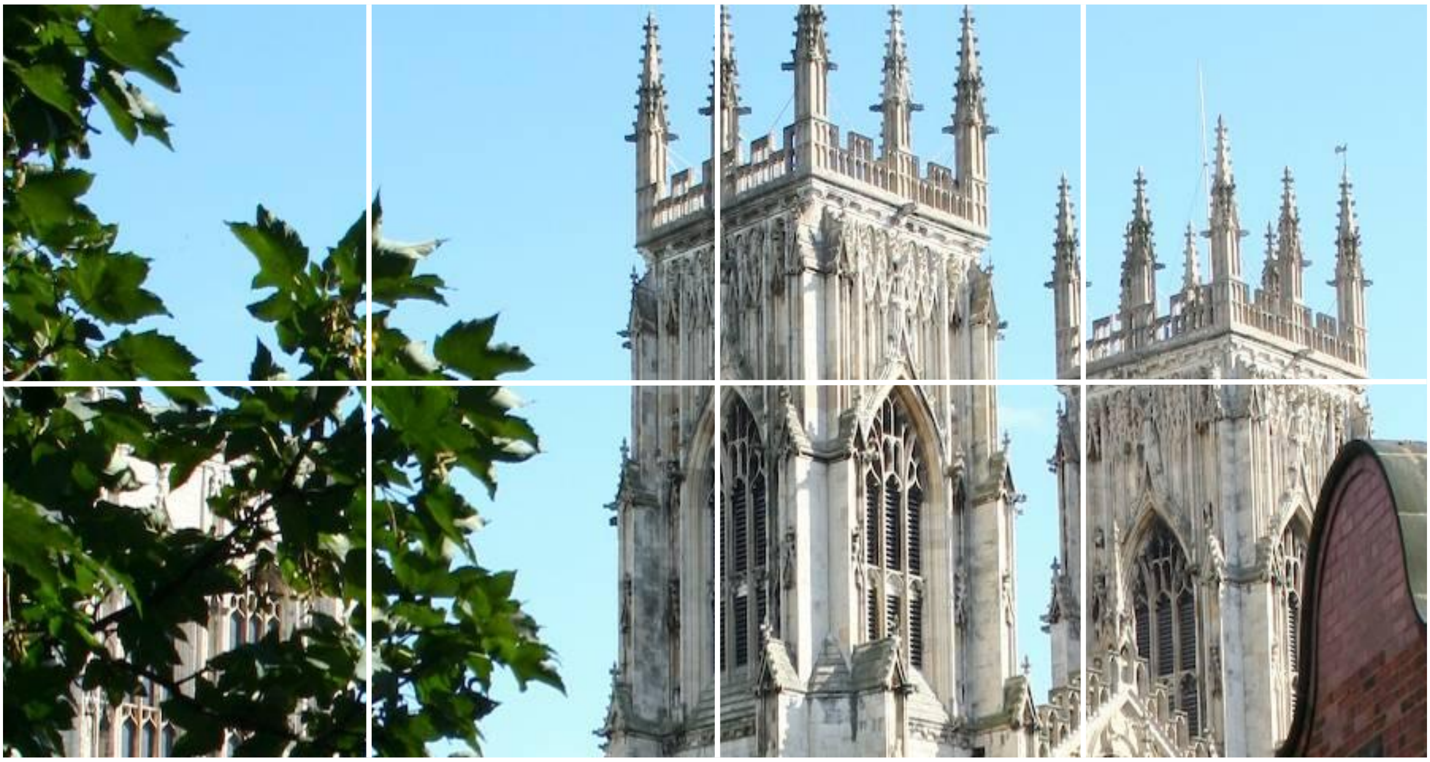

Renewable energy

Strategic viability study for York

Final report

City of York Council
Restricted Commercial
ED47718
Version 6
Date: December 2010

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Customer	City of York Council
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Executive summary

The City of York Council is developing an evidence base for the Yorks' Local Development Framework, which will shape the future development of the City for the period to 2031. AEA and Savills were appointed by The City of York Council to prepare the portion of the evidence base that will address renewable energy potential.

Context

This report sets out the methodology and outputs from a renewable energy strategic viability study for York. The aim of this study is to inform City of York Council about the potential, viability and deliverability of renewable energy options within York.

This report examines national and regional policy, looks at energy demand and the status of renewable energy in York. This provides a robust understanding of the key drivers and priorities for the development of renewable energy, as well as the demand for energy within the study area.

In assembling a reliable evidence base for the renewable energy content of the York Development Framework, a wide range of legal, policy and guidance is potentially of relevance. Relevant provisions have thus been reviewed in order to provide a clear context for the York study.

Throughout the production of this report, there have been developments in the technology arena. Guidance on the assessment of renewable energy potential across an area has only recently emerged and economic incentives for renewables are changing with the introduction of Feed in Tariffs and the advent of the Renewable Heat Incentive. The changing backdrop has been incorporated into the current study as far as is practicable.

Assessment of demand

The report establishes a baseline of current electricity and heat demand for the study area, then explores the potential energy demand from new developments. This review shows that future demand in **York is expected to reach 759,842 MWh of electricity and 1,678,599 MWh of heat per year by 2020.** This equates to an increase of approximately 3% in electricity and heat demand. Existing, planned and potential energy production sites within York are identified, along with their installed capacity.

In order to achieve the aspirations of the UK Renewable Energy Strategy lead scenario for 30% electricity and 12% of heat to be supplied from renewable energy, York would need to produce **227,953 MWh/yr of electricity and 201,432 MWh/yr of heat from renewable sources by 2020**.

Current operation, planned and prospective renewable energy in York accounts for 4.05% of future electricity and 0.36% of future heat demand**.**

Assessment of potential

Much of the potential comes from anticipated new residential developments planned for in the Core Strategy. There are inherent limitations in predicting the future, as above, and so the approach has limitations in predicting actual future dwellings and our assessment recognises this.

The report assesses the potential of employing various renewable energy sources in new developments, using the current most authoritative methodology for assessing renewables potential across an area, namely the Department of Energy and Climate Change's report entitled, " Renewable and Low Carbon Energy Capacity Methodology", (January 2010). Where appropriate the methodology has been adapted for York's local conditions, constraints and situation.

Based upon the assessment set out in this report, the estimated potential for low and zero carbon energy in York is summarised in table S1.

Table S1: Technical potential by technology for renewable energy in York to 2031

Technology	MWh/year pre 2020		MWh/year total (up to 2031)	
	Electricity	Heat	Electricity	Heat
Large wind	78,840	-	78,840	
Medium wind	78,840	-	78,840	
Hydro (0-10 kW)	49	-	49	
Hydro (10-20 kW)	194	-	194	
Hydro (100-500 kW)	1,314	-	1,314	
Hydro (500-1500 kW)	4,380	-	4,380	
CHP (district - electricity and heat)	17,520	35,040	17,520	35,040
Biomass (district heating)	-	19,710	-	19,710
Small and micro wind	294	-	480	-
Biomass for single building heating	-	7,623	-	16,451
Solar PV domestic	1,564	-	2,551	-
Solar thermal domestic	-	489	-	540
Ground/air source heat pumps domestic	-	6,534	-	6,693
Total	**182,995**	**69,396**	**184,168**	**78,434**
Energy demand (current)	**737,020**	**1,627,599**	**737,020**	**1,627,599**
% met by RE generation	**24.83%**	**4.26%**	**24.99%**	**4.82%**
Energy demand (future)	**759,842**	**1,678,599**	**759,824**	**1,678,599**
% met by RE generation	**24.08%**	**4.13%**	**24.24%**	**4.67%**

The above table shows that generation capacity identified up to 2020 falls short of the UK Renewable Energy Strategy lead scenario for both electricity and heat. However, it is noted that further potential could be identified through the following means:

- Additional heat mapping at the lower level super output area to identify sites with potential for CHP or district heating networks.
- Identification of existing and future commercial and industrial sites with roof space suitable for solar technologies.
- The retrofitting of existing housing stock with renewable and low carbon technologies to reduce overall energy demand within the study area.

It should be noted that there are limitations to the results of the study. These include:

- Site-specific technologies are not pursued to their definitive conclusion – the study gives insights on areas of potential and can indicate that a given area of York may have more potential than another, but no hard conclusion can be reached.
- The sources of information upon which the report's insights and conclusions are based are from standard, UK recognised sources, which are by their nature inexact as they have a 'broad brush' area approach.
- The study looks into the future on issues such as efforts needed to reach defined future targets or renewable energy potential from various sources not yet established. By its very nature this will be inexact and imprecise. When considering the scope for renewable energy technologies, the level of development already undertaken has an impact on the ability to provide accurate figures of MW potential.

Viability and feasibility

Viability and feasibility were assessed in consideration of quantitative and qualitative analysis. An economic analysis was firstly undertaken producing a Potential Curve. This shows relative potential against capital cost of the technologies. The results were incorporated into a multi-criteria analysis to reflect the City of York's Council's current policy priorities, with technologies assessed as high, medium or low against a range of criteria derived from a policy review and internal meetings. This methodology combined the above to produce a prioritised table of the technologies. Table S2 below shows the prioritised technologies in York.

Table S2: Technology options in York prioritised by cost analysis and by multi criteria analysis

Renewable energy potential curve [cost effectiveness, with significant potential with York]	Multi-criteria analysis [benefit in terms of meeting local strategic objectives]
Highest preference Large/medium wind	**Highest preference** Heat pumps[1]
Higher preference Biomass (district heating) Biomass for single building Heat pumps	**Higher preference** Large wind Hydropower
Mid preference Solar thermal Solar PV Biomass CHP	**Mid preference** Biomass for single building heating Medium wind Solar thermal Solar PV
Lowest preference Hydropower Small and micro wind	**Lowest preference** Biomass for district heating Biomass CHP Small and micro wind

In addition, the green job creation potential of each technology is estimated.

The purpose of these analyses is not to exclude particular technologies as unsuitable for development, but is to show which technologies are likely to have most economic benefit and be most favourably received within York in that they reflect current policy objectives. These analyses show that preference should mainly be for onshore wind which could provide benefits to York in all areas, as a relatively cost effective option.

Sustainable Design and Construction

The viability and feasibility of introducing high sustainable buildings standards on construction projects in York are also assessed in an additional annex. This sets out the main applicable nationally recognised standards for the domestic sector and the non-domestic sectors, and provides a briefing on each.

The annex recommends that higher building standards should not be set for new housing funded by the HCA or for non-domestic buildings, but notes that City of York Council might wish to consider setting standards for new private sector housing in line with those for public sector buildings. Advice is set out on the guidance that could be published

[1] Both air source and ground source

Planning Policy

We set out our findings in a planning policy context in the following section. The recommendations are stated in a way that is conducive to ease of transcription into policies for York's Core Strategy.

Recommendations

The main findings of the report are as follows:

- Based on existing capacity, capacity from schemes with planning consent but not yet in place and the identified potential from the relevant technologies, it is recommended that the City of York Council's LDF Core Strategy includes targets to secure 39MW of installed renewable electricity capacity and 15MW of installed renewable heat capacity by 2020 and 40MW of installed renewable electricity and 18MW of installed renewable by 2031.
- Based on identified potential and its estimated contribution to City of York's total energy demand, and if the City of York Council determines that it is reasonable to assume a medium level of renewable energy development in York, a carbon dioxide reduction target of around 10% from renewable energy should be achievable.
- Based on the identified potential from the relevant technologies, and having regard to the support now available from Feed-in Tariffs, an on-site target requiring 9-10% reduction of CO_2 emissions would be possible. However, York may want to consider setting a more ambitious target of 15% to encourage higher levels of renewables in new development.
- Rather than (or as well as) setting a Merton-style target for renewable energy in new development, as discussed in the bullet point above, City of York Council could consider adjusting their policy focus towards promoting and encouraging the development and physical integration of on and off-site renewable energy generation capacity
- These target commitments could be incorporated into draft policy CS14, expressed as a discrete policy, or otherwise incorporated into the supporting text for policy CS14.
- Other planning policies that York City Council could adopt to encourage low and zero carbon energy installations are:

  - Passive solar design should be considered at the planning application stage for all new developments across the city.
  - The City of York's LDF Core Strategy include a criteria-based policy addressing the potential for wind energy. The policy should embrace wind energy development at a variety of scales, so as to acknowledge the potential for medium-sized turbines.
  - The City of York's LDF Core Strategy includes a policy acknowledging the potential for biomass CHP
  - the City of York's LDF Core Strategy includes a policy acknowledging addressing the potential for small scale hydro power projects

Further findings are:

- The City Council should seek to facilitate the transition to zero-carbon construction through the publication of a supplementary planning document on sustainable design and construction.
- Guidance and a programme on the retrofit of existing properties should be established
- The City Council should monitor developments in the knowledge/understanding of renewables technology, such as reports on any of the main technologies or developments in renewables applications in the residential sector.
- The City of York Council should enhance the evidence base with improved levels of detail and new information, where appropriate. For example, mapping energy demands at the lower level super output area (LLSOA), when these data become available, would provide a more detailed assessment of sites and identify LLSOA areas that have the greatest potential for renewable energy technologies.
- Having regard to national planning guidance and the renewable energy resource estimates identified in the study, the report recommends a planning policy approach for the future development of York's low and zero-carbon energy resources.
- Arising from this are opportunities for York to develop as a centre of expertise for sustainable construction, assisting the city's economic transformation
- The Eco Community at the British Sugar part of the York Northwest site is a specific development presents an opportunity to promote low-carbon development and energy planning.
- City of York Council itself can help to stimulate demand and lead by example through incorporating renewable and low carbon energy considerations into its own agenda and procedures.
- Working through partnerships and the development of an engagement strategy will help to promote and deliver lasting change within York.

Abbreviations

AGL	Above ground level
AONB	Areas of Outstanding Natural Beauty
AQMA	Air quality management area
ASHP	Air source heat pumps
BERR	[Former] Department for Business, Enterprise and Regulatory Reform
BMS	Building Management System
BRE	Buildings Research Establishment
BREEAM	BRE Environmental Assessment Method
BSF	Building Schools for the Future
CERT	Carbon Emissions Reduction Target
CESP	Community Energy Saving Programme
CFL	Compact fluorescent lamp
CIBSE	Chartered Institution of Building Services Engineers
CHP	Combined heat and power
CLG	(Department for) Communities and Local Government
CO_2	Carbon dioxide
CRC	Carbon Reduction Commitment
The Code	Code for Sustainable Homes
DCLG	Department of Communities and Local Government
DECC	Department of Energy and Climate Change
DER	Dwelling emission rate
DIY	Do it yourself
DTI	Department of Trade and Industry
E/O	Extra Over: extra cost above that required to comply with the 2006 Building Regulations
EA	Environment Agency
EPBD	European Performance of Buildings Directive
EPS	Expanded polystyrene
EST	Energy Saving Trust
EU	European Union
FIT(s)	Feed-in tariff(s)

GIS	Geographical information systems
GSHP	Ground source heat pumps
ha.	Hectares
HCA	Homes and Communities Agency
Heat Load	A requirement for heat at a site or in an area that, typically, requires a heating source(s) – such as a boiler, CHP system, heat pump or other heat provider.
HLP	Heat Loss Parameter
IBA	Important Bird Area
kW	Kilowatts (1kW = 1,000 watts)
kW/km^2	Kilowatt per kilometre squared
kWh/yr	Kilowatt hours per year
kWp	Kilowatt peak
LCEGS	Low carbon and environmental goods and services
LDF	Local Development Framework
LEED	Leadership in Energy and Environmental Design Green Building Rating System
LF	Load factor
LLSOA	Lower level super output area
LNR	Local Nature Reserve
LZC	Low or zero-carbon
LZCT	Low or zero-carbon technologies
m/s	Metres per second
MCA	Multi-criteria analysis
MLSOA	Middle level super output area
MMC	Modern Methods of Construction
MVHR	Mechanical Ventilation with Heat Recovery
MW	Megawatts (1MW = 1,000kW)
MWh/yr	Megawatt hours per year
NI 185	National Indicator 185: Percentage CO_2 Reduction from Local Authority Operations
NI 186	National Indicator 186: Per Capita Reduction in CO_2 Emissions in the Local Authority Area
NI 188	National Indicator 188: Planning to Adapt to Climate Change
NNR	National Nature Reserve
OSB	Oriented strand board

PPS	Planning Policy Statement
PSD	Passive Solar Design
PV	Photovoltaics
Ramsar	Ramsar sites are wetlands of international importance designated under the Ramsar Convention.
RE	Renewable energy
RES	Renewable Energy Strategy
RESTATS	Renewable Energy STATisticS database for the UK
RHI	Renewable Heat Incentive
RSPB	Royal Society for the Protection of Birds
RSS	Regional Spatial Strategy
SAC	Special Areas of Conservation
SHW	Solar Hot Water
SIPs	Structural insulated panels
SMART	Specific, measurable agreed, realistic and time-dependent
SPA	Special Protection Areas
SPD	Supplementary Planning Document
SSSI	Sites of Special Scientific Interest
TER	Target Emission Rate
uPVC	Unplasticised polyvinyl chloride
U-value:	Is a measurement of the overall heat energy transfer rate (under standard conditions) through a particular section of construction material. It is defined as the rate of heat flow in watts (W) through an area of 1 square metre (m) for a temperature difference across the structure of 1 C degree centigrade or Kelvin (K).
VOCs	Volatile organic compounds
W/m^2K	U-value unit
ZCH	Zero-carbon Home

1 Introduction

Background ◈ Study aims ◈ City of York area ◈ Project approach and report structure

1.1 Background and study aims

1.1.1 In late 2009 the City of York Council appointed consultants AEA and Savills to undertake a renewable energy strategic viability study for the city. The aim of the study was to inform the Council about the potential, viability and deliverability of renewable energy options within York, with the findings intended to form a part of the evidence base for renewable energy targets in the Council's Local Development Framework Core Strategy.

1.1.2 The Local Development Framework (LDF) is the plan for the future development of York. It will be a blueprint for the economic, social and environmental future of York which will provide the framework for implementing the Council's aims and objectives that affect the use of land and buildings. The Core Strategy lies at the heart of the LDF and will set the overall direction for the plan by driving forward the spatial planning framework for the city. Having published its LDF Core Strategy Preferred Options for public consultation in June 2009, the Council is now preparing a draft Core Strategy for submission to the Secretary of State, after which it will undergo public examination.

1.1.3 As chapter three of this report explains, national planning guidance advises planning authorities to develop an evidence-based understanding of the local feasibility and potential for renewable and low-carbon energy technologies in their areas. To this end, AEA and Savills were instructed to:

- identify the potential for the development of renewable energy in York in spatial planning terms;
- investigate the deliverability and viability of renewable energy from large-scale 'stand-alone' technologies (e.g. large-scale wind and biomass) through to integrated on-site options (e.g. solar photovoltaics, solar water heating and heat pumps);
- assess the potential contribution of renewable energy to the city's energy consumption; and
- provide the Council with practical advice and recommendations on the deliverability of identified renewable energy targets through the emerging LDF.

1.1.4 The project brief required a review of existing and potential renewable energy resources in the city, consideration of the site characteristics of developments that might facilitate renewable energy use, an assessment of economic viability and recommendations for a defensible policy approach towards renewable and low carbon energy in the city's LDF.

1.2 The study area

1.2.1 The City of York Council is a Unitary Authority serving a resident population of approximately 194,900[2], with over 70% of these living in the principal urban area. The study addresses the whole area served by the Council, an area some 272 square kilometres in extent. In addition to the city itself, the study area thus includes an extensive rural hinterland that includes the local services centres of Upper and Nether Poppleton, Haxby and Wigginton and Strensall, the villages of Copmanthorpe, Bishopthorpe and Dunnington, and over a dozen smaller villages and hamlets.

1.2.2 Whereas York is perhaps best known as a historic Minster city and focus for tourism, the city is an important centre for science, industry and professional services, supported by a strong university. The emerging LDF Core Strategy aims to facilitate the transformation of the city's economy whilst addressing local housing needs, particularly the affordability of housing. Parts of the study area are earmarked for regeneration, and these sites will offer particular opportunities for renewable and low carbon energy development.

1.2.3 Most undeveloped areas of the study area lie within a proposed green belt. Green wedges focused around the historic 'strays' and the Ouse 'ings' are a key feature of the locality, providing distinctive tracts of undeveloped common land that extend from the countryside into the heart of the city. York's green infrastructure also includes eight Sites of Special Scientific Interest (SSSI), and other locally-important sites for nature conservation and recreational open space.

[2] Source: Office of National Statistics; 2008 mid-year estimate, revised May 2010.

Figure 1-1: Location of York within Yorkshire and the Humber

Source: Yorkshire and Humber Assembly

1.3 Project approach and report structure

1.3.1 Having regard to the requirements of the study brief, this report is structured as follows. Chapter Two examines the current profile of energy supply and demand in the study area. Existing levels of demand for electricity and gas – a principal source of heat – are identified for both domestic and non-domestic consumers, to provide an overall picture of York's energy requirements and a baseline for assessing the potential of renewable and low-carbon energy sources to meet this demand. Future domestic energy demand to 2020 is then estimated. The chapter also identifies the principal renewable energy generation capacity already in operation in the study area.

1.3.2 Chapter Three proceeds to examine the policy context for renewable and low-carbon energy use in York. Because a wide range of statutes, regulations, policy and guidance is potentially of relevance, Chapter three provides a summary of the principal requirements, with further analysis provided in Annex 2 to this report. The policy review is relevant not least because it conditions expectations for the city's renewable energy targets.

1.3.3 With these policy aspirations in mind, Chapter Four provides a systematic analysis of renewable energy resources in the study area, identifying total potential resources for new developments in 2020 and 2031 and taking into account the effect of a range of environmental constraints to their use. The chapter includes consideration for both 'stand-alone' technologies and 'on-site' renewable energy systems.

1.3.4 In order to gain an appreciation of the practical likelihood of renewable energy resources being used, it is important to take into account their viability and their potential wider benefits. To this end, Chapter Five applies two assessment methodologies. The first is a form of marginal abatement cost curve, which plots individual renewable energy technologies against the cost of deployment to give a picture of the likely scale and sequence of deployment. The second is a multi-criteria analysis, which allows the range of renewable energy options to be compared against economic, social and environmental criteria that reflect wider policy objectives in York. Chapter five also considers the potential for renewable energy utilisation to stimulate 'green jobs' in the local economy.

1.3.5 Having identified a range of sustainable energy opportunities that reflect the City of York's environmental context and development circumstances, Chapter Six proceeds to offer suggested targets for 2020, as well as recommendations and actions for the implementation of a defensible policy approach in the city's LDF core strategy and supplementary documents.

1.3.6 An important influence on the ability of new development to achieve a lower carbon footprint is the sustainability of its design and construction. This is reviewed in Annex 11 of the report, with a view to identifying the scope for sustainable design and construction to be supported through LDF and other planning policy and guidance.

1.3.7 Throughout the report, regard has been had to the requirement for the resulting development plan policy to comply with the tests of soundness set out in the government's Planning Policy Statement 12: Local Spatial Planning. Recommended targets and policies are thus intended to be justified, effective and consistent with national policy, and will support a spatial planning approach that is demonstrably effective, being deliverable, flexible and able to be monitored.

2 Energy profile in York

Current energy demand ◈ Energy demand of future development sites ◈ Energy production and renewable energy in York

To establish the overall potential for renewable energy technology capacity within York, it is essential to understand the level of current and future demand, the make-up of this demand in terms of electricity and heat requirements, and the spatial distribution. Different renewable technologies meet different types of energy demand, and often have viability constraints associated with meeting certain levels of demand – in terms of both spatial distribution and loading (i.e. peak hours).

This chapter assesses the current levels of energy demand within York, and how energy is currently produced and distributed. The chapter goes on to assess likely future demand from the predicted developments within York. The study then assesses clusters of demand to provide York with an early indication of the technologies that are best suited, or unsuitable, for each area.

Most importantly, the levels of existing, planned and proposed renewable energy generation within York are reviewed and compared to existing targets set within the RSS and the indicative lead scenario directives that have been presented in the 2009 UK Renewable Energy Strategy. This effectively establishes the gap between current generation levels and those that the City of York should be aiming for within the 2020 timescale.

2.1 Current energy demand

2.1.1 Current energy demand in York has been estimated using data on 2008 electricity and gas consumption at middle level super output area (MLSOA), which have been obtained from the Department of Energy and Climate Change (DECC)[3].

2.1.2 Electricity demand

2.1.3 Table 2-1, Figure 2-1 and Figure 2-2 display the electricity consumption data for domestic, commercial and industrial buildings in York.

[3] http://www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_2008/mlsoa_2008.aspx

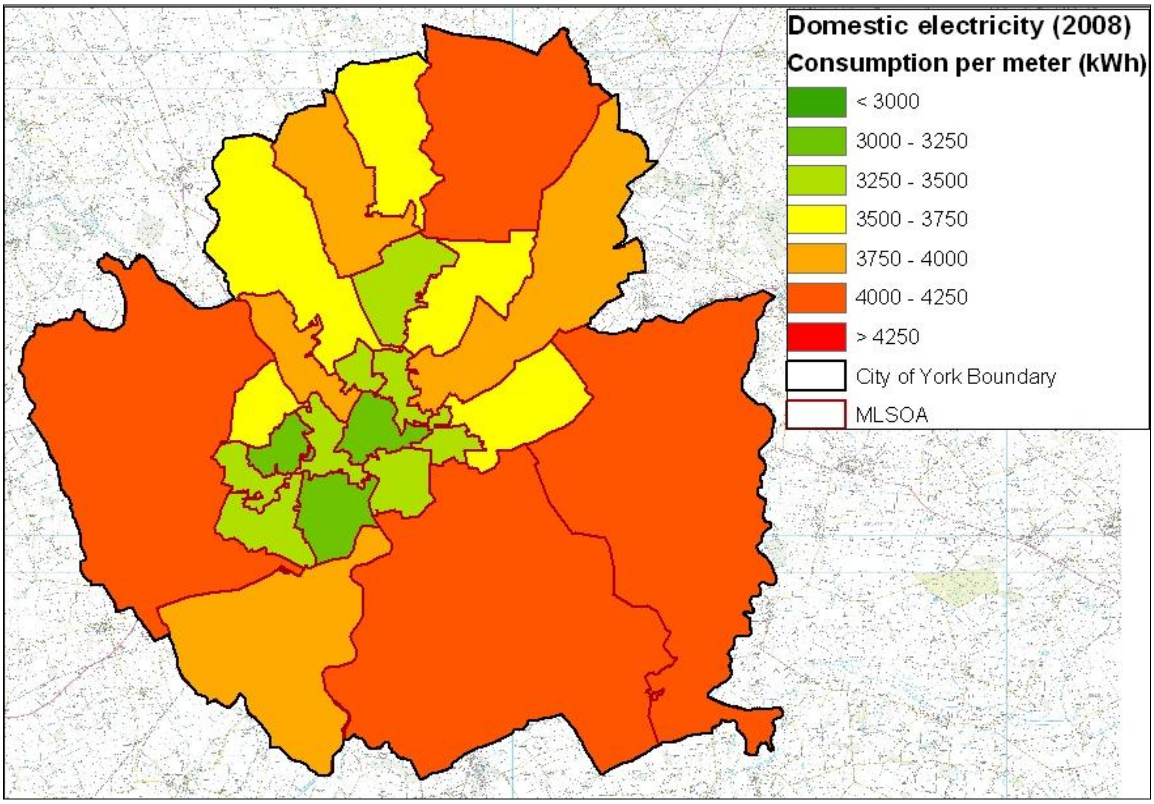
2.1.4 The average UK domestic electricity consumption in 2007 was 4,392kWh per meter point[4]. The average electricity consumption in York in 2008 was 3,629kWh per meter point, which is below the national average. Figure 2-1 shows that all areas have domestic consumption of less than the national average, with areas around York city centre having the lowest domestic consumption.

2.1.5 The areas with higher electricity demand, towards the outskirts of York, are areas where energy efficiency measures and renewable energy technologies might achieve the greatest fossil fuel displacement, when incorporated into domestic buildings.

Table 2-1: Total Electricity Consumption in York (2008) [5]

	Consumption (MWh/yr)
Domestic	264,415
Industrial and commercial	472,604
Total consumption	**737,020**

Figure 2-1: Domestic electricity consumption in York (2008)

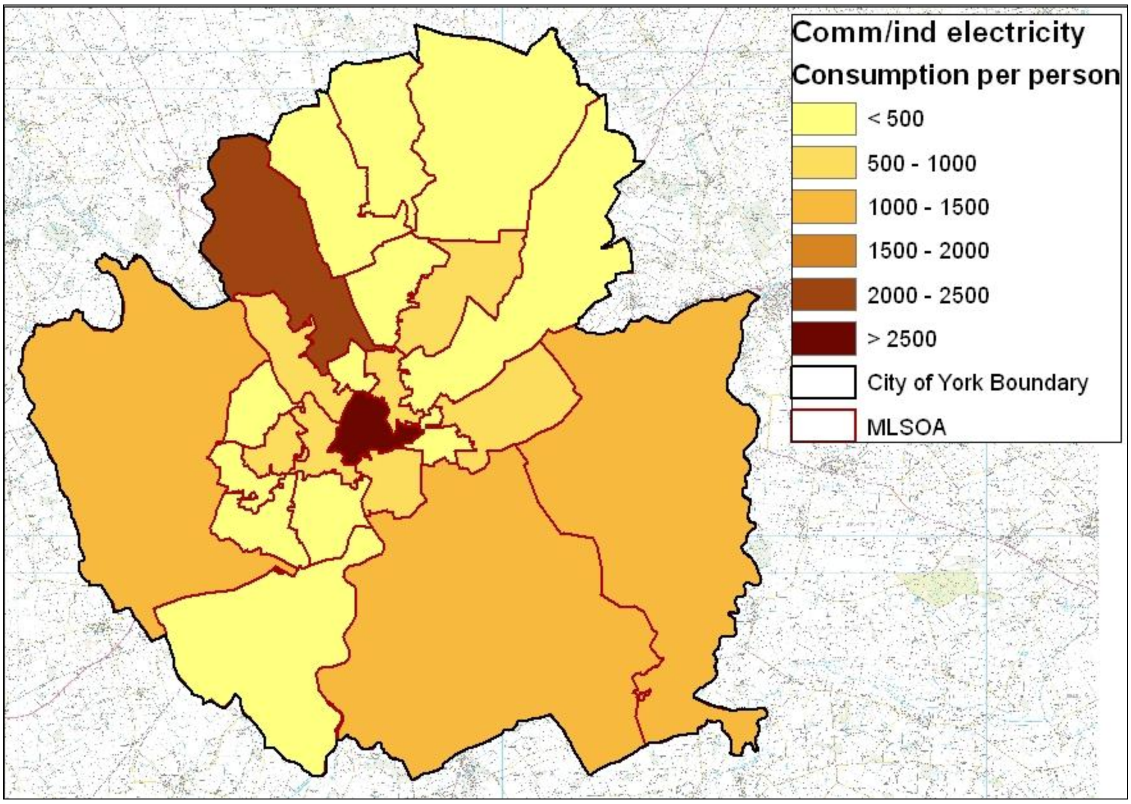


Source: AEA

4 Source: Department of Energy and Climate Change (2008) Energy trends, December 2008. http://www.decc.gov.uk/media/viewfile.ashx?filepath=statistics/publications/trends/file49202.pdf&filetype=4

5 http://www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_2008/mlsoa_2008.aspx

Figure 2-2: Commercial and industrial electricity consumption in York (2008)



Source: AEA

2.1.6 Figure 2-2 shows that electricity demand in commercial and industrial buildings is highest per capita in central York and to the North West. As with domestic electricity, these areas with higher electricity demand are where renewables and energy efficiency measures in commercial and industrial buildings would result in the greatest fossil fuel displacement.

2.1.7 UK average electricity consumption for employment was 5,500kWh per employee per year in 2006[6]. It is not possible to compare how York performs against this national average, as figures for employees in 2008 have not been made available by MLSOA.

2.1.8 Gas demand

2.1.9 Table 2-2, Figure 2-3 and Figure 2-4 display the gas consumption data for York, which is a good indication of heat demand. An adjustment has been made for fuel conversion efficiency. This conversion has been made as gas boilers do not convert gas to heating with 100% efficiency. Therefore, the gas required to meet the heating requirement or 'heat load'of a building will depend on the

[6] Source: DECC, High-level indicators of energy use at regional and local authority level, 2006. http://www.decc.gov.uk/en/content/cms/statistics/regional/high_level/high_level.aspx Figures for York.

energy conversion efficiency of the heating system. An approximate figure of 80% has been estimated using CIBSE's Guide F on energy efficiency in buildings[7].

Table 2-2: Total Gas Consumption in York (2008) [8]

	Consumption (MWh/yr)	Adjusted consumption (80%) (MWh/yr of heat)
Domestic	1,297,682	1,035,746
Industrial and commercial	739,816	591,853
Total consumption	**2,034,499**	**1,627,599**

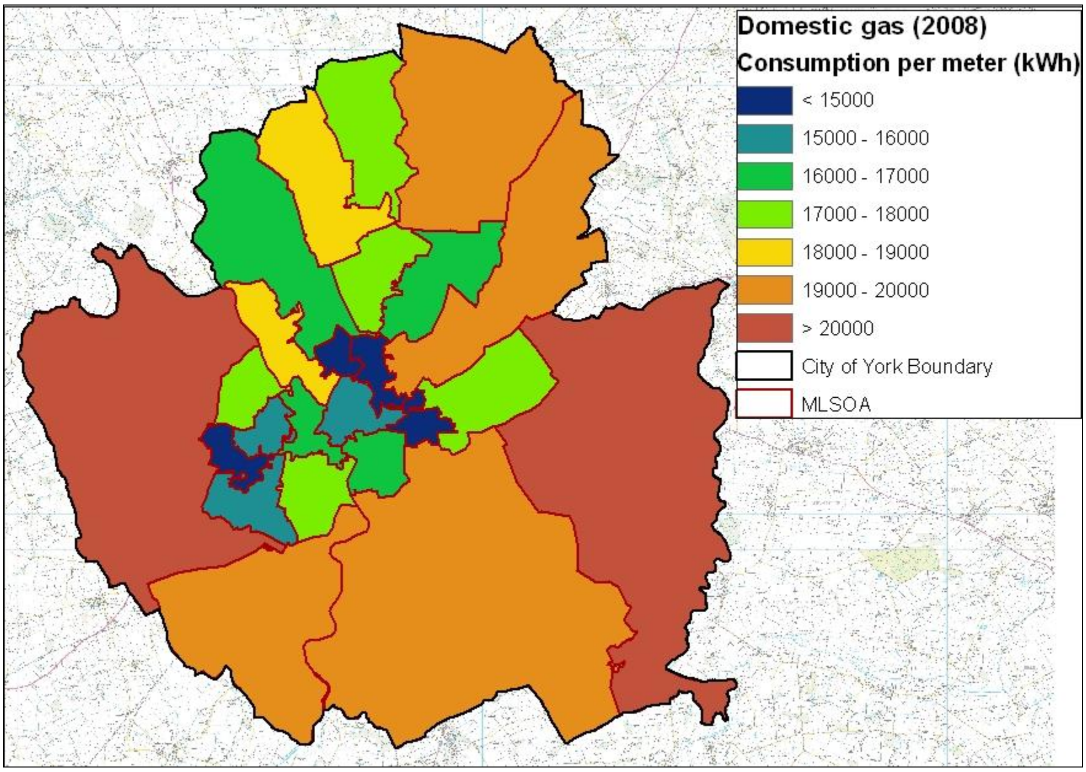
2.1.10 The average UK domestic gas consumption in 2007 was 17,815kWh per meter point[9]. The average gas consumption in York in 2008 was 17,169kWh per meter point, which is below, but very close, to the national average. Figure 2-1 shows that areas around York city centre have the lowest domestic consumption, typically below the national average. The areas of higher than average heat requirements, or heat loads, are areas where renewable heating technologies and district heating networks might achieve the greatest fossil fuel displacement, when incorporated into domestic buildings and neighbourhoods.

[7] CIBSE Guide F, "*Energy Efficiency in Buildings*", provides seasonal efficiency curves for various use scenarios under a mixed boiler system. The efficiency figure for a mix of conventional and condensing boilers is approximately 80%.

[8] http://www.decc.gov.uk/en/content/cms/statistics/regional/mlsoa_llsoa/mlsoa_2008/mlsoa_2008.aspx

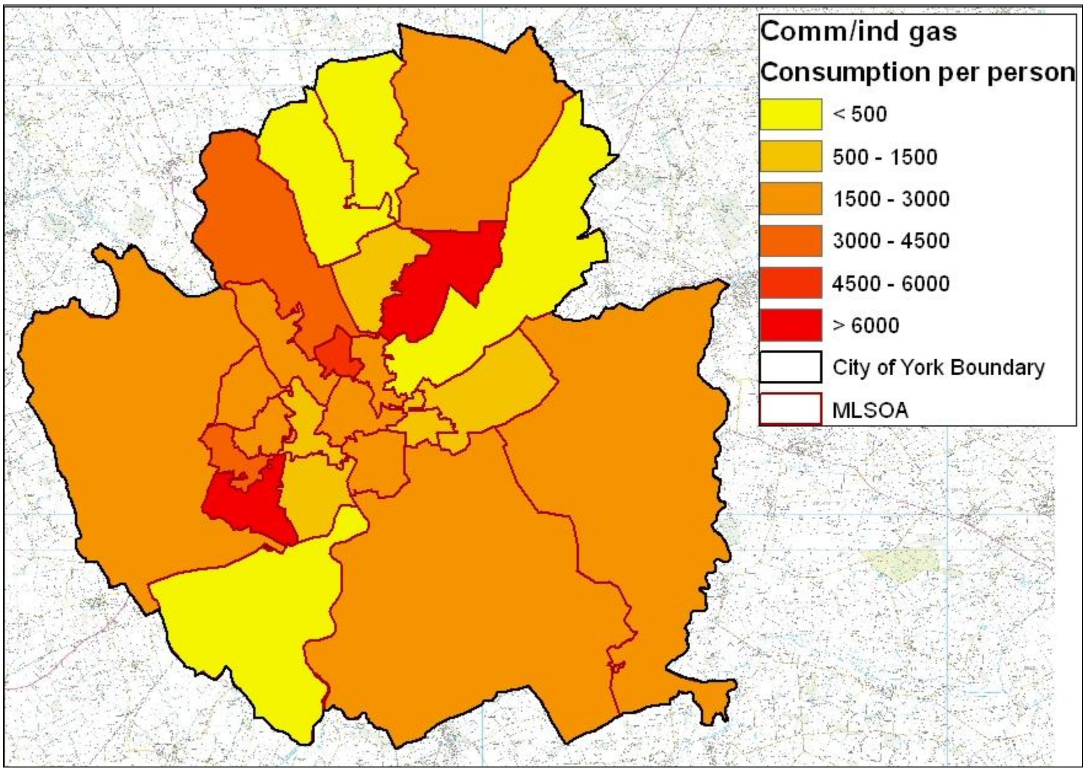
[9] http://www.decc.gov.uk/media/viewfile.ashx?filepath=statistics/publications/trends/file49202.pdf&filetype=4

Figure 2-3: Domestic gas consumption in York (2008)



Source: AEA

Figure 2-4: Commercial and industrial gas consumption in York (2008)



Source: AEA

2.1.11 Figure 2-4 shows that heat demand in commercial and industrial buildings is highest per capita in area to the north east and southwest of central York. As with domestic gas, these areas with higher heat demand are where renewable heat technologies and district heating would result in the greatest fossil fuel displacement, when incorporated into existing commercial or industrial buildings.

2.1.12 UK average gas consumption for employment purposes was 12,100kWh per employee per year in 2006[10]. As with the domestic data, it is not possible to compare how York performs against this national average without employment figures for the MLSOAs.

2.1.13 The DECC data used to calculate heat demand do not include non-gas use, such as oil, LPG or other forms of fossil fuel use. However, whilst data were not available for this study, homes off the gas grid are the prime target for the renewable heat technologies. City of York Council should identify such areas and explore the options for renewable heat and district heating.

[10] Source: DECC, High-level indicators of energy use at regional and local authority level, 2006. http://www.decc.gov.uk/en/content/cms/statistics/regional/high_level/high_level.aspx
Figures for York.

2.2 Future energy trends

2.2.1 The Core Strategy (preferred approach) plans for 5,100 new houses to be delivered over the next 6 years (with 13,422 over the next 20). In order to estimate the electricity demand from new residential developments to 2016 it is assumed that average electricity delivered in a UK household equals 4,475 kWh/yr[11]. Similarly, the average gas demand of 10,000kWh/year was applied.

2.2.2 It should be noted that while estimates for future energy demand are based on current thinking, energy demand is likely to reduce in future, as building regulations are revised to make all new homes zero carbon by 2016[12]. Therefore, levels of electricity demand for developments constructed more than five years in the future are not calculated, as all new residential developments after 2016 should be zero carbon. Therefore, without any carbon reduction measures, demand would remain similar to 2015 levels.

Table 2-3: Estimates of future energy demand by 2020

Development	House numbers	Electricity (MWh/yr)	Heat (MWh/yr)	
Development to 2011	1,700	7,607	17,000	Pre 2020
Development to 2016	3,400	15,215	34,000	
Development to 2021	2,746	Not calculated	Not calculated	Post 2020
Development to 2031	5,576			
Additional future demand	13,422	22,822	51,000	-
Current level of demand	-	737,020	1,627,599	-
Total future demand		**759,842**	**1,678,599**	

Source: AEA

2.2.3 The lead scenario in the UK Renewable Energy Strategy (2009)[13] suggests that 30% of electricity and 12% of heat demand could be met in the UK by renewables by 2020. Based on estimates of potential demand, as summarised in Table 2-3, and the lead scenario in the Renewable Energy Strategy, York would need to produce 227,953 MWh/yr of electricity and 201,432 MWh/yr of heat per year from renewable sources by 2020.

2.2.4 Electricity and heat demand for future commercial properties have not been calculated. Whilst the Council's growth priorities and potential sites are noted, this information in itself is not sufficient to provide estimates as this would be dependent on more detailed information such as building design and layout. Nevertheless demand is likely to increase up to 2019 after which it is expected

[11] Calculated using UK Energy Statistics. http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx

[12] It should be noted that changes in building regulations or political changes may alter these predicted figures in relation to zero carbon in the future.

[13] DECC: The UK Renewable Energy Strategy 2009

that all new commercial buildings will be zero carbon. Areas with high commercial energy have been identified in section 2.1 of this report.

2.3 Energy production and renewable energy in York

2.3.1 Current energy production

2.3.2 There are no large power stations located within City of York Council Authority Area. The nearest power stations to the city are Drax Power Station and Eggborough Power Station, which are both located to the south of York in Selby. Drax has a capacity of 3,960 MW and Eggborough 1,960 MW. Both plants are currently capable of co-firing biomass and coal, with Drax having a target of producing 12.5% of its output from renewable fuels by mid-2010. In addition, Drax and Siemens Project Ventures have announced plans to develop a 290 MW dedicated biomass-fired power station on land adjacent to the existing power station.

2.3.3 Generation schemes in place and proposed

2.3.4 In order to determine how far York has already progressed towards meeting their RSS renewable energy targets[14], Table 2-4 and Table 2-5 consider the capacity of operational and planned renewable energy developments, as well as prospective schemes that have been identified by City of York Council. These are mapped in Figure 2-5.

