel sold on UK forecourts to come from a renewable source by 2010. This will help meet our climate change objectives as well as contributing to other Government objectives, including security of energy supply. More at: http://www.dft.gov.uk/pgr/roads/environment/rtfo/aboutrtfo

Key national policy aims towards 2020 include promotion of, and developing the supporting infrastructure to, increase the use of electric vehicles, increased the use and decarbonisation of public transport, and also supporting cycling.

Nottingham has been very successful over the years in increasing the capacity and use of public transport, cycling, tram and foot traffic over personal vehicle use. In 2006 transport represented 21% of the City's total energy consumption. Per capita energy use for transport across the City has fallen by 3.2% from 2005 to 2007.

As a growing conurbation, Greater Nottingham has been active in delivering a sustainable transport network to provide current and future residents with realistic alternatives to the private car. Greater Nottingham has been acknowledged as a 'Centre of Excellence for Local Transport Delivery' and awarded Beacon status for Accessibility.

The Joint Local Transport Plan for Greater Nottingham (prepared by the City and County Councils) has enabled considerable investment in sustainable travel modes, including Nottingham Express Transit (NET) Phase 1; development of a high quality integrated bus network (with the highest use per head of population and satisfaction levels outside London); priority measures for local buses; ticketing and smartcard initiatives; and marketing and information initiatives, including personalised travel planning.

Nottingham has also applied strict parking restrictions in the City centre and is the only City in the country which is actively seeking to implement a Workplace Parking Levy (WPL), which will provide some of the finance for future investment in sustainable transport measures. As a direct result of the sustainable travel initiatives which have been implemented, City traffic levels have grown at less than 1% per year since 2000.

Against this background, Nottingham is aiming to become an exemplar for urban sustainable travel in England. This vision will be achieved via:

- A lifecycle approach to encourage and enable people to make sustainable travel choices at key decision points in their lives;
- Incentivised travel opportunities to motivate hardened car commuters to try out sustainable travel options and to support disadvantaged communities with limited travel horizons;
- A culture change brought about via extensive community and business engagement through the deployment of 'Smarter Travel Champions', resulting in walking, cycling and public transport being modes of choice rather than last resort;

- A healthier population resulting from sustainable travel becoming integrated into more active lifestyles.

The vehicle for establishing the City's statutory transport targets will be the adoption of the next Local Transport Plan. This will seek to build on targets proposed in the development of the Nottingham Sustainable Travel City programme. The key strategic target for the Energy Strategy is:

Strategic Objective 7: To set transport related carbon emissions reduction and technology targets in the forthcoming 3rd Local Transport Plan which are aligned with the energy strategy and aim to exceed the national Low Carbon Transition Plan targets by 2020. At this stage an indicative target of 20% reduction is recommended.

The above key target and others, with various initiatives to achieve them, have their own actions and monitoring arrangement which will be delivered under the transport governance structures currently being established.

The 3rd LTP programme will continue to be marketed and promoted as part of the 'Big Wheel' marketing campaign. Developed by the Greater Nottingham Transport Partnership in 2001, the Big Wheel brand provides an umbrella for all transport activities and in particular has been used to create awareness and understanding of sustainable and integrated transport and its benefits.

Further to the targets already proposed in the Sustainable Travel City programme and under development in the 3rd Local Transport Plan there are a number of additional actions that also have direct connection to the City's energy security that will be pursued to 2020.
Electricity will increasingly be required for vehicle use, especially in cities where most journeys are shorter and recharging infrastructure can be established to serve a high density of users.

In relation to the Sustainable Energy Strategy, an increased percentage of electric vehicles will also potentially represent a valuable buffer to a more variable and diverse distributed grid power supply. Rapidly emerging battery and fuel cell technology could turn cars from simple energy users to energy vectors.

The City district heating and power network is a key link between the SES and transport. The Enviroenergy private wire network has excess power at certain times that is currently sold back to the grid. This power could be sold on for electric vehicle charging in the City, particularly to City Council fleet vehicles.

AIM 6: CREATE LOCAL JOBS AND OPPORTUNITIES IN ENERGY SECTOR BUSINESSES.

Nottingham is the UK's most energy self-sufficient City. The City ESCO, Enviroenergy, provides heat and in some cases power to a large proportion of the City centre. This includes the two large City shopping centres, the Victoria Centre and the Broadmarsh Centre, the headquarters of Her Majesty's Revenue and Customs (HMRC), the East Midlands Development Agency (EMDA) and many City Council offices. Heat is also provided to 4,600 homes. Thus low carbon energy security is assured for many City homes, businesses and public sector services.

While energy supply is becoming more expensive and potentially less secure; Nottingham has the unique capacity amongst UK cities of being able to offer a stable, low carbon energy environment, for many business premises and workforce.

This important selling point for Nottingham, backed up by our geographically central location will be of interest to businesses, particularly those working in the energy sector.

Strategic Objective 1: The City's unique strength in energy self-sufficiency will be used to promote Nottingham in the UK and Europe as the first choice for location of sustainable energy related and green tech business, innovation and growth.

We have two major universities with research expertise in low carbon buildings and design. The University of Nottingham School of the Built Environment is renowned for its work on low carbon buildings. The universities offer a wealth of academic support and research facilities for energy related industry seeking innovative solutions to technical problems, accessible through the universities' Ingenuity programme.

Strategic Objective 8: To work closely in partnership with business, universities and technology partners to ensure Nottingham accelerates the process and maximises the impact of demand led innovation in energy technology and management within the City.

Carbon footprints within procurement (Scope 3 emissions) are becoming a major target within public sector bodies e.g. procurement emissions made up 60% of the NHS carbon footprint in 2008. The demand for lower carbon supply chains from both public and private sector will need to be met through innovative business carbon management practices and improved industrial processes. The regional iNets and the universities' Ingenuity programme, linking businesses with academic institutions to solve some of these problems, will be essential in ensuring the City and the region's businesses are well placed to provide lower carbon services and goods to meet rising demand. If properly supported this should increase the competitivity and growth of local businesses, while lowering local carbon emissions.

Nottingham Energy Partnership is providing energy services to domestic properties across the city. Over the last 10 years through the Greater Nottingham Healthy Housing Service, NEP has consistently drawn in more than £1m per annum of national grant funding, enabling the installation of physical measures in city properties. This investment has come largely through the governments Warm Front programme and utility company CERT[69] funding.

The City has already reduced its domestic gas consumption by 16% over the last 5 years, through the work of NEP and local housing associations. This has added £15m per annum to the local economy, through reductions in gas bills alone. The City Council with NEP will be working to maximise the value of the Warm Zone and Community Energy Savings Programme (CESP), building on them to ensure that there is a continually growing and diversifying stream of work for companies operating in the domestic sustainable energy sector in the City. Our excellent record on domestic energy efficiency is good for the city's economic stability.

[69] The Government consulted on proposals to amend the Carbon Emissions Reduction Target (CERT) through the Electricity and Gas (Carbon Emissions Reduction) Order 2008, S.I. 2008/188. This gives effect to a key element of the Prime Minister's £1 billion Home Energy Saving Programme announcement of 11/09/08. CERT, which commenced in April 2008, is the Government's flagship household sector energy and carbon saving scheme. CERT places a 3 year (i.e.: up to March 2011) obligation on energy suppliers to meet ambitious household carbon saving targets. Suppliers meet their targets by promoting (e.g.: through subsidy) the take-up of energy saving measures, including loft and cavity wall insulation and high-efficiency lighting and appliances.

The Carbon Emissions Reduction Target 2008-2011 (CERT). Relevant documents, including background and scope, are available at: http://www.decc.gov.uk/en/content/cms/consultations/open/cert/cert.aspx

Over the next 3 years, through the Warm Zone and CESP programmes, NEP in partnership with the City Council, Scottish and Southern and Nottingham City Homes will be drawing in £5m to £11m worth of investment into private sector and social housing; upper range dependant on the success of developing CESP programmes. This investment will, through creating demand, support significant employment and training in trades such as insulation installers, plumbers, electricians, solar technology installers and energy surveyors.