Table 2-4: Operational renewable energy generation projects

Technology / Fuel	Owner / Location / Name	Capacity (MW)
Biomass	Joseph Rowntree School	0.3
Biomass	York High School	1.1
Biomass	Energise Sports Centre	1.3
Biomass	Acomb Library	0.1
Biomass	Danesgate Skills Centre	0.25
Landfill Gas	Yorwaste Ltd/Biogas, Harewood Whin Landfill Site	2.37
Wind	Tesco Stores Ltd, Stirling Road, York	0.004
Wind	Tesco Stores Ltd, Tadcaster Road, Dringhouses	0.004
Wind	City of York Council, Eco Depot, Hazel Court	0.015
Solar PV	City of York Council, Eco Depot, Hazel Court	0.052
Total		**5.5**

Sources: 2008 RESTATS database and City of York Council

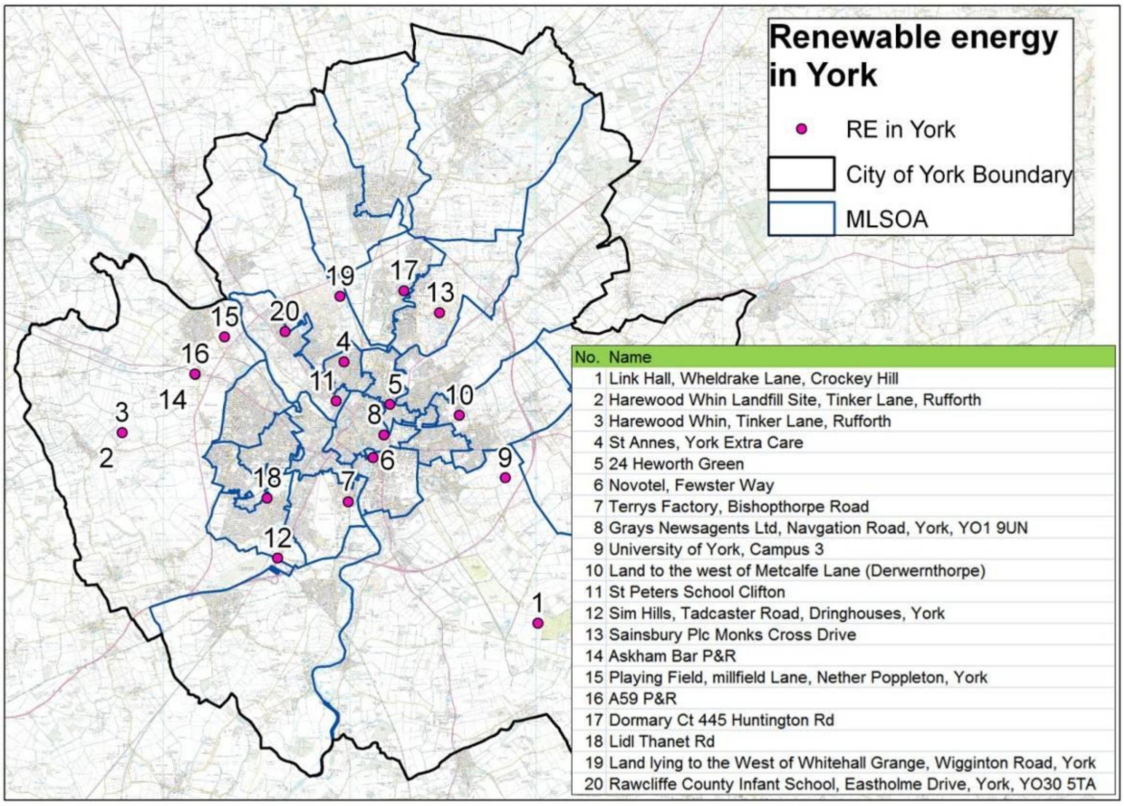
[14] The Yorkshire and Humber plan was revoked by the government on the 6th July 2010.

Table 2-5: Proposed renewable energy generation projects

Technology / Fuel	Owner / Location / Name	Capacity (MW)
Biomass	Land to the west of Metcalfe Lane	0.624
Biomass	Harewood Whin, biomass power	2.5
Biomass	University of York	0.25
Wind	Link Hall, Crockey Hill	0.0015
Wind	Sim Hills, Dringhouses, York	0.004
Wind	Playing field, Nether Poppleton	0.0028
CHP	St Peters School, Clifton	0.07 (electric)
Air source heat pump	St Anne's, York Extra Care	0.024
Total		**3.4**

Source: City of York Council

Figure 2-5: Installed, planned and prospective renewable energy sites in York



Source AEA

2.3.5 Operational renewable energy developments amount to 5.5 MW of York's installed capacity. Planned and prospective future developments have a capacity of just less than 3.4 MW, giving just almost 9 MW capacity towards York's renewable energy targets.

2.3.6 In order to understand this potential against the current energy demand in York, typical load factors[15] have been assumed for each of the installed, planned and prospective technologies, as summarised in Table 2-6[16]. This allows an estimate of MWh/yr of either electricity or heat to be calculated for each technology, which is compared to current and future energy demand in Table 2-7.

Table 2-6: Calculation of MWh/yr of electricity and heat from installed, planned and prospective RE

Name of installation	Tech. / Fuel	Capacity MW	Load factor	MWh/yr electricity	MWh/yr heat
Operational					
Joseph Rowntree School	Biomass	0.3	0.15	-	394
York High School	Biomass	1.1	0.15	-	1,413
Energise Sports Centre	Biomass	1.3	0.15	-	1,681
Acomb Library	Biomass	0.1	0.15	-	136
Danesgate Skills Centre	Biomass	0.25	0.15	-	333
Yorwaste Ltd/Biogas, Harewood Whin Landfill Site	Landfill Gas	2.37	0.7	14,533	-
Tesco Stores Ltd, Stirling Road, York	Wind	0.004	0.1	4	-
Tesco Stores Ltd, Tadcaster Road, Dringhouses	Wind	0.004	0.1	4	-
City of York Council, Eco Depot, Hazel Court	Wind	0.015	0.1	13	-
City of York Council, Eco Depot, Hazel Court	Solar PV	0.052	0.1	46	-
Proposed					
Harewood Whin, biomass power	Biomass	2.5	0.73	15,987	-
Land to the west of Metcalfe Lane	Biomass	0.624	0.15	-	820
University of York	Biomass	0.25	0.44	-	964
Link Hall, Crockey Hill	Wind	0.0015	0.1	1	-
Sim Hills, Dringhouses, York	Wind	0.004	0.1	3.7	-
Playing field, Nether Poppleton	Wind	0.0028	0.1	2	-
St Peters School, Clifton	CHP	0.07 (e)	0.8	198	293
St Anne's, York Extra Care	Air source heat pump	0.024	0.18	-	38
Total		**8.9***		**30,791**	**6,072**

*** Installed capacity of approximately 5MW of renewable electricity technologies and 4.0MW of renewable heat technologies***

15 The load factor represents the fraction of output typically achieved over a year compared with the output that would be achieved if the equipment operated permanently at full output. Depending on the technology this could take into account, for example, reduced energy demand (e.g. heating), periods when the resource is not available (e.g. wind, solar) and any equipment downtime.

16 Full details of load factor assumptions are provided in Annex 9

Table 2-7: Comparison of energy generated by installed, planned and prospective RE to current and future energy demand (2008).

	Electricity	Heat
Installed, planned or prospective RE development	30,791	6,072
Current energy demand	737,020	1,627,559
% current demand	**4.18%**	**0.37%**
Future energy demand*	759,842	1,678,599
% future demand	**4.05%**	**0.36%**

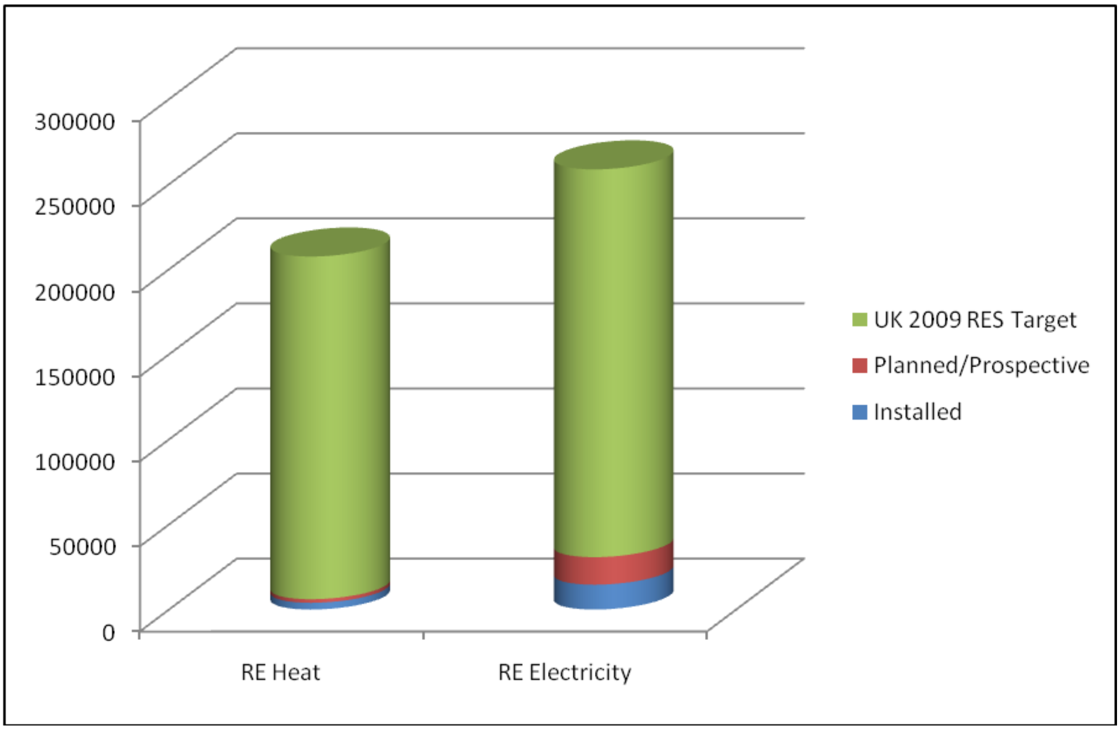
****Future energy demand = energy demand from existing domestic and commercial developments (current energy demand) + expected energy demand from future domestic developments, as calculated in Table 2-3. Energy demand from future commercial developments is NOT included.***

2.3.7 Table 2-7 shows that York's current level of installed, planned and prospective renewable energy development only meets approximately 4% of current and future levels of electricity demand and less than 0.5% of heat demand.

2.3.8 Figure 2-6 shows the relative progress towards the suggested UK 2009 Renewable Energy Strategy Targets of 30% electricity and 12% heat being produced by renewable energy by 2020. For electricity, this 'pipeline' capacity amounts to 13% towards this target; and heat amounts to approximately 3% towards this target.

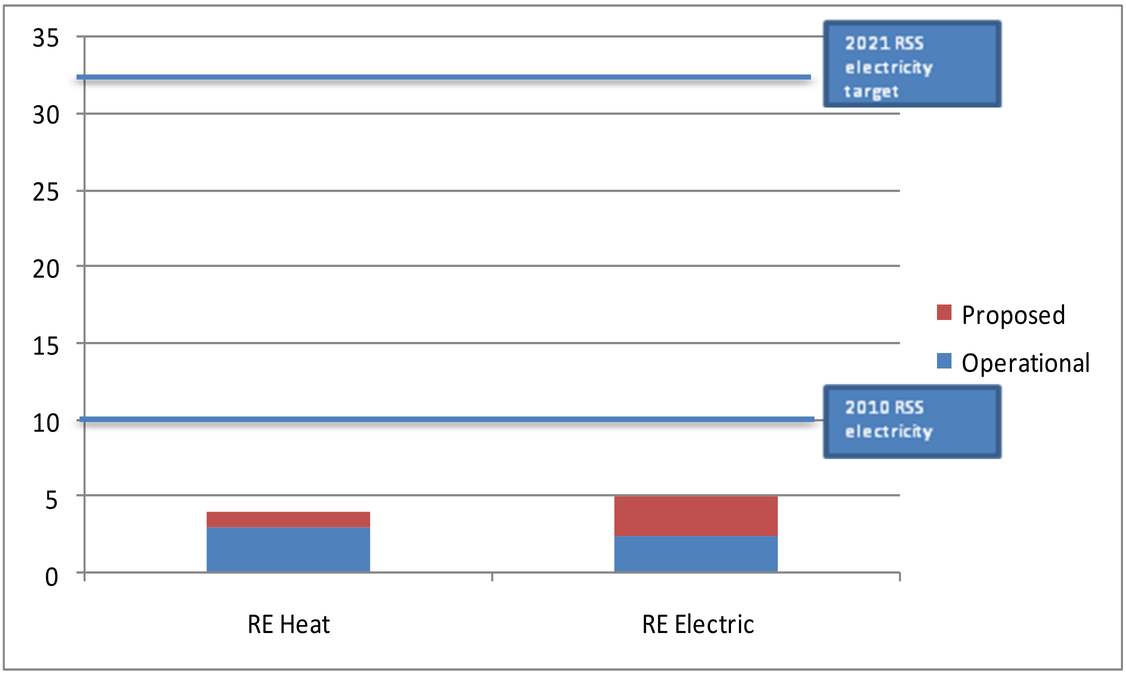
2.3.9 Figure 2-7 shows the relative progress towards the grid connected electricity targets set out in the RSS.

Figure 2-6: Installed, planned and prospective renewable energy in York against 2009 UK Renewable Energy Strategy lead scenario



Source: AEA

Figure 2-7: Installed, planned and prospective renewable energy in York against RSS targets



Source: AEA

2.4 Energy profile of York – conclusions

2.4.1 York's current domestic electricity consumption per meter is below the national average. Total consumption is 264,415 MWh/yr.

2.4.2 York's current industrial and commercial electricity consumption is 472,604 MWh/yr.

2.4.3 York's current domestic gas consumption per meter is around the national average, with areas around central York having lower than average consumption. Total gas consumption is 1,297,682 MWh/yr, equating to approximately 1,035,746 MWh/yr of heat demand.

2.4.4 The areas of higher than average heat requirements, or heat loads, are areas where renewable heating technologies and district heating networks might achieve the greatest fossil fuel displacement, when incorporated into domestic buildings and neighbourhoods.

2.4.5 York's current industrial and commercial gas consumption is 739,816 MWh/yr, equating to around 591,853 MWh/yr of heat demand.

2.4.6 It has not been possible to estimate heat demand of homes unconnected to the gas grid as this data is not collected by DECC. However, these should be identified as prime targets for renewable heat technologies.

2.4.7 Future energy demand in York is expected to reach 759,842 MWh/yr of electricity and 1,678,599 MWh/yr of heat by 2020.This equates to an increase of 3% in electricity and heat demand.

2.4.8 In order to achieve the figures in the UK Renewable Energy Strategy lead scenario, York would need to produce 227,952 MWh/yr of electricity and 201,432 MWh/yr of heat from renewable sources by 2020.

2.4.9 The current list of installed, planned and prospective renewable technologies amount to a capacity of approximately 9MW. Given the load factors for each technology, this equates to approximate production of 30,791MWh/yr electricity and 6,072MWh/yr heat. The expected energy production of these developments would only meet approximately 1.5% of York's current and future energy demand.

Given the current and proposed levels of renewables generation, which equates to 13% and 3% for electricity and heat respectively, of the UK 2009 RES lead scenario recommendation, there is a significant gap in York realising the targets levels of renewables generation. The following sections will therefore focus on the delivery mechanisms that can be used within York to promote and encourage uptake of renewables; and the technologies most suitable both technically and spatially for the York area and key new development sites.

3 Policy context and scoping

National policy ◈ The development plan ◈ Additional policy and guidance ◈ Future policy ◈ Policy implications for York

A particular stimulus for the commissioning of this report was an obligation arising from national planning policy guidance for planning authorities to have an evidence-based understanding of the local feasibility and potential for the use of renewable and low-carbon energy . However, there is a wider statutory and policy framework concerning sustainable energy use in the UK. In identifying a suitable policy approach for the City of York, it is considered desirable to review this wider context and to anticipate the future direction of policy, in so far as this can be discerned, to provide a broad policy baseline for the current study.

Because the volume of relevant statutes, policy and guidance is large, this chapter is only able to provide an overview of relevant provisions. A more detailed review of the policy context can be found in annex 1 to this report.

3.1 National Policy context

3.1.1 National-level provisions of potential relevance to the energy efficiency and renewable energy content of the City of York Core Strategy comprise primary statutes, Building Regulations requirements and a series of supporting delivery mechanisms. Together, they form the national delivery framework for the delivery of renewable energy. As noted, these requirements are explained in more detail in annex 1 to the current report. In summary, they are as follows.

3.1.2 Statutes

3.1.3 **Sustainable Energy Act 2003**: This legislation required the government in England and Wales to make progress towards and report upon the implementation of objectives set out in the 2003 Energy White Paper Our Energy Future – Creating a Low Carbon Economy, which included actions at a local level and in the town and country planning domain.

3.1.4 **Climate Change and Sustainable Energy Act 2006**: Amongst other things, this legislation required the UK government to publish an annual monitoring report on greenhouse gas emissions. The Act gave the Secretary of State powers to promote microgeneration, and required the provision of information to local authorities on energy efficiency, micro-generation and the alleviation of fuel poverty. By such means, the 2006 Act acknowledged the role of local authorities in the attainment of national energy and greenhouse gas reduction targets.

3.1.5 **Climate Change Act 2008**: One of three significant pieces of legislation passed in 2008, the Climate Change Act placed into statute the UK's target of reducing carbon dioxide emissions by at least 80% from 1990 levels by 2050. These targets will require action at the local level if they are to be met. The Act also required the UK government to initiate a range of initiatives concerning climate change reduction and reporting.

3.1.6 **Energy Act 2008**: The Act implemented the legislative aspects of the 2007 Energy White Paper: Meeting the Energy Challenge. It updated energy legislation to reflect the availability of new technologies such as carbon capture and storage (CCS) and the UK's changing requirements for secure energy supply, such as offshore gas storage. It also made provision for two measures of significant relevance at the local level in the foreseeable future. The first is the Feed-in Tariffs (FITs) system of financial support for low-carbon electricity generation in projects up to 5MW, which came into effect in February 2010. In York as elsewhere, FITs will encourage a lot more small-scale installations on and beside new and existing buildings. The second is the Renewable Heat Incentive (RHI), due to be launched in April 2011. This will be a financial support programme for renewable heat generated from large industrial sites down to individual households. In the urban areas of York, RHI should stimulate interest in local heat supply and district heating networks.

3.1.7 **Planning Act 2008**: This legislation Act created a new system of development consent for nationally significant infrastructure projects – the Infrastructure Planning Commission [17]. The new system covers certain types of energy, transport, water, waste water and waste projects. Unless a project in excess of 50MW generation capacity came forward in York, then the power of determination will remain with the City Council.

3.1.8 Planning and Energy Act 2008

3.1.9 This Act enables a local planning authority in England to include policies in a development imposing reasonable requirements for:

- A proportion of energy used in development in its area to be energy from renewable sources in the locality of the development.
- A proportion of energy used in development in its area to be low carbon energy from sources in the locality of the development.
- Development in its area to comply with energy efficiency standards that exceed the energy requirements of the Building Regulations.

[17] The Coalition Government elected in May 2010 is committed to replacing the IPC.

3.1.10 The Act thus provides the City of York Council with complementary powers to encourage decentralised, low carbon and renewable energy use in new developments.

3.1.11 Building Regulations requirements and the Code for Sustainable Homes

3.1.12 In 2006 the Government announced a ten-year transition towards a target that all new homes from 2016 must be built to zero carbon standards, to be achieved through a step-by-step tightening of the Building Regulations.

3.1.13 The Code sets six levels of attainment for new-build housing, with mandatory sustainable development requirements set out under -nine categories, including energy performance. On energy, the requirements represent a percentage reduction in carbon emissions compared with Building Regulations Part L1 (2006), as follows:

- Code level 1 – 10 per cent reduction
- Code level 2 – 18 per cent reduction
- Code level 3 – 25 per cent reduction
- Code level 4 – 44 per cent reduction
- Code level 5 – 100 per cent reduction
- Code level 6 – zero-carbon development

3.1.14 'Zero carbon' means that the equivalent of no net carbon dioxide emissions from the home from all energy use – cooking, washing and appliances as well as space heating, cooling, ventilation, lighting and hot water. This represents a challenge to planning authorities and developers and alike. Considerable efforts will be required in terms of political will, policy formulation, planning and strategy, know-how and skills development to achieve the targets within the envisaged timetable. In York city centre and other historic environments such as the surrounding villages, there will be a need to reconcile the established concern to protect and enhance the historic environment with the introduction new construction methods and on-site energy generation systems in response to the higher levels of the Code for Sustainable Homes.

3.1.15 The delivery framework

3.1.16 Annex 1 to this report also summarises a range of supporting policy instruments and initiatives that may be of relevance to the transition to a low-carbon economy in York. These include the following.

3.1.17 National Indicators 185, 186 and 188

3.1.18 Since April 2008, local authorities have been required to report their performance against 198 national priority outcomes in local area agreements. These include the following:

National Indicator 185 - Percentage CO_2 reduction from LA operations The aim of this indicator is to measure the progress of local authorities to reduce CO_2 emissions from the relevant buildings and transport used to deliver its functions, and to encourage them to demonstrate leadership on tackling climate change.

National Indicator 186 - Per capita reduction in CO_2 emissions in the LA area This relies on centrally produced statistics to measure end user CO_2 emissions in the local area from the business and public sector, domestic housing and road transport.

National Indicator 188 – Planning to Adapt to Climate Change NI188 is designed to measure progress in preparedness in assessing and addressing the risks and opportunities of a changing climate. The aim of this indicator is to embed the management of climate risks and opportunities across all levels of services, plans and estates.

3.1.19 Responses to these indicators produced by the City of York Council might be capable of being used in the monitoring of relevant LDF policy on climate change and sustainable energy.

3.1.20 National strategies

3.1.21 The following strategies were also taken into account in the preparation of this report.

Our Energy Challenge - *Microgeneration Strategy 2006*: Microgeneration is the small-scale production of heat and/or electricity from a low carbon source. The strategy, produced by DTI/BERR, identified the conditions under which microgeneration becomes a realistic alternative or additional source of energy for householders, communities and small businesses. The strategy assisted in laying the foundation for the FITs system described earlier in this chapter.

The UK Biomass Strategy 2007: The purpose of this strategy, again produced by DTI/BERR, was to guide and define government policy with the aim of achieving carbon savings from biomass, while complying with EU policies and the Biomass Action Plan. The strategy aimed to support existing renewable energy and climate change targets, as well as promoting a competitive and sustainable market and supply chain for biomass. Options for biomass energy include woodfuel, straw, waste wood, energy crops, waste and agricultural waste, all of which are available in the York area in lesser or greater quantities.

A Woodfuel Strategy for England 2007: The aim of the strategy, produced by the Forestry Commission, is to identify what the government needs to do to help business, community and local authorities make woodfuel work commercially. The strategy prioritised local heat generation and small to medium combined heat and power schemes, useful around towns and cities. It also focuses on dedicated electricity generation and large-scale generation and co-firing. The strategy considered the environmental impacts of woodfuel use, and recommended mitigation measures.

The Renewable Energy Strategy 2009: In 2008 DBERR consulted on a range of possible measures to deliver the UK's share of the targets set out in the EU's Renewable Energy Directive. Together these measures could lead to a ten-fold increase in use of renewable energy – across electricity, heat and transport – by 2020. The resulting *Renewable Energy Strategy* was published in the summer of 2009. It set out a lead scenario suggesting that we could see more than 30% of our electricity generated from renewables, up from about 5.5% today, with 12% of our heat generated from renewables, The strategy also supported electric vehicles and the further electrification of the rail network. However, the report noted that this scenario will only be possible with strong, co-ordinated efforts from a dynamic combination of central, regional and local government, as well as other public groups, the private sector and dedicated community groups and individuals.

3.1.22 Planning policy statements

3.1.23 Planning Policy Statements (PPS) offer detailed advice to local planning authorities on the renewable energy content of local development documents. From a sustainable energy perspective, guidance relevant to the current study is concentrated in the following Planning Policy Statements (PPS).

- PPS1: Delivering Sustainable Development
- PPS1 supplement: Planning and Climate Change
- PPS3: Housing
- PPS22: Renewable Energy

3.1.24 Other PPSs might be of relevance to renewable energy use in particular circumstances, including PPS23: Planning and Pollution Control in the context of combustion-based technologies, and PPS5: Planning for the Historic Environment with respect to building-mounted systems. However, the four PPSs listed above represent the principal expression of sustainable energy policy from a town and country planning perspective. Their requirements are identified in detail in Annex 2 to this report, and are summarised in Table 3-1 below.

Table 3-1: Sustainable energy and the planning process: principal requirements from relevant Planning Policy Statements

PPS1	PPS1 CCS	PPS3	PPS22	Ref.	PPS requirement
13(ii). 20. 22. 36.	9.	38.	1(ii). 18.	1.	Development plans should address climate change and promote energy efficiency (EE) and renewable energy (RE) use.
22.	19.		1(ii). 18.	2.	Development plans should promote and encourage, rather than restrict, the use of renewable resources
30.	11.			3.	Planning policies should not conflict with the Building Regulations or other legislative requirements
32(ii).				4.	Integrate sustainable energy policies with other development and regeneration policies
36.	41.			5.	Design and Access Statements can be used to show how policy objectives will be met.
41.		38.	1(vii).	6.	Importance of community involvement
	9. 30. 37.			7.	Plans should make a full contribution to delivering the government's Climate Change Programme and energy policies
	10. 24. 28.		18.	8.	Plans should make good use of opportunities for decentralised, renewable and low carbon energy in new development
	18.			9.	LDFs should build upon RSS, SCS and local climate change strategies
	20(a).			10.	LPAs should not require energy developers to demonstrate need.
	20(b).		19.	11.	Landscape and townscape protection should be consistent with PPS22 and not restrictive
	20(c).		1(iii). 6. 7.	12.	Policies should be criteria-based but can identify suitable areas or sites for RE if there is clear certainty that an RE project will come forward.
	20(d). 26-28.	38.	8.	13.	LPAs can set targets for the proportion of energy supply in new development to come from decentralised, renewable and low carbon energy sources, where there are clear opportunities, with specific requirements to facilitate connection
	21.			14.	Consider using LDOs for decentralised, renewable and low carbon energy
	26.			15.	LPAs should have an evidence-based understanding of renewable and low carbon energy
	27.			16.	Co-locate potential heat suppliers and customers
	30.			17.	Policies should support innovation in construction and support the national timetable for reducing carbon emissions from buildings

PPS1	PPS1 CCS	PPS3	PPS2 2	Ref.	PPS requirement
	31-33.			18.	LPAs can anticipate higher sustainability standards where there is clear and justified potential, on an area or site-specific basis, in a DPD
	34-36.			19.	Annual monitoring should assess against PPS1-CCS targets
			1(v)	20.	LPAs should not make assumptions about commercial and technical feasibility of RE projects
			12. 14.	21.	Identify criteria for the type and size of RE development in nationally designated areas, and do not create buffer zones around these areas
			16.	22.	LPAs should not use a sequential approach to site selection for RE projects, and should recognise the potential of remote brownfield sites
			22.	23.	RE development should be located and designed so as to minimise any increase in ambient noise levels
			23.	24.	RE plants that generate odour should not be located close to existing residential areas
			24.	25.	Ensure that any traffic increase associated with RE development is minimised,
			25.	26.	Policies should not specify minimum separation distances between wind turbines and power and transport infrastructure

3.2 Regional Context

3.2.1 The development plan

3.2.2 The development plan for an area guides the future development and use of land. At the Core Strategy Preferred Options stage the development plan for the City of York included the Yorkshire and Humber Plan - Regional Spatial Strategy to 2026[18]. At that stage the emerging Core Strategy was in conformity with the regional plan. However, the RSS was revoked on 6 July 2010. Whilst work on the York LDF progresses, the City Council continues to apply policies in the City of York Draft Local Plan 2005 for development control purposes.

3.2.3 The RSS had set renewable energy targets for the sub-regions. York falls in the North Yorkshire sub-region. The RSS targets for North Yorkshire were 209 MW of installed grid-connected renewable energy by 2010 and 428 MW by 2021. For the City of York, the targets were 11 MW installed capacity by 2010 and 31 MW installed capacity by 2021.

3.3 Emerging planning policy in York

3.3.1 The City of York's LDF Core Strategy Preferred Options were published for public consultation in summer 2009. The LDF vision sees York become a 'leading environmentally friendly city; in part by reducing energy use and carbon generation, exceeding the renewable energy targets set within the RSS'.

3.3.2 Section 15 resource efficiency provides the focus for the core strategy's sustainable energy policies. The preferred strategic objective, targets and policy provided for consultation are replicated in Table 3-2.

Table 3-2: The preferred approach for resource efficiency policies identified in the City of York's LDF Core Strategy Preferred Options was published for public consultation (2009)

Strategic Objective The City of York Council will seek to help reduce York's eco and carbon footprint through the promotion of sustainable design and construction, energy efficiency and renewable energy, thereby reducing overall energy use and help in the fight against Climate Change.

[18] The government has announced its intention to revoke regional spatial strategies. Clarification of the timing of this is awaited at the time of writing.

Targets

Progress towards the Strategic Objective will be measured against the following targets:

All new developments and conversions to be built to the highest quality design using innovative construction and energy and water efficient methods based on targets set out in the forthcoming Sustainable Design and Construction SPD;

To exceed the RSS targets of 11 MW of renewable energy by the year 2010 and 31 MW by the year 2021 using installed grid-connected technology;

All new developments and conversions of more than 10 dwellings or 1,000m^2 of non-residential floorspace to offset at least 10% of the predicted carbon emission through on-site renewable energy generation; and

The number of planning applications for new developments over 1000m^2 that integrate CHP and district/block heating or cooling infrastructure.

Policy CS14: Sustainable Resource Use

The LDF will contribute to the reduction of York's eco and carbon footprint through Sustainable Design and Construction and promoting energy efficiency through the application of the Energy Hierarchy. This will be achieved in the following ways:

(i) Future development and conversions will be a high standard of sustainable design and construction using innovative techniques promoting high standards of energy and water efficiency.

All new development and conversions of more than 10 dwellings or 1,000m^2 of non-residential floorspace will offset at least 10% of the predicted carbon emission through on-site renewable energy generation.

(ii) Through ensuring we exceed the RSS targets for York through either on-site or off-site generation.

The Allocations DPD will identify suitable sites for standalone renewable energy, taking into account any impact on the environment, sensitivity of the landscape, and historic character and setting of York.

(iii) All new developments over 1,000 m^2 will be required to assess the feasibility of integrating CHP and district /block heating or cooling infrastructure (along with other renewable energy technologies).

An SPD will be delivered to address in detail, high quality design and construction, energy efficiency, carbon reduction targets, decentralised, renewable and low carbon technologies and many other core principles of embedded sustainable development into the LDF.

3.3.3 The preferred options document includes the following area-specific sustainable energy provisions.

3.3.4 Sustainability is identified as the overriding principle for development in the British Sugar York Northwest area, which offers potential to develop an exemplar sustainable community. This will involve all areas of sustainability including sustainable design and construction and sustainable technologies such as those used to generate renewable energy (para 6.14).

3.3.5 North Selby Mine is identified as potentially being well suited to the development of 'green technologies', such as the development of renewable energy (paras. 11.30 and 15.11).

3.3.6 The document also sets out clear indicators and monitoring provisions for climate change, greenhouse gas reductions and the use of renewable and low carbon energy.

3.4 Other regional and local policy and guidance

3.4.1 Other policy and guidance reviewed in the context of this study includes the following:

Yorkshire and Humber Regional Economic Strategy 2006-2015: The strategy aims to 'promote the transition to a low carbon economy through highly efficient use of energy and resources in businesses and (to) apply high energy and environmental design standards to buildings and neighbourhoods'. A progress report is published annually.

Regional Energy Infrastructure Strategy 2007: This included an Action Plan to 2010, whose objectives were to maximise low carbon energy generation, promote the reduction in energy demand and lead the way in delivering secure regional and national energy supplies.

Renewable and low-carbon energy capacity methodology 2010: In January 2010 DECC published an updated methodology outlining the process to determine renewable and low-carbon energy capacity at a regional level. Some of the methods described are also appropriate for determining resource at the local level.

York Sustainable Community Strategy: The environment, and the desire to see it protected and enhanced, is one of the ten medium-term priorities identified within this document.

The City of York Council also has a 40% CO_2 reduction target by 2020 and is committed to the Covenant of Mayors. This is a commitment by signatory towns and cities to go beyond the objectives of EU energy policy in terms of reduction in CO_2 emissions through enhanced energy efficiency and cleaner energy production and use. Section 0 explores the percentage of CO_2 that could be saved through supplying energy from renewable sources. This will help the City Council to move towards achieving its CO_2 reduction targets.

Climate Change Framework and Action Plan for York (due to the adopted January 2011)

The Climate Change Framework is the overarching document that will enable York to accelerate actions to reduce carbon emissions across the city. It demonstrates the actions already on-going and highlights the key areas the city needs to begin to drive forward for coordinated action to tackle climate change. The Climate Change Action Plan for York will deliver coordinated actions across the city to meet the Climate Change Framework's targets and ambitions.

3.5 Summary and implications

3.5.1 The range of law, policy and guidance in the sustainable energy domain is wide and widening. An important objective for the current study is thus to codify this advice and provide clarity. In these terms, the essential themes arising from the law, policy and guidance summarised in this chapter and reviewed in more detail in Annex 1 are as follows.

- National, regional and local policy clearly acknowledges the threat of climate change and the need for a coherent response, embracing both mitigation and adaptation.
- The use of fossil fuels as our primary energy sources in the UK is a significant source of the greenhouse gas emissions that are understood to be contributing to climate change. Measures to reduce fossil fuel dependency, including energy efficiency methods and the development of low carbon and renewable energy services, are thus given priority in the national energy policy.
- International and European targets for carbon reduction and renewable energy use are transposed into UK law. At the same time there are other policy drivers for reducing dependency on fossil fuels. These include the decline in UK coal, oil and gas production and a commensurate need to develop alternative, secure, indigenous energy supplies, in order both to reduce reliance on fossil fuel imports from politically unstable regions of the world and to limit the UK's reliance on unpredictable global energy markets.
- At the national level, the government has put in place or is introducing a series of legal obligations, market-based mechanisms, strategies and targets to promote energy efficiency and renewable energy use.
- Micro-generation received a significant new stimulus in February 2010 through the introduction of the Feed-in Tariff (FIT) system, which provides householders and businesses with incentives to generate their own electricity from eligible renewable energy technologies, and permitted development rights have been extended to cover a wider range of domestic energy installations.
- To match the established market mechanism for encouraging the generation and use of renewable electricity – the Renewables Obligation Certificate (ROC) – a Renewable Heat Incentive is due to be launched in April 2011.

- Local authorities have monitoring requirements with respect to corporate and area-wide greenhouse gas emissions, and various incentives are available for raising the energy efficiency of the social housing stock.
- There is also extensive planning guidance with respect to climate change and the need to encourage renewable energy generation.
- Previous studies of renewable energy potential in the Yorkshire and Humber region have helped to identify the general availability of resources and the range of technologies likely to be deployed during the plan period for the current York LDF core strategy

3.5.2 The specific national and regional policy priorities that are most important for City of York Council to consider when developing policies for renewable energy are as follows:

- The Government has set a target that all new homes should be zero-carbon by 2016. These targets cannot be delivered by energy efficiency improvements alone.
- Under the Sustainable Energy Act 2003, governments in England and Wales may direct energy conservation authorities to make improvements to energy efficiency in residential accommodation.
- The Climate Change and Sustainable Energy Act 2006 aims to enhance the UK's contribution to combating climate change and is also aimed at alleviating fuel poverty and securing diverse and long term energy supplies for the UK. The Climate Change Act 2008 puts into statute the UK's targets to reduce carbon dioxide emissions through domestic and international action by at least 80% (previously 60%) by 2050 and at least 34% by 2020 (currently under revision), against a 1990 baseline.
- The Energy Act, along with the Planning Act 2008 and Climate Change Act 2008, ensures that legislation underpins the UK's long-term energy and climate change strategy.
- The Code for Sustainable Homes measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package.
- York's performance against National Indicators 185, 186 and 188 will be affected by the use of renewable energy resources in the city.
- York's Climate Change Framework and Action Plan that will enable York to accelerate actions to reduce carbon emissions across the city.

3.5.3 In summary, there is a broad but generally consistent context for the sustainable energy policies that the City of York Council needs to develop in the Core Strategy and other LDF documents. Furthermore, the Planning Policy Statements reviewed in this chapter provide a clear template for what the LDF policies need to do:

- promote and encourage, rather than restrict, the use of renewable resources;
- avoid conflict with the Building Regulations;
- be integrated with other development and regeneration policies;

- be generally criteria-based, with sites identified where there is clear certainty of an energy project coming forward;
- identify opportunities for co-locating potential heat suppliers and customers;
- support innovation in sustainable construction;
- not make assumptions about viability, or apply a sequential approach to site selection;
- not specify minimum distances between wind turbines infrastructure, or identify buffer zones around nationally designated areas.

3.5.4 The PPSs reviewed in this chapter also advise that planning authorities can:

- set targets for the proportion of energy supply in new development that comes from decentralised, renewable and low carbon sources;
- use local development orders to promote decentralised, renewable and low carbon energy use.

The chapters that follow seek to provide the evidence base for a policy approach in York that meets these requirements whilst responding to the various historical, natural and landscape qualities that underpin the locality's special character and distinctiveness.

4 Renewable energy options & constraints

Technology scoping and capacity calculations ◈Constraints mapping

Given the level of gap between the current installed and planned renewable technologies within York, the growing energy demand and the ever increasing raft of legislative and policy directives on promoting the use of renewable energy technologies, it is essential that the City of York Council have a sound understanding of the technologically feasible, potential capacity for renewables. Without this sound basis, it will be difficult for York to set achievable targets for the authority area as a whole, or more specifically for any new developments. This chapter focuses on establishing this total potential by:

- identifying the overarching spatial constraints within the authority area that will limit deployment of renewable technologies;
- identifying technologies that have limited, or no, capacity for implementation due to a combination of either spatial and/or technological constraints;
- establishing the total capacity for the technologies which could be deployed within the region; and
- by inference, this chapter will also therefore identify areas more suited for renewable energy potential; and compare these with the key development sites and known growth areas within the region.

This process will provide the next layer to the gap analysis carried out in section 2, in ascertaining whether the UK Renewable Energy Strategy lead scenario guidance, or RSS targets, are realistically achievable in the 'best case' scenario for York.

4.1 Constraints mapping

4.1.1 To calculate the technical and practically available resource in York, a range of constraints to renewable energy development need to be considered. In this study we have taken the relevant constraints specified in the DECC methodology[19] and any other constraints identified locally within the City of York's Core Strategy[20]. A full list of constraints considered, the impact of each constraint, and whether or not these are national or local designations, can be found in Annex 10.

[19] DECC (2010) Renewable and low-carbon energy capacity methodology; methodology for the English Regions; January 2010.

[20] City of York Core Strategy Preferred Options June 2009

4.1.2 These constraints were mapped in GIS and used as filters to determine areas that might be suitable for the implementation of particular technologies.

4.1.3 The areas considered as potential constraints, include those outlined in Planning Policy Statement 22 (PPS22), as follows:

- International Designated Sites – Special Protection Areas, Special Areas of Conservation, RAMSAR Sites and World Heritage Sites[21].
- National Designations – Sites of Special Scientific Interest, National Nature Reserves, National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts, Scheduled Monuments, Conservation Areas, RSPB reserves, Listed Buildings, Registered Historic Battlefields and Registered Parks and Gardens[22].

4.1.4 Not all of the environmental designations identified in PPS22 and the DECC energy capacity methodology are applicable in the York area. Figure 4-1 to Figure 4-8 show the environmental constraints identified as potentially being of relevance to the current study. These include the following.

- International and national nature conservation designations

These areas are shown in Figure 4-1. They include Strensall Common, which is a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI); the Lower Derwent Valley, including Derwent Ings, which is a Special Protection Area (SPA) and a Ramsar wetland as well as a SAC and SSSI, and the River Derwent SAC and SSSI. The City of York also has a number of non-statutory sites of nature conservation interest.

Paras. 9-12 of PPS22 *Renewable Energy* provide guidance on how these designations should be interpreted in the context of renewable energy development. In summary, renewable energy projects should only be permitted where it can be demonstrated that these would not compromise the objectives of the designation, an absence of alternatives and an overriding public benefit in the development proceeding.

It is assumed for the purposes of the current study that these designations represent a significant constraint to most forms of renewable energy development. Because the Lower Derwent Valley is a protected SPA bird habitat, the assessment of the wind energy resource will take into account the potential for ornithological constraints in the wider area. Similarly, the assessment of the hydro-power resource on the Derwent will have regard to the presence of protected lamprey populations as a potential constraint.

- Built heritage

Figure 4-2 shows the location of statutorily listed buildings, conservation areas, scheduled ancient monuments and other archaeologically important

[21] Sites where planning permission for renewable energy projects should only be granted once an assessment has shown that the integrity of the site would not be adversely affected.

[22] Sites where planning permission for renewable energy projects should only be granted where it can be demonstrated that the objectives of designation of the area will not be compromised by the development, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.

areas in York. The City of York's historic core provides a particular focus for these designations, along with the central areas of outlying villages.

Paragraph 11 of PPS22 advises that planning permission for renewable energy projects should only be granted where it can be demonstrated that the objects of these designations will not be compromised, with any significant adverse effects outweighed by economic, social and economic benefits of the proposals.

Paragraph HE1.1 of PPS5 *Planning for the Historic Environment* offers further guidance:

Local planning authorities should identify opportunities to mitigate, and adapt to, the effects of climate change when devising policies and making decisions relating to heritage assets by seeking the reuse and, where appropriate, the modification of heritage assets so as to reduce carbon emissions and secure sustainable development. Opportunities to adapt heritage assets include enhancing energy efficiency, improving resilience to the effects of a changing climate, allowing greater use of renewable energy and allowing for the sustainable use of water. Keeping heritage assets in use avoids the consumption of building materials and energy and the generation of waste from the construction of replacement buildings.

In the current context, it is assumed that built heritage designations will constrain large-scale renewable energy developments such as large wind turbines or biomass power stations, and will also limit the deployment of building-mounted systems such as solar thermal and photovoltaic systems. However, built heritage designations are not regarded as a complete constraint to the solar energy technologies, which can sometimes be deployed unobtrusively in the valleys of roofs or on the roofs of rear outbuildings. Some other renewable energy technologies, such as ground-source heat pumps, have little or no external visual manifestation and would be little constrained by heritage designations.

- Preserving the Historic Character and Setting of York

'The Approach to the Green Belt Appraisal' (2003) study carried out by the Council indicated that regardless of the extent to which the City may have to identify further land to meet its development requirements and needs, there are areas of land outside the built up areas that should be retained as open land due to their role in preserving the historic character and setting of York. The land that was identified falls within the following categories:

- *areas which retain, reinforce and extend the pattern of historic green wedges, for example, the Strays, the 'Ings', Green Wedges and extensions to the Green Wedges;*
- *areas other than the Green Wedges which provide an impression of a historic city situated within a rural setting. This relates to significant tracts of undeveloped land, which provide an open foreground to the City. For example, good views of the Minster from recognised vantage points; and*
- *areas which contribute to the setting of villages whose traditional form, character and relationship with the City and surrounding agricultural landscape is of historic value, for example Askham Richard and Askham Bryan.*

'The Approach to the Green Belt Appraisal' (2003) also indicated that there are areas of land outside the built up areas that should be retained as open land as they prevent communities within the environs of York from merging into one another and the city. These areas were considered to have a key role in preserving the identity of the settlements and villages around York. The relationship of York to its surrounding settlements is a key element of the City's character. This relationship is not simply about the distance between the settlements but also their size.

All these areas are shown in Figure 4-3 and given the local evidence base should be regarded as a constraint.

- Green belt

Paragraph 13 of PPS22 advises that:

When located in the green belt, elements of many renewable energy projects will comprise inappropriate development, which may impact on the openness of the green belt. Careful consideration will therefore need to be given to the visual impact of projects, and developers will need to demonstrate very special circumstances that clearly outweigh any harm by reason of inappropriateness and any other harm if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources.

York currently has a draft Green Belt boundary, which is not treated as an absolute constraint in the current study. The Green Belt boundary will be adopted through the LDF process.

- Green infrastructure

The Council are currently undertaking work to identify the City's Green Infrastructure. Figure 4-3 shows currently identified regionally significant corridors, along with nationally, regionally and locally designated nature conservation sites. In addition to the regionally significant green corridors it is also acknowledged there will be district and local level corridors that will need to be taken into account for specific schemes. Collectively, these character areas provide a further level of detail on the local environmental sensitivities to which renewable energy projects might need to respond in their siting and design. These Green Infrastructure designations would be seen as a non absolute constraint.

- Constraints specific to wind energy development

Figure 4-4 and Figure 4-5 show the potential constraints to development from the principal electricity transmission lines, roads and railways in the study area. These are of relevance only to wind turbine developments, where a notional 'topple distance' based on turbine height and/or blade diameter and an additional margin is often applied to protect major transport and infrastructure assets. An assumed separation distance of 150 metres has been employed in the current study.

The separation distances from existing buildings and major growth areas, to address the potential adverse effects of noise and shadow flicker from wind turbines is also an important consideration. In practice, the specific relationships between wind turbines and sensitive properties would have to be modelled and the appropriate separation distance determined on a site-by-site basis. This will obviously differ depending on the technology involved, for example, large wind turbines (e.g. 125 metres to tip) might require greater separation distances to achieve acceptable noise levels in a tranquil area, in urban areas with higher background noise levels – such as a large industrial estate – a smaller separation distance might well be acceptable in these terms.

- Air quality management areas

These are shown in Figure 4-6 and Figure 4-7, and are treated as a potential constraint to the deployment of combustion-based renewable energy technologies such as biomass CHP.

- Flood risk

Figure 4-8 shows flood risk areas in the study area. For the purposes of the current study, these will be treated as development constraints in a manner consistent with PPS25 *Development and Flood Risk*. Hydro projects would, by definition, need to be within areas prone to fluvial flood risk. However, the protection of hydro-power assets from flood damage is a normal design consideration.

4.1.5 The DECC methodology on conducting regional renewable energy assessments recognises that proximity to grid and grid capacity are important economic issues at a site level. The guidance also states that for the regional assessment that grid issues should not be used to reduce the regional resource. Accordingly, grid connection issues have not been used as constraint to the resource assessment for York.

4.1.6 It is emphasised that the actual level of constraint imposed upon a development can be determined only by site-specific evaluation. However, the interpretation of constraints summarised above, based as it is upon published planning guidance, is considered to provide a reasonable basis for the assessment of York’s renewable energy resource potential.

4.1.7 All maps have been generated by AEA, unless otherwise stated.

Figure 4-1: International and national designations

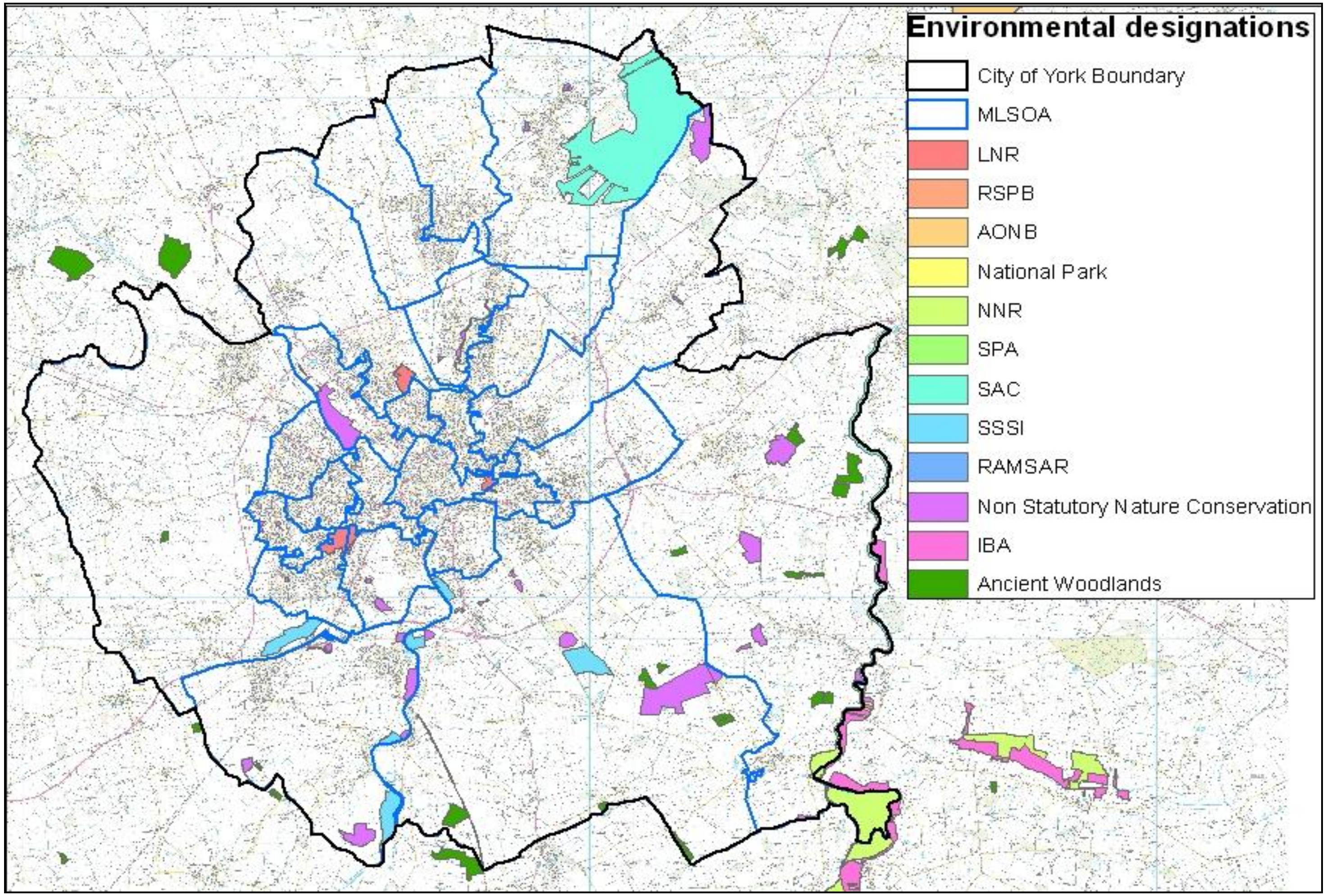


Figure 4-2: Local designations

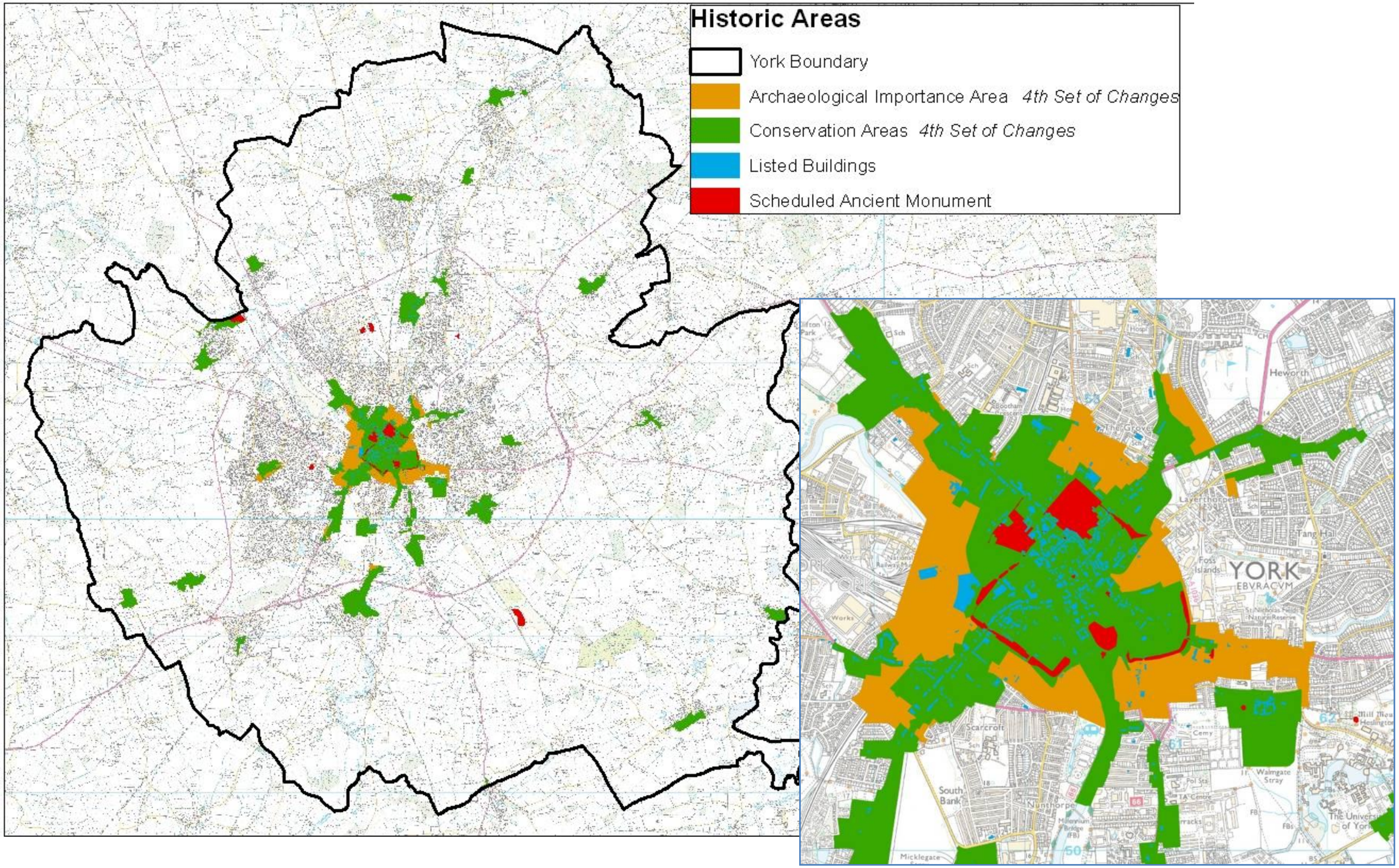
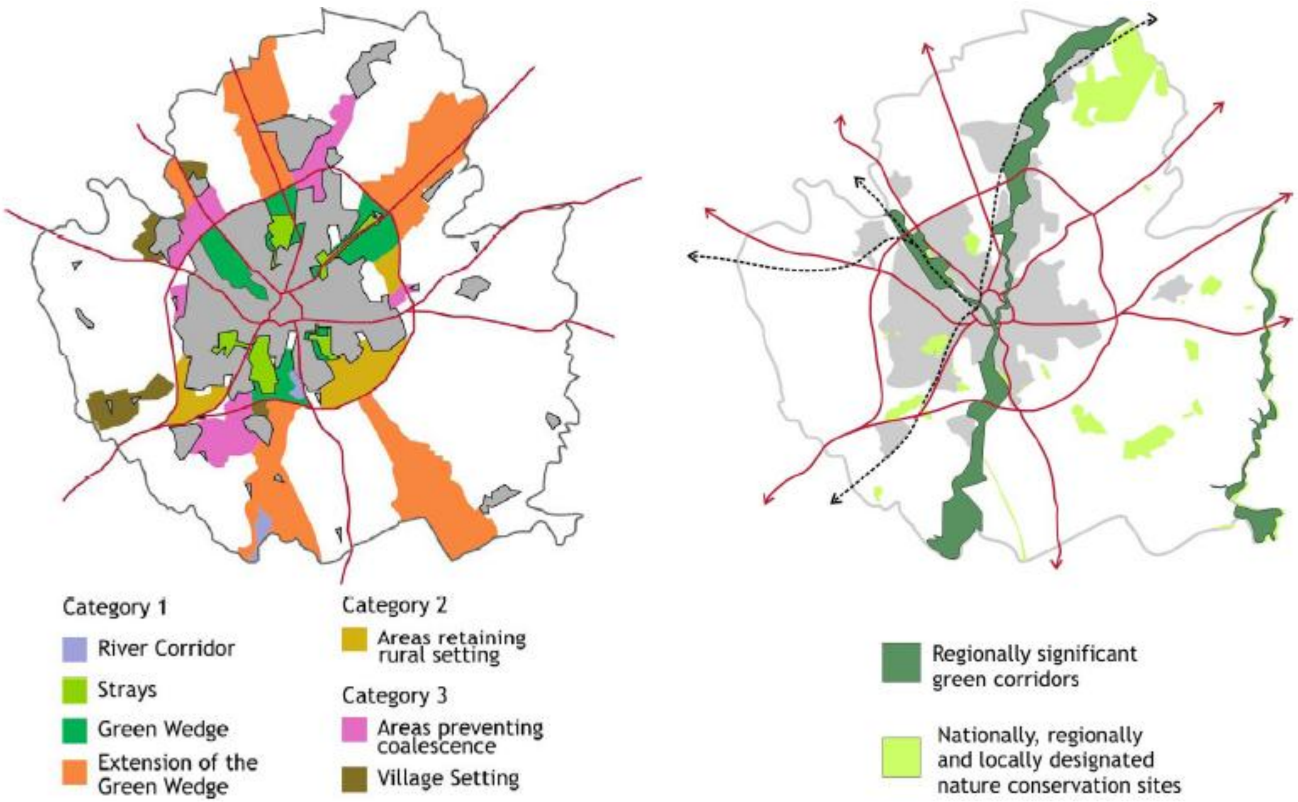


Figure 4-3: York historic character and setting areas and green infrastructure, including Nature Conservation Sites



Source: June 2009 City of York Core Strategy

Figure 4-4: Power lines, roads and railways

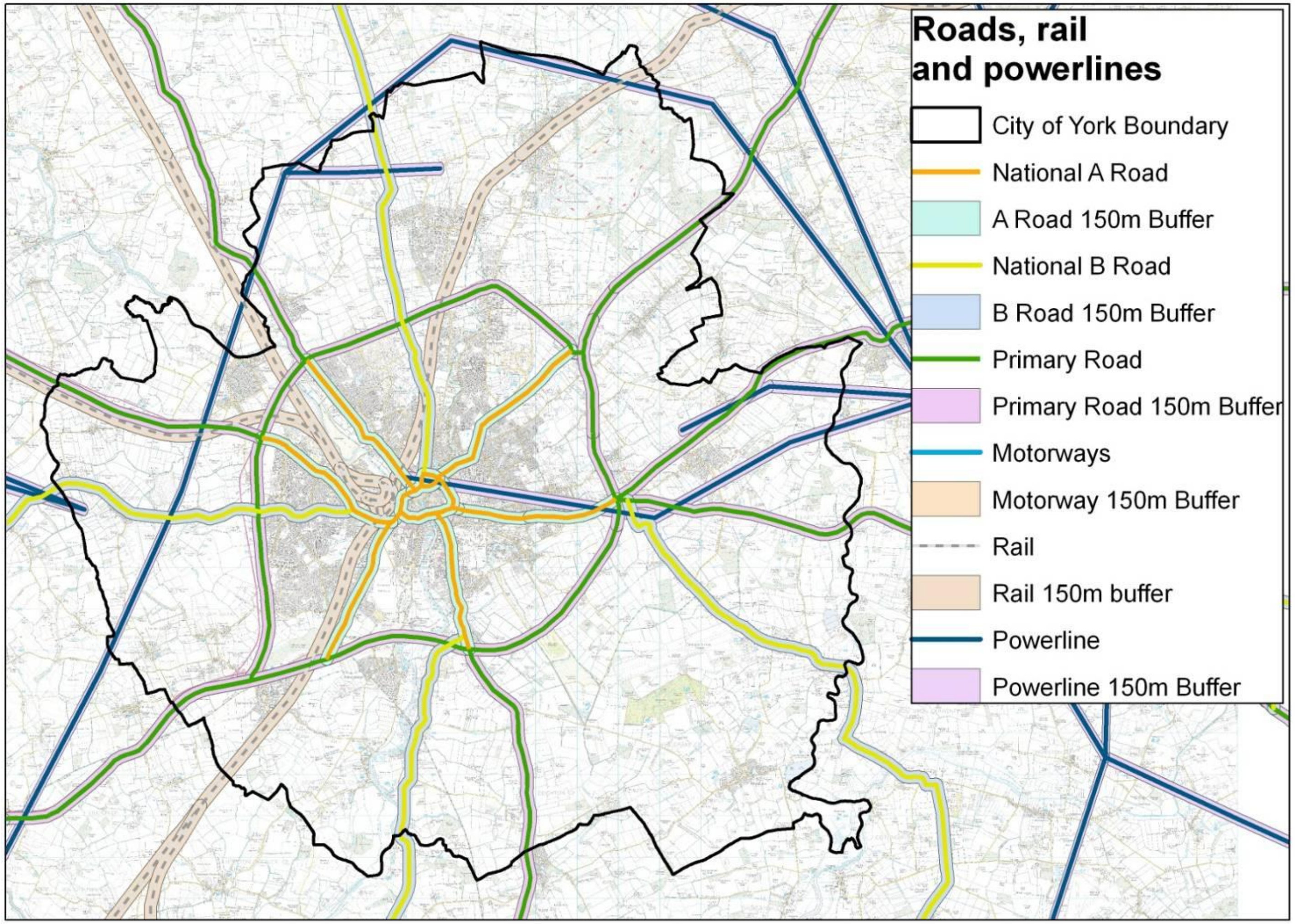


Figure 4-5: Power lines, roads and railways – city centre inset

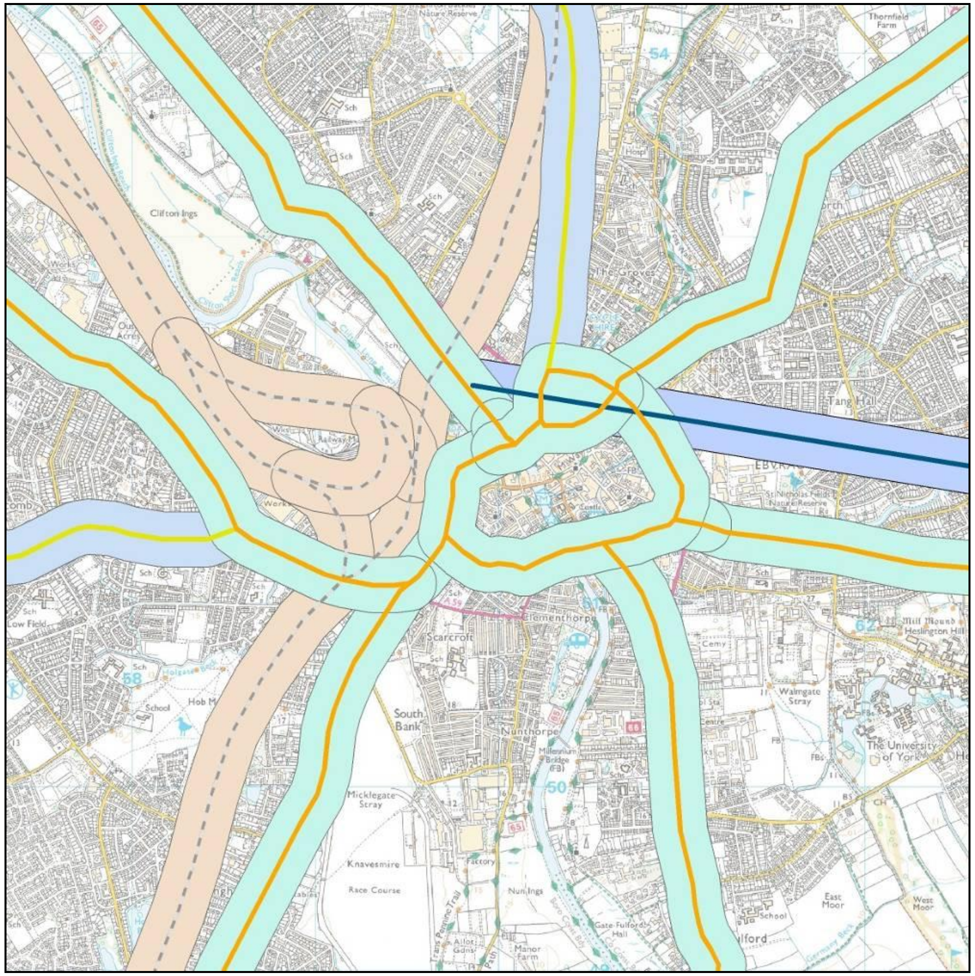


Figure 4-6: Air Quality Management Areas

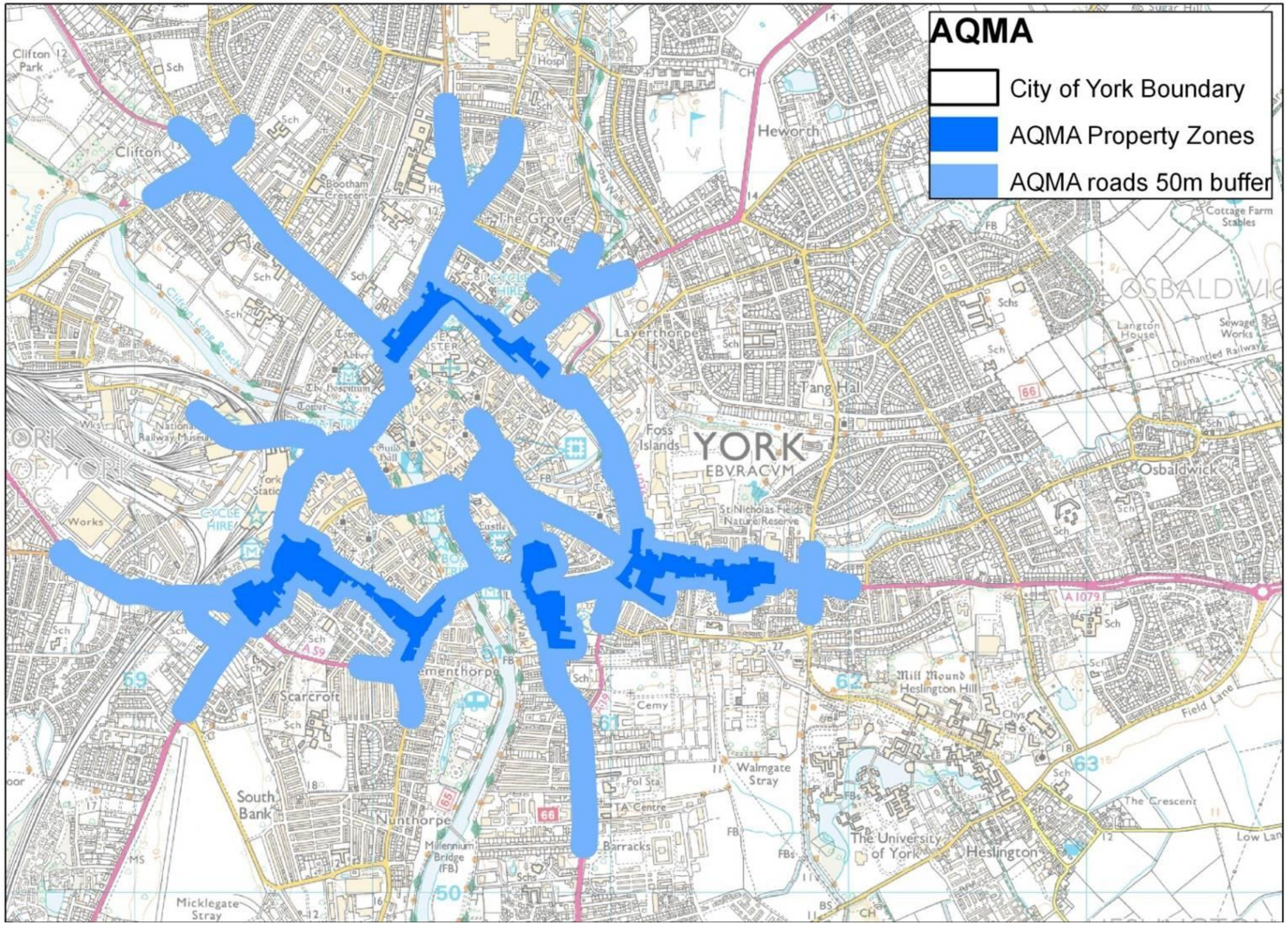


Figure 4-7: Air quality and Gas Demand

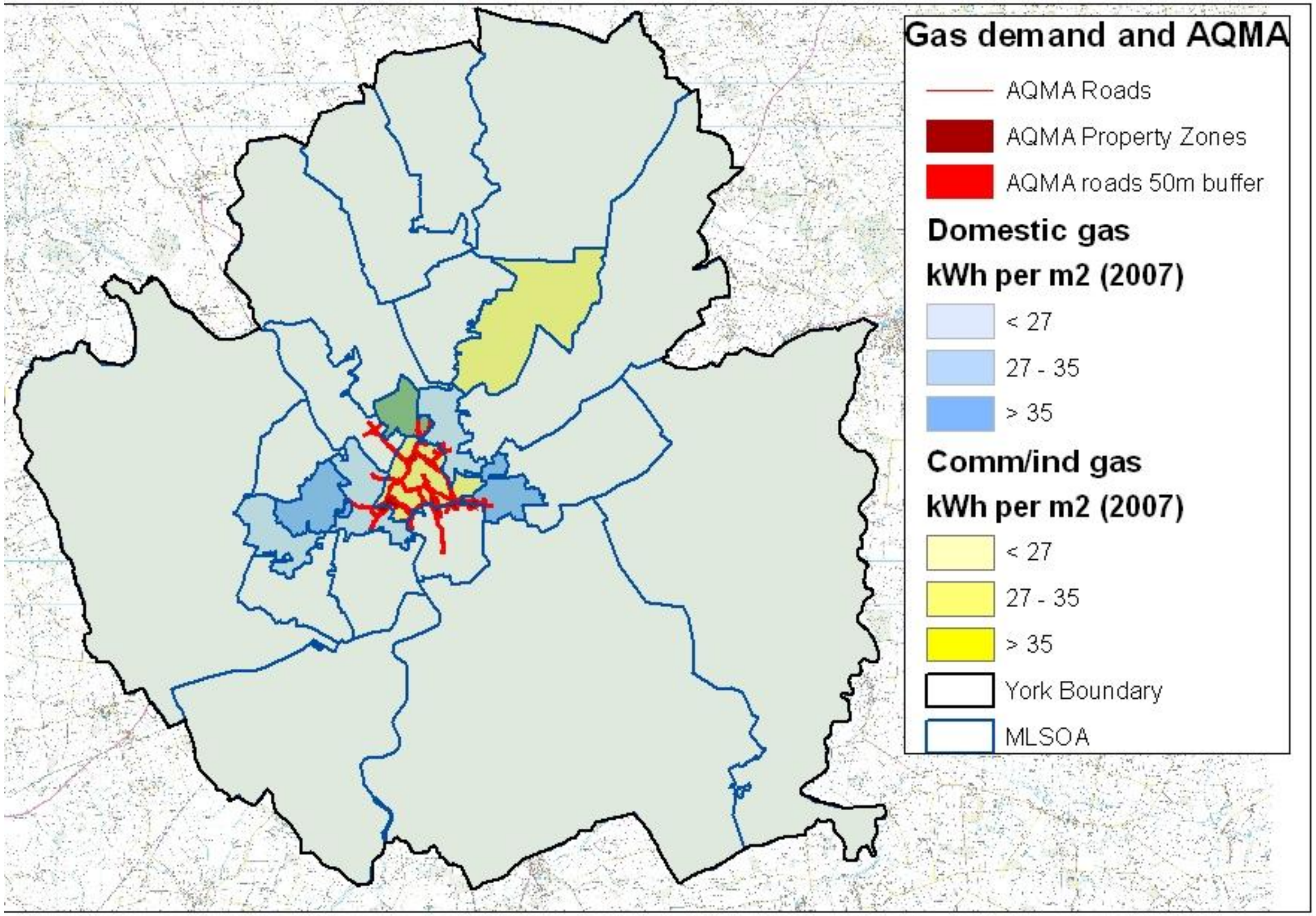
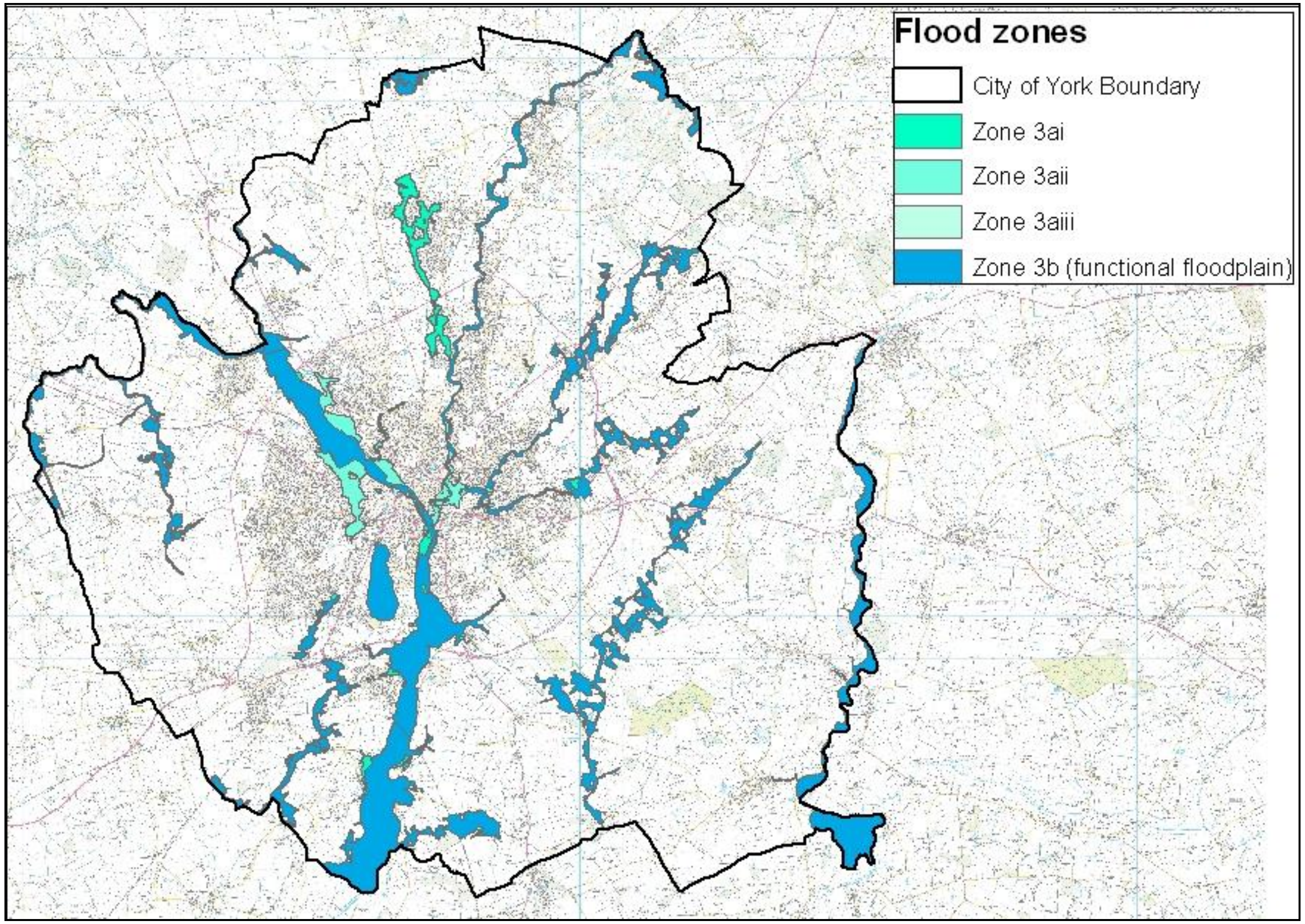


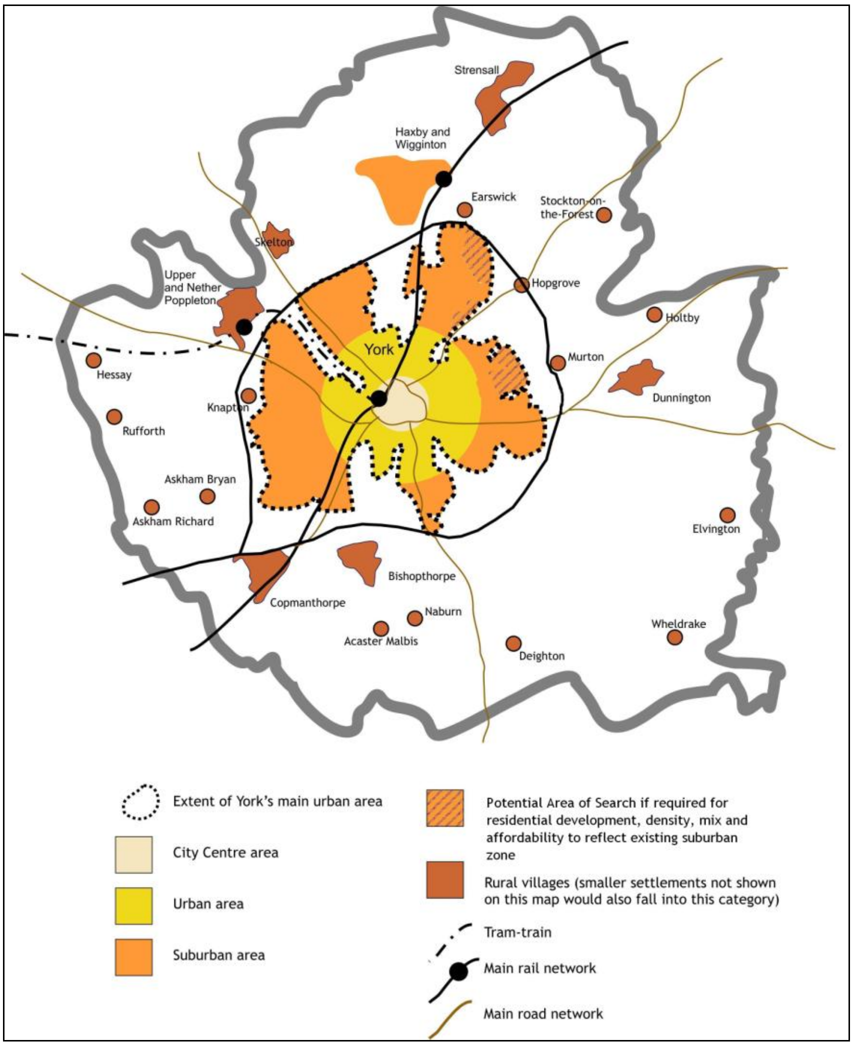
Figure 4-8: Flood zones



4.2 Conclusions on Spatial Constraints

4.2.1 The spatial constraints in Figure 4-1 are spread across the York area and no firm insights can be drawn on their applicability to specific development areas or the application of technologies. The remaining spatial constraints appear to vary with development/building density. The city centre area is the most dense with density reducing the further out you get from the centre. Figure 4-9 below indicates areas of city centre or urban density against suburban or rural density. This reflects York's Core Strategy Preferred Options position. The LDF Working Group have since reconsidered the use of the potential areas of search.. From the diagrams in the previous section, more constraints tend to apply at higher densities.

Figure 4-9: York's Housing Areas (taken from York's Core Strategy Preferred Options document)



4.3 Freestanding generation

4.3.1 This section explores York's options for freestanding electricity generation from hydropower, large and medium scale wind. District heating and building integrated technologies are considered in section 4.4 and 4.5 respectively. Each of these sections takes into consideration the relevant constraints from those that are outlined in section 4.1.

4.3.2 This section does not provide a full insight into each technology as this can be found in the detailed technical guidance in the Companion Guide to PPS22[23].

4.3.3 Large and medium wind: > 500kW

4.3.4 Onshore wind energy generation is a mature technology, with a track record of around 20 years in the UK[24], and longer worldwide. Wind energy has been the fastest growing renewable energy source over the last number of years, and this is expected to continue, with further reductions in turbine costs and increases in their size and efficiency, together with market mechanisms and incentives[25].

4.3.5 The UK is the windiest country in Europe, and so has significant scope for wind energy generation[26]. A modern 2.5 MW turbine at a suitable site will generate around 6.5 GWh of electricity each year, which, using the UK average of 4,392 kWh/yr per meter point and one meter point per house, would generate electricity sufficient to power over 1,400 homes. In 2007 wind energy was accounting for 2.2% of the UK's electricity[26]. The Committee on Climate Change's 2008 report on 'Building a Low Carbon Economy', advised that onshore and offshore wind together could deliver 30% of the UK's electricity by 2020. This 33 GW of capacity, if developed, would deliver over £60 billion of investment and create approximately 160,000 green collar jobs[27].

4.3.6 In order to assess the opportunities available for commercial scale wind turbines over 1.5 MW in size, and medium (or community) scale wind turbines from 500 kW to 1.5 MW in size, the following methodology was employed:

- An assessment of the natural resource – wind speeds using separate thresholds for commercial and medium scale turbines.
- Filtering of constraints to wind development – environmental designations, roads, rail and housing – as shown in the earlier figures. As stated in the DECC methodology, a buffer is applied to houses, roads and rail, but not to environmental designations.
- Calculation of wind turbine density and hence the MW potential, using the DECC methodology figure of 9MW/km^2 as a benchmark.

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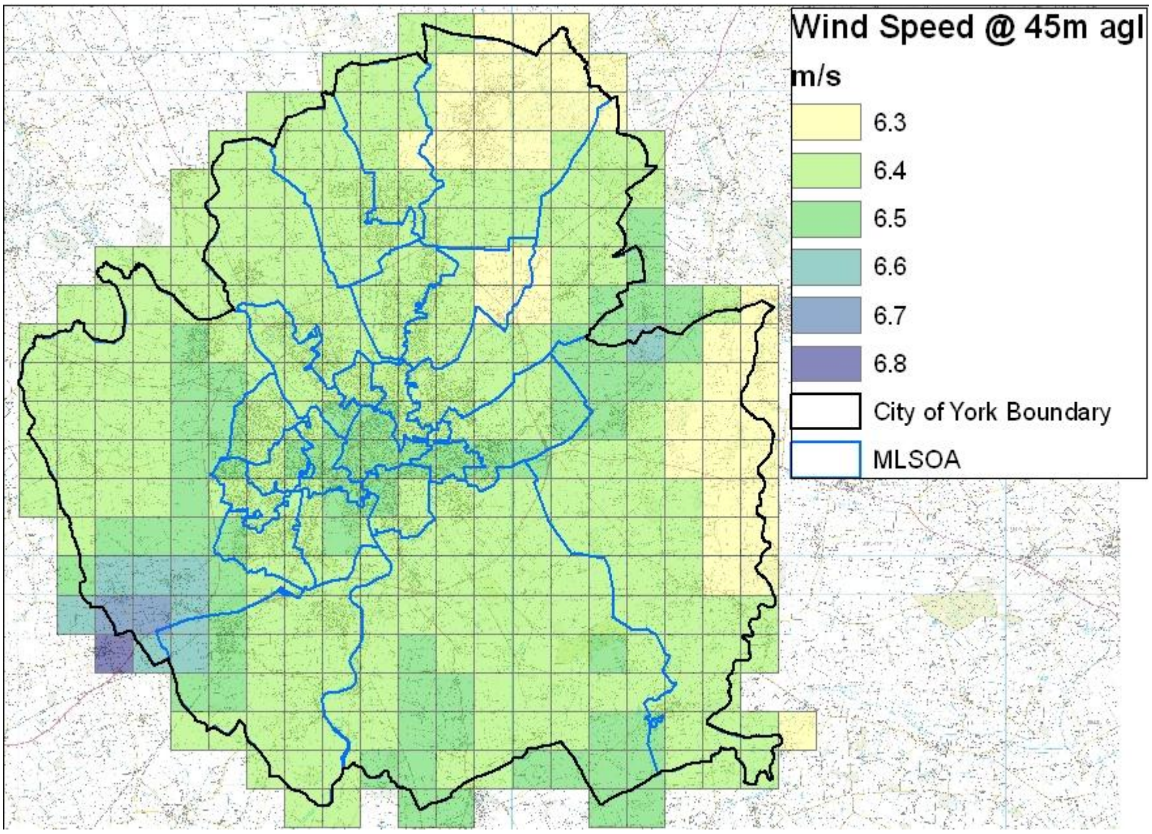
23 http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable
24 The UK's first windfarm was built at Delabole in 1991. Source: BWEA
25 Such as the Feed-in Tariffs, which will improve paybacks on medium turbines and make them more commercially viable.
26 Source: Renewables UK, http://www.bwea.com/onshore/index.html
27 Source: BWEA

4.3.7 The average annual wind speed in a 1km^2 grid was assessed to determine the naturally available wind resource in metres per second (m/s). Data on wind speeds was extracted from DECC's UK wind speed database (NOABL)[28]. Areas with unviable wind speed were then excluded. Literature suggests that wind speeds above 5m/s at 45 metres above ground level (agl) could be considered viable. However, most developers only consider sites with wind speeds above 6m/s at 45m agl[29].

4.3.8 In this study, wind speeds above 6m/s at 45m agl for commercial scale wind and wind speeds above 5m/s at 45m agl for medium scale wind are considered viable – in line with the DECC guidance. Figure 4-10 shows wind speeds at 45m agl within York. This shows that York has wind speeds of between 6.3 and 6.8 metres per second at 45m agl. This means that all areas in York have a potentially viable wind speed. The highest potential, in terms of wind speeds, is to the south west of York.

Figure 4-10: Wind speeds at 45m agl in York



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[28] DECC's UK wind speed database is based on use of the NOABL model, a wind flow model based on a computational fluids dynamics method. The NOABL database contains estimates of wind speed at 10, 25 and 45m above ground level to 1km grid square resolution assuming ground cover of short grass and no obstacles (e.g. trees or buildings). The model makes some important assumptions and approximations. However, the results are useful as a rough guide and have been shown to match reasonably well to observed wind conditions. Note that the UK wind speed database has a tendency to underestimate the wind speed at coastal locations.

[29] It should be noted that most large-scale wind turbines have much higher hub heights than 45 meters, typically being above 80m, and that wind speeds will be higher at these heights.

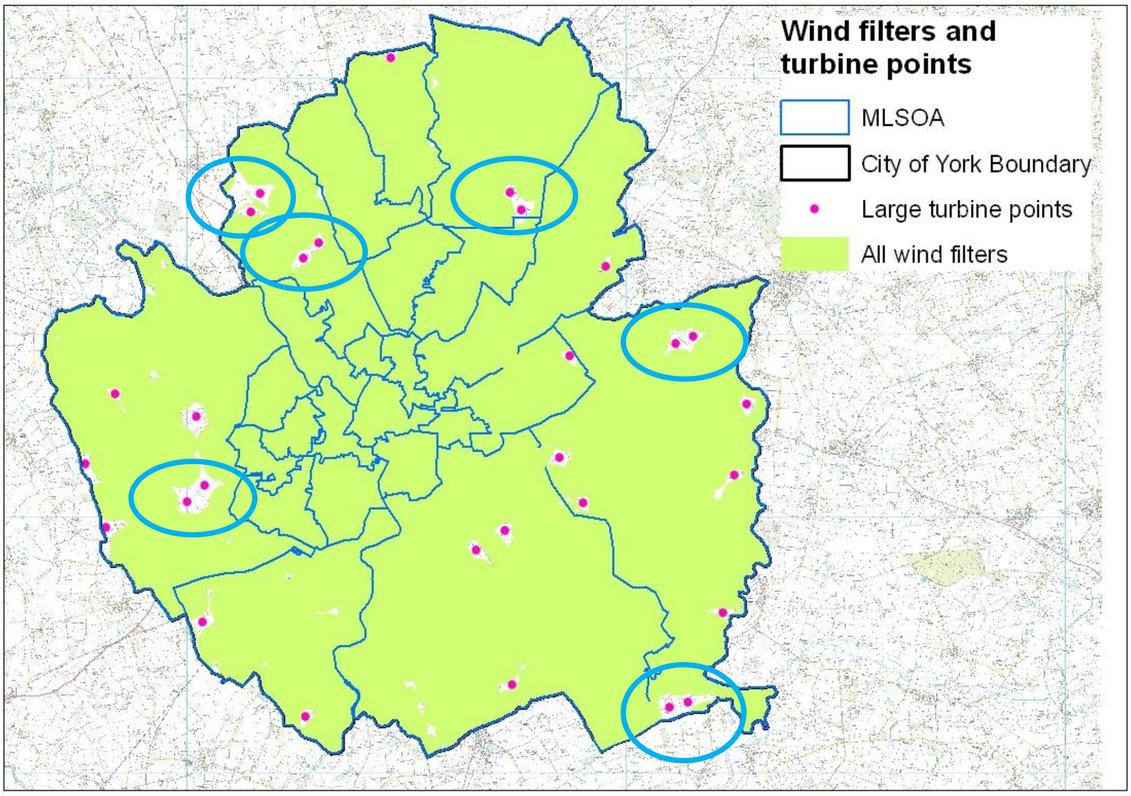
Source: AEA

4.3.9 The constraints as discussed above were applied in order to filter out the least viable areas in York. The green areas in Figure 4-11 and Figure 4-12 indicate parts of York that are covered by one or more of the constraints. The clear areas are parts of York that are unconstrained and would be considered appropriate for the location of either large or medium scale wind turbines.

4.3.10 The potential turbine locations, as shown in Figure 4-11 and Figure 4-12 are determined using the benchmark figure of 9MW/km^2 as a guide:

- **Commercial scale wind**: potential turbine points were mapped with a separation distance of approximately 500 metres. This allows around 3-4 turbines per km^2 – a capacity of 7.5-10MW/km^2 for 2.5MW turbines. The mapping of all potential locations for large turbine is shown in Figure 4-11.
- **Medium scale wind**: potential turbine points were mapped with a separation distance of approximately 300 metres, allowing 7-9 turbines per km^2 – a capacity of 7-9MW for 1MW turbines. The mapping of all potential medium turbine points is shown in Figure 4-12.