Strategic Objective 4: To reduce local authority, domestic and 'industrial and commercial' energy consumption in Nottingham in line with the detailed targets.

With a typical 5-6 year return on investment for energy efficiency work through CERT, Warm Front and CESP schemes, a £11m investment will represent a further £2.8m per annum in household bill savings across the City, a large proportion of this money will stay within the city's economy. With energy prices set to rise substantially over the next 10 years, the enduring and cumulative positive impact of these measures on the City economy will increase.

The Warm Zone programme offers many opportunities for encouraging local supply chain businesses and the mainstreaming or market testing of technological and delivery innovation in the city.

Many of the large carbon and energy savings required over the next 10 years can be achieved with readily available technologies; the opportunities in terms of economic growth are in supply chain and in logistics of delivery, rather than technological research and development. Later incremental savings will however require a new generation of energy efficiency, building materials, processes, energy generation and carbon and energy management technologies; such as phase change materials, organic LEDs and smart grid management systems.

Nottingham University is at the cutting edge in many areas especially with respect to energy and the built environment. To ensure that intellectual property developed in Nottingham turns into jobs in Nottingham will require close collaboration between the Universities, city businesses and the Council. Provision of appropriate local markets for low carbon products, future proofed business facilities with low cost low carbon energy supply, skilled staff and a high city profile for energy and low carbon business as well as good low carbon, low cost transport links may all help encourage university spin out businesses to remain within the City.

The business and domestic support programmes will be outlined in the Sustainable Energy Strategy Action Plan. Alongside national economic incentives, these will increase demand for small scale renewable energy technologies from domestic and non-domestic customers in the City.

Nottingham is host to the global headquarters of Siemens, the leading manufacturer of smart metering and smart grid solutions in the UK. By 2020 all UK homes and potentially all businesses will have a smart meter[70]; Nottingham could take a lead on demonstrating the value of this technology.

Nottingham is also host to the headquarters of E.ON UK and E.ON's UK Research and Training Centre.

Locally there are a number of suppliers and installers of renewable and sustainable energy technologies, many of whom have been supported by the NEP SunGain programme over the last 5 years.

Nottingham and the East Midlands also host a large number of companies involved in the wind power supply chain. Romax Technology, based at the Nottingham Science Park, is a major supplier of gearbox software and consultancy to the wind industry globally. With wind power targeted to constitute most of the government's 28% renewable electricity target by 2020, this should be a key area of growth for the city.

In the words of Ed Miliband, Secretary of State of Energy and Climate Change:

"Across business, we can build up the skills to be more resource efficient. Like the internet, saving carbon can become part of how business is done: every financial officer knowing their savings and liabilities from carbon, every builder having the skills to build in a way which saves energy.[...] So alongside the country's Low Carbon Transition plan, every business, every community will need to be involved. Together we can create a more secure, more prosperous low carbon Britain and a world which is sustainable for future generations". (*Foreword, UK Low Carbon Transition Plan, 2009).*

[70] The Government announced in October 2008 that it intends to mandate electricity and gas smart meters for all households.
For this reason, in May 2009 the Government issued a public consultation making proposals in two areas fundamental to rolling out smart meters to domestic households, these being:

- the delivery model or market arrangements for installing and on-going management of smart meters; and
- smart meter functionality.

The consultation also invited views on the type of energy consumption information that should be provided to consumers to maximise their engagement and on the Government's expectation that a standalone real-time display would be provided with a smart meter.
For non-domestic metering, the Government also issued a consultation on advanced/smart metering for small and medium sized (commercial and public sector) sites in July 2008. DECC's website on Smart metering for electricity and gas: http://www.decc.gov.uk/en/content/cms/consultations/smart_metering/smart_metering.aspx

AIM 7: DEVELOP STRONG EXTERNAL AND COMMUNITY PARTNERSHIPS

To ensure the delivery of the actions and targets set in this Strategy, a City Energy Strategy Steering Group will be established, representing business, community and public sector interests.

Separate working groups will be established to oversee the delivery of the specific areas of the Energy Strategy.

Elements of the Strategy will fall under the management of other partnerships; these will coordinate with and report on progress to the City Energy Strategy Steering Group and Technical Coordination group. Communications will play a key part in the success of the Energy Strategy implementation.

Strategic Objective 6: To develop resource and maintain a prioritised action plan and delivery management structure including key partners and technical experts to deliver the Strategy, with an annual review cycle for the Action Plan and review cycles aligned with national carbon budgeting periods for the Strategy.

Strategic Objective 8: To work closely in partnership with business, universities and technology partners to ensure Nottingham accelerates the process and maximises the impact of demand led innovation in energy technology and management within the City

AIM 8: SUPPORT LOCAL COMMUNITY ENERGY INITIATIVES

Clear and supportive information, advice and guidance is essential to support energy efficient behaviour, inform consumer choices and domestic investment in low carbon technologies.

It is essential that provision of technology, subsidy and investment in housing stock is associated with support for community groups providing local action at a community and doorstep level.

People will only take up offers if there is a perceived need, and whilst the issues of climate change, rising energy prices and peak oil are all complex subjects with a national profile, these issues need to be integrated into peoples' communities and lifestyle to ensure responsibility is taken at a personal and household level.

Once capacity has been reached in improving the thermal and electrical efficiency of buildings, further savings will require a more significant weight to be placed on behaviour change and promotion of the uptake of efficient appliances. These changes will require a community based approach, education support and engagement for the long term to follow on from investment in insulation, boilers and renewable energy.

While the City should provide the tools and investment to ensure there are no barriers to low carbon communities, communities also need to be able to take ownership of the problems and work out which solutions are appropriate and workable for them.

There are a range of local and national organisations such as NEP, Transition Nottingham, Energy Saving Trust, National Energy Action, Global Action Plan, providing advice, guidance and support to communities and individuals.

A number of Nottingham's communities have Transition Towns groups that raise awareness and support action in preparation for peak oil, decreasing energy security and combating climate change. Existing tenant and resident groups will need to be encouraged to participate in initiatives as they develop.

Strategic Objective 9: The City and partners will support the development of local and grass roots organisations seeking to enable their communities to reduce carbon footprints, energy bills and adapt to inevitable climate change and peak oil.

Whilst the message is common to all, communities are complex; geographical, social and economic; social mix, different levels of access to money and credit, priorities, and different levels of understanding of how these issues relate to everyday life, and different local energy resources. The issues of energy supply, price and climate change alongside the opportunities for support will need to be presented and re-presented in many different ways.

To this end support will be provided for local community groups wishing to establish local targeted energy generating or saving programmes. Communities like the Meadows are already taking a leading role in demonstrating how taking ownership of local energy resources can raise the profile and local ownership of the issues of climate change and energy supply, so accelerating local action in energy efficiency and behaviour change. Local community programmes can also attract voluntary sector funding to support more targeted household support, providing opportunities for volunteering and training.

5. Energy supply and use in Nottingham

5.1 Historical context, current energy use and generation patterns

Energy use (all figures in GWh)

Table 14: Summary of energy use in Nottingham, broken down by fuel type, by source, and by year. Note that all figures are provided in gigawatts hour (GWh). *Source: NEP, 2009.*

Fuel type	Detail	2003	2004	2005	2006
Coal	Industry & commercial	68.42	60.72	57.55	57.53
	Domestic	11.71	2.41	1.27	1.1
	Total	80.13	63.13	58.82	58.63
Manufactured fuels	Industry & commercial	0.24	0.11	0.55	0.17
	Domestic	32.73	0	0.07	0.06
	Total	32.97	0.11	0.62	0.23
Petroleum products	Industry & commercial	202.23	209.83	221.18	222.35
	Domestic	32.79	8.21	8.3	8.48
	Road Transport	1,209.77	1,210.11	1,377.20	1,378.53
	Rail	8.77	24.12	18.33	18.67
	Total Transport	1,218.54	1,234.23	1,395.53	1,397.20
	Total ex-transport	235.02	218.04	229.48	230.82
Natural Gas	Industry & commercial	2,039.93	1,721.83	1,590.50	1,447.37
	Domestic	2,269.82	2,043.27	2,018.72	1,919.22
	Total	4,309.75	3,765.10	3,609.22	3,366.59
Electricity	Industry & commercial	840.98	961.76	1,054.32	1,007.92
	Domestic	501.44	519.96	528.67	522.51
	Total	1,342.42	1,481.71	1,582.99	1,530.43
Total energy consumed in Nottingham from renewables and waste	Total	143.61	152.5	139.75	154.67
	%	2.39%	2.76%	2.55%	2.98%
Totals by Consuming sector	Industry & commercial	3,151.80	2,954.25	2,924.10	2,735.34
	Domestic	2,848.49	2,573.85	2,557.03	2,451.37
	Transport	1,218.54	1,234.23	1,395.53	1,397.20
Total energy used		7,218.83	6,762.33	6,876.66	6,583.91

Energy Generated (all figures in GWh)

Table 15: Summary of energy generation in Nottingham, broken down by fuel type, by source, and by year. Note that all figures are provided in gigawatts hour (GWh). ***Source: NEP, 2009***

Fuel type	Detail	2003	2004	2005	2006
Gas CHP electricity (Total generated - Estimated from EU ets allowances)	Industry & commercial	191.79	190.42	192.02	190.71
Gas CHP heat (Total generated- Estimated from Eu ets allowances)	Industry & commercial	375.96	371.99	382.49	371.97
Total power generated in city (Renewable and waste)	Total	59.11	63.63	43.9	64.05
	% city electricity use	4.40%	4.29%	2.77%	4.19%
Total heat generated in city (Renewable and waste)	Total	128.08	133.6	121.89	127.22
	% of total non electric/non transport energy demand	2.75%	3.30%	3.13%	3.48%
Total power generated in city (gas CHP, Renewable and waste)	Total	250.9	254.05	235.92	254.76
	% Total power demand (assuming all used locally)	15.75%	14.64%	12.97%	14.27%
Total heat generated in city (gas CHP, Renewable and waste)	Total	504.04	505.59	504.37	499.19
	% of total non electric/non transport energy demand	10.82%	12.49%	12.94%	13.65%
Total energy generated in city	Total	754.94	759.64	740.29	753.95
	% of total energy consumption	10.46%	11.23%	10.77%	11.45%

The **Sustainable Community Strategy** target of 20% of energy to be produced within the Greater Nottingham area from renewable or low/zero carbon sources relates to the final 2 rows in the table above. Nottingham currently generates 11.45% of its total energy use from low or zero carbon sources.

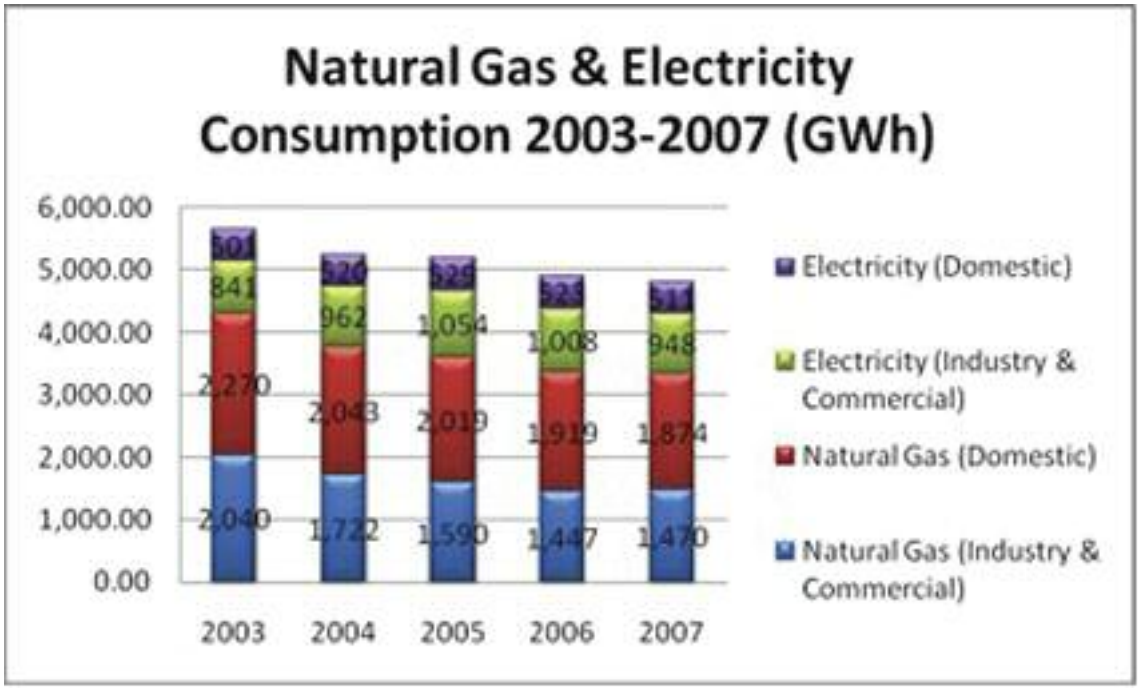


Figure 16: Nottingham's total electricity and gas consumption between 2003 and 2007 (5-year period), broken down into end consumer type. Note that all figures are provided in gigawatts hour (GWh). ***Source: NEP, 2009.***

Nottingham's overall gas and electricity consumption has been falling year on year since 2003. This has been largely due to significant reductions in gas consumption, a 28% fall in industrial and commercial gas use and a 17.4% fall in domestic gas use. Domestic energy savings are well above national trends. Electricity use has grown in both domestic and non-domestic consumers, broadly in line with national trends.