Figure 4-11: Wind constraints and potential large-scale turbine locations



Source: AEA

Note: blue circles are discussed in paragraph 4.3.14

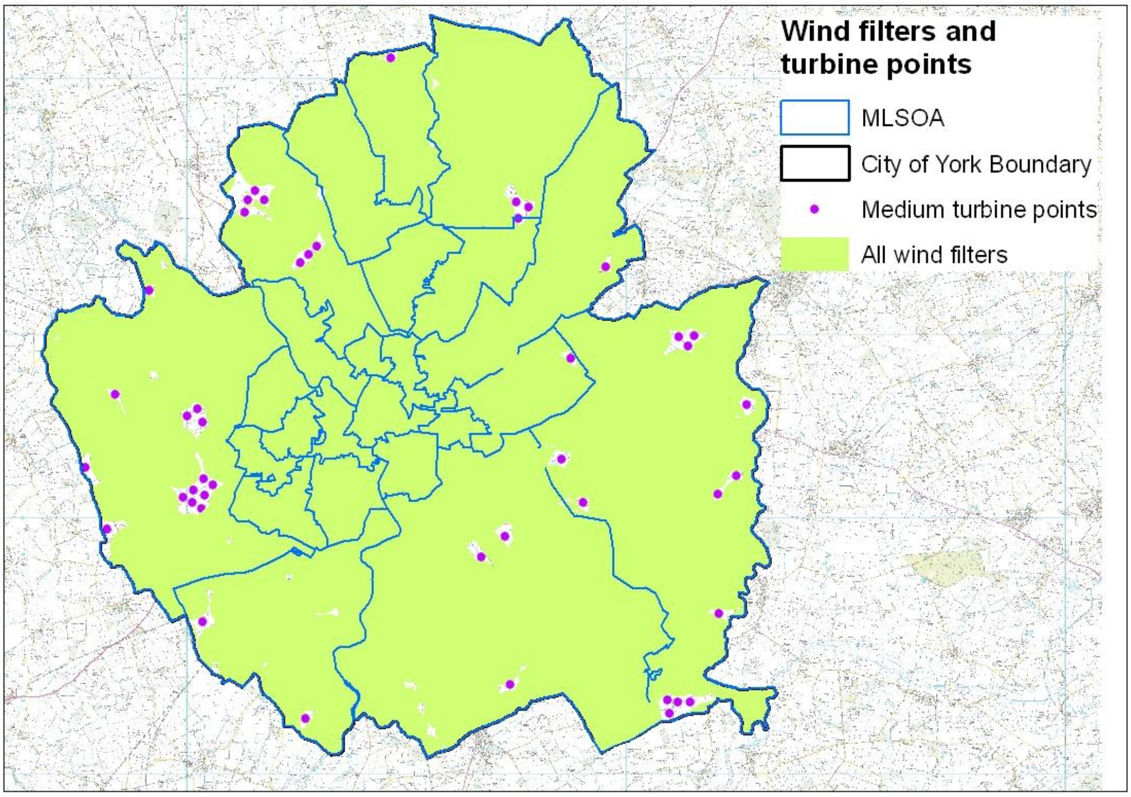
4.3.11 To assess the potential scale of wind energy resource requires assumptions about the size of the turbines that would be deployed. In the case of large scale wind we assume a commercial scale 2.5 MW turbine. To assess the potential for large scale wind we use this size of turbine to identify areas where the constraints enable 2.5 MW turbines to be located. These points are shown in the map for large turbines. The same process is used for medium scale wind but using 1 MW turbines.

4.3.12 If these areas were to be investigated in detail then the size and location of the turbines would be chosen in the light of detailed insight into the site conditions. Hence the areas left un-shaded represent areas of search for large and medium wind potential.

4.3.13 Our assessment has, however, identified potential for large or medium wind near Escrick, south of Deighton. This could potentially bring in the North Selby Mine site. This site is referred to in the Core Strategy (page 126, para 15.11) as having been identified as being well suited to the development of green technologies and the generation of renewable technologies (in the City of York Employment Land Review, Stage 2). We therefore take the view that investigation of site potential at the North Selby Mine site should head any list of prioritised sites. Our assessment takes into consideration the constraints mentioned in 4.1. We also note that there exist plans, identified in York's evidence base, for the sustainable use of the site at the moment[30]

[30] Plans are being drawn up by Science City York to transform the old North Selby site into a high-tech green power plant. The centre would include specialist facilities allowing scale-up and demonstration of sustainable energy processes, as well as purpose-built laboratory space and on-site renewable power generation.' Source: http://www.selbytimes.co.uk/selby-news/150-jobs-hope-at-former.5238571.jp

Figure 4-12: Wind constraints and potential medium-scale turbine locations



Source: AEA

4.3.14 However, as commercial and medium scale wind are mutually exclusive, we have assumed that York would have a maximum potential for up to four commercial scale wind farms and remaining potential would be for medium scale wind[31]. Using this assumption, the following locations, circled in blue in Figure 4-12, have been suggested for large scale turbines:

- Northwest of York: Two areas, each with potential for two 2.5MW turbines
- North of York: Two 2.5MW turbines
- East of York: Two 2.5MW turbines
- West of York: Two 2.5MW turbines
- Southeast of York: Two 2.5MW turbines

4.3.15 This equates to a total for of 12 large wind turbines with a cumulative generation capacity of 30 MW, if the individual turbines are rated at 2.5 MW capacity.

4.3.16 Excluding these large scale wind turbine locations, York would have potential for up to 30 medium scale turbines an indicative total capacity of 30 MW.

[31] Maximum of twelve 2.5MW turbines or thirty 1MW turbines

4.3.17 Large and medium wind turbines have a load factor of around 30%[32], which means that electricity generation is the equivalent to operation at full output for 30% of the year. Using this assumed load factor, estimated electricity generation potential from large and medium wind in York is summarised in Table 4-1.

Table 4-1: Estimated electricity generation from York's large and medium wind potential

Technology	Potential no. of units	MW/unit	Installed capacity (MW)	Electricity MWh/yr
Large wind	12	2.5	30	78,840
Medium wind	30	1.0	30	78,840

*

4.3.18 Hydropower

4.3.19 Hydropower is a technology that is well established. Water flowing from a higher to a lower level is used to drive a turbine, which produces mechanical energy, which is usually turned into electrical energy by a generator, or more rarely to drive a useful mechanical device. The energy produced is directly proportional to the flow volume of water and the head. There are high head–low volume applications and low head-high volume applications.

4.3.20 The Environment Agency (EA) has published a report looking at the opportunities for hydropower alongside the environmental sensitivity associated with exploiting hydropower opportunities to give a national overview[33.] This report identifies opportunities for hydropower in York, as shown in Figure 4-13.

4.3.21 This diagram shows that, in York upon the rivers Ouse, Foss and Derwent, there is opportunity for hydropower opportunities of four different sizes:

- Three 0-10kW generators, all to the east of central York, around the area to the North of The Fulford (York) Golf Club.
- Four 10-20kW generators, stretching from central York to North York (on the Rivers Ouse and Foss).
- One 100-500kW generator, to the southwest of the city, on the City of York boundary.
- One 500kW-1,500kW generator, to the south the York, on the River Ouse.

4.3.22 The results and maps presented here, produced by the EA, are indicative only[34] and do not replace site-by-site analysis. The data is not meant to be used for specific site analysis and identification at this stage, and is instead aimed at

[32] See Annex 9 for source references for all load factors applied
[33] Source: http://www.environment-agency.gov.uk/shell/hydropowerswf.html
[34] While the opportunities are shown on a map, the report does not provide any further detail on the precise location and further details on any of the mapped opportunities.

giving a national and regional level picture of the location and size of the opportunity along with a coarse environmental assessment. The EA have stated that they plan to improve and expand upon this work, with the longer term aim of developing and delivering a strategic approach to hydropower deployment at the catchment level. Making information available to developers and stakeholders about the opportunities available and the environmental sensitivity associated with them.

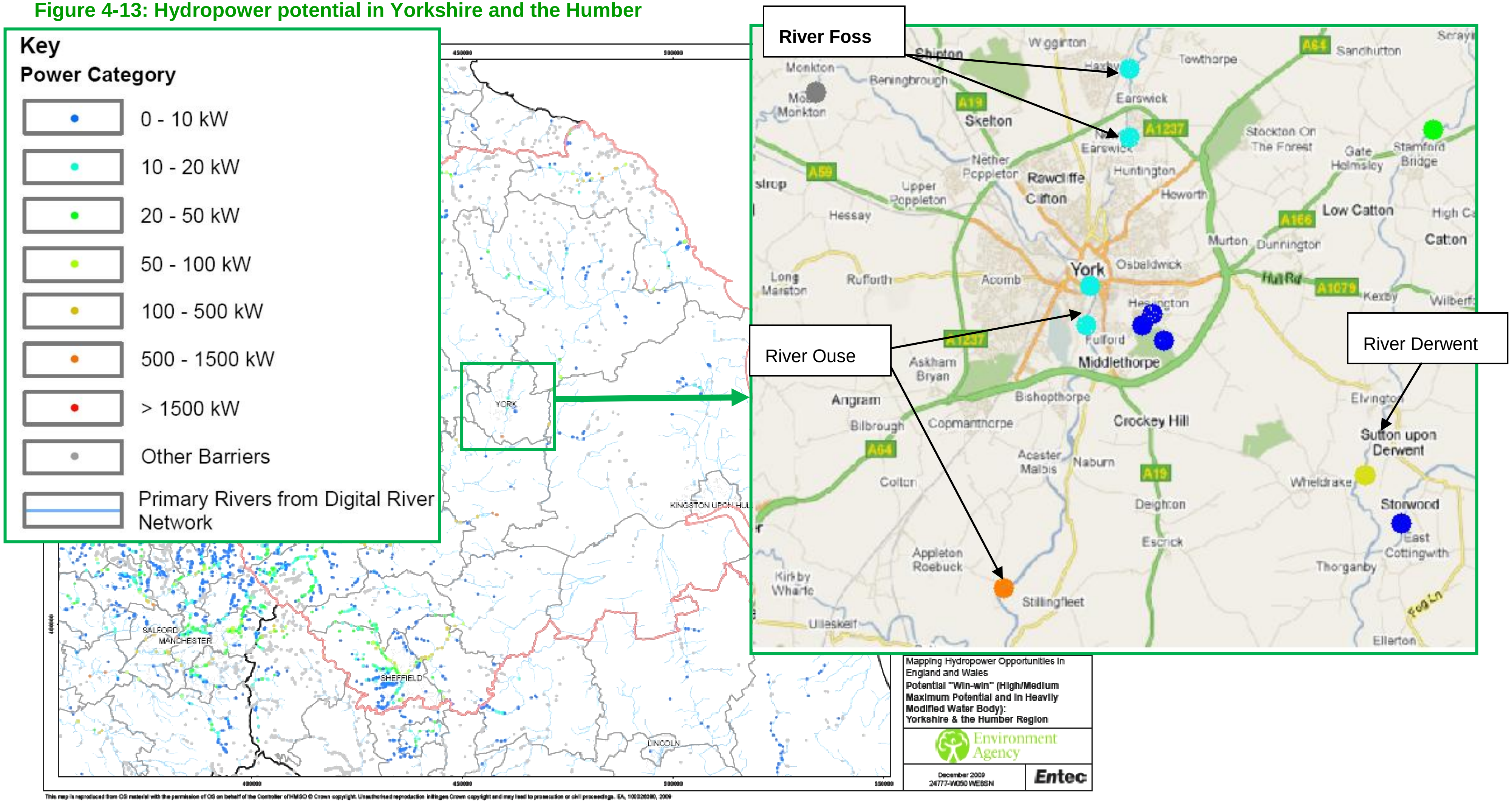
4.3.23 Assuming a load factor of 50% for larger hydropower generators, and 0.37 for smaller, the estimated electricity generation potential from York's potential sites is summarised in Table 4-2.

Table 4-2: Estimated electricity generation from York's hydropower potential

Technology	Potential no. of units	Assumed kW/unit	Installed capacity (kW)	Installed capacity (MW)	Electricity MWh/yr
Hydro (0-10kW)	3	5	15	0.015	49
Hydro (10-20kW)	4	15	60	0.06	194
Hydro (100-500kW)	1	300	300	0.30	1,314
Hydro (500-1500kW)	1	1,000	1,000	1.00	4,380
Total			**1,375**	**1.375**	**5,937**

*

Figure 4-13: Hydropower potential in Yorkshire and the Humber



4.4 District networks

4.4.1 This section discusses some potential options from district networks in York, including combined heat and power (CHP) and district heating options. Both CHP and district heating networks can be supplied by a range of fuels. Rather than being too prescriptive about the fuel source, this higher level scoping looks at what type of heat requirements, or heat loads, may be suitable for being supplied by a district CHP or heating network.

4.4.2 Hence in this assessment we consider two options:

- CHP – production of electricity (sold to local consumers or to the electricity market) and heat, distributed through heat pipes to customers.
- District Heating – production of heat, distributed through heat pipes to customers.

4.4.3 In both cases an important consideration is the heat loads that could be served by the heat network. Areas with high heat loads[35] have potential for district heating or CHP. Options for both retrofitting existing housing and new development could be explored. Costs are lower for new development as the costs of trenches for the heat pipes are lower. Heat networks can best serve[36]:

- Areas with an **'anchor load'** – a relatively large and relatively stable heat load, e.g. hospitals. Neighbouring residential areas could also be connected to the network.
- **Mixed use areas** – residential and commercial building that have a mix of complementary thermal load profile, which together make a large and stable heat load.
- Areas of **high density housing**, e.g. flats.

4.4.4 For the purpose of this study, it is assumed that both a district heating scheme and a CHP would both use biomass as a fuel source. CHP could also be fuelled by anaerobic digestion or another form of energy from waste.

4.4.5 Biomass CHP is only environmentally efficient when a high proportion of the heat load is utilised. With 100% heat utilisation it is one of the most efficient technologies in terms of emission savings. With less than 10% average heat load it is one of the worst biomass technologies in terms of emission savings. Therefore, CHP should only be considered where high average heat loads exist. For those areas where heat loads are still high, but possibly not suitable for CHP, a biomass district heating network should be considered.

4.4.6 Heat technologies are not subject to many of the visual and other constraints that influence wind turbine or hydro site selection as they are predominantly building based. Still, the biomass technologies discussed here will be subject to air quality restrictions. However, these restrictions will impact only where cumulative impacts of installations push emissions above a threshold, as it is

[35] The heat requirement of a site or area
[36] Source: Sustainable Development Commission (2007) Community Heating CHP for Existing Housing.

assumed best practice is followed in installations[37]. Figure 4-6 and Figure 4-7 show where AQMAs are located within York and therefore the restrictions surrounding roll out of biomass installations in relation to predicted heat demand.

4.4.7 At present detailed heat mapping at the lower level super output area (LLSOA) is not possible as this resolution of energy data is not available. Some general comments can be made on new developments that may be suitable for a CHP or district heating network, however, if York intends to develop biomass district heating and/or CHP, it is recommended that detailed heat mapping is carried out at the LLSOA in order to determine specific sites with opportunity.

4.4.8 The consultation on the new planning policy statement 'Planning for a Low Carbon Future' sets out that local authorities will be required to undertake such heat mapping exercises in order to focus down on opportunities for decentralised energy. Specific development sites[38] that should be explored are:

- York Northwest (York Central): Mixed use, with up to a maximum of 1,780 dwellings. The mixed use nature of the site and potentially high density of residential development could result in a large and relatively stable heat load.
- York Northwest (British Sugar): Mixed use, with up to 1,250 dwellings on 50-75% of the site. Again, the mixed use nature of the site could result in a large and relatively stable heat load.
- Terry's Factory: mixed use, including employment and up to 395 residential units. Potential for high and relatively stable heat load.
- Hungate: mixed use development with employment on site. Heat load would depend on mix of land use. If unsuitable for biomass CHP, biomass for district heating could be considered.
- University of York; Heslington East: University campus, including Science City type employment. Potential will have a high and stable 'anchor load'.

4.4.9 It is assumed that at least two development sites would have potential for biomass CHP and three would have potential for biomass district heating. However, it should be noted that York may have a much higher capacity for district networks. As discussed, more detailed heat mapping would help to identify the most suitable sites.

4.4.10 For the purpose of estimating energy production from this identified potential, it is assumed that the CHP networks consist of a 4MW generator supplying 1/3 electricity and 2/3 heat, while the biomass district heating networks are supplied by a 1MW boiler. The load factor for both technologies is 75%.

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[37] Environmental Protection UK, in partnership with LACORS, has produced draft guidance for local authorities on the air quality impacts of biomass, which is now available on their website; www.environmentalprotection.org.uk/biomass

[38] It should be noted that some of these development sites may already have planning consents and further future potential will be subject to these existing planning consents.

Table 4-3: Estimated electricity generation from York's district CHP and district heating potential

Tech.	Potential no. of units	Assumed MW/unit	Installed capacity (MW)	MWh/yr electricity	MWh/yr heat
Biomass CHP	2	4.0	8	17,520	35,040
Biomass district heating	3	1.0	3	0	19,710
Total			**11**	**17,520**	**54,750**

4.5 Building integrated technologies

4.5.1 This section discusses potential within York for micro-generation that could be integrated into residential, commercial and industrial developments. Technologies explored are:

- Small and micro wind
- Single building biomass heating
- Solar thermal
- Solar photovoltaics (PV)
- Heat pumps

4.5.2 In order to determine the potential for each of these technologies in new developments within York, the method laid out in the DECC methodology is followed. This applies either assumptions about suitable wind speeds (for small and micro wind) or assumptions on the number of suitable properties for the other technologies. However, to obtain a more realistic estimate for the potential in new developments within the York region, we have applied three additional assumptions:

- 2.5% of York is covered by AQMA's. It is assumed that this percentage of development would be unsuitable for biomass for single building heating due to the air quality implications as discussed earlier[39].
- For small/micro wind, biomass for single building, solar thermal and solar PV it is assumed that the majority of flats would be unsuitable, due to shared external areas and fuel store needs (for biomass). York is seeking a 70:30 mix of houses to flats in new developments, so it is assumed that 30% of new developments are flats and are hence unsuitable[40].
- It is assumed that more than one electricity technology would not be installed in a single building, and the same for heat technologies. Therefore, either small/micro wind or solar PV would be installed in one

[39] A new AQMA at Fulford was designated following completion of the assessment of the renewable energy options within York. However, the new AQMA only covers a very small percentage of York's area and does not change the overall renewable energy potential figures.

[40] It should be noted that flats tend to be high density development and therefore district heating or CHP networks should be considered.

building, and one of biomass heating, solar thermal, ground source heat pumps or air source heat pumps would be installed in the same building.

It should be noted that, while preserving the historic character of York (in terms of Conservation Areas and Listed Buildings) is an important consideration, assumptions on historical limitations have not been applied. York has a number of Historic Character areas, as shown in Figure 4-2. These provide a degree of inhibition to potential for building integrated renewables. However, it is not possible to quantify the level of inhibition. This is because the constraint offered by the designations that come under 'historic areas', do not inhibit potential per se, but might do should the extent or intrusion of the proposed technology installation be such that planners see fit to refuse. This extent or intrusion cannot be quantified in an area level study, but instead would be on a site by site or case by case basis. It is recognised that the Historic character within York is important, but this is an issue that requires consideration on a site-by-site basis and not when determining overall maximum potential. There are also areas of land outside the built up areas that should be retained as open land due to their role in preserving the historic character and setting of York. The land that was identified falls within the following categories:

- *areas which retain, reinforce and extend the pattern of historic green wedges, for example, the Strays, the 'Ings', Green Wedges and extensions to the Green Wedges;*
- *areas other than the Green Wedges which provide an impression of a historic city situated within a rural setting. This relates to significant tracts of undeveloped land, which provide an open foreground to the City. For example, good views of the Minster from recognised vantage points; and*
- *areas which contribute to the setting of villages whose traditional form, character and relationship with the City and surrounding agricultural landscape is of historic value, for example Askham Richard and Askham Bryan.*

4.5.3 Property numbers as provided by City of York Council have been used to calculate the potential for each of the building integrated technologies. The figures for these are shown in Table 4-4. Results for each technology are shown as generation potential per 2020 (developments to 2011 and 2016) and post 2020 (developments to 2021 and 2031).

Table 4-4: New residential property numbers in York[41]

Year	Up to 2011	2012 - 2016	2017 - 2021	2021 - 2031
Number of properties	1,700	3,400	2,746	5,576
Year	**Pre 2020**		**Post 2020 (to 2031)**	
Number of properties	5,100		8,322	

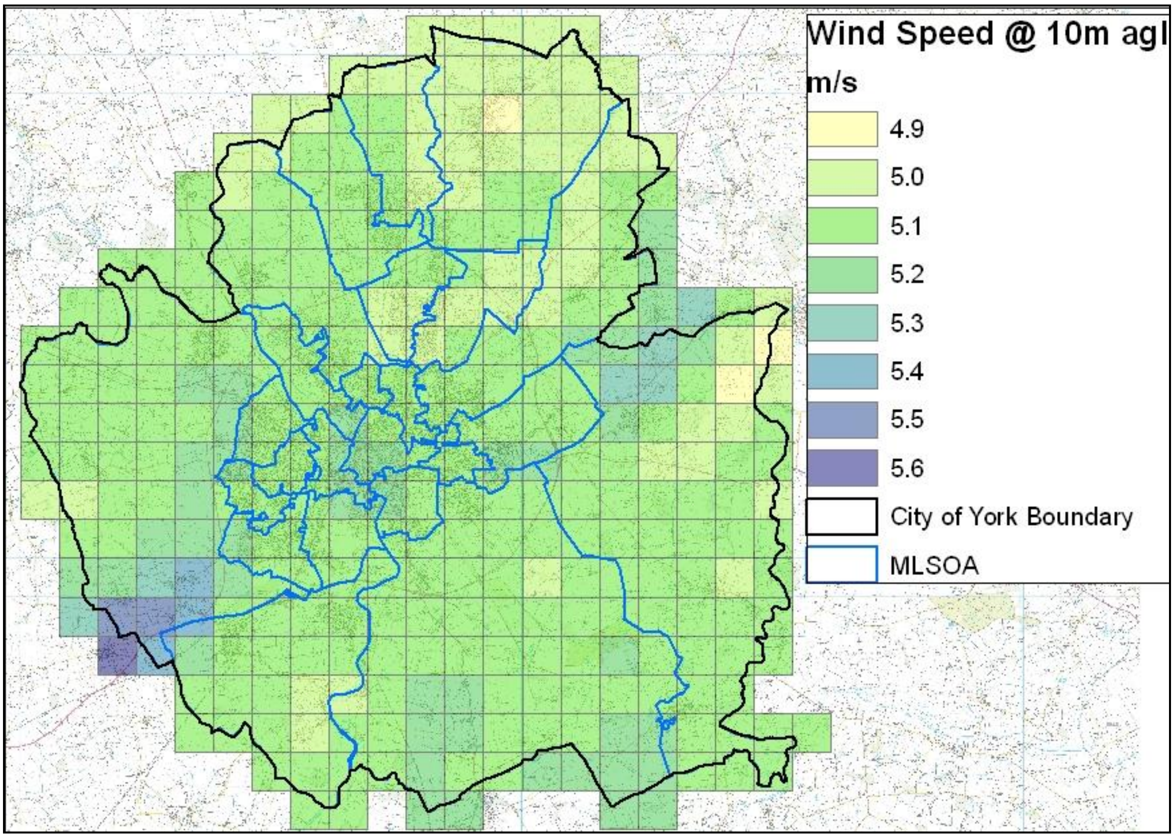
[41] City of York Council Core Strategy Preferred Options June 2009

4.5.4 Small and micro wind

4.5.5 Small and micro wind capture energy from the wind and converts it to usable electricity. Sales of small and micro wind are increasing[42]. Smaller wind turbines suffer disadvantages from poor siting leading to reduced yields (e.g. because of turbulence, shading and reduced wind speeds at the micro level)[43]. Minimum wind speeds are used to identify which installations will not be viable. The UK government's NOABL database provides the only comprehensive set of data on wind velocities across an area and is used here.

4.5.6 The average annual wind speed in a 1km^2 grid was assessed to determine the naturally available wind resource in metres per second (m/s). Areas with wind speeds above 4.5m/s at 10m agl in built up areas are considered viable for micro scale wind, as specified in the DECC methodology. As seen in Figure 4-14 all areas within York have wind speeds above 4.5m/s at 10m agl, with areas of highest wind speeds to the south west of the city. Therefore, all new developments are considered to have potential for small or micro wind.

Figure 4-14: NOABL wind speeds at 10m agl



Source AEA

42 http://www.bwea.com/pdf/publications/RenewableUK_Small_Wind_Market_Report.pdf
43 http://www.energysavingtrust.org.uk/Global-Data/Publications/Location-location-location-The-Energy-Saving-Trust-s-field-trial-report-on-domestic-wind-turbines

4.5.7 The Energy Saving Trust (EST) has a wind speed tool[44] that allows one to determine whether wind speed at a particular postcode is suitable for micro scale wind. This can be utilised on a site-by-site basis to determine viability. It should also be noted that a 2009 EST micro-wind report[45] noted that both NOABL (the UK wind speed database) and Met Station wind speed prediction models over-estimate the predicted wind speed at sites with a building mounted turbine, largely due to the impact of local obstructions on the wind resource. This result shows that the actual wind speeds measured at urban and suburban sites will be less than predicted. The outcome of this is that building mounted wind turbines in urban and suburban locations may not be as viable as it would appear from NOABL wind speeds. However, small-scale wind at rural locations would still be considered viable within York. The EST wind speed tool should be used to check the viability of sites before development.

4.5.8 Assuming that flats (30%), and urban areas (53% of York[46]) are unsuitable, and that only 50% of the remaining would have small or micro wind installed, as opposed to solar PV, 839 properties would have potential pre 2020 and 1,369 post 2020, giving a total of 2,208 properties[47].

4.5.9 A 2kW turbine size is assumed and a load factor of 2%.

Table 4-5: Estimated electricity generation from York's small and micro wind potential

Tech.	Potential no. of units	Assumed kW/unit	Installed capacity (MW)	MWh/yr electricity
Small/micro wind (pre 2020)	839	2	1.68	294
Small/micro wind (post 2020)	1,369	2	2.74	480
Total			**4.42**	**774**

4.5.10 Biomass for single building heating

4.5.11 Biomass for single building heating utilises biomass boiler technology in the same way as conventional heating boilers, displacing fossil fuel energy. Extra requirements for a biomass fuel store and vehicle access for deliveries are the main practical considerations. Efficiencies of biomass boilers are usually lower than the standard high efficiency conventional combi and condensing combi boilers installed as a matter of course in new developments. Sustainability of the

44 http://www.energysavingtrust.org.uk/Generate-your-own-energy/Can-I-generate-electricity-from-the-wind-at-my-home

45 http://www.energysavingtrust.org.uk/Global-Data/Publications/Location-location-location-The-Energy-Saving-Trust-s-field-trial-report-on-domestic-wind-turbines

46 As calculated from GIS mapping of urban areas of York. Once these regions were mapped the area was calculated and then expressed as a percentage of the total area of York.

47 It should be noted that small and micro scale wind may not be suitable in all locations and that applications would need to be considered on a case-by-case basis to ensure there is no loss of residential amenity.

whole process of utilising biomass fuels is a consideration too. Biomass from forestry sources should be obtained from suitably managed woodland.

4.5.12 A small area of York (approximately 2.5%) was discounted to account for air quality management areas (AQMAs) and flats were excluded due to fuel store needs. It was also assumed that small, single building biomass boilers would not be installed alongside solar thermal, GSHP and ASHP. 870 properties would have potential pre 2020 and 1,420 post 2020, giving a total of 1,863 properties.

4.5.13 A boiler size of 10kW is assumed and a load factor of 15%.

Table 4-6: Estimated electricity generation from York's single building biomass potential

Tech.	Potential no. of units	Assumed kW/unit	Installed capacity (MW)	MWh/yr heat
Single building biomass (pre 2020)	870	12	8.7	7,623
Single building biomass (post 2020)	1,420	12	14.2	16,451
Total			**27.48**	**24,074**

4.5.14 The constraints were applied generically across the area, and so no specific development area is identified as having greater or lesser potential.

4.5.15 Solar photovoltaics and solar hot water heating

4.5.16 Photovoltaics (PV) systems exploit the direct conversion of daylight into electricity in a semi-conductor device. The most common form of device comprises a number of semi conductor cells, which are interconnected to form a solar panel or module. There is considerable variation in appearance, but many solar panels are dark in colour, and have low reflective properties. Solar panels are typically 0.5 to 1m^2 having a peak output of 70 to 160 watts. A number of modules are usually connected together in an array to produce the required output, the area of which can vary from a few square metres to several hundred square metres. A typical array on a domestic dwelling would have an area of 9 to 18m^2, and would produce 1 to 2 kW peak output (kWp).

4.5.17 Solar water heating (SWH) systems can be used to heat water for a variety of purposes. Amongst the most common are domestic use, light industrial and agricultural use and the heating of swimming pools.

4.5.18 At present, the widest use is in the residential domestic hot water sector. SWH systems are very rarely also used to provide space heating. The domestic sector is an obvious priority – a well-designed system should provide 50–60% of annual domestic hot water requirements, with most of this energy captured between May and September[48].

4.5.19 The key component in a solar water heating system is the collector. Two main types are common in the UK: flat plate collectors and evacuated tube collectors. In both types, radiation from the sun is collected by an absorber, and is transferred as heat to a fluid, which may be either water, or a special fluid employed to convey the energy to the domestic system using a heat exchanger.

4.5.20 When determining potential for solar photovoltaics (PV) and solar hot water heating, flats were excluded due to shared external areas. 50% of new developments were assumed to be suitable, with a southerly orientation, as per the DECC methodology. As with the other technologies it is also assumed that only one electricity or heat producing technology would be installed per property.

4.5.21 A 2kW capacity for solar photovoltaics and 2.5kW capacity for solar hot water is assumed, with a load factor of 10% for solar photovoltaics and 5% for solar hot water.

Table 4-7: Estimated electricity generation from York's solar PV potential

Tech.	Potential no. of units	Assumed kW/unit	Installed capacity (MW)	MWh/yr electricity
Solar PV (pre 2020)	893	2	1.79	1,564
Solar PV (post 2020)	1,456	2	2.91	2,551
Total			**4.7**	**4,115**

Table 4-8: Estimated electricity generation from York's solar hot water heating potential

Tech.	Potential no. of units	Assumed kW/unit	Installed capacity (MW)	MWh/yr heat
SHW (pre 2020)	446	2.5	1.12	489
SHW(post 2020)	728	2.5	1.23	540
Total			**2.35**	**1,029**

4.5.22 The constraints were applied generically across the area, and so no specific development area is identified as having greater or lesser potential.

4.5.23 The DECC methodology also indicated that 40% of current commercial building and 80% of industrial buildings would be suitable for solar technologies. It does not give a figure for new commercial or industrial buildings. However, as information on numbers of new or existing commercial and industrial buildings along with their roof space is not available, it has not been possible to calculate

[48] PPS 18 'Renewable Energy', Best Practise guidance from: http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/planning_policy_statement_18__renewable_energy__best_practice_guidance.pdf

generation capacity for these buildings. It should be noted that these buildings are likely to have good potential for the incorporation of solar technologies and developers should be encouraged to consider this option.

4.5.24 Heat pumps

4.5.25 Heat Pumps can upgrade low temperature heat to higher, more useful, temperatures. Where the heat source is ambient, from outside air or the ground, the use of a heat pump will result in a reduction in fossil fuel use and reduction in emissions, making this technology a significant renewable option.

4.5.26 It is assumed that York would have mixed potential for both GSHP and ASHP. Hence, where GSHP are constrained, ASHP may be viable and vice versa.

4.5.27 It should be noted that heat pumps are not currently economically viable compared to gas heating systems. Therefore, in the short term, heat pumps have the most potential in off-gas grid areas, where they can be retrofitted. Many, if not all, new developments in York will be sited in 'on-gas' areas, and therefore there is a degree of uncertainty as to the present applicability of heat pumps in new developments. However, the Renewable Heat Incentive (RHI) will improve the economics of heat pumps and hence there may be greater potential in the future.

4.5.28 In line with the DECC methodology only a portion of new developments have been considered viable for heat pumps. This is assumed to vary with urban v non-urban areas, and so an assessment of these was carried out (53% excluded – as per micro wind). As with the other domestic heat technologies, it has been assumed that neither type of heat pump would be installed alongside another heat producing technology.

4.5.29 A 6.5kW capacity is assumed for heat pumps, with a load factor of 18%[49].

Table 4-9: Estimated electricity generation from York's heat pump potential

Tech.	Potential no. of units	Assumed kW/unit	Installed capacity (MW)	MWh/yr heat
Heat pumps (pre 2020)	638	6.5	4.14	6,534
Heat pumps (post 2020)	1,040	6.5	4.25	6,693
Total			**8.39**	**13,227**

[49] It should be noted that there can be noise concerns associated with heat pumps in certain locations and applications would need to be considered on a case-by-case basis to assess this potential issue.

4.6 Generation capacity – summary and conclusions

4.6.1 Table 4-10 summarises the total potential generation capacity for renewable energy in York.

Table 4-10: Summary of potential generation capacity for renewable energy in York

Technology	Potential MW capacity		MWh/yr pre 2020		MWh/yr total (up to 2031)	
	2020	To 2031	Electricity	Heat	Electricity	Heat
Large wind	30	30	78,840	-	78,840	-
Medium wind	30	30	78,840	-	78,840	-
Hydro (0-10 kW)	0.015	0.015	49	-	49	-
Hydro (10-20 kW)	0.06	0.06	194	-	194	-
Hydro (100-500 kW)	0.3	0.3	1,314	-	1,314	-
Hydro (500-1500 kW)	1.0	1.0	4,380	-	4,380	-
CHP (district - electricity and heat)	8	8	17,520	35,040	17,520	35,040
Biomass (district heating)	3	3	-	19,710	-	19,710
Small and micro wind	1.68	2.74	294	-	480	-
Biomass for single building heating	8.7	14.2	-	7,623	-	16,451
Solar PV domestic	1.79	2.91	1,564	-	2,551	-
Solar thermal domestic	1.12	1.23	-	489	-	540
Ground/air source heat pumps domestic	4.14	4.25	-	6,534	-	6,693
Total	**89.8***	**97.7****	**182,995**	**69,396**	**184,168**	**78,434**
Energy demand (current)[49]	**-**	**-**	**737,020**	**1,627,599**	**737,020**	**1,627,599**
% met by RE generation	**-**	**-**	**24.83%**	**4.26%**	**24.99%**	**4.82%**
Energy demand (future)[50]	**-**	**-**	**759,842**	**1,678,599**	**759,842**	**1,678,599**
% met by RE generation	**-**	**-**	**24.08%**	**4.13%**	**24.24%**	**4.67%**

** 67.5MW from renewable electricity and 22.3MW from renewable heat technologies*
***69.7MW from renewable electricity and 28.0MW from renewable heat technologies*

49 Our assessment of this is set out in Chapter 2.
50 When assessing % contribution, we note that this is akin to hitting a moving target, as energy demand will not remain at current levels. We have made an assessment of future energy demand up to 2015, but not beyond as the figures become uncertain due to the introduction of zero carbon homes.

4.6.2 What can be seen from this table is that York has technically available potential for all of the technologies reviewed. However, it also shows that if all renewable energy potential identified up to 2020 were developed, it would only meet 24% of electricity demand and 4% of heat, which is lower than the UK Renewable Energy Strategy lead scenario for both electricity and heat.

4.6.3 The highest technologies which have the best potential in terms of MWh/yr generation potential are:

- Large and medium wind.
- Biomass CHP
- Biomass for district heating
- Biomass (for single building heating).
- Ground and air source heat pumps (in future domestic developments).
- Solar photovoltaics hydro and small/micro wind have lower levels identified generation potential. Solar thermal (for hot water heating) has the lowest potential.

4.6.4 A matrix showing the spatial distribution of preferred technology locations is provided in Chapter 6, further to the application of the cost/benefit analysis.

While there is a large amount of scope for renewable energy technologies, meeting the Renewable Energy Strategy lead scenario target of 30% electricity and 12% heat from renewable heat technologies by 2020 will be a challenge. This challenge may be addressed to some extent through:

- The identification of additional sites with potential for CHP or district heating networks. Heat mapping at the lower level super output area has been suggested to achieve this.
- Identification of existing commercial and industrial sites with roof space for suitable for solar technologies. Also developers of new commercial and industrial sites should be encouraged to consider technologies such as solar or CHP, as appropriate.
- The retrofitting of existing housing stock with renewable and low carbon technologies.
- Creation of an energy action plan for delivering renewable and low carbon energy within York, which should include provisions for the above actions.

5 Analysis of the benefits of options

Renewable energy potential curve ◈ Multi-criteria analysis

In order to gain an appreciation of the 'practical' likelihood of renewable energy implementation and uptake rates, it is important to take into account their economic viability and other potential wider benefits as this could impact significantly upon the overall potential identified within the preceding chapter.

This Chapter seeks to do this using two assessment methodologies. The first is a form of marginal abatement cost curve, which plots individual renewable energy technologies against the cost of deployment to give a picture of the likely costs scale and sequence of deployment.

The second is a multi-criteria analysis, which allows the range of renewable energy options to be compared against economic, social and environmental criteria that reflect wider policy objectives in York.

This Chapter also considers the potential for renewable energy utilisation to stimulate 'green jobs' in the local economy

5.1 Renewable energy potential curve

5.1.1 The renewable energy potential curve plots the identified potential for renewable energy within York against the typical capital costs for development. This tool can assist decision makers in assessing the cost implications of achieving a given target or how much deployment might be achieved for a given capital spend.

5.1.2 Aside from its use in assessing cost implication, this renewable energy potential curve provides a useful tool for York on other levels:

- It can be used to inform City of York Council about additional costs that developers would incur should they be required to meet more stringent or ambitious renewables targets.
- The renewable energy economic picture is constantly changing[51] and an advantage of a tool like a renewable energy potential curve is that it is designed to be iterative and allows for the data inputs to be adjusted in the future. It should be noted that, at present, the curve is based on standard

[51] For example the advent of the Renewable Heat Incentive (RHI) and Feed-in Tariffs (FITs) will change the economics of renewable energy development.

capital costs and does not include any adjustment for incentives such as the feed in tariffs (FITs). This is due to the varying level of benefit installers would receive, depending on whether they were the householder, a local authority housing provider or a developer. Annex 4 provides a technical note on FITs.

5.1.3 The renewables potential curve was compiled from known standard costs for implementation based on a number of sources[52], combined with our assessment of realistic potential for the various technologies.

Figure 5-1: Steps to compile a renewables potential curve

Step 1: Compile a list of capital costs for the range of technologies

Step 2: Combine with list of potential installed capacity for the range of technologies

Step 3: Set out the list of technologies by capital cost with the lowest first

Step 4: Construct data for cumulative potential against the range of technologies

Step 5: Plot capex against cumulative potential for all technologies

Table 5-1: CAPEX estimates for construction of renewable potential curve[53]

CAPEX estimates	£/kW
Biomass (single building heating)	£440
Biomass (district heating)	£1,000
Large wind	£1,500
Medium wind	£1,500
Ground/air source heat pumps domestic	£1,720
Solar water heating domestic	£1,750
Hydro	£2,700
Community biomass CHP	£3,700
Solar PV domestic	£4,700
Small and micro wind	£4,750

5.1.4 Figure 5-2 shows the renewable energy potential curve for York, with the potential for each technology displayed as blocks. Technologies that have low potential in absolute terms are represented by the narrowest boxes. The long

[52] Renewable energy heat curve – evidence base for the RHI; Element Energy report – evidence base for the FiTs; Cross checked vs. the CESP and CERT evidence.

[53] Sources: Explanatory memorandum to the electricity and gas (carbon emissions reduction) order 2008; CESP.

flat boxes are lowest cost/highest potential, with tall thin blocks the highest cost/lowest potential. This curve is based on the potential for technologies to 2020[54], as calculated in sections 2 to 4.

5.1.5 The initial assessment Figure 5-2 shows that in terms of cost per MW installed biomass for single building heating is the most cost effective option, with small and micro wind the least cost effective.

5.1.6 Large and medium wind are two technologies that have good potential with York and are some of the more cost effective technologies.

5.1.7 Biomass district heating and single building heating are also cost effective and have some potential within York.

5.1.8 As mentioned in section 4.4, York may have further potential for district networks, which could be identified through a detailed heat mapping exercise.

5.1.9 Community CHP has relatively high costs, but fairly good potential within York.

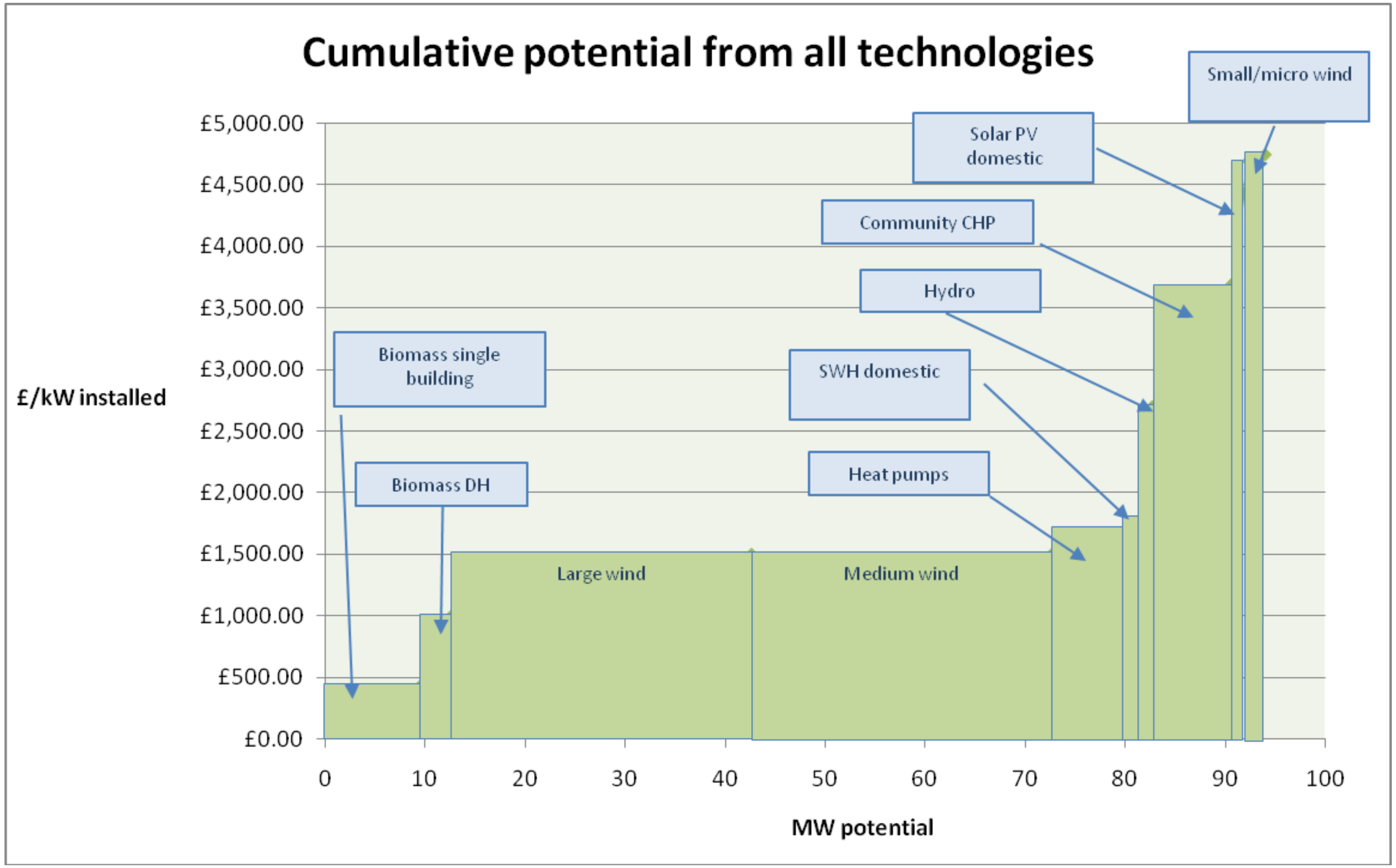
5.1.10 Solar PV and water heating are shown as having limited potential within York and are relatively expensive.

5.1.11 However, as discussed in section 4.5.15, it has not been possible to estimate the potential for solar technologies on commercial and industrial buildings, which is likely to significantly increase the potential within York for solar.