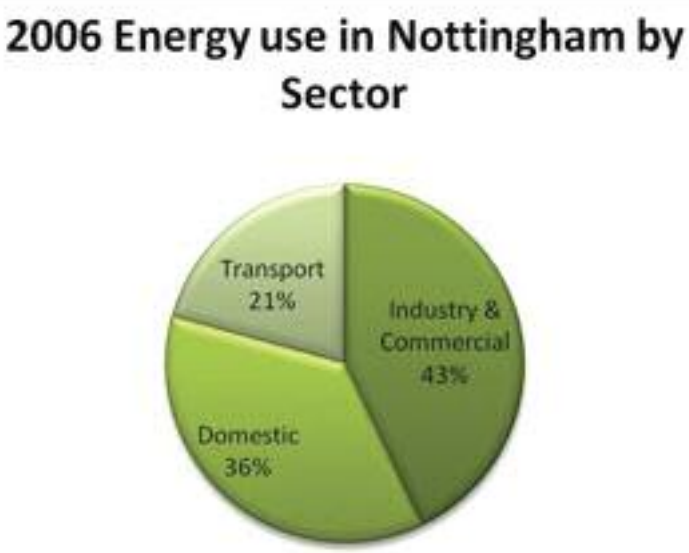
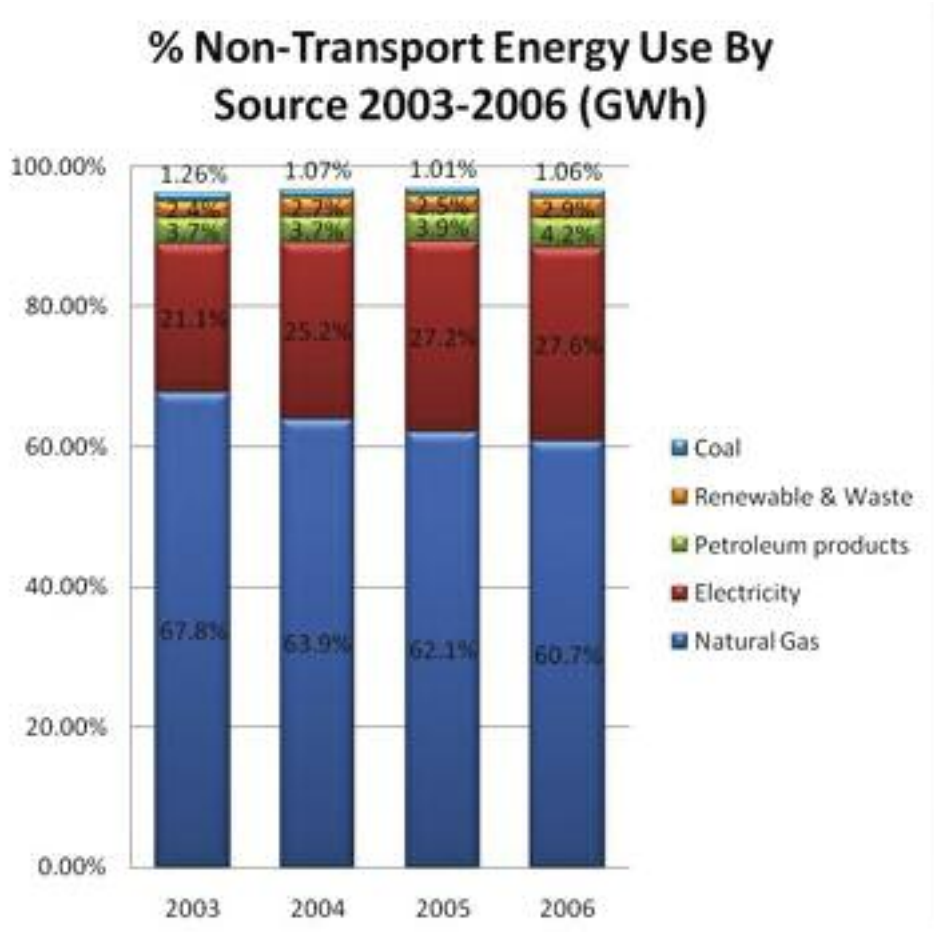


Figure 17: Nottingham's total non-transport energy use between 2003 and 2006 (4-yr period), broken down into energy source and percentage within the total mix. *Source: NEP, 2009.*

Gas use has fallen faster than electricty use. Electricity use is now a larger proportion of the final energy use in Nottingham. The amount of energy consumed from renewables and waste has remained unchanged since 2003, however as total energy use from fossil fuels and electricty has fallen, renewables and waste are making a growing proportion of the residual energy use. Energy consumed from renewables and waste is largely that which is distributed by the City district heating network.

Figure 18: Nottingham's total energy use during 2006, broken down proportionally into end consumer type. *Source: NEP, 2009.*



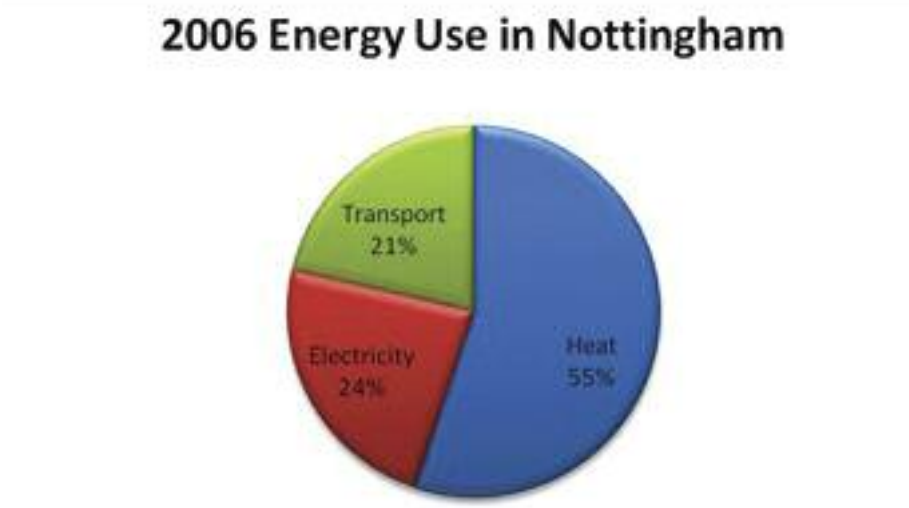


Figure 19: Nottingham's total energy use during 2006, broken down proportionally into energy use type. *Source: NEP, 2009.*

Electricity demand is not falling as fast as gas. There are a number of reasons for this. There has been an increased use of cooling in the UK, both in commercial and domestic buildings.

Electrical air conditioning now accounts for 4% of final electricity consumption and is predicted to rise further with rising global temperatures. Cooling demand in the service sector alone could account for 6% of final electricity consumption by 2020[71]. In the commercial sector, cooling consumes more energy than heating, and climate change is likely to lead to even more demand for cooling both in homes and workplaces.

[71] Department for Environment Food and Rural Affairs: Policy Brief: Improving the Energy Performance of Air Conditioning Products, (2008) July LMM
http://www.mtprog.com/spm/files/download/byname/file/2006-07-10%20Policy_Brief_Air_Con_doc%20fin.pdf

Figure 20: The UK's non-transport energy generated locally from renewable and waste, broken down into individual locations and represented as % proportion of each location's total energy generation. *Source: NEP, 2009.*

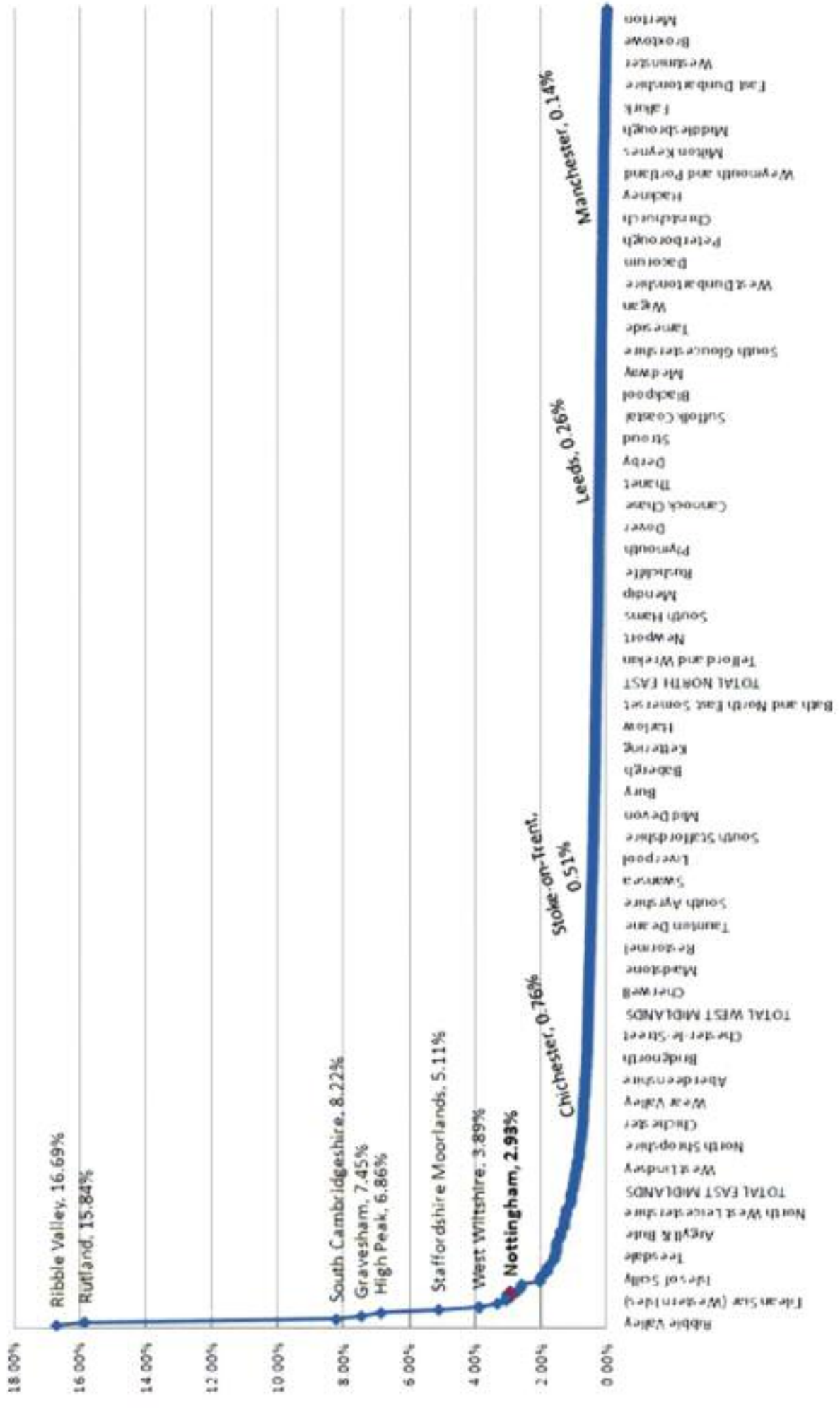
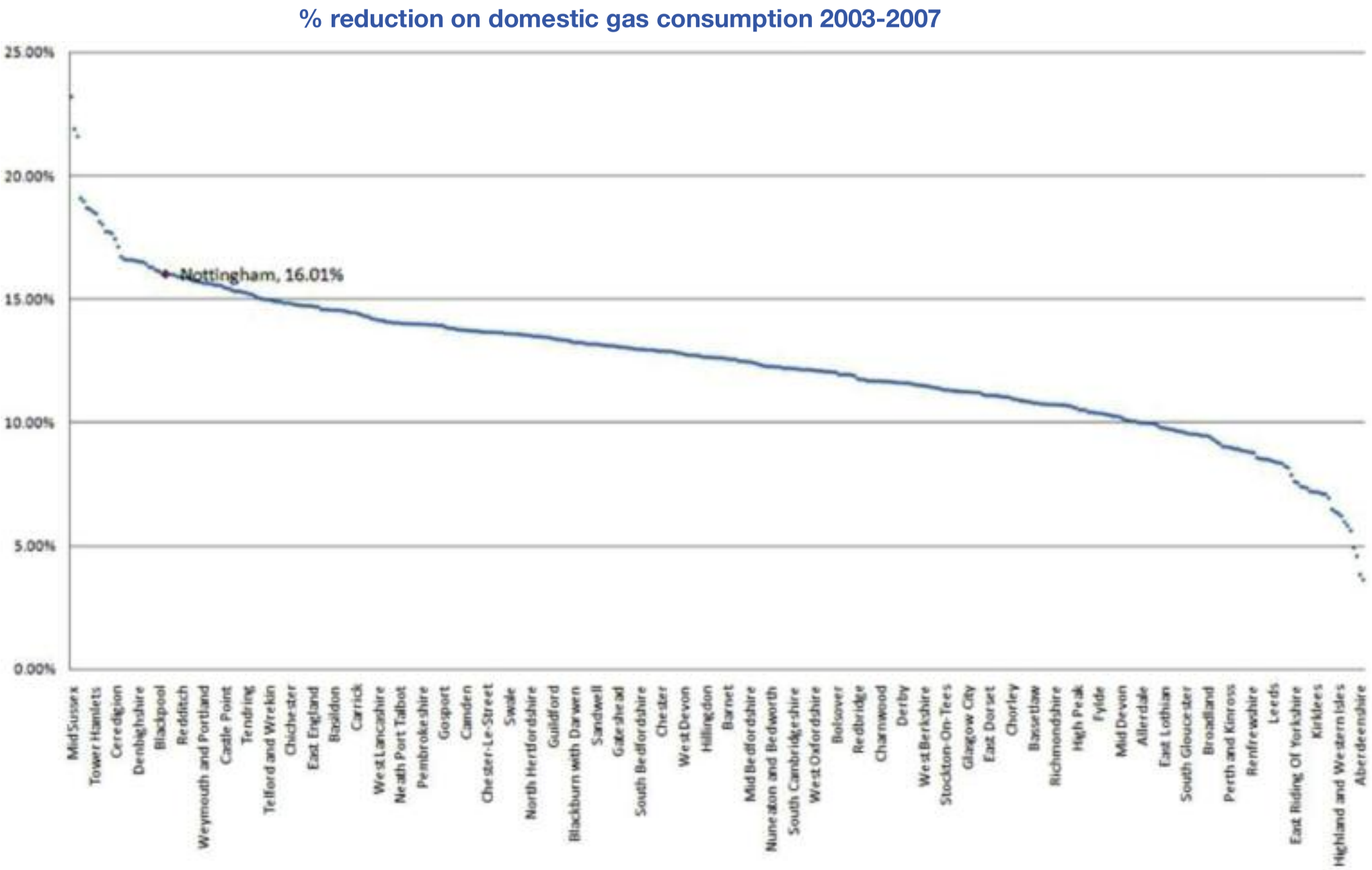


Figure 21: The UK's reduction in domestic energy gas consumption between 2003 and 2007 (5-yr period), broken down into individual locations and represented as % reduction achieved at each location. *Source: NEP, 2009.*



Transport

Table 16: Total fuel consumption in Nottingham between 2003 and 2007 (5-yr period), broken down by different types of road transport systems. Note that figures are represented in thousands of tonnes of fuel. *Source: NEP, 2009.*

	2003	2004	2005	2006	2007
Buses	6.0	5.5	4.8	4.9	5.0
Diesel Cars	10.3	11.1	14.4	15.4	16.2
Petrol Cars	53.7	52.8	57.2	55.8	53.2
Motor Cycles	0.5	0.4	0.6	0.6	0.6
HGV	10.4	10.6	12.4	12.8	12.6
Diesel LGV	11.4	11.9	16.0	16.2	16.7
Petrol LGV	1.5	1.4	1.4	1.4	1.2
Personal (1)	70.5	69.8	77	76.7	75
Freight (2)	23.3	23.9	29.8	30.4	30.5
Total	93.8	93.7	106.8	107.1	105.5
(1)	Personal travel includes buses, diesel cars, petrol cars and motorcycles				
(2)	Freight includes HGV, diesel LGV and petrol LGV				