5.1.12 In addition, where installers can reap the benefits of the FITs and renewable heat incentive, this will mitigate the high capital cost investment for these technologies.

[54] This timeframe reflects the fact that the capital costs of technologies will be changing over time and it is unrealistic to predict too far into the future. Our calculations are split by potential up to 2020, and by potential beyond this.

Figure 5-2: Renewable energy potential curve for York, with technologies displayed



Source: AEA

Table 5-2: Figures underlying renewable potential curve – CAPEX estimates, kW of potential in York and estimated costs for development

CAPEX estimates	£/kW	kW potential in York (to 2020)	Potential costs for development (equivalent to area of blocks in curve)
Biomass (single building heating)	£440	8,702	£3,828,880
Biomass (district heating)	£1,000	3,000	£3,000,000
Large wind	£1,500	30,000	£45,000,000
Medium wind	£1,500	30,000	£45,000,000
Ground/air source heat pumps domestic	£1,720	4,144	£7,127,680
Solar water heating domestic	£1,750	1,116	£1,953,000
Hydro	£2,700	1,375	£3,712,500
Community biomass CHP	£3,700	8,000	£29,600,000
Solar PV domestic	£4,700	1,785	£8,389,500
Small and micro wind	£4,750	1,678	£7,970,500
		89,800	**£155,582,060**

5.2 Multi-criteria analysis

5.2.1 An appraisal of the various technology options was undertaken using a multi-criteria analysis (MCA). This technique, which is supported by the Department for Communities and Local Government (CLG), allows decision makers to assess the performance of the technology options against a range of criteria to ascertain those options that are most and least appropriate for the local authority area. As a decision tool used to prioritise options, MCA is particularly relevant in situations where there are multiple objectives, solutions and stakeholders. Particular benefits include:

- Criteria do not need to be expressed in monetary terms. This allows other impacts, costs and benefits, such as social and environmental ones, to be taken into consideration.
- It allows for comparison of a range of diverse technology options.
- It allows for incorporation of wider policy and stakeholder priorities into the decision making process.

5.2.2 This technique shows those technologies that have most benefit in York in terms of helping to move towards achieving strategic objectives.

5.2.3 When using MCA to as a tool to assist in developing policy options, targets and recommendations for renewable and low carbon energy, the following process, as promoted by the Department for Communities and Local Government, should be followed[55]:

1. **Identify objectives**: Good decisions need clear objectives. Where possible, these should be specific, measurable agreed, realistic and time-dependent (SMART).
2. **Identify options**: Identified options should be those technologies that have been shown to have potential within the local authority region.
3. **Identify criteria**: Identified criteria should allow the technology options to be compared on their contribution towards meeting the objectives.
4. **Analyse options**: Options will be analysed, using the selected criteria, with appropriate weightings.
5. **Make choices**: A final decision on the most appropriate option(s) needs to be made by the local authority, using the evidence gathered throughout the MCA process.
6. **Monitoring and feedback**: Good decision making requires a continuous reassessment of previous choices. Monitoring and feedback are important and will help to inform future decisions.

5.2.4 The City of York Council has laid out its key objectives within their Core Strategy, Sustainable Community Strategy and Local Development Framework

[55] Communities and Local Government (2009) Multi-criteria analysis: a manual; Department for Communities and Local Government: London; January 2009; http://www.communities.gov.uk/documents/corporate/pdf/1132618.pdf

(LDF) documents. However, it is important that local authorities have a clear understanding of the objectives of additional stakeholders.

5.2.5 It is also useful to classify objectives according to their level of importance. These levels of importance can then be reflected in the MCA process through weighting of the criteria.

5.2.6 Within York a range of objectives were identified through discussions with City of York Council. The vision laid out in York's Core Strategy lays out a number of key objectives for the city. This vision is influenced by:

- The themes encompassed in York's Sustainable Community Strategy[56].
- York's issues challenges and opportunities
- The Regional Spatial Strategy for Yorkshire and the Humber
- The UK Sustainable Development Strategy (Securing the Future).

5.2.7 The key objectives from York's LDF Core Strategy, taken from the spatial elements of York's Sustainable Community Strategy, that have been used to help develop a range of locally appropriate criteria for use in the MCA process are:

- York's special historic and built environment
- Building confident creative and inclusive communities
- A prosperous and thriving economy
- A leading environmentally friendly city.

5.2.8 The technology options to be analysed within the MCA were identified in section 4. These are:

- Biomass for single building heating
- Biomass (district heating)
- CHP (community biomass)
- Hydropower
- Large wind
- Medium wind
- Small and micro wind
- Solar PV
- Solar water heating
- Ground/air source heat pumps domestic

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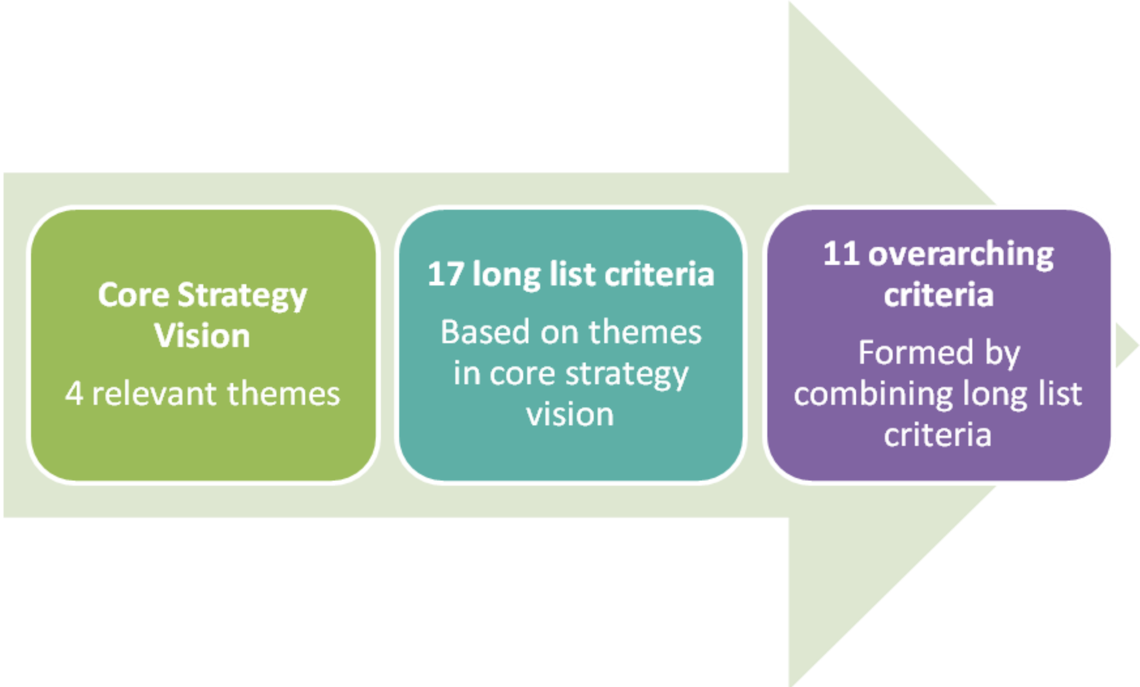
[56] The Sustainable Community Strategy was launched by the Without Walls partnership in 2008. The partnership consists of members from a range of public, voluntary and business organisations in York. It would be beneficial to include the partner organisations in any future stakeholder consultation.

5.2.9 Selecting appropriate criteria that will allow comparison of the contribution made by each technology options to meeting a local authority's objectives is essential to the success of the MCA process. The process undertaken with York is shown in Figure 5-3.

Figure 5-3: Process for identifying and finalising MCA criteria



5.2.10 A long list of all potential criteria was developed, using the key objectives from York's Core Strategy[57] and vision. This resulted in 17 key criteria. The following three key considerations were introduced to reduce and group the criteria to form a short list:

- Does the criterion have relevance to the set objectives?
- Does the criterion have evidence that can underpin the decision process?
- Does the criterion allow differentiation of the various technology options?

5.2.11 The short listed items became the 11 overarching criterion. Table 5-3 shows the long list criteria suggested for York, how these are linked into the Sustainable Community Strategy (SCS) themes, and how they have been grouped to form the finalised short list.

5.2.12 It is important that criteria selected are relevant across a local authority area and are not site-specific. A key assumption that is made in this MCA process is that, if a technology were to be developed at a later date, then a proper site selection exercise would be undertaken and that sites will be properly designed in line with best practice guidance.

[57] Which reflects and interprets the objectives of York's Sustainable Community Strategy

Table 5-3: Criteria selection

Core Strategy Vision	Long list criterion	Provenance / links to other policy objectives	Overarching criterion	Rational / comments
Building confident, creative and inclusive communities	Energy and fuel poverty	LDF – sustainable neighbourhoods	High quality affordable housing	Some technologies are directly capable of reducing energy and fuel poverty and hence improving housing quality. Certain technologies are more cost effective than others are and hence are more likely to keep housing affordable.
	Housing affordability	LDF – affordable housing		
	Effect on green infrastructure and open spaces	LDF – sustainable neighbourhoods / green infrastructure	Effect on green infrastructure and open spaces	The protection of green infrastructure and open spaces is related to the land take impacts of each technology
A leading environmentally-friendly city	CO_2 Savings	LDF – reduction in CO_2	CO_2 savings	This is an inherent object of the project. Shows climate change mitigation/adaptation potential.
	Energy / heat delivered	LDF – reduction in energy use	Energy / heat delivered	Energy or heat output from a typical system is a good indicator of viability and deliverability
	Natural resources and waste	LDF – reduction of natural resource extraction	Natural resources and waste	Particular technologies will reduce the necessity for natural resource extraction and/or will reduce waste
	Air Quality	LDF – air quality	Air Quality	Technologies will have varying impacts on air quality
A prosperous and thriving economy	Sustainable Design and Construction	LDF – sustainable design and construction	None – site specific consideration	This is a site-specific consideration. Sustainable design and construction recommendations will be a project output – detailed in annex 11. Not used as a criterion
	Green jobs	LDF – green jobs	Green jobs	Technologies will have varying potential to offer local employment opportunities
	Capital costs	LDF – prosperous and thriving economy	Capital costs	Standard industry criterion for comparison of technologies

Core Strategy Vision	Long list criterion	Provenance / links to other policy objectives	Overarching criterion	Rational / comments
	Commercial return	LDF – prosperous and thriving economy	Commercial viability	An indicator of viability and deliverability. Implicitly covered through a combination of other criteria – energy/heat delivered, capital costs and commercial risk
	Commercial risk	LDF – prosperous and thriving economy		An indicator of viability and deliverability. Should encapsulate the various risks faced during development and implementation of a technology. The potential commercial return should also be considered.
York's special historic and built environment	Archaeology	LDF – archaeology	Historic character and cultural heritage	Technologies and their probable scales of development will offer varying levels of threat to historic character, cultural heritage, archaeology and architecture.
	Architecture	LDF – architecture		
	Historic Character	LDF – setting and historic character		
	Cultural heritage	LDF – setting and historic character / archaeology / architecture		
	Landscape and visual effects	LDF – setting and historic character / archaeology / architecture	Landscape and visual effects	Technologies will have varying potential to impinge on landscape and visual amenity

5.2.13 Analysis of the options entails:

- Scoring each technology, based on how it performs against each criterion.
- Weighting each criterion, based on the importance of the underlying policy objective.

5.2.14 Table 5-4 shows the weighting of each criterion, alongside the scale on which it will be scored on. This is supported by Annex 5, which gives the full scoring for each of the overarching criterion Table 5-5 shows the weighting and scoring combined to show the overall preference of technologies relating to each criterion, using a simple colour coding. Table 5-6 shows the final MCA decision matrix.

Table 5-4: Criteria scoring matrix

Criteria	Low	Medium	High	Importance of policy objective (weighting)
High quality affordable housing	Technology has low potential to alleviate fuel poverty in a cost effective manner. Lower impact on housing quality	Mid-range	Technology has high potential to alleviate fuel poverty in a cost effective manner. Higher impact on housing quality	Low
Green infrastructure and open spaces	Technology and scale of development offers higher effects on open spaces, natural environments or green infrastructure	Mid-range	Technology and scale of development offers lower effects on open spaces, natural environments or green infrastructure	Medium
CO_2 savings	Has lower potential to offset CO_2	Mid-range	Has greater potential to offset CO_2	High
Energy / heat delivered	Typically has low energy / heat output	Mid-range	Typically has high energy / heat output	High
Natural resources and waste	Has lower potential to reduce extraction of natural resources	Mid-range	Has greater potential to reduce extraction of natural resources	Low
Air quality	Greater potential to adversely affect air quality	Mid-range	Zero potential to adversely affect air quality	High
Green jobs	Lower potential, generally, to offer related employment opportunity	Mid-range	Greater potential, generally, to offer related employment opportunity	Low
Capital costs	Technology costs are at the high end of the scale	Mid-range	Technology costs are at the low end of the scale	High
Commercial viability	Riskier developments. Technologies are less proven in terms of reliability and commercial return	Mid-range	Lower risk developments. Technologies are more proven in terms of reliability and commercial return	Medium

Criteria	Low	Medium	High	Importance of policy objective (weighting)
Historic character and cultural heritage	Technology and probable scales of development offers highest threat to historic character and cultural heritage	Mid-range	Technology and probable scales of development offers lowest threat to historic character and cultural heritage	**High**
Landscape and visual effects	Developments with the greater potential for impinging on landscape and visual amenity	Mid-range	Developments with the lower potential for impinging on landscape and visual amenity	**High**

Table 5-5: Determining preference of technology options

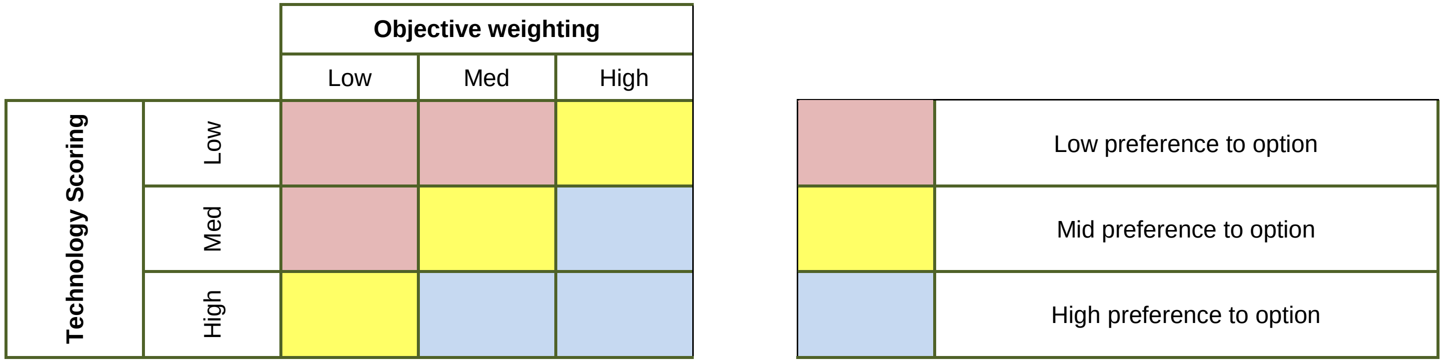
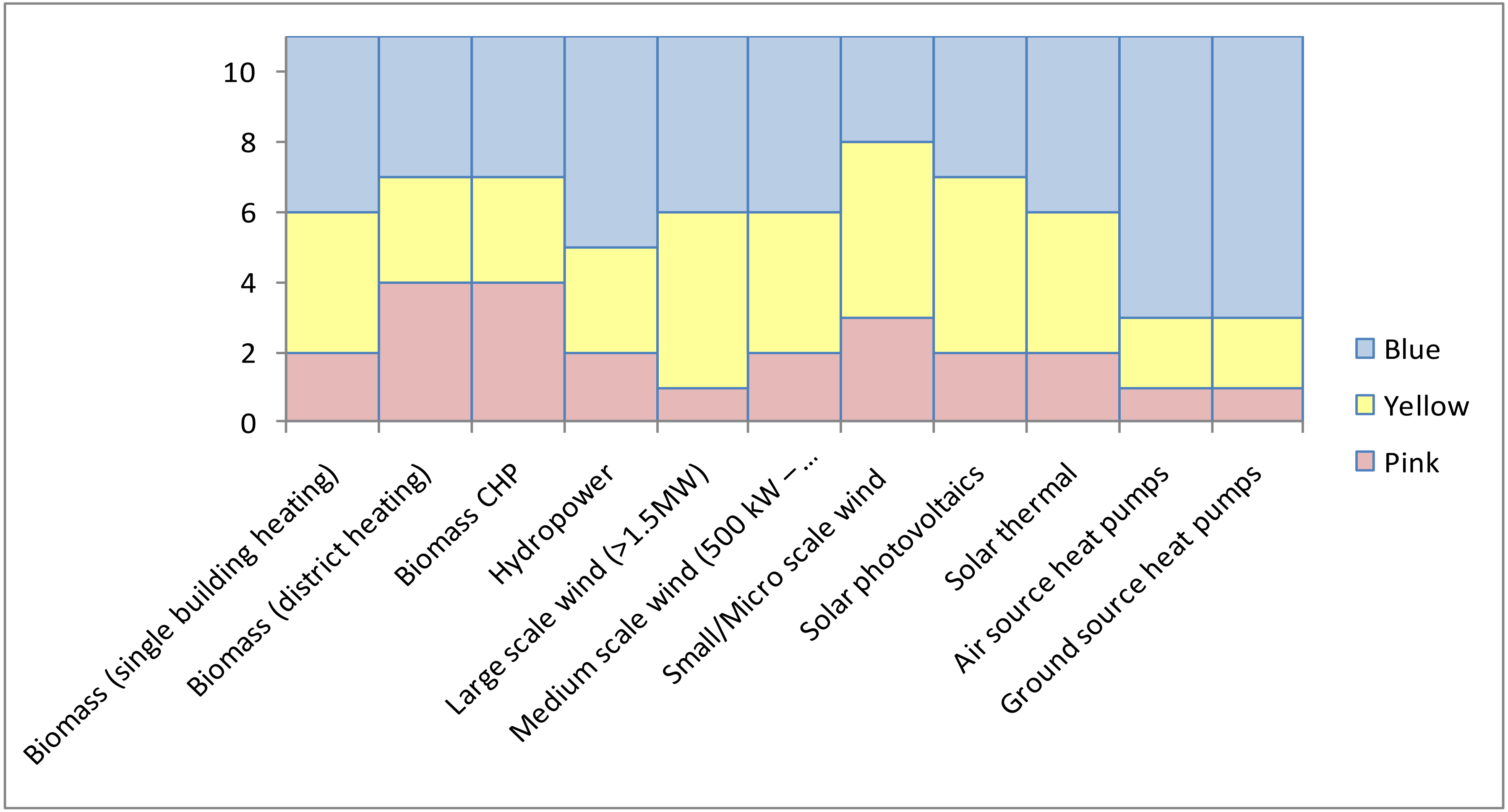


Table 5-6: Multi-criteria analysis decision matrix

Criteria \ Technology	Weighting	Biomass (single building heating)	Biomass (district heating)	Biomass CHP	Hydropower	Large scale wind (>1.5MW)	Medium scale wind (500 kW – 1.5MW)	Small/Micro scale wind	Solar photovoltaics	Solar thermal	Air source heat pumps	Ground source heat pumps
High quality affordable housing	L	H	M	M	L	L	L	M	M	M	H	H
Green infrastructure/open spaces	M	H	L	L	M	M	M	H	H	H	H	H
CO_2 savings	H	L	M	H	H	M	M	L	L	L	H	H
Energy / heat delivered	H	L	H	H	M	H	H	L	L	L	M	M
Natural resources and waste	L	M	L	L	H	H	H	H	H	H	H	H
Air quality	H	M	L	L	H	H	H	H	H	H	H	H
Green jobs	L	L	H	H	M	H	M	L	M	L	L	L
Capital costs	H	M	H	H	L	H	M	L	L	M	M	M
Commercial viability	M	M	L	L	H	M	M	L	H	H	H	H
Historic character and cultural heritage	H	M	M	M	H	M	M	L	L	L	M	H
Landscape and visual effects	H	H	L	L	M	L	L	M	M	M	H	H
Totals		Blue=5 Yell.=4 Pink=2	Blue=4 Yell.=3 Pink=4	Blue=4 Yell.=3 Pink=4	Blue=6 Yell.=3 Pink=2	Blue=5 Yell.=5 Pink=1	Blue=5 Yell.=4 Pink=2	Blue=3 Yell.=5 Pink=3	Blue=4 Yell.=5 Pink=2	Blue=5 Yell.=4 Pink=2	Blue=8 Yell.=2 Pink=1	Blue=8 Yell.=2 Pink=1

Figure 5-4: MCA outputs*



****** Technologies with more blue area will have most benefit in terms of meeting York's overall strategic objectives***

5.3 Benefits of renewable energy options – summary

5.3.1 The renewable energy potential curve provides information on the lowest capital cost options against available potential within York and allows ranking of technologies on this basis. The MCA allows an order of preference to be established based on which technologies provide the most scope for meeting York's strategic objectives.

5.3.2 Table 5-6 shows the renewable energy potential curve order of preference alongside the MCA preference. It also shows the technologies with best job creation potential. This table should allow the City of York Council to make decisions on which technologies it should focus on with regards to planning policy and providing supporting advice and guidance for developers and potential installers. It can also help to inform decisions on what technologies may be best to install on council-owned properties.

Table 5-6: order of preference from feasibility and viability analysis

Renewable energy potential curve [cost effectiveness, with significant potential with York]	Multi-criteria analysis [benefit in terms of meeting local strategic objectives]
Highest preference Large/medium wind	**Highest preference** Heat pumps[58]
Higher preference Biomass (district heating) Biomass for single building Heat pumps	**Higher preference** Large wind Hydropower
Mid preference Solar thermal Solar PV Biomass CHP	**Mid preference** Biomass for single building heating Medium wind Solar thermal Solar PV
Lowest preference Hydropower Small and micro wind	**Lowest preference** Biomass for district heating Biomass CHP Small and micro wind

5.3.3 It should be noted that the purpose of these analyses is not to exclude particular technologies as unsuitable for development, but is to show which technologies are likely to have most benefit and be most favourable within York. This provides City of York Council with a steer on which technologies should be provided with the most guidance to encourage uptake.

[58] Both air source and ground source

Looking at most viable costs versus the strategic benefits of each technology shows a different order of preference. Based on these first two streams of analyses, heat pumps and large wind come out as technologies with good potential and cost viability and ability to meet strategic objectives in the context of York. Onshore wind also has significant job creation potential.

Small and micro wind would be considered the least favourable option in all streams of analysis.

5.4 Green jobs

5.4.1 The low carbon and environmental goods and services (LCEGS) sector is a rapidly growing area with significant employment opportunities. In 2004 it accounted for 400,000 jobs in 17,000 companies in the UK and had a turnover of around £25 billion[59]. It is suggested that the LCEGS sector market will grow to £46 billion by 2015 with employment growing by at least 100,000 over the same period[60]. The growth in the LCEGS sector represents part of the transition to a low-carbon economy. Both central and local government should encourage the growth of this sector by ensuring stable demand for low carbon products and services and by reducing barriers to growth.

5.4.2 The LCEGS sector market and green jobs span many traditional sectors of the economy, such as energy supply and construction, as well as newer industries and technologies, such as wind and solar power generation. However, even in the case of newer industries, supply chains will consist largely of traditional industries, such as steel, iron and the manufacture of machine parts. Figure 5-5 shows the 2007/08 market value of the LCEGS sector in the UK, as identified by an industry analysis commissioned by BERR.

5.4.3 The BERR LCEGS industry analysis showed that the sectors with the largest market value and highest growth rates are in the renewable energy and emerging low carbon sector. The product groups providing the best overall opportunities are:

- Wind Energy
- Solar Photovoltaics (PV)
- Carbon Finance
- Alternative Fuels
- Geothermal
- Biomass
- Building Technologies
- Alternative Fuels for Vehicles

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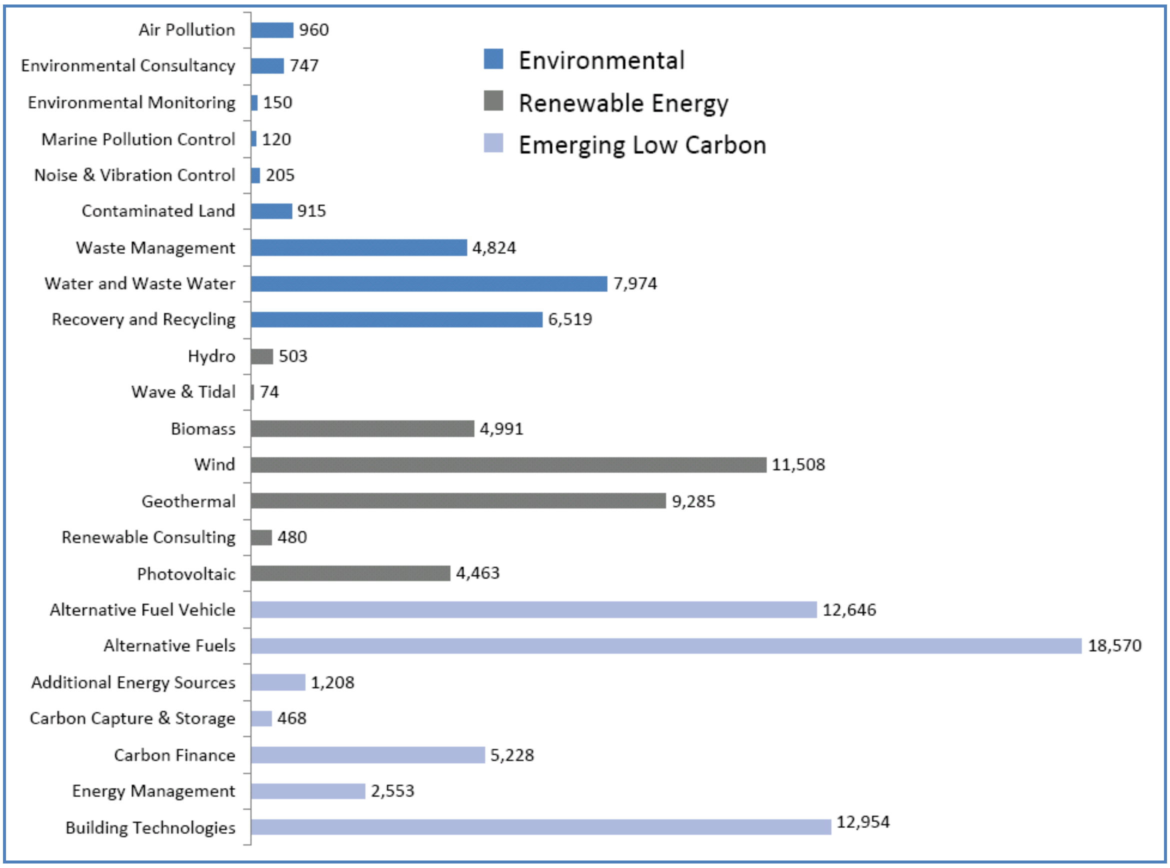
59 Source: House of Commons Environmental Audit Committee (2009) Green jobs and skills, second report of session 2008-09; Report, together with formal minutes, oral and written evidence.
60 TUC (2005) A Fair and Just Transition; Research report for Greening the Workplace, July 2005

Figure 5-5: UK market value of low carbon and environmental products and services, 2007/08 (£m)[61]



5.4.4 A renewable supply chain gap analysis carried out by the Department of Trade and Industry (DTI)[62] identified wind, solar PV and biomass as areas of opportunity in the UK. Hydro and wave/tidal[63] are also identified as areas of opportunities. These technologies have significant potential for investment and job creation in the UK. However, one threat is competition from other countries in the manufacture of renewable energy equipment, such as wind turbines and PV panels.

5.4.5 The move away from carbon intensive goods, products and services towards a low-carbon economy will have an impact on jobs in sectors that are more carbon-intensive, such as non-renewable energy producers. Therefore, the transition to a low-carbon economy needs to be supported by coherent policies and strategies that both promote and support the transformation of the market. Engagement and dialogue with key stakeholders is important to ensure that environmental policies that aim to drive the low carbon transition are fair, integrated and sustainable.

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[61] Source: BERR (2009) Low Carbon and Environmental Goods and Services: an industry analysis
[62] DTI (2004) Renewable supply chain gap analysis
[63] Not applicable in the context of York

5.4.6 The Local Government Association has identified[64] five key areas where councils can work to help stimulate green jobs and the LCEGS sector.

- Promoting low-carbon development and energy planning, particularly in new developments within York.
- **Exercising powerful leadership and demonstration effect** by developing services, buildings and facilities, so that they become low-carbon and resilient to climate change. City of York Council should lead by example, wherever possible.
- **Shaping innovation and markets through procurement**, by buying into low-carbon and renewable energy solutions. One opportunity would be sourcing of some of City of York Council's energy from renewable energy producers.
- **Working with employers and employment and skills providers**, ensuring that skills gaps are identified and new training opportunities are provided.
- **Identifying and supporting innovation**, by identifying intellectual assets that provide a stimulus for innovation. There is an opportunity for City of York Council to work with partners, such as York University, to provide such a stimulus within York.

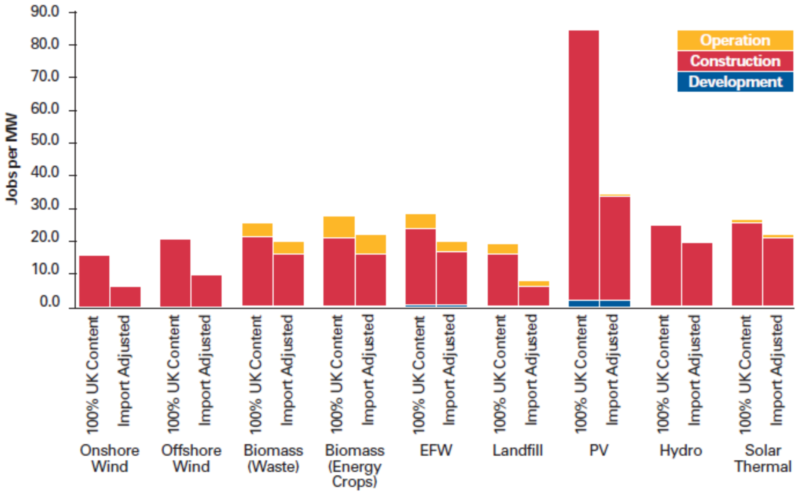
5.4.7 Investment in renewable energy is likely to create direct jobs as well as indirect jobs across the entire supply chain of the renewable industry including environmental monitoring, development design, commissioning and procurement, manufacturing, installation, project management, transport and delivery and operations and maintenance.

5.4.8 A renewable supply chain gap analysis carried out by the Department of Trade and Industry (DTI) in 2004 estimated jobs created per MW for a number of renewable technologies in the UK.

[64] Local Government Association (2009) Creating green jobs: developing local low-carbon economies.

Figure 5-6: Jobs per MW for renewable technologies in the UK fall when adjusted for import assumptions[65]

Jobs per MW by Phase of the Project Cycle and Technology

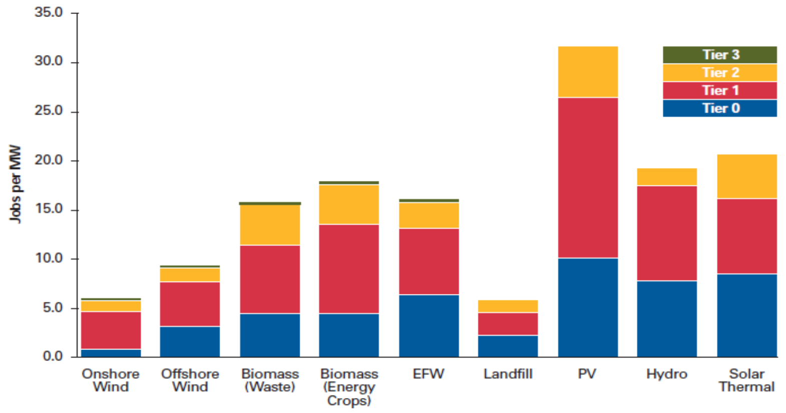


Note: PV is currently very capital and labour intensive. The market penetration of this technology has been low, although the Feed-in Tariff system launched in February 2010 is expected to stimulate a substantial increase in the uptake of this technology, amongst others.

5.4.9 Figure 5-6 emphasises the importance of construction activities in generating demand for labour. Also, to sustain employment a significant pipeline of projects is needed since construction jobs for one project are short lived. Jobs per MW for each technology (indirect jobs) at different levels of the supply chain were also estimated.

Figure 5-7: The supply chain for the construction phase[66]

Jobs per MW at each supply chain tier for the construction phase

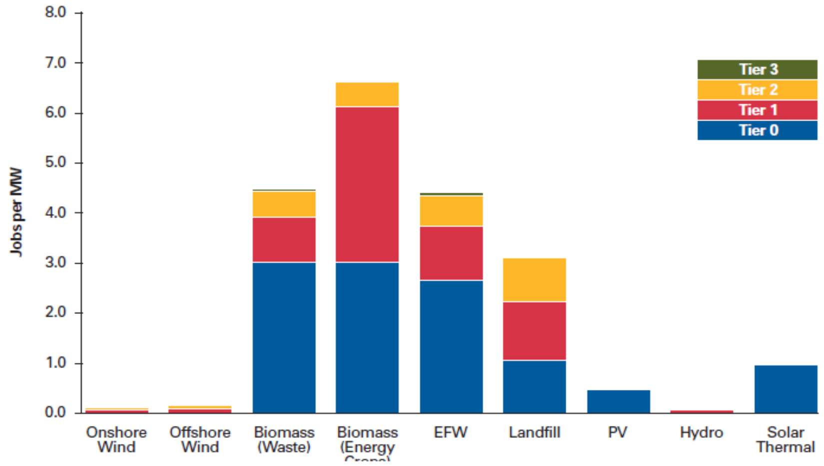


Note: EFW - Energy from Waste, PV – Photovoltaic

65 Source: DTI (2004) Renewable supply chain gap analysis
66 Source: DTI (2004) Renewable supply chain gap analysis

Figure 5-8: Jobs in the supply chain for operations phase

Jobs per MW at each Supply Chain Tier for the Operations Phase



5.4.10 Figure 5-7 and Figure 5-8 show that:

- The supply chain for the construction phase supports a significant number of jobs in biomass, PV, solar thermal and hydro.
- Most of the jobs in the supply chain for the operations phase are in biomass, EFW and landfill.

5.4.11 Using figures on the job creation potential per MW, Table 5-7 shows a summary of the job creation potential for particular technologies in York. This table shows that onshore wind has the most job creation potential within York. Biomass and solar PV also have significant levels of potential. The above sources do not provide estimates for job creation potential from micro-scale wind, heat pumps and biomass for single heating; therefore it has not been possible to calculate job creation potential from these.

Table 5-7: Job creation potential summary in York[67]

Technology	Direct jobs (per MW)	Indirect jobs (supply chain)		Total (per MW)	MW in York	Job creation potential
		Construction	Operation			
Onshore wind	16	6	0	22	60	1,320
Hydro	25	19	0	44	1.375	61
Biomass (waste)	25	15	4.5	45	11*	528
Biomass (energy crops)	26	18	6.5	51		
Solar PV	84	32	0.5	117	2.91	340
Solar thermal (SWH)	26	21	1	48	1.23	59

** Biomass CHP and district heating potential combined*

*** Average of 48 jobs per MW*

[67] These are calculated based on the graphically illustrated jobs potential per MW for each technology as set out in this section, but applied in the context of the MW potential in York.

5.4.12 Table 5-8 repeats Table 5-6, but has factored in the job creation potential discussed in this section to include a column with a summary order of preference for job creation.

Table 5-8: Summary assessment of order of preference in consideration of Renewable energy potential curve, MCA and job creation opportunities

Renewable energy potential curve [cost effectiveness, with significant potential in York]	Multi-criteria analysis [benefit in terms of meeting local strategic objectives]	Job creation potential
Highest preference Large/medium wind	**Highest preference** Heat pumps[68]	**Highest preference** Onshore wind
Higher preference Biomass (district heating) Biomass for single building Heat pumps	**Higher preference** Large wind Hydropower	**Higher preference** Solar PV Biomass (district heating/CHP)
Mid preference Solar thermal Solar PV Biomass CHP	**Mid preference** Biomass for single building heating Medium wind Solar thermal Solar PV	**Mid preference** Solar thermal Hydropower
Lowest preference Hydropower Small and micro wind	**Lowest preference** Biomass for district heating Biomass CHP Small and micro wind	**Not estimated** Heat pumps Biomass for single building heating Small and micro wind

[68] Both air source and ground source

6 Targets and policy recommendations

Target setting ◈ Planning policy recommendations ◈ Future work

Having confirmed the existing pattern of energy use in the City of York and reviewed the policy context for the current study, this report has identified the range of renewable and low carbon energy resources available in the locality. The theoretical resources have been the subject of various analyses to establish their viability and to determine the likelihood that these resources can be put to practical use in York, in free-standing or on-site energy generation projects.

This chapter considers the results of the resource and viability assessment from a town and country planning perspective. It begins with a review of the energy targets it would be reasonable to adopt in the City of York, and then recommends a planning policy approach that would promote and encourage the attainment of these targets.

6.1 Target setting

6.1.1 Paragraph 26 of the government's Planning and Climate Change: supplement to PPS1 advises that LPAs can set targets for the proportion of energy supply in new development to come from decentralised, renewable and low-carbon energy sources, where there are clear opportunities, with specific requirements to facilitate connection. Targets should be flexible, seek to exploit opportunities for setting higher target percentages on particular sites or development areas, reflect local opportunities, be underpinned by sufficient evidence and be viable and deliverable.

6.1.2 Policies can be expressed as a percentage of the predicted energy demand or the predicted CO_2 emissions of the new development to be met from decentralised, renewable or low-carbon sources. If a reduction in predicted energy demands is required, it is important that what is meant by energy is clearly defined. Each kWh of grid electricity delivered results in 0.544 kg CO_2 equivalent, while each kWh of natural gas only 0.184 kg CO_2 equivalent[69]. This means that the CO_2 savings from using decentralised, renewable or low carbon sources will vary considerably depending on whether electricity, gas or another fossil fuel is displaced. It should be noted that the CO_2 emissions associated with electricity use will gradually fall in future years as the mix of electricity generation moves away from high carbon sources. Therefore, depending on the interpretation of energy, actual CO_2 emissions reduction could vary greatly.

6.1.3 Using a CO_2 emissions reduction target can overcome this problem. Predicted CO_2 emissions of the new development are established[70] and then a percentage of this must be met from decentralised, renewable or low carbon sources. To encourage and account for efficiency improvements, reductions in emissions that result from planned improvements to the efficiency of the building fabric, lighting and other services should be deducted to arrive at an adjusted baseline demand.

6.1.4 It is also useful for targets to be set for MW of installed capacity. This allows comparison against regional and national targets for installed capacity.

6.2 CO_2 reduction targets for York

6.2.1 Energy demand for existing properties, as well as future housing development sites (to 2020 aligning with the UK Renewable Energy Strategy lead scenario), was estimated in section 2, which together with Annex 3, provides detail on how this was calculated. This demand has been converted to $kgCO_2$ equivalent emissions using Carbon Trust and DECC conversion factors[71] of:

- Grid electricity: 0.544 kg CO_2e per kWh
- Natural gas: 0.184 kg CO_2e per kWh
- Fuel oil: 0.266 kg CO_2e per kWh

6.2.2 Table 6-1 summarises these calculations, showing estimated energy demand and CO_2 emissions for the whole of York, to 2020, based on the energy demand calculations in sections 2.1 and 2.2. These are based on current energy

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69 Source: http://www.carbontrust.co.uk/cut-carbon-reduce-costs/calculate/carbon-footprinting/pages/conversion-factors.aspx

70 A method commonly adopted to predict CO_2 emissions from new development is to establish the CO_2 emissions that would have arisen from the development if it was designed to comply with the current Building Regulations and then add allowances for unregulated emissions (source: Planning Advisory Service).

71 Sources: http://www.carbontrust.co.uk/cut-carbon-reduce-costs/calculate/carbon-footprinting/pages/conversion-factors.aspx and http://www.defra.gov.uk/environment/business/reporting/pdf/20090928-guidelines-ghg-conversion-factors.pdf

demand for domestic and commercial and future energy demand for domestic developments. As all new residential developments after 2016 should be zero carbon, carbon dioxide emissions are not expected to increase significantly post-2020[72].

Table 6-1: Estimated carbon dioxide emissions for York

Energy demand	Electricity (MWh/yr)	Heat (MWh/yr)
Current energy demand (commercial and residential)	737,020	1,627,599
Future residential housing (pre-2020)	22,822	51,000
Total future energy demand	**759,824**	**1,678,599**
kg CO_2 equivalent by 2020*	**413,354,048**	**299,478,216**
Total kg CO_2 equivalent by 2020	**712,832,264**	

*** Assumed that electricity is supplied from the grid and heat is from natural gas***

6.2.3 Carbon dioxide equivalent (CO_2e) emissions that could be offset by the pre-2020 renewable energy potential, as summarised in section 4.6, is shown in Table 6-2, together with the abatement potential for operational and prospective development, as summarised in section 2.3.3.

Table 6-2: CO_2 abatement potential from renewable energy technologies identified in chapter 4

Potential technology / planned development	Elect. estimated kWh/year	Gas estimated kWh/year	Load met (assumed)	Conversion factor	Estimated kg CO_2e / year
Large wind	78,840,000	-	Elec	0.544	42,888,960
Medium wind	78,840,000	-	Elec	0.544	42,888,960
Hydro (0-10kW)	48,618	-	Elec	0.544	26,448
Hydro (10-20kW)	194,472	-	Elec	0.544	105,793
Hydro (100-500kW)	1,314,000	-	Elec	0.544	714,816
Hydro (500-1500kW)	4,380,000	-	Elec	0.544	2,382,720
CHP (biomass district)	17,520,000	35,040,000	Elec/heat	0.304	15,978,240
Biomass (district heating)	-	19,710,000	Heat (gas)	0.184	3,626,640
Small and micro wind	293,968	-	Elec	0.544	159,919
Biomass for single building heating	-	7,622,843	Heat (gas)	0.184	1,402,603
Solar PV domestic	1,563,660	-	Elec	0.544	850,631
Solar thermal domestic	-	488,644	Heat (gas)	0.184	89,910
Ground/air source heat pumps domestic	-	6,533,865	Heat (fuel oil)	0.184	1,738,008
Total kg CO_2e abatement potential from renewable energy potential in new developments					**112,853,648**

72 Carbon dioxide emissions could potentially fall post-2020, due to factors such as the demolition of older housing stock or closure of industrial sites, etc.

Table 6-3: CO_2 abatement potential from renewable energy technologies that are already planned, as identified in chapter 2

Planned development	Elect. estimated kWh/year	Gas estimated kWh/year	Load met (assumed)	CO_2 factor	Estimated kg CO_2e / year
Harewood Whin Landfill Gas	14,533,000		Electricity	0.544	7,905,952
Joseph Rowntree School Biomass		394,000	Heat	0.184	72,496
York High School Biomass		1,413,000	Heat	0.184	259,992
Energise Sports Centre Biomass		1,681,000	Heat	0.184	309,304
Acomb Library		136,000	Heat	0.184	25,024
Danesgate Skills Centre		333,000	Heat	0.184	61,272
City of York Council, Eco Depot, Hazel Court, Wind	13,000		Electricity	0.544	7,072
City of York Council, Eco Depot, Hazel Court, Solar PV	46,000		Electricity	0.544	25,024
Land to the west of Metcalfe Lane		819,936	Heat	0.184	150,868
Harewood Whin, Biomass Power	15,987,000		Electricity	0.544	8,696,928
Proposed university campus between Field Lane & Low Lane		963,600	Heat	0.184	177,302
Link Hall, Wheldrake Lane, Crockey Hill	131		Electricity	0.544	71
Tesco Stores Ltd, Stirling Road, York	400		Electricity	0.544	218
Tesco, Tadcaster Road, Dringhouses	400		Electricity	0.544	218
Sim Hills, Dringhouses, Wind	370		Electricity	0.544	201
St Peter's School Clifton, CHP	198,000	293,000			161,624
Poppleton Junior Football Club	2,453		Electricity	0.544	1,334
St Anne's York Extra Care ASHP		38,000	Heat	0.184	6,992
Total tCO_2e abatement potential from planned, pipelined or prospective renewable energy					**17,862**
Total kg CO_2e abatement potential from renewable energy potential in new developments (from Table 6-2)					**112,854**
Total tCO_2e abatement potential (potential from all sources – sum of two figures above)					**130,716**
Total tCO_2e equivalent from demand by 2020 (from Table 6-1)					**712,832**
Potential % of CO_2e abatement from renewable energy development					**18.3%**

** Conversion factor for CHP assumed that it produced 1/3 electricity and 2/3 heat*

Note: Estimated kg CO_2 does not take into consideration efficiencies of future boilers

6.2.4 In order to determine what target might be feasible for renewable energy in York, a number of scenarios, each assuming a different degree of renewable energy development, have been explored:

- **Scenario 1, business as usual**: only planned, pipelined and prospective developments are realised (as shown in Table 6-3)
- **Scenario 2, low**: planned, pipelined and prospective developments are realised, as well as **25%** of the renewable energy potential from new developments (as shown in Table 6-2 and Table 6-3).
- **Scenario 3, medium**: planned, pipelined and prospective developments are realised, as well as **50%** of the renewable energy potential from new developments (as shown in Table 6-2 and Table 6-3).
- **Scenario 4, high**: planned, pipelined and prospective developments are realised, as well as **75%** of the renewable energy potential from new developments (as shown in Table 6-2 and Table 6-3).
- **Scenario 5, aspirational**: planned, pipelined and prospective developments are realised, as well as **100%** of the renewable energy potential from new developments (as shown in Table 6-2 and Table 6-3).