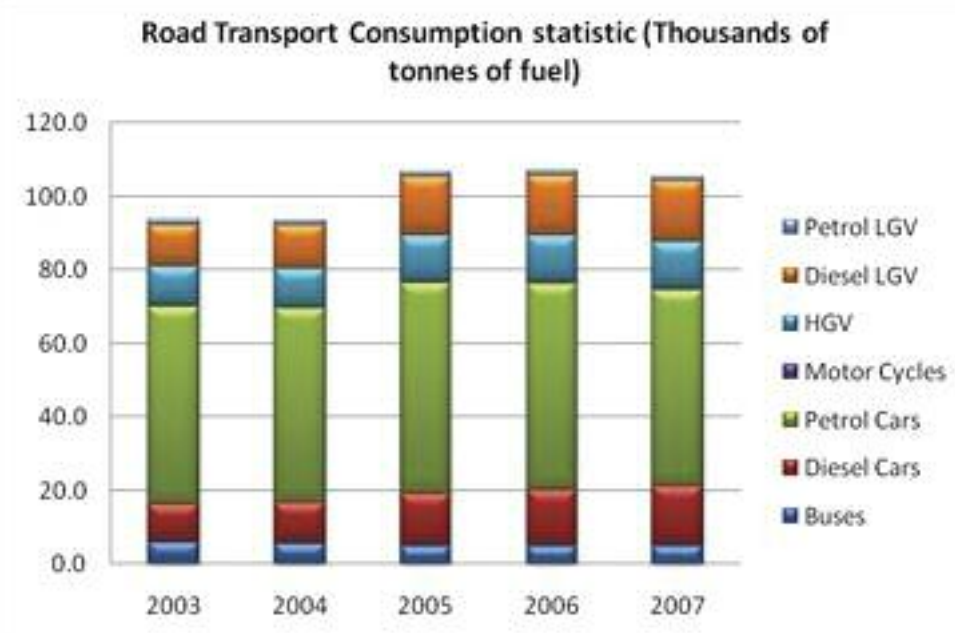


Figure 22: Total fuel consumption in Nottingham between 2003 and 2007 (5-yr period), broken down by % proportional contribution of different types of road transport systems. *Source: NEP, 2009.*

While Nottingham's transport fuel consumption rose between 2004 and 2005, the trend has been reversed since then, with fuel use falling year on year. Petrol vehicle use in particular is falling with an increase in use of more efficient and lower CO2 emission diesel.

6. Financing the strategy

There is a need for several types of finance to ensure the timely implementation of the Strategy.

- **Finance for the large capital energy generation projects.**
- **Finance for the major public, business and domestic energy efficiency programmes.**
- **Finance to support the delivery structures required to ensure the Strategy is coordinated, delivered and monitored.**

The Action Plan associated with the Strategy provides a structure for management and delivery of the strategic objectives and targets with timescales and priorities.

While there are essential roles in the delivery and management of the Strategy in the areas of **transport, research, industrial growth and employment,** and **policy**, the entities delivering in these areas also have wider roles that stretch beyond the Energy Strategy. That said, each of the partnerships above will need some support and resource to deliver elements from the Energy Strategy and to ensure that they are able to fund specific energy related projects. The coordinating, monitoring and reporting role will also need to be adequately resourced.

The two key entities for direct delivery of the Strategy are **Enviroenergy** in terms of energy generation programmes and **Nottingham Energy Partnership**, in terms of energy saving programmes and coordination.

A closer relationship between NEP and Enviroenergy and success in accessing major capital funding for energy generating and saving programmes is critical in ensuring the success of the Strategy.

Between Enviroenergy and NEP the City has the essential elements of a city wide ESCO, NEP delivering significant energy saving across all sectors and Enviroenergy delivering city based energy generation, united under a comprehensive city wide Energy Strategy.

With rising energy and carbon costs, homes and businesses in the City may struggle to pay bills. The costs to deliver public services will also rise with fuel and energy costs. Conversely as Enviroenergy grows and diversifies, increasing revenue from higher energy prices and incentives to generate low carbon heat and power should make Enviroenergy increasingly profitable. These returns will need to be recycled to further energy conservation and generation initiatives to ease the impact of higher prices for residents and business.

While there will be other projects and novel structures delivering some specific innovative programmes, such as Mozes, the community ESCO within the Meadows, NEP and Enviroenergy will act as the main delivery vehicles for ensuring the key targets of the Energy Strategy are met.

Many of the energy generating technologies covered in the Energy Strategy represent attractive investment opportunities. Enviroenergy is the ideal vehicle to own and manage these assets, either wholly or in a Joint Venture with others. The Council will consider the use of prudential borrowing to purchase capital assets for Enviroenergy to ensure revenue from energy generation and distribution is retained to support the further expansion of the heat network and fund energy efficiency measures in the City.

7. Communication, monitoring & review

The Sustainable Energy Strategy will be reviewed on a 5 year cycle in line with the end of each of the national carbon budget cycles to ensure that all targets and objective are still relevant, realistic and are being met. The 1st review will be in 2 years, at the end of 2011, as the current carbon budgeting period is already underway. Following reviews will be at the end of 2016 and the end of 2021. Through 2020 the Strategy for the next 2 carbon budget periods (to 2030) will be developed.

The associated Action Plan will have an annual review cycle to ensure that actions are relevant, timely and prioritised to contribute to the strategic objectives and targets.

A Steering Group will meet bimonthly.

A Technical Coordination group will meet monthly to ensure coordination across the delivery of the action plan to meet the specific targets, and sub groups at least bi-monthly to progress specific areas of the Action Plan.

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9. Contributor's credit

Steering group

- **Cllr Graham Chapman** (Deputy Leader Nottingham City Council)
- **Cllr Katrina Bull** (Portfolio Holder for Sustainability, NCC)
- **Barry Horne** (Corporate Director - Environment and Regeneration)
- **Andy Vaughan** (Director of Environmental Services)
- **Neil Horsley** (Chief Executive, Nottingham Development Enterprise)
- **Alan Swales** (Stewart Regeneration Partnership)
- **Julia Dale** (Nottingham Trent University)
- **Philip Angus** (General Manager, Nottingham Energy Partnership)

Lead

- **Jerome Baddley** (Sustainable Energy Development Manager, Nottingham Energy Partnership)

Technical group

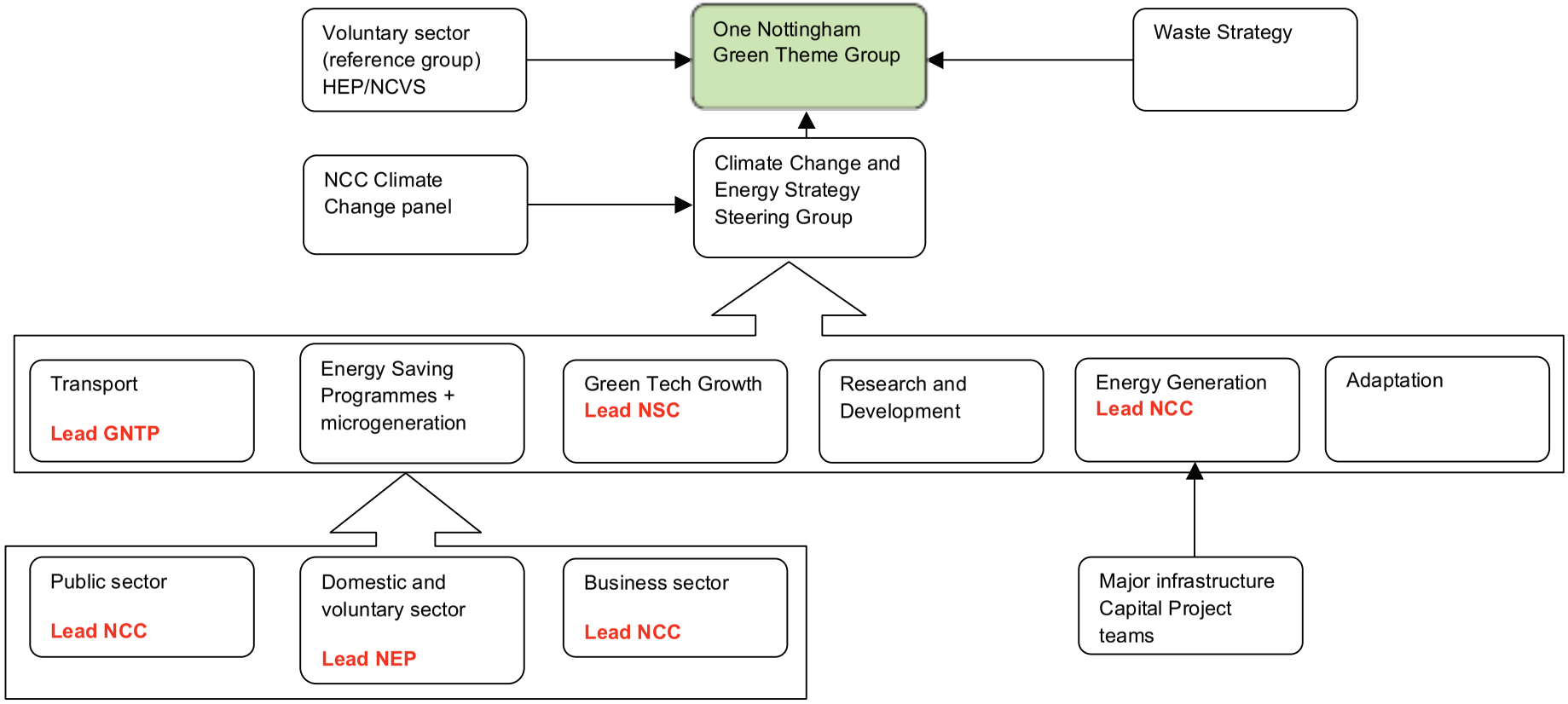
- **Cllr David Smith** (NCC)
- **Grant Butterworth** (Head of Planning, Transport and Intelligence Strategy, NCC)
- **Paul Riley** (Head of Waste Management, NCC)
- **Antony Greener** (Waste Strategy & Development Manager, NCC)
- **Keith Elliot** (Team Leader Energy, Mechanical Services and Health and Safety)

Advice, Technical Excellence and Reactive Maintenance, NCC)

- **Mathew Easter** (Sustainable Development Manager, NCC)
- **Andrew Estrop** (Director, Enviroenergy)
- **Richard Wood** (Planning, Transport & Intelligence Strategy, NCC)
- **Miranda Cumberbatch** (Affordable Warmth Programme Manager, Nottingham Energy Partnership)
- **Eric Rennie** (Planning, NCC)
- **Dr Robin Wilson** (Nottingham University)
- **John Beardmore** (Director-T4 Sustainability)
- **Laura Mayhew Manchon** (Project support, NEP)

Delivery structure

The strategy will be delivered under the One Nottingham structure, alongside the Climate Change Strategy. The delivery structure below will be used to provide steering, technical support and oversight to ensure the targets within climate and sustainable energy strategies are met to support the key local and national targets. Actions within the plan are given a named lead, time scale and detailed against a delivery group. The groups below will be responsible for meeting regularly to ensure support and coordination in the delivery of their actions and annually reviewing their actions to determine further key priorities in their area. Numbered groups have actions detailed against them in the plan.



Group:	1. Governance					
Group Lead:	Climate and Energy Strategy Steering Group , reporting to Green Nottingham (One Nottingham LSP theme group)					
Ref no.	**Relates to Aims**	**Action Brief**	**Action Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO6	7	**To develop resource and maintain a prioritised action plan and delivery management structure including key partners and technical experts to deliver the strategy, with an annual review cycle for the action plan and review cycles aligned with national carbon budgeting periods for the strategy.**	Climate and Energy Strategy Steering Group	high	Sep-10	Sep-11

Group:	2. Energy Savings Programmes -Public sector					
Group Lead:	Nottingham City Council					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO4		**To reduce LA, Domestic and 'Industrial and commercial' energy consumption in Nottingham in line with the detailed targets**				
2.1	1	City Council to plan and monitor its internal carbon reduction (NI 185) targets through a Climate Change Panel	NCC	high	Sep-10	
2.2	1	City Council to relocate and centralise services to energy efficient buildings i.e. Loxley House	NCC	high	2010	
2.3	1	To reduce the City NHS energy consumption through a planned Carbon Reduction Programme	City NHS	high	Aug-10	
2.4	6,7	Establish a public and voluntary sector organisational carbon footprinting and carbon reduction support programme.	NEP	high	Dec-10	
2.5	1,4,5	City council to establish electric vehicle charging points for fleet, connected to Enviroenergy low carbon private wire supply	NCC	medium	Jun-11	
2.6	1,4,5	City council to connect Loxley House power supply to Enviroenergy low carbon private wire supply	NCC	high	Jun-11	

Group:	3. Energy Savings Programmes- Domestic and voluntary sector					
Group Lead:	Nottingham Energy Partnership					
Ref no.	Relates to Aims	Action Brief	Lead	Priority (highest, high, medium, low)	Target date	Review date
SO4		**To reduce LA, Domestic and 'Industrial and commercial' energy consumption in Nottingham in line with the detailed targets**				
SO9		**The city and partners will support the development of local and grass roots organisations seeking to enable their communities to reduce carbon footprints, energy bills and adapt to inevitable climate change and peak oil.**				
3.1	2,6	Complete all cavity and loft insulation measures in all tenures through area based, community and targeted programmes	NEP	highest	Jan-12	
3.2	2,6,7,8	Establish pilot solid wall insulation projects using Community Energy Savings Programme (CESP) funding across tenures	NEP	highest	Apr-10	
3.3	2	Ensure that energy 'current cost' monitors are available from all the City's lending libraries	NEP	high	Apr-10	
3.4	2,4,6	Source funding to establish an IAG, marketing and customer support programme to accelerate uptake of domestic and community PV in the city, capitalizing on the governments Feed in Tariffs.	NEP	medium	Sep-10	
3.5	2,6,8	Expand the CESP pilot areas to all suitable homes in the city	NEP	high	Jan-12	
3.6	2,4,8	Establish a citywide interest free green loans programme	NEP	medium	Apr-11	
3.7	2,4,6,8	Source funding to Support Sungain IAG, marketing and customer support programme to accelerate uptake of domestic and community SWH in the city	NEP	medium	Apr-11	
3.8	2,6,8	Work with voluntary sector partners to develop community energy savings support programmes to match capital grants and funding for energy efficiency provided through CESP and Warm Zone	NEP	medium	Sep-10	
3.9	2,6,8	The city council will support and participate in the development of Meadows Ozone Community Energy ltd (MOZES)	NCC	medium	Jul-10	

Group:	4. Energy Savings Programmes- Business sector					
Group Lead:	*Nottingham City Council*					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO4		To reduce LA, Domestic and 'Industrial and commercial' energy consumption in Nottingham in line with the detailed targets				
	3,6,7	Establish a business sustainable energy support service to provide IAG around carbon management, renewable energy and energy savings opportunities to ensure Nottingham businesses are well placed in terms of energy security and in providing their services	NCC	high	Sep-10	
	3,7	Establish a City Business Energy Task Group	NCC	medium	Jan-11	
	4,7	Work with businesses to determine industrial or retail sites in the city suitable for biomass CHP, localised, district or partnership energy solutions.	NCC	high	Apr-11	
	3	Encourage and support a rapid switch over to smart metering for gas and electricity amongst non-domestic energy users in the city .	NCC	high	Apr-11	

Group:	5. Energy Generation Programmes					
Lead:	Nottingham City Council					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO3		**To develop the city's installed low or zero carbon energy generation and distribution capacity in line with the detailed targets in the Nottingham Sustainable Energy Strategy.**	Enviroenergy	0		
SO2		**Major capital investments detailed within the Energy Strategy and its action plan to be assessed for delivery through innovative partnerships, including with Enviroenergy, the City's ESCO and district heating provider. This will enable Enviroenergy to build a mixed portfolio of generation and income for continuous re-investment in energy efficiency and generation in Nottingham.**	NCC	0		
5.1	2,4,6	Develop a local biomass aggregation, processing and transfer site to support the local supply chain of biomass fuel from waste and sustainably managed wood sources.	Enviroenergy	highest	Dec-11	
5.2		Work with City PCT and Nottingham University Hospitals to support conversion of the city hospital coal - fired heat station to a lower carbon fuel	Enviroenergy/ NuH	highest	Dec-12	
5.3	2,4,6	Build a large exemplar Biomass CHP plant.	Enviroenergy	high	Dec-12	
5.4	3,4,5	Develop the capacity of Enviroenergy to maximise opportunities in local electricity sales via private wire, including evaluation of the use of Enviroenergy electricity to power electric vehicles e.g.: City Council fleet, tram.	Enviroenergy	high	Apr-11	
5.5	4	Establish a case and location for an anaerobic digester plant to turn the city's green and food waste into energy and compost.	NCC	medium	Apr-11	