6.2.5 The calculations for each of these scenarios are shown in Table 6-4.

Table 6-4: Carbon abatement potential of renewable energy development scenarios

Scenario level	CO_2e from planned, pipelined and prospective (tCO_2e)	CO_2e from renewable energy in new developments (kg CO_2e)	Total CO_2e savings (kg CO_2e)	% CO_2 abatement potential
S1: Business as usual	17,862	0	17,862	2.5%
S2: Low	17,862	28,214	46,076	6.5%
S3: Medium	17,862	56,427	74,289	10.4%
S4: High	17,862	84,640	102,502	14.4%
S5: Aspirational	17,862	112,854	130,716	18.3%

6.2.6 Table 6-4 shows the range of carbon reduction targets that could be achievable in York. If City of York Council determines that it is reasonable to assume a medium level of renewable energy development in York, a carbon dioxide reduction target of around 10% from renewable energy should be achievable. This potential is actually likely to be higher as there is likely to be further opportunities for district heating networks and incorporation of renewable technologies into commercial properties, given that the study does not calculate energy demand targets up to 2019, as discussed in sections 4 and 2 respectively. York could therefore consider setting a minimum, but achievable target of 10% of energy to be sources from renewable or low carbon sources by 2020.

6.2.7 Potential targets for new developments

6.2.8 Areas of new development have significant potential for the development of renewable energy technologies. In order to determine the level that site specific targets for new developments could be set at, AEA have looked at CO_2e emissions from future domestic properties, alongside potential for technologies that are specific to either property type. In order to do this, the generation potential from the building integrated technologies, discussed in section 4.5, has been converted to estimated CO_2e savings, using conversion factors, as above. These savings are then compared the estimated CO_2e emissions of the new developments, calculated using the MWh/year demand, as shown in Table 6-1:

- Electricity demand of future residential housing = 22,822 MWh/year. Using the conversion factor of 0.544 kg CO_2e per kWh, this equates to 12,415CO_2e.
- Gas demand of future residential housing = 51,000MWh/year. Using the conversion factor of 0.184 kg CO_2e per kWh, this equates to 9,384 tCO_2e.
- Total = 21,799CO_2e.

6.2.9 The outputs of this analysis, assuming the same scenarios as for all development, are shown in Table 6-5.

Table 6-5: Carbon abatement potential in new domestic developments[73]

Potential technology / planned development	Electricity estimated kWh/year	Gas estimated kWh/year	Load met (assumed)	Conversion factor	Estimated kg CO_2e / year
Small and micro wind	293,968	0	Elec	0.544	159,919
Biomass for single building heating	0	7,622,843	Heat (gas)	0.184	1,402,603
Solar PV domestic	1,563,660	0	Elec	0.544	850,631
Solar thermal domestic	0	488,644	Heat (gas)	0.184	89,910
Ground/air source heat pumps domestic	0	6,533,865	Heat (fuel oil)	0.266	1,738,008
Total kg CO_2 abatement potential from renewable energy potential in new developments					**4,241,071**
Total kg CO_2 equivalent from demand in new developments					**21,799,440**
S1: Business as usual					Not applicable
S2: Low					4.86%
S3: Medium					9.73%
S4: High					14.59%
S5: Aspirational					19.45%

[73] This table shows the generation potential from the building integrated technologies, as already shown in Table 6-2. This generation potential was calculated in section 4.5 using new development figures.

6.2.10 Table 6-5 shows the range of targets that could be achievable in new developments in York. If scenario 3, medium levels of renewable energy installed in new developments in York, were achieved a carbon dioxide reduction (from renewable energy) target of at least 9-10% should be achievable. With a high level of renewable energy development, a target of about 15% should be achievable – as scenario 4 shows. For comparison, examples of targets set by other local authorities for new developments are shown in Table 6-6.

Table 6-6: Local authority CO_2 reduction targets for new developments

Local authority	Suggested or actual CO_2 reduction target
Swindon (2007)	**15%** CO_2 emissions reduction in new schools, public buildings and residential developments of 10 buildings or more by 2013.
Bristol (2009)	A study suggested that an on-site renewables policy requiring **20%** reduction of CO_2 emissions was appropriate.
Sutton (2008)	Presumption that developments will achieve a **20%** reduction CO_2 emissions from on-site renewable energy generation, unless it can be demonstrated that such provision is not feasible.
Basingstoke (2010)	A suggested policy that developments should achieve an extra **15%** reduction on CO_2 emissions in all buildings after Building Regulations compliance.

6.2.11 The City of York Council could adopt a Merton-style target of 10-15% for new domestic developments. However, future Building Regulations enhancements, heralded by the Code for Sustainable Homes, will render a Merton-type approach obsolete if not immediately then very early in the life of the Local Development Documents now under preparation. Therefore, a positive approach for York would be to begin adjusting the focus of policy in York to one of promoting and encouraging the development and physical integration of on and off-site renewable energy generation capacity. Compliance with higher levels of the Code will demand such an approach. The Feed-in Tariffs and other incentives are helping to make it a reality. An engagement strategy, as recommended in annex 11, could be one-step in this approach. This approach could still be supported by targets for onsite renewable energy generation.

6.3 MW installed capacity targets for York

6.3.1 The current level (installed, planned and prospective) and future potential for installed capacity of renewable electricity and heat technologies, as shown in section 2.3 and calculated throughout section 4, is summarised below in Table 6-7. The five scenarios, as outlined in 6.2.4 are then shown.

Table 6-7: Installed renewable energy capacity and potential MW targets that could be employed within York

	Installed capacity (MW) Pre 2020		Installed capacity (MW) Post 2020 (to 2031)	
	Electricity	Heat	Electricity	Heat
Installed, planned and prospective*	5.0	4	5.0	4
Future potential**	67.5	22.3	69.7	28.0
Total	**72.5**	**26.3**	**74.7**	**32.0**
S1: Business as usual	5.0	4.0	5.0	4.0
S2: Low	21.9	9.6	22.4	11.0
S3: Medium	38.7	15.1	39.8	18.0
S4: High	55.6	20.7	57.2	25.0
S5: Aspirational	72.5	26.3	74.7	32.0

** As shown in footnote to Table 2-6*
*** As shown in footnote to Table 4-10*

6.3.2 Assuming a medium level of development of renewable energy development in York, as for CO_2 reduction targets, a target of 39MW of installed capacity for renewable electricity and 15MW of installed capacity for renewable heat by 2020 could be realistic. Having regard to further future potential from sustainable energy technologies, this target could increase up to 40MW and 18MW respectively by 2031. York could also consider using the figures shown in Table 6-7 to set interim targets for 2015 and 2025.

6.3.3 Table 4-10 showed that if all renewable energy potential identified up to 2020 were developed, it would only meet 24% of electricity demand and 4% of heat, which is lower than the UK Renewable Energy Strategy lead scenario for both electricity and heat. Therefore, while it is not possible to directly compare MW potential to the lead scenario – without knowing the technology mix that would be developed – if installed capacity is lower, then the contribution towards lead scenario targets will also be lower.

6.4 Preferred technology locations

6.4.1 Table 6-8 provides an assessment of the preferred locations for each of the technologies assessed, taking into account the location constraints as considered in Section 4 and the location of proposed new developments.

Table 6-8: Summary of Renewable Energy Potential and Locations

Technology	Scale	Locational Criteria	Locations[74]
Large Scale wind	2.5 MW turbines	Sites that have acceptable constraints (e.g. noise, roads, designations etc.)	See Figure 4-11 for location map. Identified potential for this scale of turbine are at six locations. Northwest of York - two areas with potential for two 2.5MW turbines near Skelton. North of York – two 2.5MW turbines near Earswick. East of York - two 2.5MW turbines near Holtby. West of York - two 2.5MW turbines near Askham Bryan. Southeast of York - two 2.5MW turbines between Deighton and Wheldrake.
Medium wind	1 MW turbines	Sites that have acceptable constraints (e.g. noise, roads, designations etc.)	Figure 4-12 shows identified areas of potential within the proposed green belt[3]. As with large scale wind, areas include, Northwest of York - potential near Skelton. North of York – potential near Earswick. East of York - potential Holtby. West of York - potential near Askham Bryan. South of York – Potential between Deighton and Wheldrake.
Hydro (0-10 kW)	5 kW	The Environment Agency (EA) has published a report looking at the opportunities for hydropower alongside the environmental sensitivity associated with exploiting hydropower opportunities[75]. Constraints and sensitivities are those considered within.	Figure 4-13 shows the specific areas of potential in York, mainly areas south of Heslington.
Hydro (10-20 kW)	15 kW	As above	Figure 4-13 shows potential along the Rivers Ouse and Foss, near Haxby, New Earswick, Castle Piccadilly and Terry's.
Hydro (100-500 kW)	300 kW	As above	Figure 4-13 shows potential near Wheldrake.

[74] These are not intended as specific locations but a general guide to their whereabouts. Specific, or precise, locations and specific potential should be established at site level investigation.
[75] 'Mapping Hydropower Opportunities and Sensitivities in England and Wales', the Environment Agency, Feb 2010

Technology	Scale	Locational Criteria	Locations[74]
Hydro (500-1500 kW)	1 MW	As above	Figure 4-13 shows potential to the south of York, along the River Ouse.
CHP (district - electricity and heat)	1.33 MWe 2.66 MWth	Technology will be unobtrusive as it will be integrated within the building(s) structure, so few planning constraints apply. Restrictions on potential apply. Areas with high heat loads have potential for district heating or CHP. Options for both retrofitting existing housing and new development could be explored. Costs are lower for new development as the costs of trenches for the heat pipes are lower. Heat networks can best serve[76]: Areas with an **'anchor load'** – a relatively large and relatively stable heat load, e.g. hospitals. Neighbouring residential areas could also be connected to the network. **Mixed use areas** – residential and commercial building that have a mix of complementary thermal load profile, which together make a large and stable heat load. Areas of **high density housing**, e.g. flats.	Specific development sites that should be explored are: York Northwest (central part of site): Mixed use, with up to a maximum of 1,780 dwellings. The mixed use nature of the site and potentially high density of residential development could result in a large and relatively stable heat load. York Northwest (British Sugar part of site): Mixed use, with up to 1,250 dwellings on 50-75% of the site. Again, the mixed use nature of the site could result in a large and relatively stable heat load. Terry's Factory: mixed use, including employment and up to 395 residential units. Potential for high and relatively stable heat load. Hungate: mixed use development with employment on site. Heat load would depend on mix of land use. If unsuitable for biomass CHP, biomass for district heating could be considered. University of York; Heslington East: University campus, including Science City type employment. Potential will have a high and stable 'anchor load'. These areas are listed in the first key diagram of the York Core Strategy Preferred Options Document[3].
Biomass (district heating)	1MW	As above	As above

[76] Source: Sustainable Development Commission (2007) Community Heating CHP for Existing Housing.

Technology	Scale	Locational Criteria	Locations[74]
Small & Micro wind	2 kW	The technology will be applicable in urban areas. We assess potential by identifying available buildings and adjusting numbers of dwellings via constraints set out in DECC methodology[77]. Based on this methodology we assume that 50% of dwellings are urban and excluded, and that flats should be excluded.	York's Core Strategy document shows in its key diagram the sites that will be developed over the coming years. Para 8.9 indicates the dwellings potential at these sites as set out in the SHLAA. Cross reference of these against Figure 4-9 (Figure 11 of the Core Strategy) which outlines the categories (city centre, urban, sub-urban and rural) allows an assessment of proportion of city centre/urban, against sub-urban/rural. When calculated the proportion of development potential at excluded sites, i.e. city centre/urban, is 0.53 (or 53%). The sites designated as sub-urban or rural for the purposes of this assessment are Heslington East, Germany Beck and Derwenthorpe. Section 8 of the Core Strategy sets out figures on the proportion of flats as being 30% of dwellings with 70% being houses. No indication is given as to the specifics of the development areas.
Biomass for single buildings	12 kW	These are applicable in many dwellings but flats are deemed unsuitable due to fuel store needs and AQMAs in York are also excluded	Section 8 of the Core Strategy sets out figures on the proportion of flats as being 30% of dwellings with 70% being houses. No indication is given as to the specifics of the development areas. The main AQMA areas are in the city centre. The development areas affected more specifically are Castle Piccadilly and Hungate.
Solar PV	2 kWp	Assume 50% of properties have a Southerly facing roof, that flats are not suitable (30%) and that this would not be installed with another electricity providing technology.	Distributed across new property on developments throughout York, so no particular developments are identified as affected more or less than others
Solar Hot Water	2.5 kW	Assume 50% of properties have a Southerly facing roof, that flats are not suitable (30%) and that this would not be installed with another heat providing technology.	Distributed across new property on developments throughout York, so no particular developments are identified as affected more or less than others

77 'Renewable and Low-carbon Energy Capacity Methodology - Methodology for the English Regions', DECC, January 2010

Technology	Scale	Locational Criteria	Locations[74]
Heat Pumps	6.5 kW	We assume that this would not be installed with another heat provision technology. There are a number of reasons why heat pumps are not suitable in domestic or commercial settings, such as lack of space on the building for installation, ground loop, borehole and archaeological constraints, or lack of availability of an internal heat distribution system. Only site specific assessment would precisely ascertain these constraints so for an area study we follow the assumption of the DECC methodology	Distributed across new property on developments throughout York, so no particular developments are identified as affected more or less than others

6.4.2 Large or medium Wind

6.4.3 To assess the potential scale of wind energy resource requires assumptions about the size of the turbines that would be deployed. In the case of large scale wind we assume a commercial scale 2.5 MW turbine. To assess the potential for large scale wind we use this size of turbine to identify areas where the constraints enable 2.5 MW turbines to be located. These points are shown in Figure 4-11. The same process is used for medium scale wind but using 1 MW turbines, as shown in Figure 4-12.

6.4.4 If these areas were to be investigated in detail then the size and location of the turbines would be chosen in the light of detailed insight into the site conditions. Hence the areas left un-shaded represent areas of search for large and medium scale wind.

6.5 Planning policy recommendations

6.5.1 The evidence base described in this report indicates that a wide range of measures are potentially available to the City of York Council to promote and encourage renewable energy use and energy efficiency in buildings. Not all of these measures fall within the purview of the town and country planning system. There are various complementary activities the council might wish to pursue in other areas of its corporate responsibilities. These activities include those identified at the end of this report.

6.5.2 Nonetheless, the planning process is well positioned to take a leading role in facilitating renewable energy use as an important component of York's transition to a low carbon city.

6.6 The general policy approach

6.6.1 The LDF core strategy preferred approach is responsive to the general requirements of RSS policy and relevant planning policy guidance, as summarised in chapter three of this report. The resource assessment in subsequent chapters provides the evidence base to enable the City of York Council to develop the approach proposed in policy CS14, in further compliance with relevant policy and guidance, in the following specific directions:

- sustainable energy targets;
- planning for energy efficiency;
- free-standing generation projects;
- on-site generation;
- major developments;
- green jobs.

6.6.2 These policy themes are considered in turn. In all cases, the emerging policies will enjoy greater legitimacy if they are integrated with established policy concerns in York, examples being affordable housing provision / energy poverty, rural diversification and habitat management. The ideal would be for sustainable energy provisions to be embedded in relevant policies, rather than being just confined to a discrete policy section.

6.6.3 The AEA assessment has concluded that a suitable target of 39MW installed capacity of renewable electricity technologies and 15MW of renewable heat technologies by 2020 is realistic yet ambitious. Having regard to future potential from renewable energy technologies, this target increases to 40MW electricity and 18MW heat by 2031. These targets could be met through contributions from the generation technologies shown in Table 6-9. This table is an indication only and assumed that 50% of the generation potential (as shown in Table 4-10) is realised for the technologies listed.

Table 6-9: Indicative contributions of technologies to renewable energy targets

Technology	MW installed capacity			
	2020		2031	
	Elect.	Heat	Elect.	Heat
Installed, planned and prospective	5.0	4.0	5.0	4.0
Large wind	15.0	-	15.0	-
Medium wind	15.0	-	15.0	-
Hydro	0.7	-	0.7	-
CHP (district - electricity and heat)	1.3	2.7	1.3	2.7
Biomass (district heating)	-	1.5	-	1.5
Small and micro wind	0.8	-	1.4	-
Biomass for single building heating	-	4.4	-	7.1
Solar PV domestic	0.9	-	1.5	-
Solar thermal domestic	-	0.6	-	0.6
Ground/air source heat pumps domestic	-	2.1	-	2.1
Total	**39**	**15**	**40**	**18**

6.6.4 Setting targets; policy recommendations

6.6.5 It is recommended that the City of York Council's LDF Core Strategy includes targets to secure 39MW of installed renewable electricity capacity and 15MW of installed renewable heat capacity by 2020 and 40MW of installed renewable electricity and 18MW of installed renewable by 2031, as shown in Table 6-7.

6.6.6 These target commitments could be incorporated into draft policy CS14, expressed as a discrete policy, or otherwise incorporated into the supporting text for policy CS14.

6.7 Realising the potential: planning for energy efficiency

6.7.1 In the planning and designing of new development, it is beneficial to review the potential of energy efficiency measures before considering the effectiveness of renewable energy generation options. In principle, this reduces the predicted amount of energy that the development will require, with commensurate improvements in the contribution that renewable energy sources can make to overall energy supply.

6.7.2 In view of the importance of planning policy and development control decisions to passive solar design (PSD) considerations, as considered in annex 11, it would beneficial for the City of York's LDF Core Strategy to include a specific policy provision requiring consideration for the use of PSD in new developments of all types across the city. Measures such as the Building Regulations enhancements heralded by the Code for Sustainable Homes will encourage the use of these measures, and they are most effectively integrated into the built fabric if introduced at the planning stage. Equivalent codes for commercial and public buildings are due to be published, and the same principle is likely to apply.

6.7.3 In support of this, the City Council could consider the preparation of supporting guidance in the proposed Sustainable Design and Construction SPD on energy efficiency measures such as PSD. The guiding principles for designers, developers and project managers discussed in annex 11 should form the basis of this supporting guidance.

6.7.4 The passive solar orientation of housing also facilitates the effective use of solar hot water and photovoltaic systems, considered below. Even if the latter option has been too expensive to install on a large scale to date, the current Feed-in Tariff arrangement is very favourable to PV. Market projections suggest that the costs of photovoltaic systems will fall appreciably over the next decade, such that the retro-fitting of such systems will become commonplace. A southerly orientation will facilitate the integration of PV units into established roofscapes, with the implication that PSD will help to 'future-proof' new developments in York.

6.7.5 Planning for energy efficiency: policy recommendations

6.7.6 It is recommended that the City of York Council's LDF core strategy includes a provision requiring consideration should be given to the use of passive solar design in proposals for all new development, as a means of optimising the use of solar heat, daylighting and natural ventilation.

6.7.7 This policy provision could either be included as an additional requirement in Core Strategy policy CS14, or could form the basis of a separate policy. It is acknowledged that this policy will require supporting guidance. On this basis:

6.7.8 It is recommended that, in support of this policy approach, supporting guidance on PSD is included in the City Council's proposed *Sustainable Design and Construction* Supplementary Planning Document.

6.7.9 This SPD could explain how passive solar design influences the siting, site layout, landscape and planting, built form, window design and the internal layout of buildings – all of which are normal or familiar development control considerations. The SPD could also highlight how passive solar design priorities vary with building type, with the emphasis in some building types such as offices and schools being more upon passive cooling and daylighting as a means of reducing or avoiding dependence on air conditioning and artificial lighting, rather than on the optimisation of heat gain that is desirable in housing.

6.7.10 The SPD should also acknowledge the constraints of applying passive solar design principles in historic environments, whilst noting, perhaps, the fact that vernacular architecture was sometimes responsive to such principles.

6.8 Realising the potential: free-standing generation projects

6.8.1 Table 4-1, Table 4-2 and Table 4-3 of this report identify the potential for a range of free-standing renewable energy generation projects in the City of York, amounting to an estimated 72.4 MW of generation capacity by 2031, based on the medium scenario this equates to 36.2MW. These include potential for large and medium wind turbine developments in the rural outer wards of the city, installed either in small clusters or as single turbines; for several small-scale hydro-electric installations, and for biomass CHP generation stations developed in association with the city's major regeneration sites but effectively built as free-standing operations.

6.8.2 The Feed-in Tariff arrangement that was announced by the government in February 2010 is designed to provide a stimulus for projects at this scale of deployment (i.e. up to 5 MW generation capacity). FITs reinforces the expectation that proposals for free-standing renewable energy projects will come forward in greater numbers and at a range of scales and locations during the lifetime of the LDF core strategy, and that technology-specific policy provision would be thus justified. For example, FITs is already stimulating new interest in medium-size wind turbines, particularly in locations such as farms and industrial estates.

6.8.3 Within the principal urban area, the analysis of York's sustainable energy potential in section 4.4 of this report has identified potential for biomass CHP systems in areas of high heat demand. Although commonplace elsewhere in Europe, such systems have been slow to take root in the UK, suggesting that the barriers to deployment are more institutional and logistical than technical. National policy gives clear encouragement to biomass use and CHP deployment, and the introduction of the Renewable Heat Incentive in April 2011 should provide a further commercial stimulus.

6.8.4 Whereas the current study has identified potential locations for wind, hydro and biomass developments, it is recommended that further site-specific evaluation of these locations would be required before any site-specific allocation could be contemplated. In any event, para. 6 of PPS22 advises that 'local planning authorities should only allocate specific sites for renewable energy in plans where a developer has already indicated an interest in the site'. Accordingly, the following policy approach is proposed.

6.8.5 Free-standing generation: policy recommendations

6.8.6 It is recommended that:

i) the City of York's LDF Core Strategy includes a criteria-based policy addressing the potential for wind energy. The policy should embrace wind energy development at a variety of scales, so as to acknowledge the potential for medium-sized turbines.

6.8.7 In accordance with the advice of PPS22 (para. 7), it is recommended that this policy is criteria-based, identifying in a positive rather than restrictive sense the key considerations that will would be used to judge planning applications. In this vein, the policy could support wind energy in locations where it can be demonstrated that such development would not have significant adverse effects on landscape, ecology, archaeology, built heritage and residential amenity – the latter taking into account considerations such as turbine noise and shadow flicker.

ii). the City of York's LDF Core Strategy includes a policy acknowledging the potential for biomass CHP.

6.8.8 This should also take the form of a positively expressed criteria-based policy, in keeping with the guidance of PPS22 para. 6. In the reasoned justification and in subsequent allocations policies, area action plans and supplementary planning documents, the City Council should consider identifying site-specific opportunities for biomass CHP – for example, on major development sites and in those locations where there are large buildings such as hospitals with a consistent heat demand. Any site-specific provisions should follow on from dialogue with the owners and developers of the major sites.

iii). the City of York's LDF Core Strategy includes a policy acknowledging addressing the potential for small scale hydro power projects.

6.8.9 The reasoned justification for this policy should refer to the general locations for potential hydro projects as identified in the Environment Agency assessment referenced in this report. The policy could be criteria-based, supporting hydro-power projects in locations where it can be demonstrated that such development would not have significant adverse effects on hydrology, fisheries, ecology, flood risk or local amenity.

6.9 Realising the potential: on-site generation

6.9.1 As indicated in the summary of the study area's on-site renewable energy resources in Table 6-5 of this chapter, this report has identified potential for a range of on-site or building-mounted renewable and low-carbon energy systems. Sections 4.5.15 and 4.5.24 of this report identified particular potential for heat pumps and solar thermal and photovoltaic systems for on-site generation.

6.9.2 The recommended commitment to passive solar design would facilitate the integration of the solar technologies into the city's roofscape, particularly in building types such as schools and housing. Clearly careful consideration needs to be given in York to reflect its historic character for example where there are several significant vistas over the roofscape, such as from the city walls. At the same time, there is significant potential to employ on-site technologies to improve the energy sustainability of existing buildings. The Feed-in Tariffs incentive is creating significant interest in retro-fitted PV and other systems on the part of home owners and commercial landlords.

6.9.3 The Town and Country Planning (General Permitted Development) (Amendment) (England) Order 2008 sets out a range of permitted development rights for micro-generation in the curtilage of a dwelling house, including ground and water source heat pumps and solar PV and thermal equipment. In November 2009, the Department for Communities and Local Government published a consultation paper on the further extension of permitted development rights for small scale electric and low carbon technologies, including installations on both domestic and non-domestic buildings. On this basis, the recommended scope of planning policy provisions in the core strategy is difficult to specify, although the following provisional recommendation is offered.

6.9.4 An approach commonly adopted in planning policy for on-site generation over the last decade has been to require a specified proportion of a development's energy requirements to be met by decentralised or on-site renewables. This is known generally as the Merton approach after the London Borough that pioneered such requirements. The policy approach was exemplified by policy ENV5 of the Yorkshire and Humber Plan 2008, which had set a target level of 10% of total energy demand to be met from sustainable sources, subject to this being feasible and viable. Table 6-4 of this study also indicates that a carbon dioxide reduction target of around 10% from renewable energy should be achievable. This potential is likely to be higher taking into account opportunities for district heating networks and the incorporation of renewable technologies into future commercial properties. It is recommended that York consider setting a minimum, but achievable target of 10% of energy to be sourced from renewable or low carbon sources by 2020.

6.9.5 Having regard to the architectural and historic importance of central York, the historic villages and other areas within the city boundary, it is further recommended that the City Council's proposed *Sustainable Design and Construction* SPD offers guidance on the integration of on-site renewable energy generation systems into the built environment, including retro-fitted installations and systems appropriate for use in conservation areas. The SPD could provide examples of how energy efficiency enhancements and on-site generation systems could be introduced to existing buildings, and could include best-practice case studies of how such measures might be applied in some of the principal house-types in the city. The case studies could also identify the generic installation costs, pay-back periods and carbon and energy cost savings that can be achieved in existing buildings, using data available from sources such as the Building Research Establishment and the Carbon Trust.

6.9.6 The guidance for on-site systems could be technology-based and address deployment at different levels – from the domestic scale upwards. Whereas considerable generic guidance of this type is now available, it would be beneficial if the SPD paid close attention to the particular development circumstances prevalent in York, embracing sustainable energy technologies whilst maintaining concern for the character of the city. Systems that are considered appropriate for use in conservation areas include vertically-bored ground-source heat pumps, which can be completely out of site. That might also be scope to install solar thermal and PV systems unobtrusively on valley roofs and on the roofs of outbuildings to the rear of properties, if they would enjoy good solar exposure.

6.10 Realising the potential: major developments

6.10.1 The emerging LDF core strategy for York includes provision for several significant developments in the city. These sites include York Northwest, which offers the potential to develop an exemplar sustainable community to Eco-town standards, and the North Selby Mine site, which is identified as a potential focus for the development of green technologies. Having regard to the renewable energy resources and technologies identified in this report as being available and viable for use in the City of York, it is recommended that site-specific policies and master plans / development briefs for these sites require developers to prepare comprehensive sustainable energy strategies for these and the other principal development and regeneration sites in the city. The current report will provide a useful reference source and starting point for these strategies, which should proceed to identify a bespoke approach to energy efficiency and renewable energy use that responds to site characteristics and environmental constraints and places emphasis on design integration.

6.11 Realising the potential: green jobs

6.11.1 Section 5.4 of this report examined the general potential for green jobs in York. Measures such as the Code for Sustainable Homes and its future non-domestic equivalents, the new Feed-in Tariff arrangements and the proposed Renewable Heat Incentive are likely to increase demand for a range of products and skills in the green technology and construction sector. In particular, the attainment of code levels 5 and 6 in the Code for Sustainable Homes is expected to encourage a shift towards Modern Methods of Construction (MMC), including highly efficient prefabricated construction systems in which there is only a limited skills base in the UK at present.

6.11.2 Out of this arises a significant opportunity for the City of York Council, with the assistance of Yorkshire Forward and in partnership with the region's building materials and construction sector, to take a leading regional or even national role in facilitating the development and deployment of these technologies. Should the City Council consider that this would be in the city's economic interest, the shift could be facilitated by the encouraging the use of green technologies on major development sites or council-owned land. An engagement strategy, as discussed previously, could also facilitate the development and deployment of MMC and renewable technologies.

7 Conclusions and future work

7.1 Conclusions

7.1.1 York's future energy demand is expected to reach 759,842 MWh/yr of electricity and 1,678,599 MWh/yr of heat by 2020. In order achieve the figures in the UK Renewable Energy Strategy lead scenario, 30% of electricity and 12% of heat from renewables, York would need to produce 227,953 MWh/yr of electricity and 201,432 MWh/yr of heat from renewable sources by 2020.

7.1.2 Current operation, planned and prospective renewable energy in York accounts for 4.05% of future electricity and 0.36% of future heat demand.

7.1.3 York has technically available potential for all of the technologies reviewed. The highest technologies which have the best potential in terms of MWh/yr generation potential are:

- Large and medium wind.
- Biomass CHP
- Biomass for district heating.
- Biomass for single building heating.
- Ground and air source heat pumps (in future domestic developments).

7.1.4 Solar photovoltaics, solar thermal and small/micro wind have a lower level of identified generation potential.

7.1.5 Meeting the Renewable Energy Strategy lead scenario target of 30% electricity and 12% heat from renewable heat technologies by 2020 will be a challenge within York.

7.1.6 In terms of additional benefits for York, large and medium wind come out as one of the best technologies in terms of cost effectiveness, meeting the strategic objectives of York and job creation potential.

7.1.7 Heat pumps also come out as a technology with high levels of additional benefit in York. However, it has not been possible to identify job creation potential for this technology.

7.1.8 Small and micro wind have been show to have the least additional benefits for York. However, development of these should not be dismissed.

7.1.9 City of York Council should not set higher building standards for new housing funded by the HCA or for non-domestic buildings.

7.1.10 Higher building standards could be set for new residential development, in line with standards for public housing.

7.1.11 A set of guiding principles for developers, designers and planners should be published.

7.1.12 Guidance and a programme on the retrofit of existing properties should be established. A programme of retrofitting existing properties should first focus on the most cost effective measures, such as energy efficiency measures.

7.1.13 Depending on the level of renewable and low carbon energy development, a target range of approximately 2.5-18% could be achievable in York. If City of York Council determines that it is reasonable to assume a medium level of renewable energy development in York, a carbon dioxide reduction target of around 10% from renewable energy should be achievable. This is a city wide target for 2020.

7.1.14 In terms of targets for new developments, an on-site target requiring 9-10% reduction of CO_2 emissions would be possible from renewable energy. However, York may want to consider setting a more ambitious target of 15% to encourage higher levels of renewables in new development.

7.1.15 Rather than (or as well as) setting a Merton-style target for renewable energy in new development, as discussed in the bullet point above, City of York Council could consider adjusting their policy focus towards promoting and encouraging the development and physical integration of on and off-site renewable energy generation capacity. This would apply to both domestic and commercial properties.

7.1.16 The recommended planning policy approach set out in this report includes provisions to promote energy efficiency, including a commitment to passive solar design methods, and to provide positive guidance to encourage the uptake of on- and off-site renewable generation capacity in appropriate circumstances.

7.2 Future work

7.2.1 Throughout this report, suggestions for the future delivery of renewable and low carbon energy have been proposed, alongside particular areas of opportunity for York. These can be summarised as follows:

- Other **carbon saving measures in the built environment** should be considered, particularly the retrofitting of carbon saving measures to existing building stock.

- This could also create a significant opportunity for the **creation of green jobs**.

- This British Sugar part of the York Northwest site offers potential to develop an exemplar sustainable community, which would promote low-carbon development and energy planning.

- The other part of the York Northwest site, York Central, will be a commercial development potential providing an office quarter of 87,000 - 100,000 square metres. This presents significant opportunity for the incorporation of energy efficiency and renewable energy features.
- **City of York Council** itself can help to **stimulate demand** and **lead by example** through incorporating renewable and low carbon energy considerations into its own agenda and procedures.
- Working through **partnerships** and the development of an **engagement strategy** will help to promote and deliver lasting change within York.

- An engagement strategy would include mechanisms to **enable and encourage communities** to **change their behaviours** and live in a more sustainable way.
- Engaging with a wide range of stakeholders, including businesses and intellectual assets (such as the university), will provide opportunities to **stimulate green jobs** and **drive innovation**.

- Meeting Code for Sustainable Homes will prove a challenge. City of York Council should provide designers, developers and project managers with a **set of guiding principles for development**. The following topic areas have been suggested:

- Sustainable design – including passive solar design methods
- Methods of construction
- Product and material specification
- Specification of service and control – heat, light and ventilation
- Water use
- Waste minimisation
- Outside space, landscape and boundary treatment
- Transport
- Contactor choice and raising awareness
- Renewables
- Promoting the message
- Metering and monitoring
- Health and wellbeing.

- Recommendations for planning policy focused on four topic areas

- Planning for **energy efficiency**. An sustainable design SPD, containing guiding principles for designers, developers and project managers, including on passive solar design, is a key mechanism in planning for energy efficiency.
- Realising the potential for **free-standing energy generation**. Policies on the potential for wind energy and biomass CHP are recommended.
- Realising the potential for **on-site energy generation**. Again a sustainable design and construction SPD should be used to help realise on-site energy generation potential.

- Realising the potential for **green jobs**. Working in partnership, leading by example and development of an engagement strategy are again all suggested to help realise the potential for green jobs.

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York Renewable Energy Strategic Viability Assessment

Annexes

Annexes to City of York Council

Restricted Commercial

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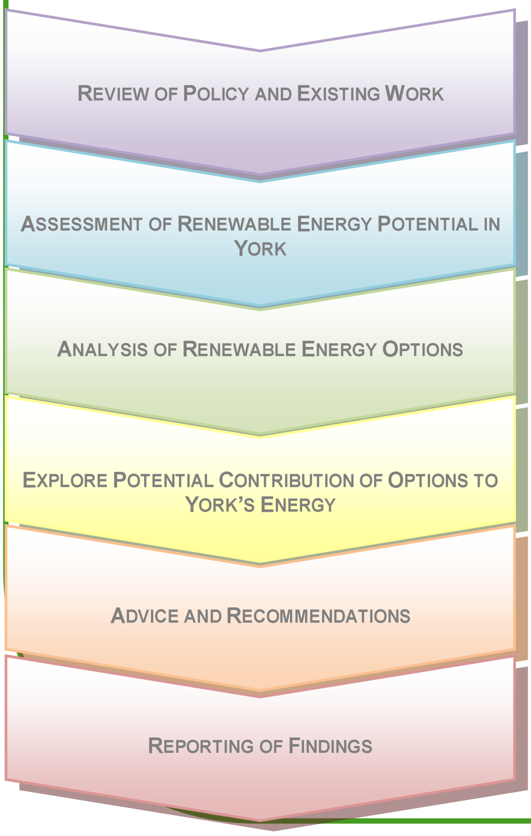
ANNEX 1 – INITIAL SCOPING REVIEW

INTRODUCTION

It is important that the planning system be strengthened so that it proves an effective tool in tackling climate change. Decisions need to be evidence-based, timely and based on the principles of sustainable development. This Renewable Energy Strategic Viability Study will form a fundamental part of York's evidence base for the progression of the Council's Local Development Framework (LDF).

Planning policy and targets can act as key delivery mechanisms for renewable energy opportunities. This study will provide advice and recommendations on appropriate renewable energy targets and the opportunities to deliver these.

Before developing York's evidence base, existing policy and work needs to be reviewed in order to establish a baseline for the project and identify gaps in information. This initial step is a review summarising relevant national, regional and local policy, as well as identifying significant regional and local work already carried out. A gap analysis has then been undertaken to establish gaps between the renewables targets set in the Regional Spatial Strategy (RSS) and the known installed and approximate pipelined capacity.



This will help City of York Council to understand the size of the challenge ahead in achieving their renewable energy targets. The evidence base development will play a role in verifying if this gap is deliverable.

The City of York Council commissioned AEA to carry out this study to develop an evidenced based understanding of the local feasibility and potential for renewable and low-carbon technologies, including microgeneration, to supply new development in the City of York.

The study will consist of six stages, as shown to the left. This report summarises the review of policy and existing work, as discussed above.

The report is presented as an interactive document, with links to key sections along the top of the page, and links to sub-sections down the left side of the page. In addition, and where relevant, the titles of sections link through to the discussed policy document of piece of work. This allows the reader to drill down to their most appropriate level of interest, or simply take an overview of key issues.

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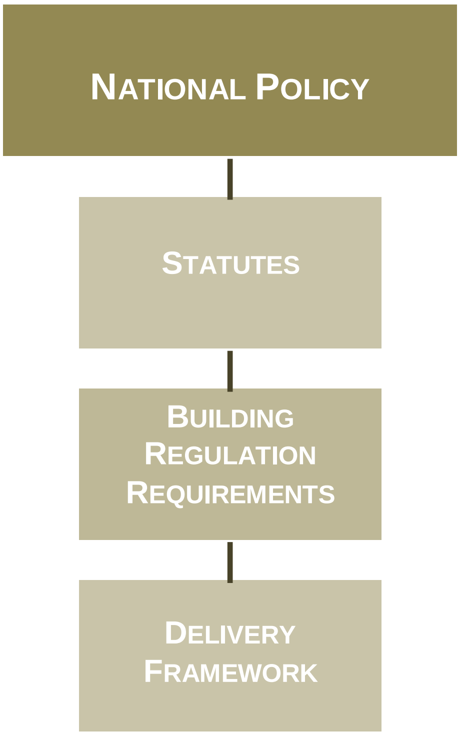
OVERVIEW

Development of renewable energy is driven by legislation, as well as national and regional planning policy. This national policy section summarises the national policies and drivers that local authorities must take into account. There is a particular focus on the planning requirements.



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SUSTAINABLE ENERGY ACT 2003

The Sustainable Energy Act was released following publication of the Energy White Paper 'Our Energy Future – Creating a low carbon economy' in 2003.

+ The government must publish an annual report on progress towards the goals set out in the Energy White Paper.
+ Government in England and Wales must identify and take steps to achieve at least one published energy efficiency aim for residential accommodation.
+ Governments in England and Wales have power to direct energy conservation authorities to make improvements to energy efficiency in residential accommodation.
+ Government is required to set targets for the use of CHP generated electricity in the central government estate, with a target specified as 2010.
+ Ofgem is required to produce regulatory impact assessments, including environmental impact assessments, for all significant new policies.
+ Funding for renewables capital grants is provided by enabling the Secretary of State to direct Ofgem to pay up to £60 million into a consolidated fund. These will be funds arising from the auctioning of electricity generated under NFFO contracts. NFFO was replaced by the renewables obligation following amendments to the Electricity Act 1989 made by the Utilities Act 2000.

National Policy

Climate Change and Sustainable Energy Act 2006

The Climate Change and Sustainable Energy Act aims to enhance the UK's contribution to combating climate change. It is also aimed at alleviating fuel poverty and securing diverse and long term energy supplies for the UK.

+ Section 2 gives the Secretary of State a duty to report annually on the level of greenhouse gas emissions in the UK and the steps that have been taken by government departments during the previous year to reduce those emissions.
+ Section 3 places a duty on the Secretary of State to publish a report on ways in which local authorities might improve energy efficiency, increase microgeneration, reduce greenhouse gas emissions and alleviate fuel poverty. Local authorities would then have to have regard to the report in exercising their functions.
+ Section 4 empowers the Secretary of State to designate national microgeneration targets, if considered appropriate.
+ Section 7 allows the Secretary of State to amend electricity distribution and supply licences to ensure that suppliers acquire exported electricity from customer's microgeneration units. Section 9 requires Ofgem to monitor this.
+ Section 10 requires the Secretary of State to review permitted development rights so as to decide provisions necessary to facilitate installation of microgeneration equipment.
+ Section 11 gives the Secretary of State the power to make building regulations with respect to microgeneration.
+ Section 12 amends Section 1 of the Sustainable Energy Act 2003 to require an annual report on the progress towards residential energy efficiency targets set out in the Housing Act 2004.
+ Section 13 extends the time limits for commencement of summary proceedings for breach of building regulations relating to the conservation of fuel and power can.
+ Sections 15 and 16 enable the Secretary of State to impose carbon emissions reduction targets on electricity and gas distributors and suppliers.
+ Section 18 requires the Secretary of State to publish a report on the contribution that dynamic demand technologies could make to reducing greenhouse gas emissions in the UK.
+ Section 19 places a duty on the Secretary of State to promote community energy projects. These should be for non-commercial purposes and, if used for residential purposes, should involve at least five dwellings. Section 20 empowers parish councils in England/community councils in Wales to encourage or promote specified

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THE CLIMATE CHANGE ACT 2008

The Climate Change Act puts into statute the UK's targets to reduce carbon dioxide emissions through domestic and international action by at least 80% (formerly 60%) by 2050 and 26% by 2020 (currently under revision), against a 1990 baseline.

+ A carbon budgeting system must be set by 1st June 2009, with the first three budget periods running from 2008-12, 2013-17 and 2018-22.
+ The Act establishes a committee on climate change to advise government on carbon budget levels.
+ Consideration is required for the review and potential inclusion of international aviation and shipping omissions in the Act's targets and budgets.
+ Further measures include powers to introduce domestic emissions trading schemes, measures on biofuels and household waste, and powers to require charges for single-use carrier bags.
+ The government must publish a programme setting out climate change adaptation measures.
+ Guidance should be published in 2009 on company reporting on greenhouse gas emissions.
+ The Act provides powers to support the creation of a community energy savings programme.
+ The Act introduces a requirement for the annual publication of a report on the efficiency and sustainability of the government estate.

ENERGY ACT 2008

The Act implements the legislative aspects of the 2007 *Energy White Paper: Meeting the Energy Challenge*. It updates energy legislation to reflect the availability of new technologies such as carbon capture and storage (CCS) and the UK's changing requirements for secure energy supply, such as offshore gas storage.

The Energy Act, along with the Planning Act 2008 and Climate Change Act 2008, ensures that legislation underpins the UK's long-term energy and climate change strategy.

+ *Offshore gas supply infrastructure*: The Act strengthens regulation to allow for private sector investment to help maintain the UK's reliable energy supplies.
+ *Carbon Capture and Storage (CCS)*: The Act creates regulations that enable private sector investment in CCS projects.
+ *Renewables Obligation (RO)*: The Act strengthens the RO to increase the diversity of electricity mix, improve the reliability of energy supplies and help lower carbon emissions from the electricity sector.
+ *Feed-in tariffs*: The Act enables the government to offer financial support for low-carbon electricity generation in projects up to 5MW. The aim is that generators will receive a guaranteed payment for generating low-carbon electricity.
+ *Decommissioning offshore renewables and oil and gas installations*: The Act strengthens statutory decommissioning requirements to minimise the risk of liabilities falling to the government.
+ *Offshore oil and gas licensing*: The Act improves licensing to respond to changes in the commercial environment and enable DECC to effectively carry out its regulatory functions.
+ *Nuclear waste and decommissioning financing*: The Act ensures new nuclear power station operators build up funds to meet the full costs of decommissioning and their share of waste management costs.
+ *Offshore electricity transmission*: The Act amends powers so that Ofgem is able to run offshore transmission licensing more effectively.
+ *Smart metering*: The Act allows the Secretary of State to modify electricity and gas distribution and supply licences, so that the licence holder has to install, or help install, smart meters.
+ *Renewable Heat Incentive*: The Act allows the Secretary of State to establish a financial support programme for renewable heat generated from large industrial sites down to individual households. This is relevant to York because it should stimulate

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PLANNING ACT 2008

Parts 1-8 of the Planning Act create a new system of development consent for nationally significant infrastructure projects. The new system covers certain types of energy, transport, water, waste water and waste projects. The number of applications and permits required for such projects is being reduced, compared with the position under current legislation.

A major role in the new system is the independent Infrastructure Planning Commission (IPC). National policy statements will set the framework for decisions by the commission.

+ Part 1 establishes the Infrastructure Planning Commission.
+ Part 2 defines a national policy statement for the new development consent system.
+ Part 3 defines a nationally significant infrastructure project.
+ Part 4 imposes a requirement for development consent in respect of such projects.
+ Part 5 sets out the requirements for an application for development consent. It also contains provisions for the pre-application consultation process.
+ Part 6 describes the process by which an application for development consent will be handled by the commission, including matters which must be taken into consideration in deciding an application.
+ Part 7 describes the provisions that might be included in an order granting development consent, including requirements corresponding to conditions, matters ancillary to the development and the authorisation of the compulsory acquisition of land. It also sets out mechanisms for modification or revocation of development consent orders.
+ Part 9 provides for compensation where land is blighted by a national policy statement or in connection with an application for development consent.
+ Part 10 adds certain town and country planning matters to the legislative competence of the National Assembly for Wales.
+ Part 11 empowers the Secretary of State to establish a community infrastructure levy by subordinate legislation.

The Planning Act 2008 reflects the recommendations of the Barker report on planning and economic growth, and the Eddington report on transport infrastructure provision. Unless a project in excess of 50MW generation capacity comes forward in York, the power of determination will remain with City of York Council.

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PLANNING AND ENERGY ACT 2008

The Planning and Energy Act enables a local planning authority in England to establish policies imposing reasonable requirements on developments in their area.

+ A proportion of energy used in development to be energy from renewable sources in the locality.
+ A proportion of energy used in development to be low carbon energy from sources in the locality.
+ Development to comply with energy efficiency standards that exceed the energy requirements of building regulations.

The Act provides complementary powers for planning authorities to encourage decentralised, low carbon and renewable energy use in new developments.

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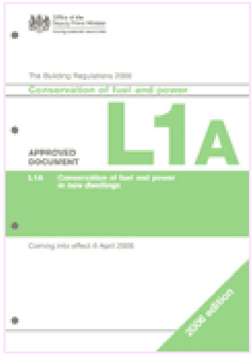

BUILDING REGULATIONS PART L

The legal framework and Approved Documents for Building Regulations Part L (Conservation of Fuel and Power) were last revised by amendments that came into effect on 6 April 2006. The changes brought into effect new energy performance requirements.

The current version of 'Approved Document L: Conservation of fuel and power' is split into four parts:

+ ***Approved Document L1A***: Conservation of fuel and power (New dwellings) (2006 edition).
+ ***Approved Document L1B***: Conservation of fuel and power (Existing dwellings) (2006 edition).
+ ***Approved Document L2A***: Conservation of fuel and power (New buildings other than dwellings) (2006 edition).
+ ***Approved Document L2B***: Conservation of fuel and power (Existing buildings other than dwellings) (2006 edition).

Part L is specific to dwellings. It controls the energy performance of building elements – the allowable area of windows, doors and other openings, air permeability of the structure, the heating efficiency of boilers and the insulation and controls for heating appliances and systems together with hot water storage and lighting efficiency. It also sets requirements for Standard Assessment Procedure (SAP) and Carbon Index ratings for dwellings. Further regulations also require the advertising of these ratings.

Part L2 relates to all building uses other than dwellings. In addition to insulation requirements and limitation of openings of the building fabric, this part considers solar heating and heat gains to structures. It controls heating, mechanical ventilation and air conditioning systems, lighting efficiency, space heating controls, air permeability plus air tightness testing of larger buildings, the certification, testing and commissioning of heating and ventilation systems, and requirements for energy meters.

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THE CODE FOR SUSTAINABLE HOMES

The Code for Sustainable Homes measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a 1 to 6 star mandatory rating system (confirmed by Government on 27th February 2008) to communicate the overall sustainability performance. It sets minimum standards for energy and water use at each level and, within England, replaces the Building Research Establishment (BRE) EcoHomes scheme.

The Code gives homebuyers information about the environmental impact of their new home and its potential running costs. It also offers builders a tool with which to differentiate themselves in sustainability terms.

From April 2007, the developer of any new home in England could choose to be assessed against the Code. Since May 2008, all new homes are required to have a Code rating and a Code certificate must be included within the Home Information Pack (HIP).

Communities and Local Government have published a '***Greener Homes for the Future***' leaflet, which discusses the Code and how it works.

In 2006, the Government announced that in 10-years, 2016, all new homes must be built to zero carbon standards. A gradual tightening of the Building Regulations will achieve this. This represents a challenge to developers and local planning authorities alike.

Considerable efforts will be required to achieve the targets within the envisaged timetable. Policy formulation, planning and strategy will be important, as well as the development of expertise and skills.

Steps to Zero Carbon homes in 2016 – timetable

Date	2010	2013	2016
Energy efficiency improvement of the dwelling compared to 2006 (Part L Building Regulations)	25%	44%	Zero carbon
Equivalent standard within	Code level 3	Code level 4	Code level 6

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NATIONAL INDICATORS 185, 186 AND 188
THE RENEWABLE ENERGY STRATEGY
THE UK BIOMASS STRATEGY 2007
THE MICROGENERATION STRATEGY 2006
THE ENGLAND WOODFUEL STRATEGY 2007
THE DRAFT HEAT AND ENERGY SAVING STRATEGY
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NATIONAL INDICATORS 185, 186 AND 188

In the 2006 Local Government White Paper, ***Strong and Prosperous Communities***, the government committed to implementing a new streamlined performance framework.

> *"The backbone of the new framework is the 198 indicators against which local government will begin to report its performance from April 2008. The national indicator set is designed to measure progress against agreed national priority outcomes in local area agreements. From 2008 this will become a much more powerful framework for devolved governance, with local areas better able to determine how to coordinate and deliver services in their area."*

Defra - 2008

NATIONAL INDICATOR 185 – PERCENTAGE CO_2 REDUCTION FROM LOCAL AUTHORITY OPERATIONS

National indicator 185 measures the progress of local authorities in reducing carbon dioxide (CO_2) emissions from relevant buildings and transport used to deliver its functions. It encourages them to demonstrate leadership on tackling climate change.

Each local authority is required to calculate their CO_2 emissions from analysis of their energy and fuel use, including where these services have been outsourced. The Carbon Trust currently provides support to local authorities to guide them through the process of calculating carbon footprints and to help them develop carbon reduction plans.

Assessment of the indicator will be a year-on-year measured reduction of CO_2 emissions. January to December 2008 is the first year of data, reported on in 2009.

CO_2 emissions in the context of this indicator are the total amount of direct and indirect CO_2 emitted from local authority operations.

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NATIONAL INDICATOR 186 - PER CAPITA REDUCTION IN CO_2 EMISSIONS IN THE LOCAL AUTHORITY AREA

National indicator 186 is measured through centrally produced statistics on end user CO_2 emissions in the local area. Emissions from business and public sector, domestic housing and road transport are included.

This data is already captured and analysed to produce area-by-area carbon emissions per capita. Analysis carried out by AEA has confirmed that this data is sufficiently robust with relatively low levels of uncertainty.

The percentage reduction in CO_2 per capita in each local authority will be reported annually. The statistics for 2005 should be used as the baseline.

There is no current guidance on how to report on achieving this national indicator. However, it is considered that DECC will require an evidence based approach, particularly for those authorities who have adopted it into their Local Area Agreements.

NATIONAL INDICATOR 188 – PLANNING TO ADAPT TO CLIMATE CHANGE

NI188 is designed to measure progress in assessing and addressing the risks and opportunities of a changing climate.

The aim of this indicator is to embed the management of climate risks and opportunities across all levels of services, plans and estates. A process indicator gauges progress of a local area to:

+ Assess the risks and opportunities comprehensively across the area.
+ Take action in any identified priority areas.
+ Develop an adaptation strategy and action plan, setting out:
  - Where the priority areas are.
  - What consultation and leadership of local partners is needed.
  - What action is being taken
  - How risks will be continually assessed and monitored in the future.
+ Implement, assess and monitor the actions on an ongoing basis.

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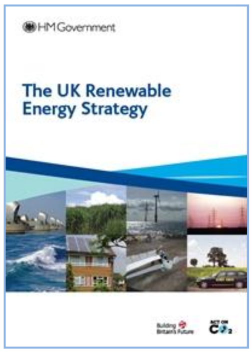
THE RENEWABLE ENERGY STRATEGY



The Renewable Energy Strategy was published in the summer of 2009. This strategy was the outcome of a consultation on possible measures that would help deliver the UK's share of the EU renewables target. These measures could lead to a ten-fold increase in use of renewable energy, across electricity, heat and transport, by 2020.

The strategy sets out a lead scenario suggesting that we could see:

+ **Over 30% of electricity generated from renewables**, up from about 5.5% today. Much of this will be from wind power, on and offshore, but biomass, hydro and wave and tidal will also play an important role.
+ **12% of heat generated from renewables**, up from very low levels today. This is to come from a range of sources including biomass, biogas, solar and heat pump sources in homes, businesses and communities across the UK.
+ **10% of transport energy from renewables**, up from the current level of 2.6%. The Government will also act to support electric vehicles and pursue the case for further electrification of the rail network.

The government noted that this scenario will only be possible with strong, co-ordinated efforts from a dynamic combination of the Devolved Administrations, central, regional and local government, as well as other public groups, private sector, dedicated community groups and individuals. Government promises to:

+ Put in place mechanisms to provide financial support for renewable electricity and heat worth around £30 billion between now and 2020.
+ Extend and expand the Renewables Obligation for large-scale renewable generation.
+ Amend or replace the Renewable Transport Fuel Obligation to increase use of sustainable biofuels.
+ Introduce a Renewable Heat Incentive and 'Feed-In Tariffs' to provide guaranteed payments to individuals, business and communities for renewable heat and small-scale electricity generation.
+ Drive delivery and clear away barriers. The Office for Renewable Energy Deployment has been established to drive delivery of the targets.
+ Increase investment in emerging technologies and pursue new sources of supply, therefore providing greater support for key developing technologies.

NATIONAL POLICY

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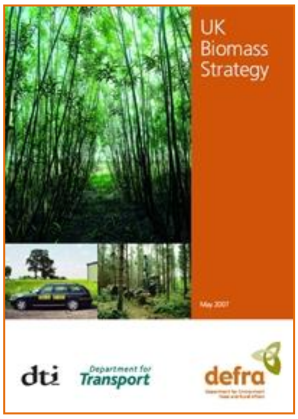
THE UK BIOMASS STRATEGY 2007

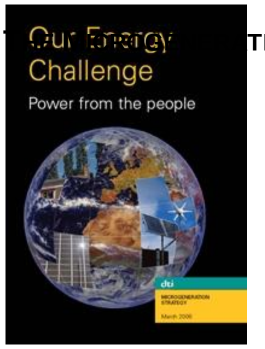


The UK Biomass Strategy guides and defines government policy with the aim of achieving carbon savings from biomass, while complying with EU policies and the Biomass Action Plan.

The strategy aims to support existing renewable energy and climate change targets, as well as promote a competitive and sustainable market and supply chain for biomass.

Options for biomass energy are woodfuel, straw, waste wood, energy crops, waste and agricultural waste. Potential biomass resources in the UK are equal to 3-4% of primary energy consumption. The greatest potential demands come from the industry and domestic sectors, with less from commercial and public services. UK biomass accounts for around 50% of the potential for substituting oil and solid fuel heating.

Biomass prices are sensitive to the supply demand balance that can be affected by non-energy markets for the same material, e.g. animal bedding. Increased supply and demand for biomass may deliver economies of scale, but the increased demand will result in the use of more expensive sources, thereby increasing marginal costs. It is likely that prices will stay relatively constant into the future.



TION STRATEGY 2006

The Microgeneration Strategy aims to create conditions under which microgeneration becomes a realistic alternative or additional source of energy for householders, communities and small businesses. Achieving this will require partnership working across local and national Government, Ofgem and the industry.

Microgeneration is the small-scale production of heat and/or electricity from a low carbon source.

The strategy addresses and will help meet the goals of the UK Energy White Paper – to maintain energy security, ensure competitive markets and address fuel poverty through affordable heating for householders.

An Energy Saving Trust study (commissioned by DTI) suggested that by 2050, microgeneration could provide 30-40% of the UK's electricity needs, helping cut domestic carbon emissions by 15% per year.

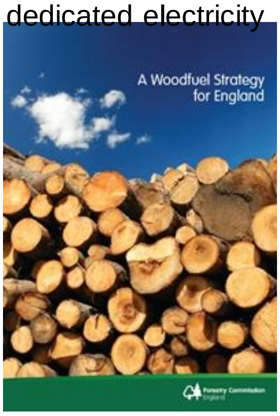
Constraints on microgeneration include cost, information and technology. It is important

THE ENGLAND WOODFUEL STRATEGY 2007

The England Woodfuel Strategy, produced by the Forestry Commission, identifies what Government needs to do to help business, community and local authorities make woodfuel work. The aims and objectives of this document are to:

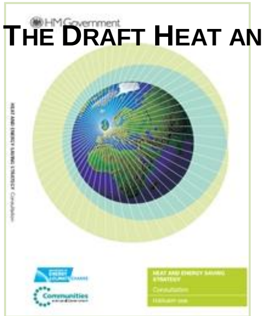
> *"…provide a framework; for Government to build, in partnership with private business, a viable and sustainable biomass industry that progressively utilises an additional 2 Mt of material from under-managed woodlands. This target represents 50% of the estimated unharvested annual increment in English woodlands; to empower businesses and individuals to engage in and practice 'one planet living' through the promotion of a local, sustainable energy source".*

The strategy prioritises local heat generation and small to medium combined heat and power schemes, useful around towns and cities. It also focuses on dedicated electricity generation and large-scale generation and co-firing.



To ensure biomass material is delivered in a sustainable market, there will need to be focus on engaging the end user (developing awareness and confidence), sourcing and extracting the material (identifying owners and persuading them) and stimulating the supply chain (viable margins and confidence in the sector).

The environmental impacts of woodfuels are both positive and negative. They affect the entire ecosystem, from soils and water to landscape and species. The strategy covers these effects, as well as suggesting mitigation measures.



THE DRAFT HEAT AND ENERGY SAVING STRATEGY

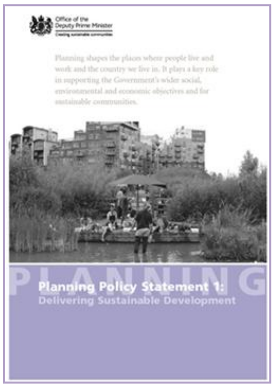
The Government published a consultation on the Heat and Energy Saving Strategy (HESS) on 12th February 2009. The consultation closed on the 8th May 2009.

The purpose of the HESS is to set out an aim of reducing emissions from buildings, bringing them as close to zero as possible by 2050.

The policies set out in the consultation document aim to reduce annual emissions by up to 44 million tonnes of CO_2 by 2020 – the equivalent of a 30% reduction in emissions from households compared to 2006 – making a significant contribution to meeting UK carbon budgets.

National Policy

PLANNING POLICY STATEMENTS:



Planning Policy Statements (PPS) offer detailed advice to local planning authorities (LPAs) on the renewable energy content of local development documents. **Appendix 1** of this report provides a table of the relevant requirements from the following PPSs:

- PPS1: Delivering Sustainable Development.
- PPS1 supplement: Planning and Climate Change.
- PPS3: Housing.
- PPS22: Renewable Energy.

The table sets the requirements against the critical tests of soundness identified in PPS12. The table will be updated as the project proceeds, and aims to give the City Council the confidence that its preferred approach will ultimately meet the critical tests of *soundness* set out in the newly-revised PPS12 – being *justified*, *effective* and consistent with *national policy*. We would also seek to ensure that the study findings will lead to a spatial planning approach that is demonstrably *effective*, being *deliverable, flexible and able to be monitored.*

Several consistent themes emerge from the PSS documents.

- The high priority accorded to climate change mitigation and adaptation.
- The important role of development plans in reducing the use of resources, including energy, and in meeting national and regional targets to this end.
- Encouragement for the use of criteria-based policies on renewable energy projects, avoiding sequential approaches, and with site-specific allocations made only where there are clear indications that the development is viable and likely to proceed.
- The need for LPAs to avoid duplicating requirements set out in other legislation, including the Building Regulations.
- The value of effective community engagement.
- The need for LPAs to promote and encourage renewable and low carbon generation.
- The ability of LPAs to expect a proportion of energy demand from new development to be met by on-site or decentralised generation.
- The potential to use Local Development Orders to facilitate renewable energy use.
- The need to support innovation in sustainable buildings through planning policy.
- The need for local requirements for decentralised energy supply to be set out in a

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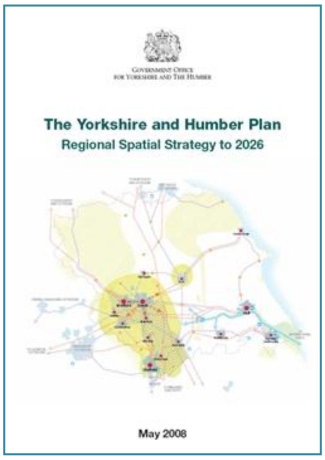
THE YORKSHIRE AND HUMBER PLAN, REGIONAL SPATIAL STRATEGY TO 2026 (2008)



The 2008 Regional Spatial Strategy (RSS) and its policies set specific targets for local authorities within the Yorkshire and Humber region.

This plan was published by the Government Office for Yorkshire and the Humber in May 2008. It provides the overarching strategy for York's statutory development plan. The plan contains the following relevant provisions.

Policy YH1 sets out the overall approach and key spatial priorities. These include a requirement for plans and strategies to promote renewable energy generation.

Policy YH2 concerns climate change and resource use. Amongst other things, it requires plans and strategies to:

+ Encourage better energy, resource, and water efficient buildings.
+ Increase renewable energy capacity and carbon capture.

These policies are to help meet the regional target of a 20-25% reduction in greenhouse gas emission by 2016 (compared to 1990 levels). The RSS also sets out targets for energy efficiency in buildings by the same date, while acknowledging that spatial planning policy can exert only limited influence over greenhouse gas emissions from existing buildings.

Policy YH8 is concerned with green infrastructure. Amongst other things, it requires Local Development Frameworks (LDFs) to *'identify the functional role of green infrastructure in supporting the prevision of renewable energy, urban micro-climate control and flood risk management'*.

The strategy provides a route map for delivery over the next 15-20 years. Actions are set out under three time periods – 'early years', 'mid years' and 'later years'.

+ The list of environmental actions in the early years includes '*increased generation of renewable energy, but mostly from wind turbines*'.
+ Mid-years actions include '*more energy provided by combined heat and power, from renewable and more efficient sources*', along with '*increased generation of renewable energy, with greater contributions from bio-mass and PV*'.
+ Under the later years category, it is anticipated that there will be '*greatly increased generation of renewable energy, with biomass and PV providing the mainstay of*

The Development Plan

Section 6 of the RSS discusses York. ***Policy Y1: York sub area policy*** contains a number of requirements for plans, strategies, investment decisions and programmes in the York sub area, some that are of particular relevance to this study.

'Protect and enhance the nationally significant historical and environmental character of York, including its historic setting, views of the Minster and important open areas';

'Protect and enhance the particular biodiversity, landscape character and environmental quality of the York sub area'

'Help to mitigate flooding through proactive planning and management and provide appropriate protection'

'Improve air quality, particularly along main road corridors in York'.

In particular, strategic patterns of development should:

Focus most development on the Sub Regional City of York, whilst safeguarding its historic character and environmental capacity

Promote development at Selby to foster regeneration and strengthen and diversify its economy within the Leeds City Region

Support an appropriate scale of development at Malton to support local regeneration and the role of York

Elsewhere in the sub area, use a managed approach to development to focus on meeting local housing needs and appropriate economic diversification.

Section 10 sets out a series of environmental policies, including ***Policy ENV5: Energy***:

The Region will maximise improvements to energy efficiency and increases in renewable energy capacity. Plans, strategies, investment decisions and programmes should:

A. *Reduce greenhouse gas emissions, improve energy efficiency and maximise the efficient use of power sources by:*

1. Requiring the orientation and layout of development to maximise passive solar heating.
2. Ensuring that publicly funded housing, and Yorkshire Forward supported development, meet high energy efficiency standards.
3. Maximising the use of combined heat and power, particularly for developments with energy demands over 2MW, and incorporating renewable sources of energy where

B. *Maximise renewable energy capacity by:*

1. Delivering at least the following Regional and Sub-Regional targets for installed grid-connected renewable energy capacity:

Regional and Sub-Regional targets for installed grid-connected renewable energy capacity

	2010	2021
HUMBER	124MW	350MW
NORTH YORKSHIRE	209MW	428MW
SOUTH YORKSHIRE	47MW	160MW
WEST YORKSHIRE	88MW	295MW
OFFSHORE	240MW	630MW
TOTAL	**708MW**	**1862MW**

2. Annually monitoring planning permissions and developments against the indicative local authority targets for 2010 and 2021 set out in Table 10.2 and taking action accordingly in order to ensure the regional and sub-regional targets are exceeded.

3. Promoting and securing greater use of decentralised and renewable or low-carbon energy in new development, including through Development Plan Documents setting ambitious but viable proportions of the energy supply for new development to be required to come from such sources. In advance of local targets being set in DPDs, new developments of more than 10 dwellings or 1000m^2 of non-residential floorspace should secure at least 10% of their energy from decentralised and renewable or low-carbon sources, unless, having regard to the type of development involved and its design, this is not feasible or viable.

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The RSS identifies a series of indicators and targets to monitor progress. Local authorities are identified as playing a lead implementation role in the attainment of targets, with local development frameworks and development control being the principal mechanisms.

The RSS proceeds to identify indicative local targets for installed grid-connected renewable energy in 2010 and 2021.

RSS indicators for renewable and low carbon energy capacity

INSTALLED GRID-CONNECTED RENEWABLE ENERGY WILL HAVE INCREASED CAPACITY (MW).
RENEWABLE ENERGY CAPACITY IN EXTANT PLANNING PERMISSIONS (MW).
INSTALLED NON-GRID-CONNECTED RENEWABLE ENERGY CAPACITY (KW).
INSTALLED "GOOD QUALITY" CHP CAPACITY (MWE).
INSTALLED NON-GRID-CONNECTED "GOOD QUALITY" CHP CAPACITY (MWE).
TARGETS FOR LOCAL RENEWABLE ENERGY IN NEW DEVELOPMENT IN DPDS
IMPROVED ENERGY EFFICIENCY.

For York, the targets are 11 MW installed capacity by 2010 and 31 MW installed capacity by 2021.

Policy ENV12 sets out regional waste management objectives. It promotes adherence to the waste hierarchy but does not make explicit reference to energy recovery. Energy recovery receives passing reference in paragraph 10.65. Table 10.7 identifies current capacity for municipal solid waste, commercial and industrial waste in the region. It notes that, in 2004, the City of York had no waste-to-energy recovery capacity.

RSS Section 11 identifies the region's economy policies. ***Policy E1*****: creating a successful and competitive regional economy**, identifies the *'opportunities for business relating to the region's unique environmental assets and challenges, including sustainable construction, renewable energy, resource and waste efficiency and environmental technologies and the low carbon economy'.*

The Development Plan

North Yorkshire Structure Plan

All policies from the North Yorkshire Structure Plan have now been superseded by the relevant policies in the 2008 Regional Spatial Strategy. In September 2007, the Secretary of State had originally saved only policy (E8: North Yorkshire Green Belts). This was to avoid what would have been seen as a policy void on the general extent of the green belt in North Yorkshire.

City of York Draft Local Plan 2005

The York draft local plan was approved at a meeting of the City of York Council on 12th April 2005. It has two key roles. Firstly, it represents the most advanced stage of the draft City of York Local Plan. In this role, it comprises the 1998 deposit draft of the Local Plan amended up to and including a fourth set of changes.

Secondly, it was approved for making development control decisions in the City, for all applications submitted after the date of the 2005 Council meeting. It will be used for this purpose until it is superseded by elements of the Local Development Framework.

The general strategy policies contained within this Plan promote sustainable development across the City. In particular, Policy GP4 requires all new residential and commercial developments to be accompanied by a sustainability statement. This is to set out how the proposal fits with the policy criteria outlined in GP4a. In respect to renewable technologies, this states that development should:

> *e) Minimise the use of non-renewable resources, re-use materials already on the development site, and seek to make use of grey water systems both during construction and throughout the use of the development. Any waste generated through the development should be managed safely, recycled and/or reused. The 'whole life' costs of the materials should be considered.*
>
> *h) Maximise the use of renewable resources on development sites and seek to make use of renewable energy sources, such as heat exchangers and photovoltaic cells.*

A specific renewable energy policy is outlined in policy GP5 which states that proposals for the development of renewable energy facilities '*will be encouraged provided there is no significant adverse effect on the existing landscape, air quality, biodiversity,) water resources, agricultural land (defined as grades 1, 2 or 3a) or sites of archaeological or historic importance*'.

The justification for policy GP5 states that in assessing applications for renewable energy facilities the potential impact of the proposal on the local environment will be balanced against the wider contribution to reducing emissions of greenhouse gases

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CITY OF YORK LOCAL DEVELOPMENT FRAMEWORK

The Local Development Framework (LDF) for the City of York will, once adopted, comprise of a series of documents that will guide development in the City to 2030. The LDF projects forward beyond the 2026 end date of the Regional Spatial Strategy in order to set a green belt boundary for the City that will endure for the long term.

CORE STRATEGY

In June 2006, the Council published Issues and Options Paper for their Core Strategy, in with a second Paper in September 2007. The Core Strategy Preferred Options stage was published for public consultation between June and August 2009.

The emerging Core Strategy, which is currently still at preferred options stage, sets out the vision for the City, which encompasses the ambitions of York's Sustainable Community Strategy. One of the key aims of the vision is to be a leading environmentally friendly city. Alongside this vision for the City, the emerging Strategy explains that one of the key challenges for the LDF is to protect and enhance York's unique historical legacy.

The strategy includes an 'Ecological Footprint' for the City. This sets out the results from the UK Ecological Budget Project, which identified York's eco-footprint in 2006 to be 5.38 gha per person, just under the UK average of 5.4 gha per person. The emerging Core Strategy explains that this is not sustainable and York needs to move towards a more resource efficient future. This will include making better use of renewable energy. It refers to the work of the North Yorkshire Renewable Energy Study (2005), which indicates that York has the potential to generate around 31MW of renewable energy by 2021. The emerging strategy identifies that York currently generates less than 3MW. Specific mention is given to the potential for the North Selby Mine to contribute towards the City's renewable energy targets.

The LDF will help deliver York's aspiration to become a 'leading environmentally friendly city' and reducing its carbon and eco-footprint. The LDF will also play a key role in helping the city to adapt to, and mitigate against, climate change. To meet these aspirations York must:

+ Strike an appropriate balance between physical growth and environmental sustainability and ensuring that the environmental consequences of actions are adequately managed.
+ Reduce energy use and carbon generation, exceeding the RSS renewable energy targets.
+ Contribute to reduction of waste through innovation and improvement of current waste practices, promotion of recycling, and provision of suitable and accessible sites.

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The preferred approach for the City's spatial strategy is to identify development opportunities that will create conditions for a prosperous thriving economy and sustainable inclusive communities. The Strategy states that this needs to be done in a way that protects York's special historic and natural environment. It should also recognise the challenge of climate change and link to a reduction in York's carbon and eco-footprint. Use of Brownfield sites should be maximised.

In developing an appropriate Core Strategy for the City the document examines a number of key issues. These are the relationship between York and its surrounding settlements, the role of the city and district centres, as well as key constraints for the City. The constraints focus around the need to preserve the historic character and setting of York, protecting and enhancing York's green infrastructure and minimising flood risk. Further detailed work has been undertaken for each of these areas and this forms part of the evidence base to the Core Strategy.

The Green Belt Appraisal (2003) indicates that there are areas of land outside the built up areas that should be retained as open land due to their role in preserving the historic character and setting of York. Work on the green infrastructure in the City highlights that nationally and locally significant nature conservation sites, along with appropriate buffers and land within regional level green corridors, will be excluded when considering future potential development locations. The general extent of these areas are indicated in the Core Strategy.

In respect to Flood Risk, the Core Strategy highlights this is a key local planning issue for York. The Council has produced a Strategic Flood Risk Assessment (2007) which shows the extent of flood zones across York. The Core Strategy highlights that to reduce further damage to property and infrastructure, as well as to maximise public safety, Flood Risk Zones 3a and 3b are considered inappropriate for future development for housing or employment.

The strategy identifies key strategic development sites, such as York North West (policy CS3) which is anticipated to deliver a substantial amount of future development (around 3,030 dwellings and 87,000m^2 of office space). This area offers the potential to develop an 'exemplar sustainable community', which will include *'outstanding sustainable design, use of sustainable technologies and prioritising access by sustainable transport modes'* (policy CS3).

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Chapter 15 is devoted to resource efficiency. The stated strategic objective of the Council is '*to help reduce York's eco and carbon footprint through the promotion of sustainable design and construction, energy efficiency and renewable energy, thereby reducing overall energy use and help in the fight against Climate Change'.* This whole Core Strategy Plan is geared towards achieving this aim. Progress towards this objective will be measured against four targets relating to sustainable design and construction, renewable energy and reductions in carbon emissions. These targets are set out in detail in Policy CS14. This states that a reduction of York's carbon and eco-footprint will be achieved in the following ways:

> *'(i) Future development and conversions will be a high standard of sustainable design and construction using innovative techniques promoting high standards of energy and water efficiency.*
>
> *All new development and conversions of more than 10 dwellings or 1,000m^2 of non-residential floorspace will offset at least 10% of the predicted carbon emission through on-site renewable energy generation.*
>
> *(ii) Through ensuring we exceed the RSS targets for York through either on-site or off-site generation.*
>
> *The Allocations DPD, will identify suitable sites for standalone renewable energy, taking into account any impact on the environment, sensitivity of the landscape, and historic character and setting of York.*
>
> *(iii) All new developments over 1000m^2 will be required to assess the feasibility of integrating CHP and district /block heating or cooling infrastructure (along with other renewable energy technologies)*
>
> *An SPD will be delivered to address in detail, high quality design and construction, energy efficiency, carbon reduction targets, decentralised, renewable and low carbon technologies and many other core principles of embedded sustainable development into the LDF.'*

The delivery and monitoring of Policy CS14 is defined in a series of key local indicators in chapter 20 of the Core Strategy. These indicators will enable review of the policy.

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REGIONAL SPATIAL STRATEGY
NORTH YORKSHIRE STRUCTURE PLAN
CITY OF YORK DRAFT LOCAL PLAN 2005
CITY OF YORK LDF

CORE STRATEGY
ALLOCATIONS DEVELOPMENT PLAN DOCUMENT
YORK NORTH WEST AREA ACTION PLAN, ISSUES AND OPTIONS
CITY CENTRE AREA ACTION PLAN

CORE STRATEGY – PREFERRED OPTIONS DEVELOPMENT SITES

The Core Strategy Preferred Options document identifies nine major development opportunities and sites, which are considered of key important in terms of future spatial strategy for York. It will be important that these are considered within the lifetime of this project. These sites are detailed and shown on the map below.

+ **York Northwest (1)**: is the largest and most significant regeneration project in the York area. It consists of two Brownfield sites, York Central and British Sugar, linked by a public transport corridor. An Area Action Plan is under development for these sites. Part of the former British Sugar site is a site for a Demonstration Exemplar Urban Eco Settlement project. This will deliver a first phase of innovative eco-principles in an urban regeneration setting.
+ **Castle Piccadilly (2)**: is a strategic city centre site, next to Clifford's Tower.
+ **Heslington East (3)**: is a 65-hectare site, which will become a new campus for the University of York. It is located between Heslington Village and Grimston Bar Park and Ride. It has received outline planning consent.
+ **Hungate (4)**: is a second city centre site. It is located next to the River Foss. Phase 1 development has begun on this site.
+ **Nestlé South (5)**: is a potential redevelopment opportunity on the older, southern part of the Haxby Road factory site.
+ **Germany Beck (6) and Derwenthorpe (7)**: are two sites with the potential to provide over 1,200 homes. They have both received outline planning consent.
+ **Terry's (8)**: is a potential redevelopment opportunity of a former factory complex near York Racecourse.
+ **Layerthorpe (9)**: is a potential redevelopment opportunity of a key gateway to York city centre.

CONSULTATION RESPONSES TO PREFERRED OPTIONS AND POLICY CS14

The Council's summary document records 31 individual respondents to chapter 15 of the Core Strategy Preferred Options. Consultation responses are the views of residents and other stakeholders, and are not necessarily the views of the Council. These responses highlight broad support for the policies. Certain elements were suggested for consideration in the Core Strategy.

- Establish locally distinctive policy. Specific proactive policies and plans should be included in development plan documents (DPDs) and supplementary planning documents (SPDs).
- Address support for residents and Climate Change Act targets within local policy.
- Policy should be consistent with Regional Spatial Strategy (RSS) and targets only applied where feasible and viable.
- The 10% RSS target should be a minimum interim target until local, evidence based targets are adopted. There is scope in York for exemplary targets.
- LDF policy should be criteria based, with key criteria against which applications can be judged.
- Utilise University of York knowledge for Local Carbon Futures and Biorefinery initiative.
- Mention of sustainable use of water supplies.
- Develop a mechanism to verify energy performance in developments.
- Measures should also focus on existing buildings, with clear timescales, targets and indicators. Overall, policy should promote sustainable building in its widest sense.
- Strategy should discuss the creation of renewable energy infrastructure.
- Consideration needs to be given to a wide range of technologies and options.
- The 10 dwelling threshold could be considered overly prescriptive.
- Mention the impact of resources on resultant air quality.
- Coal Bed Methane has potential within York.

Respondents indicated specific sites that they felt have potential.

- **North Selby site** for standalone renewable energy production (although it was mentioned that this may not be suitable due to interference from bird life and falling within the green belt).

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ALLOCATIONS DEVELOPMENT PLAN DOCUMENT

The Allocations Development Plan Document (DPD):

+ Identifies development sites that will deliver the objectives of the Council's Core Strategy.
+ Determines the green belt boundary and settlement boundaries around York and the surrounding villages.
+ Identifies land for transport requirements such as park and ride facilities and highway and cycleway improvements.
+ Identifies land for potential waste and minerals workings.

An Issues and Options paper was published for consultation purposes between March and May 2008. This consultation invited views on housing and employment sites that emerged through the production of the evidence base for the LDF. This evidence came from the Strategic Housing Land Availability Assessment, the Employment Land Review and other detailed technical assessments that took place prior to the production of the Strategic Flood Risk Assessment, York Landscape Appraisal, Green Belt Appraisal, retail and other studies. The consultation document also invited the submission of additional sites for consideration.

In respect to renewable energy, the document highlights that it may be necessary to consider large-scale renewable energy generation. This could include stand-alone renewable energy facilities, such as wind, biomass, hydro and photovoltaics. The consultation document invites comments on whether the council should be identifying sites for large scale renewable energy installations and whether there any sites that would be appropriate.

CONSULTATION RESPONSES

Six respondents replied to the consultation document. Consultation responses are the views of residents and other stakeholders, and are not necessarily the views of the Council.

+ One considered that the Council site at London Bridge should be considered for renewable energy generation.
+ Another considered that developments, such as those at Terry's and the university, should be obliged to have CHP schemes.
+ Another expressed the view that all proposals should be forced to include renewable energy technologies

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YORK NORTH WEST AREA ACTION PLAN – ISSUES AND OPTIONS

York North West is a major area for regeneration and includes the two major development sites, York Central (35-37 ha) and British Sugar (39.5 ha). The North West Area Action Plan provides detailed policy guidance within the strategic context of the emerging Core Strategy.

The draft document sets out a suggested vision for this significant area alongside a draft set of objectives for the development, two of which are:

> *'To provide an exemplar high quality development both in terms of building design and the treatment of the spaces between them.*
>
> *To create a carbon neutral community, which acts as an exemplar for sustainable building design and construction, renewable energy generation, innovative solutions to minimise the impact of transport and contributes to the reduction in York's eco-footprint.'*

The area has the potential to become an exemplar of sustainable development with potential to develop new sustainable design techniques, innovative transport solutions, meet the highest BREEAM rating and utilise new sustainable technologies and materials. This will have benefit in terms of employment opportunities.

Housing development in the area should meet the Code for Sustainable Homes level 3.

An Issues and Options document was completed and sent out for public consultation between November 2007 and January 2008.

CONSULTATION RESPONSES

Three respondents to this document raised the issue of renewable energy. Consultation responses are the views of residents and other stakeholders, and are not necessarily the views of the Council.

- One stated that it would be helpful for the document to incorporating on site renewable energy generation and other low carbon technology as well as the potential to maximise the use of CHP within York North West.
- One respondent wanted to see the area exceed the minimum RSS targets.
- The third welcomed the positive approach to renewable energy development.

CITY CENTRE AREA ACTION PLAN

The City Centre Area Action Plan will form another key element of the Local Development Framework. The plan will protect the City's special qualities, but also identify area-based proposals to stimulate enhancement where needed. It will focus on issues such as shopping, tourism, the evening economy, employment, traffic and transport, the historic environment, the public realm, recreation, community facilities, cultural activity and housing. Public engagement, on its Issues and Options Stage, has been carried out between July and October 2008.

CONSULTATION RESPONSES

Early responses to this document (four in total) suggest that a vision should be expressed in this document, which is stronger on climate change and environmental protection. A general comment is made that there should be the aim for an energy descent plan. In respect to the historic environment, all options are possible. However, one respondent thinks there should be scope for improving energy capturing roof systems. A further respondent considers that the historic environment theme and option 3 are too prescriptive. As with the previous consultations, responses are the views of residents and other stakeholders, and are not necessarily the views of the Council.

YORKSHIRE AND HUMBER REGIONAL ECONOMIC STRATEGY 2006-2015

The Regional Economic Strategy (RES) acknowledges both the threat of climate change and the economic opportunity it offers to the region. From an economic perspective, it also identifies the need to ensure security of energy supplies.

Sustainable development is identified as one of three crosscutting themes in the RES. The strategy aims to *'promote the transition to a low carbon economy through highly efficient use of energy and resources in businesses and (to) apply high energy and environmental design standards to buildings and neighbourhoods'.*

Objective five concerns transport, infrastructure and environment. A specific objective within this section is to *'ensure effective energy, utilities and broadband investment'.* The actions identified include the promotion of *'energy security and reduced fossil fuel dependency by more energy efficiency and clean and renewable energy generation'*.

Under objective six (stronger cities, towns and rural communities) the RES notes that '*a high quality approach to developments will incorporate good design, high environmental and energy standards and accessible locations*'. In common with the RSS, the RES identifies the reduction of greenhouse gas emissions by 20-25%, over the 1990 baseline, as a target and indicator for 2016.

The RES does not form a part of the development plan. However, under the new Local Democracy, Economic Development and Construction Act, an integrated regional strategy will need to be produced to replace the current RSS and RES.

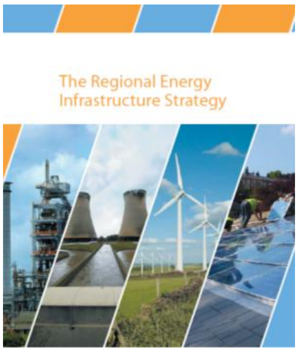
THE REGIONAL ENERGY INFRASTRUCTURE STRATEGY

The scope of the Regional Energy Infrastructure Strategy (2007) is limited to regionally specific issues and actions that the Regional Energy Forum (REF) has the capacity to deliver. Therefore, it has a particular focus on the development of physical infrastructure.

The Strategy and Action Plan, which build on the priorities for energy in the Regional Economic, Spatial and Housing Strategies, were developed through a process of consultation with regional stakeholders. Stakeholders included academia, developers, councils, fuel suppliers, power producers, energy efficiency, grid infrastructure and microgeneration. Socio-economic and political bodies such as Government Office for Yorkshire and The Humber (GOYH), Yorkshire and Humber Assembly (YHA), Yorkshire Forward (YF) and the Renewable Energy Foundation (REF) were also consulted.

This Action Plan has a timeframe to 2010. The actions are focussed on three key objectives:

- Maximise low carbon energy generation.
- Promote the reduction in energy demand.
- Lead the way in delivering secure regional and national energy supplies.



In order to achieve the objectives of the Action Plan, primary developments the region should be:

- Clean coal power stations.
- Regional bioenergy, including biomass and biofuels.
- Combined heat and power (CHP) and community energy schemes in urban and rural renewal programmes.
- Microgeneration of electricity and heat, mainstreamed throughout communities and built environment.

The strategy observes that the regional uptake of renewables has been limited to date due to constraints such as planning, financial feasibility, public understanding and availability of proven technology.

In addition, resources to support renewable energy development in the region are limited and investment in grid infrastructure is required. The strategy notes that solar thermal and photovoltaic (PV) systems dominate microgeneration market and onshore wind dominates the large-scale market.

Future Energy Yorkshire suggests development of both on- and off-shore wind in the region, but also suggests marine energy sources, solar collector technology, biomass heat and CHP systems. For small-scale renewable energy, the focus will be on technologies that can easily be installed in high numbers and that support other regional strategies.

It is estimated that approximately 2% of the region's total energy requirement could come from the bio-fraction of waste. This would equate to a 25% reduction of waste going to landfill.

RENEWABLE AND LOW-CARBON ENERGY CAPACITY METHODOLOGY; DRAFT METHODOLOGY

In September 2009 a draft methodology outlining the process to determine renewable and low-carbon energy capacity at a regional level was published for stakeholder review and comment.

The main purpose of this methodology is to ensure that there is synergy between regional approach to determining renewable and low-carbon energy capacity and national strategy and policy. The methodology will ensure consistency in the region's evidence bases. These evidence bases will underpin regional renewable and low-carbon energy targets.

The methodology will be important for local evidence bases, and associated renewable and low carbon targets, to be consistent with the methodology for the regions. To ensure consistency with the emerging region-wide Renewable Energy Study, the processes described in the draft methodology will be followed, where possible, when assessing the potential capacity within York.

SUSTAINABLE COMMUNITY STRATEGY FOR NORTH YORKSHIRE

The North Yorkshire Strategic Partnership (NYSP), which is made up of partnerships and organisations across the public, private and voluntary and community sectors, produced the Sustainable Community Strategy for North Yorkshire. The vision stated in this document is:

> *'North Yorkshire – a place of equal opportunity where all can develop their full potential, participate in a flourishing economy, live and thrive in secure communities, see their high-quality environment and cultural assets maintained and enhanced, and receive effective support when they need it'.*

The strategy has a long-term vision, but focuses high-level issues and priorities over the medium-term (3 years). Environment, and the desire to see it protected and enhanced, is one of the ten medium-term priorities identified within this document. The strategic aims are to:

Contribute to combating global warming through reduced greenhouse gas emissions and safeguarding and adding to carbon sinks.

Reduce waste to landfill and increase recycling.

Conserve and enhance bio-diversity, natural habitats and the natural and built environments.

Develop solutions to reduce the risk, and mitigate against the impact of, flooding and use non-physical flood defence systems as opportunities to enhance habitats and biodiversity.

Support and encourage greater involvement of commercial interests in environmental and conservation issues.

Additional Policy and Guidance

Without Walls Partnership

York – A City Making History; Vision and Sustainable Community Strategy 2008-2005

The Without Walls partnership, made up of organisations from across York, has created a Vision and Sustainable Community Strategy for York. Part of this vision is for York to be a leading environmentally friendly and sustainable city.

Draft York Climate Change Strategy and Action Plan

The Without Walls partnership is also currently creating the York Climate Change Strategy and Action Plan. The aims of this strategy and action plan are to reduce carbon emissions and other greenhouse gas emissions in line with national and regional targets, as well as better prepare the City of York to adapt to future climatic changes. The partnership has also set a target of 25% reduction in carbon emissions across their own operations by 2013.

Future Policy

There are legislative, policy or funding changes on the horizon, whose impacts should be considered as part of this study.

Low Carbon Transition Plan

August 2009 saw the publication of the Government's Low carbon Transition Plan to 2020. This plan summarises the Government's position on how it will deliver emission cuts of 18% on 2008 levels by 2020.

For the first time, all major UK Government departments have been allocated their own carbon budget and must produce their own plan.