5.6	2,4,6	By 2020, to expand and update CHP capacity at London Road Heat Station to use additional steam from a 3rd line at Eastcroft incinerator.	Enviroenergy	high	ongoing	
5.7	2,3,4,5	Significantly expand the district heating network, and maximize local heat distribution to new and established domestic and non-domestic properties.	Enviroenergy	high	ongoing	
5.8	2,4,6	Support the development of large wind power at the 3 significant wind sites in the City; Grove Farm, The Racecourse and The Meadows Embankment	Enviroenergy	low	2020	
5.9	2,4,6	Investigate the feasibility of developing Holme Pierrepoint sluices for hydro energy generation	Enviroenergy	medium	2016	
5.11	2,4,6	Survey the city's open spaces for suitable small scale wind 2.5-15KW sites	NEP	medium	Apr-11	

Group:	6. Green Tech Growth					
Lead:	Nottingham Science City					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO1		**The city's unique strength in energy self-sufficiency will be used to promote Nottingham in the UK and Europe as the first choice for location of sustainable energy related and green tech business, innovation and growth.**	NSC		2010	
6.1	3,4,6,7	Building on the city's reputation for energy security, the city will aim to establish an energy park to support new and relocating energy related businesses to base their operations here.	NSC	high	2013	
6.2	3,4,6,7	Develop a local GreenTech Industry Strategy to form a key element of the Nottingham Energy Strategy	NSC	high	Jan-11	
6.3	3,4,6,7	To support the Nottingham Science Park in attracting more SME and start-up businesses in the energy and low carbon sector.	NSC	high	2010	
6.4	3,4,6,7	Collectively lobby EMDA for an Energy iNet / or mechanism to provide Companies access to Energy Business Advisors with specific sector experience and expertise	NSC	high	Sep-10	
6.5	3,4,6,7	Closely monitor the development of EMDA's Energy Connections Programme in order to link local companies to this support package	NSC	medium	ongoing	
6.6	3,4,6,7	Support the University of Nottingham in the development of an Energy research and test bed demonstration facility at the Jubilee Campus and link SME's to this resource	NSC	high	ongoing	
6.7	3,4,6,7	Develop and maintain intelligence on local Companies in the emerging Energy sector	NSC	medium	ongoing	

6.8	3,4,6,7	Investigate the issue of skills and provision in this field in relation to creating the right skill base across all levels of a future GreenTech Sector. Including design innovation, consultancy, manufacture and installation.	NSC	high	Jul-10	
6.9	6	Evolve and modify the Cleantech YES Post Grad programme to offer an Enviro-entrepreneurs master class business development programme to applicants across the City and County	NSC	medium	Sep-10	

Group:	7. Policy and planning					
Group Lead:	Nottingham City Council					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO5		**NCC will work to ensure local planning policy, and local authority capital procurement supports the timely delivery of the city sustainable energy strategy, through developing and setting rigorous, evidenced, local targets for carbon and energy sustainability in new development.**	NCC			
7.1	2,4	Through the Local Development Framework process, the City will consult on the tightening of local planning policy, with regards to renewables and energy efficiency, to deliver on small scale renewable energy targets in the wider context of viable sustainable development objectives. The city will establish whether there is an evidence base to recommend higher targets in the LDF, within certain zones of the city e.g.: to encourage connection to district heating networks.	NCC	high	**2012**	

7.2	2	The City Council will seek to accelerate the Code for Sustainable Homes and Building Regulations, on the road to zero carbon new build by 2016. The CSH level will be reviewed as Code Level requirements increase to 2016, and will be subject to value for money tests and viability assessment through the statutory planning process.	NCC	high	**2012**	
7.3	2	Through the planning and development process, encourage developers to meet zero carbon homes standard and to seek to ensure that all new housing development will be capable of feasibly being retrofitted to achieve the zero carbon standard.	NCC	medium		
7.4	2,7,8	Promote the development of the Meadows area as Nottingham's first 'low carbon action zone'.	NCC	medium		
7.5		Where possible to demand through NCC commissioning code levels 1 in advance of national building regulation from all new housing built on NCC land	NCC	medium		
7.6		To require through NCC commissioning, that all new public sector infrastructure is designed to an appropriate maximum 'in use' carbon intensity (kgCO2e/m2) and designed to maintain this standard within specified future climate change and energy costs risk limits.	NCC	high		
7.7		Evaluate the potential for establishing a Community Infrastructure Levy fund for the purchase of Low or Zero Carbon technologies within the city	NCC	high		
7.8		Encourage all new non-domestic developments, not already 'Zero carbon', to be suitable for later 'Zero carbon' retrofit	NCC	medium		

Group:	8. Research and Development					
Lead:	TBC					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO8		**To work closely in partnership with business, universities and technology partners to ensure Nottingham accelerates the process and maximises the impact of demand lead innovation in energy technology and management within the city**				
8.1	1,4	To assess economics of installing low or zero carbon energy sources on the city council estate in the light of Feed in Tariffs	NCC	high	Sep-10	
8.2	1,4,5	To determine the feasibility of running city council fleet, on Enviroenergy electricity	NCC	medium	Sep-10	
8.3	4,5	To conduct a city wide heat and cooling demand and source mapping excercise	Enviroenergy	highest	Sep-10	
8.4	4,7	Conduct detailed feasibility study into use of city open air car parking areas for PV to power zero carbon transport initiatives	NEP	medium	Apr-11	
8.5	1,4,5,7	Work with Universities to evaluate the potential for the use of the river and canal as heat sources for Water Sourced	NEP	medium	Apr-11	

		Heat pumps				
8.6	2,6,7	Work with the Universities, Enviroenergy and the local Distribution Network Operator to establish the feasibility of using Electric Vehicles to buffer grid supply and act as energy vectors.	NEP	low	Dec-11	
8.7	2,4	Through the Warm Zone partnership, provide opportunities for moving innovative products and delivery mechanisms to the mainstream	NEP	high	ongoing	

Group:	9. Transport					
Group Lead:	The Greater Nottingham Transport Partnership					
Ref no.	**Relates to Aims**	**Action Brief**	**Lead**	**Priority (highest, high, medium, low)**	**Target date**	**Review date**
SO7		**To set transport related carbon emissions reduction and technology targets in the forthcoming 3rd Local Transport Plan which are aligned with the energy strategy and aim to exceed the national Low Carbon Transition Plan targets by 2020. At this stage an indicative target of 20% reduction is recommended.**	GNTP			
9.1	5	Incentivise and support the increased uptake of electric vehicles including electric buses, cars and scooters, in the city within local transport policies	GNTP	medium	2011	
9.2	7	Encourage connection of the Net2 tram extension to the Enviorenergy private wire electricity supply.	GNTP	high	2010	
9.3	4,5	To consider future connections with the canal and river for water freight to bring biomass fuel into the city, when developing spatial plans.	GNTP	medium	2011	
9.4	5	Increase public transport patronage by one million extra trips	GNTP	high	2020	
9.5	5	Reduce single occupancy journeys to work by 20%	GNTP	high	2020	
9.6	5	Double the level of cycling within targeted areas	GNTP	high	2020	
9.7	5	Retain modal share of car-borne journeys to school at below 20%	GNTP	high	2020	
9.8	1,3,5	Increase willingness to use sustainable travel options (formal target value to be adopted following baseline survey)	GNTP	high	2020	

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