The aim is to channel about £3.2 billion to help households become more energy efficient. This will be achieved by increasing the current programme by 20% and helping make the UK a centre of green industry by supporting the development and use of clean technologies. This will include investing in research and development of new low carbon technologies. £405 million, announced in April 2009, will be used to deliver a major boost to technologies where the UK has the greatest potential, with up to £120 million investment in offshore wind and an additional £60 million to cement the UK's position as a global leader in marine energy.

Some of the key mechanisms identified include:

Infrastructure Planning Commission

The Planning Act 2008 provides for a new independent Infrastructure Planning Commission to take decisions on nationally significant energy infrastructure projects, and this will happen from 2010.

National Policy Statements (NPSs) will be put in place for infrastructure development. These will set out the national need for energy infrastructure and other guidance on national policy that the IPC needs to consider when making decisions. Planning authorities, including responsible regional authorities preparing Regional Strategies, must have regard to these new NPSs when preparing development plans and, where relevant, when making planning decisions under the Town and Country Planning system.

This will help ensure that decisions on renewables and other sectors, whether large or small, are taken consistently. The new regime will provide three opportunities for communities and interest groups to have their say:

+ During the public consultation on the NPSs.
+ Through local consultation at the pre-application stage

FUTURE POLICY

A SMARTER GRID FOR THE FUTURE

By 2030 we will see a step change in intermittent generation delivered through both large and small-scale renewable plants, more price responsive consumers enabled by the roll out of smart meters and possible increases in demand for electricity from structural changes in power use, such as a move to use of electric vehicles.

The Government has committed to a programme to roll out smart meters to every consumer by the end 2020. It is anticipated that this will require an £8 billion private sector investment.

DEVELOPING NEW TECHNOLOGIES

Direct funding for innovation will be provided through the Energy Technologies Institute (ETI), which aims to invest up to £1 billion over the next 10 years in low carbon energy technologies, including networks. The Government is engaging with the recently established ETI networks panel that is scoping the objectives they set for a call for projects.

THE RENEWABLE HEAT INCENTIVE

The Renewable Heat Incentive is to provide financial assistance to generators of renewable heat, and producers of renewable biogas and biomethane. Details of the scheme have not yet been however the following will be key features:

+ It is expected that the incentive will apply to generation of renewable heat at all scales, whether it is in households, communities or at industrial scale.
+ The incentive should also cover a wide range of technologies including biomass, solar hot water, air- and ground-source heat pumps, biomass CHP, biogas produced from anaerobic digestion, and biomethane injected into the gas grid.
+ The RHI will be banded for example by size or technology (e.g. larger scale biomass heat may require less support per MWh than others).
+ It is anticipated that the incentive payments will be funded by a levy on suppliers of fossil fuels for heat. These are mainly licensed gas suppliers but also include suppliers of coal, heating oil and LPG. The aim is to have the RHI in place by April 2011.

FUTURE POLICY

FEED IN TARIFFS

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 and will:

+ Engage communities, businesses and domestic households in the fight against climate change.
+ Reduce reliance on centrally generated electricity.
+ Increase security of supply.
+ Reduce losses through transmission and distribution networks.

Small-scale low-carbon electricity technologies include:

+ Wind.
+ Solar photovoltaics (PV).
+ Hydro.
+ Anaerobic digestion.
+ Biomass and biomass combined heat and power (CHP).
+ Non-renewable micro-CHP.

FITs will guarantee a price for a fixed period for electricity generated using small-scale low carbon technologies. The Government is committed to having FITs in place in April 2010.

FUTURE POLICY

BUILDING REGULATIONS REVIEW

Progress towards the ‘zero carbon’ standard will be made through the progressive tightening of the Building Regulations and the Government recently set out proposals for the first step of 25% improvement in 2010, and by 44% by 2013 compared to 2006 regulations.

New homes will be built to a zero carbon standard from 2016 and non-domestic by 2019, meaning that their net carbon emissions over a year will be zero. This will require high standards of energy efficiency. Any remaining carbon that is not abated onsite will need to be dealt with, although in what way is still to be specified.

As for new non-domestic buildings, the zero carbon targets are slightly different. 2016 for schools (which are being dealt with outside Communities and Local Government), 2018 for public sector buildings and 2019 for all other non-domestic buildings. However, the approach to meeting the zero carbon target for non domestic buildings is similar to that of domestic buildings.

The approach to meeting the non-domestic zero carbon target is currently at the consultation stage. The current approach to maximise the volume in the allowable solutions market and to make it easier for developers, particularly in mixed use schemes, is that the government intend to have a common approach to allowable solutions for homes and non-domestic buildings. We will be seeking to develop a single system for delivery and assurance and we will expect the same allowable solutions to be available for all types of development.

FUTURE POLICY

COMMUNITY FUNDING

The Government have proposed a Community Energy Saving Programme (CESP). The broad policy proposals for the design of the programme include:

+ Placing a further obligation on energy suppliers and electricity generators to meet a CO2 reduction target by providing energy efficiency measures to domestic consumers.
+ Requiring that this obligation is met by providing these measures to households in areas with high levels of low incomes.
+ To offer these measures as a package to homes, to deliver a 'whole house approach' – so that homes can receive all the major energy efficiency measures they need, which could also include district heating schemes.
+ Specifying that only certain measures are eligible to count towards the CO2 targets, focusing on those measures that can make a substantial difference to a household emissions and fuel bills.

In addition the Government are extending the remit of Carbon Emissions Reduction Target (CERT) and the basket of measures that can be offered through this programme – potentially to include more small scale renewables. CERT is the Government's flagship household sector energy and carbon saving scheme, which is an existing obligation on energy suppliers to meet household carbon saving targets.

This gives effect to a key element of the Prime Minister's £1 billion Home Energy Saving Programme.

The Government propose to:

+ Increase the overall lifetime carbon saving target on household energy suppliers by 20 per cent.
+ Provide new incentives to encourage the installation of loft insulation.
+ Encourage energy suppliers to promote Real Time Energy Display devices and provide face to face energy-related advice by giving these measures a pre-determined carbon score.
+ Allow suppliers to meet a greater percentage of their targets through innovative measures.
+ In addition, the Government are considering piloting a move from upfront payment to 'pay as you save' models of long-term financing for energy saving, so it will be more affordable to make the changes needed to make the whole house low carbon.
+ Introducing "clean energy cash-back" schemes so that people, businesses and

EPBD RECAST 2010

Consultation is underway to determine the exact nature of the proposed recast of the European Performance of Buildings Directive. It is thought likely that the following elements will be adopted from December 2010:

+ Dropping of the 1,000m^2 threshold to 250m^2.
+ Clarification of "buildings frequently visited by the public" for a display of an Energy Performance Certificate (EPC).
+ A requirement for effective control systems and penalties for non-compliance.
+ A requirement for public buildings to implement all measures identified for improvement.

CARBON REDUCTION COMMITMENT

The CRC will be a mandatory emissions trading scheme for the UK. It will create a new carbon market worth around £600 million per year by putting a price on carbon dioxide (CO_2) emissions from energy use. This price will start at £12 per tonne, but is likely to rise in later years as emissions caps take hold. The revenues the Government receives from the sale of emissions allowances will be returned to participants in relation to their position in a league table. If you reduce emissions you can profit, but if your emissions increase you will lose out. How you perform relative to other participants will be published by the Government every year, so this will have implications for public image.

Future Policy

Integrated Regional Strategy for Yorkshire and the Humber

An Integrated Regional Strategy (IRS) for Yorkshire and the Humber is currently under development. This strategy is being design to delivery sustainable economic growth in the Region over a period of 15 to 20 years.

One of the topics that will be covered by the IRS is how climate change and energy needs will be addressed within the region.

It is intended that the IRS will be built on robust evidence, which will then be used to develop draft policy options. The evidence base work carried out over the development of York's Local Development Framework will be important in the process of developing the IRS, as the regional evidence base will be built from local information. This local information will be joint together with other local data from across the region to develop the regional view.

REGIONAL WORK

In recent years there have been a number of studies carried out in the Yorkshire and Humber region that have considered renewable energy.

These studies have had varying aims – to assess the region's potential for renewable energy, to suggest realistic targets or to act as guidance to support the development of renewable energy. It is important to review and understand previous guidance and studies, in addition to the policy context for renewables, to understand where gaps may exist.

DEVELOPMENT OF A RENEWABLE ENERGY ASSESSMENT AND TARGETS FOR YORKSHIRE AND THE HUMBER

In 2002 AEA carried out a renewable energy assessment for the Government Office for Yorkshire and the Humber and the Yorkshire and Humber Assembly. The study aimed to assess renewable energy across Yorkshire and Humber and develop targets for 2010 and 2021. This study built upon the Department of Trade and Industry's (DTI) Lancashire and Yorkshire Renewable Energy Study (LYREPS) and involved a review of the policy context and the technical opportunities, as well as stakeholder consultation.

The report suggested a target for the region of 674MW by 2010 (9.4% of the region's electricity distribution), with 183MW of this being new capacity in North Yorkshire and 53MW being all existing regional renewable energy capacity. A target of 1,850MW was suggested for 2021 (22.5% of the region's electricity distribution). The report indicated that these targets would be challenging, but could be met with a strong mix of technologies including:

- Offshore wind farms.
- Onshore wind turbines (combination of single turbines, clusters and wind-farm developments).
- Large and medium scale biomass, including co-firing within existing power plants.
- Photovoltaic (PV) power in domestic and commercial buildings.
- Combined heat and power.
- Wave energy projects.

REGIONAL WORK

Suggested Renewable Energy Targets

ELECTRICITY SOURCE	TARGET YEAR	YORKSHIRE AND HUMBER TARGET (MW)	NORTH YORKSHIRE TARGET (MW)
GRID CONNECTED WIND ENERGY	2010	55 – 280	38.5 – 133
	2021	280 – 700	NOT INDICATED
WOOD BIOMASS PLANTS	2010	42 – 72	0 – 25
	2021	90 – 230	NOT INDICATED
SMALL HYDRO POWER SCHEMES	2010	1 – 3	0.6 – 2.2
	2021	3 – 5	NOT INDICATED
PHOTOVOLTAIC POWER SCHEMES (DWELLINGS)	2010	2.2 – 10.5	0.34 – 1.6
	2021	10.5 – 142	NOT INDICATED
PHOTOVOLTAIC POWER SCHEMES (COMMERCIAL)	2010	1 – 3.1	0.1 – 0.4
	2021	3.1 – 6.5	NOT INDICATED
PHOTOVOLTAIC POWER SCHEMES (MOTORWAY)	2010	0 – 2.4	0
	2021	2.4 – 6.4	NOT INDICATED
LANDFILL GAS SCHEMES	2010	UP TO 56	UP TO 3.2
	2021	0 – 28	NOT INDICATED
MUNICIPAL WASTE COMBUSTION SCHEMES	2010	22.3 – 36.6	0
	2021	0 – 36.6	NOT INDICATED

The report also estimates that approximately 2,250 jobs could be created in the region through the development of wind and biomass prospects alone.

One issue that was identified within this study was that wind energy projects in the region tended to have a relatively low rate of planning success due to lack of consistency in the planning systems treatment of these.

The need for a region-wide Action Plan to help focus the effort of various regional parties was identified. An outline plan, along with twenty short-term actions and appropriate measures, was suggested to help the region move towards achieving its targets.

Regional Work

Planning for Renewable Energy Targets in Yorkshire and Humber

Following on from the 2002 renewable energy assessment, AEA was commissioned to undertake a second piece of work to provide a more detailed, local level assessment in consultation with local authorities. Targets and appropriate development criteria to 2010 and 2021 were to be developed for the sub-regional and local level. In addition, methodologies would be developed to allow local authorities to develop their own targets.

Refined potentials were developed at both the local authority level and at the sub-regional level for a range of technologies. Relevant targets for the region, sub-region of North Yorkshire and for York can be summarised as follows:

Targets for the sub-region of Humber and for York.

		Estimated Potential (MW) 2010	Estimated Potential (MW) 2021
Yorkshire and Humber	Total	702	1,850
North Yorkshire sub-region	Total	209	361
York	Wind	10	15
	Biomass Wood	-	2.2
	Co-firing / Biomass	-	7.2
	Hydro	0.90	0.90
	PV	0.32	5.9
	Total	**11.2**	**31.3**

This report also illustrated that the 2010 estimated potential for the North Yorkshire region is 15MW higher than the 194MW target that was defined in the 2004 Regional Spatial Strategy (RSS). The report suggested that York's contribution to the 194MW renewable energy RSS target for 2010 should be 11MW. No 2021 targets were given in the report, but it was indicated that North Yorkshire's 2021 potential is 350MW.

The report noted that York is one of the smaller local authority districts in the region, with a below average population. The rural land surrounding the city is classified as having a high sensitivity to wind development and hence wind developments are likely to be on a small scale on appropriate pockets of land. This reduces York's overall potential to generate renewable energy.

The report also notes that built-up areas in York provide opportunities for exploiting PV technologies and this should provide a significant contribution to the 2010 target. Biomass and PV technologies are expected to be more significant by 2021. York has

Regional Work

Guidance for local planning authorities on taking forward renewable energy developments

This information pack was developed by the Government Office for the North East and Yorkshire and the Humber, to be used as a planning guide to handling renewable energy development. A pilot was to be carried out with Wear Valley District Council and Sedgefield Borough Council.

Three key information areas are covered in this information pack. First, a background to renewable energy is given, including the regional perspective. Secondly the pack looks at renewable energy in practice, including local and regional impacts, site selection factors and issues, good practice for consultation and case studies. Finally, guidance on planning for the key technologies, including an understanding of the role of trade associations, main consultees and good practice in local plan approaches.

Other useful information provided in the pack includes:

- Site selection factors and issues that can dominate planning applications for onshore wind, offshore wind, wave and tidal, hydropower and biomass/energy crops.
- Best practice advice for consultation and lists statutory, non statutory and community stakeholders.
- An overview of PPS22, including advice on the policies in regional planning guidance and development plans

Renewable Energy Toolkit; A guide for local authority planners in Yorkshire and Humber

The guide for local authority planners in Yorkshire and Humber provides more recent information relating to decentralised, renewable and low carbon energy development.

It provides an overview of national and regional requirements, as well as information on responsibilities and what is required in terms of local policies and development control.

The guide includes information on the requirements of an evidence base, as indicated in Planning Policy Statement 1's Supplement on Planning and Climate Change, as well as on the setting of targets, policies and measures. Monitoring and review of progress and performance is also discussed.

The later stages of the guide discusses mechanisms, other than planning policy, which can be used to help deliver a low carbon economy and provides advice on engaging with various stakeholders. This is followed by technical guidance and a series of case studies. No specific quantified potential targets are set out.

Regional Work

Delivering Sustainable Energy in North Yorkshire

Delivering Sustainable Energy in North Yorkshire was completed in 2005 and provided York with their Regional Spatial Strategy renewable energy targets.

This document makes recommendations on planning policy to encourage the appropriate development of sustainable energy within North Yorkshire. The focus of the guidance was:

- *Developing positive planning policies within Local Development Documents covering: sustainable energy use, integration of renewables within buildings; and stand alone renewable energy and combined heat and power (CHP) developments;*
- *Implementing and monitoring sustainable energy policy objectives;*
- *Understanding the landscape sensitivity of areas within North Yorkshire to renewable energy developments; and*
- *Assessing renewable energy proposals in relation to their impact on landscape character.*

Nine recommendations are set out for creating a positive local planning policy framework for sustainable energy. Those relating specifically to renewable and low carbon energy options are:

+ Recommendation 5 of the document states that all developments with a floor space above 1,000m^2, or ten or more residential units, should incorporate onsite renewable energy to reduce CO_2 by at least 10%.
+ Recommendation 6 of the document guides guidance on drafting conditions relating to securing onsite renewable generation.
+ Recommendation 7 sets out a range of recommendations on stand-alone renewable energy criteria base policies.
+ Recommendation 8 gives guidance on policies for Combined Heat and power (CHP).

Policy Implications

Policy Implications & Priorities for York

The implications of climate change on Council service areas will be wide ranging, from the built environment to community, energy and economy to environment and public health.

Legislation and support surrounding tackling climate change is also moving at a fast pace.

Planning authorities have a responsibility to tackle climate change and a robust evidence base must be developed by York to help set local planning policy. When developing local planning policy, it is imperative that York ensure the following priorities from national and regional policy are taken into account:

+ The government has set a target that all new homes should be zero carbon by 2016. These targets cannot be delivered by energy efficiency improvements alone.
+ Under the Sustainable Energy Act 2003, governments in England and Wales may direct energy conservation authorities to make improvements to energy efficiency in residential accommodation.
+ The Climate Change and Sustainable Energy Act 2006 aims to enhance the UK's contribution to combating climate change and is also aimed at alleviating fuel poverty and securing diverse and long term energy supplies for the UK. The Climate Change Act 2008 puts into statute the UK's targets to reduce carbon dioxide emissions through domestic and international action by at least 80% (once 60%) by 2050 and at least 26% by 2020 (currently under revision), against a 1990 baseline.
+ The Energy Act, along with the Planning Act 2008 and Climate Change Act 2008, ensures that legislation underpins the UK's long-term energy and climate change strategy.
+ The Code measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package. Since May 2008 all new homes are required to have a Code rating against the Code.
+ York's performance against National Indicators 185, 186 and 188 will be impacted by the outputs and results of this work.
+ This study will aid York in contributing to further national strategies such as The Renewable Energy Strategy, The UK Biomass Strategy 2007, The Microgeneration Strategy 2006, The England Woodfuel Strategy 2007 and The Draft Heat and Energy Saving Strategy.
+ The 2008 Regional Spatial Strategy (RSS) and its policies have explored and

Policy Implications

Policy Implications & Priorities for York

- Section 6 of the RSS is concerned specifically with the York sub-region.
- The RSS identifies indicative local targets for installed grid-connected renewable energy in 2010 and 2021. Policy ENV5 sets out targets for sub-regions of Yorkshire and the Humber. For York, the targets are 11 MW installed capacity by 2010 and 31 MW installed capacity by 2021.
- York has other policy guidance and direction in the Yorkshire and Humber Regional Economic Strategy, and the Regional Energy Infrastructure Strategy.

A range of mechanisms can be used to plan and deliver decentralised and renewable or low carbon energy, but planners need to be clear about where planning can add value and where regulation is more suitable.

Monitoring will inevitably be vital to the success of any strategy, to keep track of progress against the measures of success and objectives. As a minimum, monitoring should comprise:

- An annual progress report to keep up to date with the latest climate science, legislation and initiatives and local case studies.
- Confirmation of installation of technologies and compliance.
- Data on actual renewable and low carbon energy output, measured on an annual basis.

In order to ensure that York meet the requirements of national planning policy, the table in **Appendix 1** will be used as a compliance matrix. This will test the compliance of City of York Council against the relevant requirements of PPS1, PPS3 and PSS22 using PPS12's tests of soundness. This tool will be used throughout the project lifetime to ensure that recommendations and policy suggestions comply with national policy.

GAP ANALYSIS

IDENTIFIED & QUANTIFIED POTENTIAL
BUSINESS AS USUAL SCENARIO

IDENTIFIED AND QUANTIFIED ASSESSMENT OF POTENTIAL

As shown, various documents have assessed the potential to utilise renewable and low-carbon energy sources in both the Yorkshire and Humber region and York.

The most significant targets for York are those detailed in the Regional Spatial Strategy (RSS). This is to achieve 11 MW installed grid connected electricity by 2010 and 31 MW by 2021.

It is anticipated that a heat target will be set out within a similar legislative framework, but this is not quantifiable at this time.

BUSINESS AS USUAL SCENARIO

SCHEMES IN PLACE AND PIPELINED

In order to determine how far York is towards meeting these targets, the tables below look at the capacity of operational, planned and pipeline developments and schemes.

Renewable Energy Schemes/Developments in Place

TECHNOLOGY / FUEL	OPERATOR / DEVELOPER / COMPANY	LOCATION / NAME	CAPACITY (MW)
LANDFILL GAS	YORWASTE LTD/BIOGAS	HAREWOOD WHIN LANDFILL SITE	2.37

Source: 2008 RESTATS database and City of York Council

GAP ANALYSIS

Renewable Energy Schemes/Developments Planned/Pipelined

TECHNOLOGY / FUEL	LOCATION / NAME	CAPACITY (MW)
BIOMASS	LAND TO THE WEST OF METCALFE LANE	1.644
BIOMASS	HAREWOOD WHIN, TINKER LANE, RUFFORTH	2.5
BIOMASS	PROPOSED UNIVERSITY CAMPUS BETWEEN FIELD LANE & LOW LANE	0.25
WIND	LINK HALL, WHELDRAKE LANE, CROCKEY HILL	0.0015
WIND	TESCO STORES LTD STIRLING ROAD, YORK	0.006
WIND	TESCO, TADCASTER ROAD, DRINGHOUSES	0.006
LANDFILL GAS	HAREWOOD WHIN LANDFILL SITE, TINKER LANE, RUFFORTH	0.2
TOTAL		4.6075

Source: City of York Council

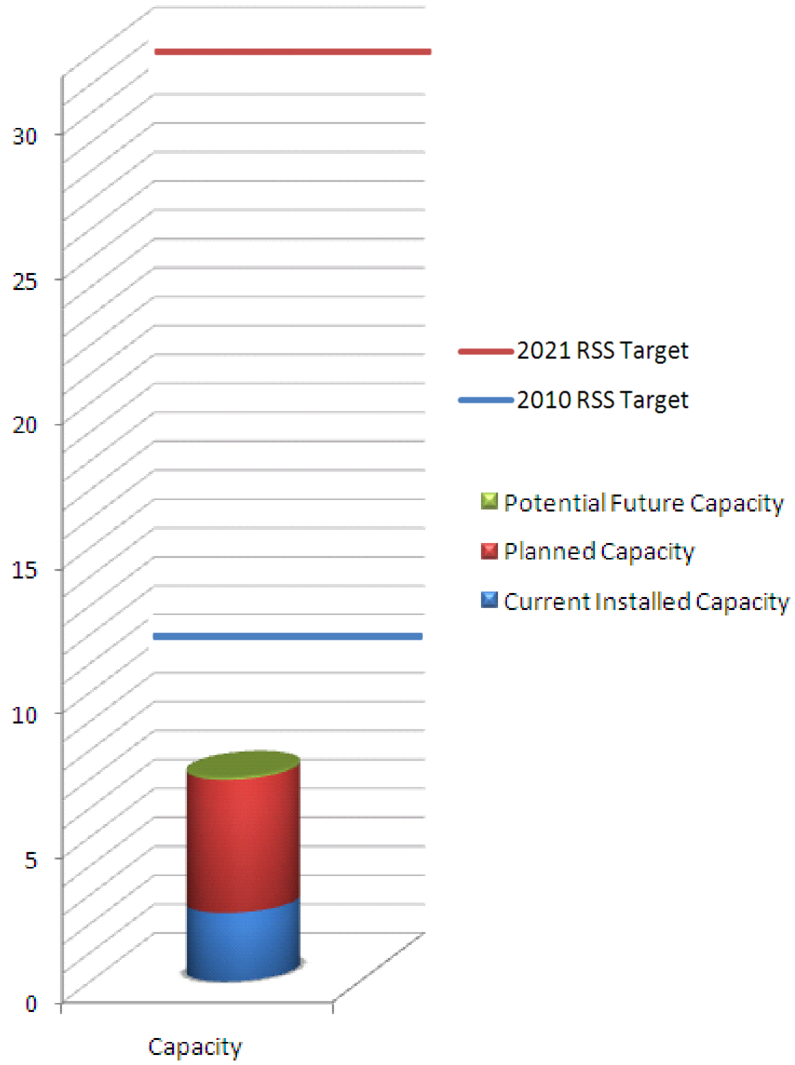
Potential Future Renewable Energy Schemes/Developments

TECHNOLOGY / FUEL	LOCATION / NAME	CAPACITY (MW)
WIND	POPPLETON JUNIOR FOOTBALL CLUB	0.015
SOLAR	POPPLETON JUNIOR FOOTBALL CLUB	0.0036
BIOMASS	POPPLETON JUNIOR FOOTBALL CLUB	0.06
TOTAL		0.0786

Source: City of York Council

GAP ANALYSIS

The figure below shows how far installed, pipelined and potential future capacity will go towards meeting York's 2010 and 2021 targets.



The potential for meeting any shortfall via small-scale renewables within the domestic sector of new developments will be investigated in later stages of this project.

Appendices

Appendix 1: Energy Efficiency and Renewable Energy Evidence Base: Key Requirements

Appendix 1

Energy Efficiency and Renewable Energy Evidence Base: Key Requirements

Ref.	Requirement	Recommended response	PPS12 tests of soundness		
			Justified Founded on a robust and credible evidence base The most appropriate strategy when considered against alternatives	**Effective** Deliverable Flexible Able to be monitored	**Consistent with national policy** In accordance with LDS Has regard to national policy In general conformity with RSS Has regard to the York SCS

	PPS1: DELIVERING SUSTAINABLE DEVELOPMENT				
13 (ii)	... local planning authorities should ensure that development plans contribute to global sustainability by addressing the causes and potential impacts of climate change - through policies which reduce energy use, reduce emissions ... promote the development of renewable energy resources, and take climate change impacts into account in the location and design of development.				
20.	Development plan policies should take account of environmental issues such as mitigation of the effects of, and adaptation to, climate change through the reduction of greenhouse gas emissions and the use of renewable energy ...				
22.	Development plan policies should seek to minimise the need to consume new resources over the lifetime of the development by making more efficient use or reuse of existing resources ... and should seek to promote and encourage, rather than restrict, the use of renewable resources (for example, by the development of renewable energy) ... local authorities should promote resource and energy efficient buildings; community heating schemes, the use of combined heat and power, small scale renewable and low carbon energy schemes in developments ...				
30.	... Planning policies should not replicate, cut across, or detrimentally affect matters within the scope of other legislative requirements, such as those set out in Building Regulations for energy efficiency.				

32 (iii)	Planning authorities should ... seek to integrate the wide range of activities relating to development and regeneration. Plans should take full account of other relevant strategies and programmes and, where possible, be drawn up in collaboration with those responsible for them.				
36.	Key objectives for design and access policies include ensuring that developments are sustainable, durable and adaptable and make efficient and prudent use of resources ...				
41.	One of the principles of sustainable development is to involve the community in developing the vision for its area. Communities should be asked to offer ideas about what that vision should be, and how it can be achieved				
	PPS1: PLANNING AND CLIMATE CHANGE - SUPPLEMENT TO PPS1				
Intro	Where there is any difference in emphasis on climate change between the policies in this PPS and others in the national series this is intentional and this PPS takes precedence.				
9.	planning authorities should prepare, and manage the delivery of, spatial strategies that make a full contribution to delivering the Government's Climate Change Programme and energy policies, and in doing so contribute to global sustainability ...				

10.	Regional planning bodies and all planning authorities should apply the following principles in making decisions about their spatial strategies ... – new development should be planned to make good use of opportunities for decentralised and renewable or low carbon energy ...				
11.	Planning authorities should adhere to the following principles in determining planning applications: – controls under the planning, building control and other regulatory regimes should complement and not duplicate each other ...				
18.	Planning authorities should consider the opportunities for the core strategy to add to the policies and proposals in the RSS, such as where local circumstances would allow further progress to be made to achieving the Key Planning Objectives set out in this PPS. In doing so, the core strategy should be informed by, and in turn inform, local strategies on climate change including the sustainable community strategy.				
19.	In developing their core strategy and supporting local development documents, planning authorities should provide a framework that promotes and encourages renewable and low carbon energy generation. Policies should be designed to promote and not restrict renewable and low-carbon energy and supporting infrastructure.				

20 a	In particular, planning authorities should ... not require applicants for energy development to demonstrate either the overall need for renewable energy and its distribution, nor question the energy justification for why a proposal for such development must be sited in a particular location;				
20 b	– ensure any local approach to protecting landscape and townscape is consistent with PPS22 and does not preclude the supply of any type of renewable energy other than in the most exceptional circumstances;				
20 c	– alongside any criteria-based policy developed in line with PPS22, consider identifying suitable areas for renewable and low-carbon energy sources, and supporting infrastructure, where this would help secure the development of such sources, but in doing so take care to avoid stifling innovation including by rejecting proposals solely because they are outside areas identified for energy generation; and				
20.d	– expect a proportion of the energy supply of new development to be secured from decentralised and renewable or low-carbon energy sources.				
21.	Planning authorities should give positive consideration to the use of local development orders (LDO) to secure renewable and low-carbon energy supply systems.				
24.	In selecting land for development, planning authorities should take into account the extent to which existing or planned opportunities for decentralised and renewable or low-carbon energy could contribute to the energy supply of development ...				

26	Planning authorities should have an evidence-based understanding of the local feasibility and potential for renewable and low-carbon technologies, including microgeneration, to supply new development in their area. This may require them, working closely with industry and drawing in other appropriate expertise, to make their own assessments. Drawing from this evidence-base, and ensuring consistency with housing and economic objectives, planning authorities should:				
26(i)	- Set out a target percentage of the energy to be used in new development to come from decentralised and renewable or low carbon energy sources where it is viable. The target should avoid prescription on technologies and be flexible in how carbon savings from local energy supplies are to be secured;				
26(ii)	where there are particular and demonstrable opportunities for greater use of decentralised and renewable or low-carbon energy than the target percentage, bring forward development area or site-specific targets to secure this potential;				
26(iii)	In bringing forward targets, set out the type and size of development to which the target will be applied;				
26(iv)	In bringing forward targets, ensure there is a clear rationale for the target and it is properly tested				

27.	In considering a development area or site-specific target, planning authorities should pay particular attention to opportunities for utilizing existing decentralised and renewable or low-carbon energy supply systems and to fostering the development of new opportunities to supply proposed and existing development. Such opportunities could include co-locating potential heat customers and heat suppliers. Where there are existing decentralised energy supply systems, or firm proposals, planning authorities can expect proposed development to connect to an identified system, or be designed to be able to connect in future. In such instances and in allocating land for development, planning authorities can set out how the proposed development would be expected to contribute to securing the decentralised energy supply system from which it would benefit.				
28.	When specifying requirements for new development to secure energy from decentralised and renewable or low-carbon energy sources, planning authorities can set specific requirements to facilitate connection. Any requirement must be fair and reasonable and, in particular, not restrict those with responsibility for providing energy to new development, or the occupiers, to any one energy provider in perpetuity.				
30.	... planning policies should support innovation and investment in sustainable buildings and should not, unless there are exceptional reasons, deter novel or cutting-edge developments. Planning authorities should help to achieve the national timetable for reducing carbon emissions from domestic and non-domestic buildings				

31.	There will be situations where it could be appropriate for planning authorities to anticipate levels of building sustainability in advance of those set out nationally. When proposing any local requirements for sustainable buildings planning authorities must be able to demonstrate clearly the local circumstances that warrant and allow this. These could include, for example, where:				
31 a	– there are clear opportunities for significant use of decentralised and renewable or low carbon energy; or				
31 b	– without the requirement, for example on water efficiency, the envisaged development would be unacceptable for its proposed location.				
32 a	When proposing any local requirement for sustainable buildings planning authorities should: - focus on development area or site-specific opportunities;				
32 b	- specify the requirement in terms of achievement of nationally described sustainable buildings standards, for example in the case of housing by expecting identified housing proposals to be delivered at a specific level of the Code for Sustainable Homes;				
32.c	- ensure the requirement is consistent with their policies on decentralised energy; and				

32.d	– not require local approaches for a building's environmental performance on matters relating to construction techniques, building fabrics, products, fittings or finishes, or for measuring a building's performance unless for reasons of landscape or townscape.				
33.	Any policy relating to local requirements for decentralised energy supply to new development or for sustainable buildings should be set out in a DPD, not a supplementary planning document, so as to ensure examination by an independent Inspector.				
33 a	In doing so, planning authorities should: - ensure what is proposed is evidence-based and viable ...				
33 b	demonstrate that the proposed approach is consistent with the housing supply trajectory required by PPS3, and does not inhibit the provision of affordable housing;				
33 c	set out how they intend to advise potential developers on the implementation of the local requirements, and how these will be monitored and enforced.				
34.	... Annual monitoring should assess progress against the objectives of this PPS and be integrated with monitoring of housing delivery and other policies. Annual monitoring reports should describe performance and, as necessary, the action intended to improve implementation or to update the strategy.				

36.	There should be clear and workable arrangements to ensure close links between the production of regional and local monitoring reports.				
37.	Reviews should reflect future updates to the national Climate Change Programme, developments in climate modelling and prediction, be sensitive to scientific and technological developments, and be carried out at least every five years				
41.	Where possible, planning authorities should make use of Design and Access Statements to obtain from applicants the information necessary to show how their proposed development will contribute to the Key Planning Objectives set out in this PPS and relevant RSS and DPD policies consistent with this PPS.				
	PPS3: HOUSING				
38.	Local Planning Authorities should, working with stakeholders, set out the criteria to be used for identifying broad locations and specific sites taking into account ... The contribution to be made to cutting carbon emissions ... where (development) can readily and viably draw its energy supply from decentralised energy supply systems based on renewable and low-carbon forms of energy supply, or where there is clear potential for this to be realised ...				

	PPS22: RENEWABLE ENERGY				
1(ii)	Regional spatial strategies and local development documents should contain policies designed to promote and encourage, rather than restrict, the development of renewable energy resources. Regional planning bodies and local planning authorities should recognise the full range of renewable energy sources, their differing characteristics, locational requirements and the potential for exploiting them subject to appropriate environmental safeguards.				
1(iii)	At the local level, planning authorities should set out the criteria that will be applied in assessing applications for planning permission for renewable energy projects. Planning policies that rule out or place constraints on the development of all, or specific types of, renewable energy technologies should not be included in regional spatial strategies or local development documents without sufficient reasoned justification.				
1(v)	Regional planning bodies and local planning authorities should not make assumptions about the technical and commercial feasibility of renewable energy projects (e.g. identifying generalised locations for development based on mean wind speeds).				
1(vii)	Local planning authorities, regional stakeholders and Local Strategic Partnerships should foster community involvement in renewable energy projects				

6.	Local planning authorities should only allocate specific sites for renewable energy in plans where a developer has already indicated an interest in the site, has confirmed that the site is viable, and that it will be brought forward during the plan period. Planning applications for renewable energy projects should be assessed against specific criteria set out in regional spatial strategies and local development documents. Regional planning bodies and local planning authorities should ensure that such criteria-based policies are consistent with, or reinforced by, policies in plans on other issues against which renewable energy applications could be assessed.				
7.	Criteria based policies should be set out in regional spatial strategies ... Other criteria based policies to reflect local circumstances should be set out by local planning authorities in their LDDs. Local planning authorities should, however, only focus on the key criteria that will be used to judge applications. More detailed issues may be appropriate to SPD.				
8.	Local planning authorities may include policies in local development documents that require a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments.				
8(i).	Such policies should ensure that requirement to generate on-site renewable energy is only applied to developments where the installation of renewable energy generation equipment is viable given the type of development proposed, its location, and design;				

8(ii).	Such policies should not be framed in such a way as to place an undue burden on developers, for example, by specifying that all energy to be used in a development should come from on-site renewable generation.				
12.	Regional planning bodies and local planning authorities should set out in regional spatial strategies and local development documents the criteria based policies which set out the circumstances in which particular types and sizes of renewable energy developments will be acceptable in nationally designated areas. Care should be taken to identify the scale of renewable energy developments that may be acceptable in particular areas ...				
14.	local planning authorities should not create “buffer zones” around international or nationally designated areas and apply policies to these zones that prevent the development of renewable energy projects.				
16 a	As most renewable energy resources can only be developed where the resource exists and where economically feasible, local planning authorities should not use a sequential approach in the consideration of renewable energy projects (for example, by giving priority to the re-use of previously developed land for renewable technology developments).				

16 b	However, in preparing local development documents and in discussions with developers, planning authorities should recognise that some previously developed sites, whilst being unsustainable in terms of other land uses (e.g. a site in a remote location unsuitable for housing) may offer opportunities for developing some forms of renewable energy projects				
18.	Local planning authorities and developers should consider the opportunity for incorporating renewable energy projects in all new developments. (and) should specifically encourage such schemes through positively expressed policies in local development documents.				
19.	... Policies in local development documents should address the minimisation of visual effects (e.g. on the siting, layout, landscaping, design and colour of schemes).				
22.	Local planning authorities should ensure that renewable energy developments have been located and designed in such a way to minimise increases in ambient noise levels. Plans may include criteria that set out the minimum separation distances between different types of renewable energy projects and existing developments. The 1997 report by ETSU for the Department of Trade and Industry should be used to assess and rate noise from wind energy development.				
23.	In cases where odour would have an impact, such plants should not be located in close proximity to existing residential areas.				

24.	For biomass projects, the need to transport crops (has) the potential to lead to increases in traffic. Local planning authorities should make sure that the effects of such increases are minimised by ensuring that generation plants are located in as close a proximity as possible to the sources of fuel that have been identified. But in determining planning applications, planning authorities should recognise that there are other considerations (such as connections to the Grid and the potential to use heat generated from the project) which may influence the most suitable locations for such projects.				
25.	For wind turbines, local development documents should (not) include policies in relation to separation distances from power lines, roads, and railways. It is the responsibility of developers to address any potential impacts,				

ANNEX 2 – SUMMARY OF PPS REQUIREMENTS

Principal requirements from relevant Planning Policy Statements

This appendix contains a summary of the principal requirements from PPS1 and its supplement, PPS3 and PPS22.

PPS1	PPS1 CCS	PPS3	PPS2 2	Ref.	PPS requirement
13(ii). 20. 22. 36.	9.	38.	1(ii). 18.	1.	Development plans should address climate change and promote energy efficiency (EE) and renewable energy (RE) use.
22.	19.		1(ii). 18.	2.	Development plans should promote and encourage, rather than restrict, the use of renewable resources
30.	11.			3.	Planning policies should not conflict with the Building Regulations or other legislative requirements
32(ii).				4.	Integrate sustainable energy policies with other development and regeneration policies
36.	41.			5.	Design and Access Statements can be used to show how policy objectives will be met.
41.		38.	1(vii).	6.	Importance of community involvement
	9. 30. 37.			7.	Plans should make a full contribution to delivering the government's Climate Change Programme and energy policies
	10. 24. 28.		18.	8.	Plans should make good use of opportunities for decentralised, renewable and low carbon energy in new development
	18.			9.	LDFs should build upon RSS, SCS and local climate change strategies
	20(a) .			10.	LPAs should not require energy developers to demonstrate need.
	20(b) .		19.	11.	Landscape and townscape protection should be consistent with PPS22 and not restrictive
	20(c).		1(iii). 6. 7.	12.	Policies should be criteria-based but can identify suitable areas or sites for RE if there is clear certainty that an RE project will come forward.

	20(d). 26-28.	38.	8.	13.	LPAs can set targets for the proportion of energy supply in new development to come from decentralised, renewable and low carbon energy sources, where there are clear opportunities, with specific requirements to facilitate connection
	21.			14.	Consider using LDOs for decentralised, renewable and low carbon energy
	26.			15.	LPAs should have an evidence-based understanding of renewable and low carbon energy
	27.			16.	Co-locate potential heat suppliers and customers
	30.			17.	Policies should support innovation in construction and support the national timetable for reducing carbon emissions from buildings
	31-33.			18.	LPAs can anticipate higher sustainability standards where there is clear and justified potential, on an area or site-specific basis, in a DPD
	34-36.			19.	Annual monitoring should assess against PPS1-CCS targets
			1(v)	20.	LPAs should not make assumptions about commercial and technical feasibility of RE projects
			12. 14.	21.	Identify criteria for the type and size of RE development in nationally designated areas, and do not create buffer zones around these areas
			16.	22.	LPAs should not use a sequential approach to site selection for RE projects, and should recognise the potential of remote brownfield sites
			22.	23.	RE development should be located and designed so as to minimise any increase in ambient noise levels
			23.	24.	RE plants that generate odour should not be located close to existing residential areas
			24.	25.	Ensure that any traffic increase associated with RE development is minimised,
			25.	26.	Policies should not specify minimum separation distances between wind turbines and power and transport infrastructure

ANNEX 3 – NEW DEVELOPMENT IN YORK

Planned residential and commercial development in York ◈ Estimates of future energy demand

The City of York's Core Strategy Preferred Options June 2009, details that the RSS requires:

- Development rate of 650 new homes per year from 2004 – 2008
- Development rate of 850 new homes per year 2008 – 2026

This amounts to a total upto 2030 of 21,260 homes; of which 7,818 have already been built or are in the process towards completion. Leaving a requirement for 13,442 homes by 2030.

At a rate of 850 new homes per year, this is assessed to give a value of 5,100 homes pre-2016 and the remainder of 8,322 to be delivered 2016 – 2030.

Electricity and heat demand for these properties have been estimated using the following assumptions.

Average electricity (kWh/yr) delivered in a UK household = 4,475.

Average heat energy (kWh/yr) delivered in a UK household = 10,000.

The figures for electricity have been calculated using UK Energy Statistics, while the figure for heat demand in a modern 3-bed house has been estimated, using AEA's knowledge of heat loads of modern buildings.

It should be noted that while estimates for future energy demand are based on current figures, energy demand is likely to reduce in future, as the Code for Sustainable Homes moves new development towards zero carbon. Therefore, levels of energy demand for developments opening post 2016 are not calculated, as all new developments post 2016 should be zero carbon. Table 1 shows the future energy demand calculations.

Table 1: Future housing energy demand

Development	House numbers	Electricity	Heat	
Development to 2011	1,700	7,607MWh	17,000MWh	Pre 2020
Development to 2016	3.400	15,215MWh	34,000MWh	
Development to 2021	2,746	Not calculated	Not calculated	Post 2020
Development to 2031	5,576			
Total	**13,422**	**22,822MWh**	**51,000MWh**	

Future employment sites and estimated employee numbers has also been provided by City of York council[1]. In order to calculate energy consumption from future commercial properties, the following assumptions have been made on the consumption per employee per year[2]:

[1] Source: City of York Council; Development sites for inclusion in future year York Saturn model (post 2008). Opening years of developments listed – 2011, 2016, 2021 and 2031.

[2] Source: DECC, High-level indicators of energy use at regional and local authority level, 2006 (figures for York used). http://www.decc.gov.uk/en/content/cms/statistics/regional/high_level/high_level.aspx

KWh electricity consumption = 5,500.

KWh gas consumption = 12,100.

Levels of energy demand for post 2019 are not calculated. Table 2 shows the future energy demand calculations.

Table 2: Future commercial energy demand

Development	Employee numbers	Electricity	Gas	Heat	
Employment to 2011	9,951	54,731	120,407	96,326	Pre 2020
Employment to 2016	1,458	8,019	17,642	14,113	
Employment to 2021	12,929	Not calculated	Not calculated	Not calculated	Post 2020
Employment to 2031	0				
Total	**24,338**	**62,750**	**138,049**	**110,439**	

ANNEX 4 – FEED IN TARIFFS

Feed in Tariffs.

Feed in tariffs (FITs) have been introduced as part of the Government's efforts to increase the amount of electricity generated from renewable sources. The UK has to generate up to 40% of its electricity from renewable sources by 2020 if it is to meet the EU targets. This represents a ten-fold increase in the next ten years[3]. The scenario the UK government is working towards to meet these targets allows for 2% of electricity to be generated from small scale renewables by 2020. This includes around 1 million solar PV installations (equivalent to 1 in 30 households) and more than 30,000 small wind turbines.

FITs have therefore been introduced to incentivise the uptake of small scale renewable technologies and help the government meet the UK's challenging targets.

FITs will be available to small scale low carbon electricity generators (<5MW). There are two key components to the FIT incentive:

- The generation tariff - this is a payment received for every kWh of electricity generation by an applicable technology (see section 3.3). This will be received by all eligible installations. The level of this tariff will vary depending on the size and type of technology and the date which it is installed. A summary of the generation tariffs which could be received is illustrated in the table below.
- The export tariff – this is received for any electricity which is exported to the grid and is paid over and above the generation tariff. There are two options under this - either a guaranteed flat rate of 3p/kWh or the producer can go with the open market value[4].
- In addition, savings can be achieved through reduced energy bills as less electricity will have to be purchased from an electricity supplier.

The tariffs available for the types and scales of electricity generation are available at http://www.fitariffs.co.uk/eligible/levels/

Once in a tariff level, the installation is locked into that tariff for either the lifetime of the tariff, or the lifetime of the technology - whichever is shorter. For a subset of the technologies, PV and wind, installations made at a later date may be subject to a reduced tariff. Tariffs will be exempt from income tax. This means that domestic users and other income tax payers will **not** be taxed for any income received from the Feed-In Tariffs or Renewable Heat Incentive. Companies will be subject to Corporation Tax on their tariff income.

The benefit of the incentive accrues to the owner of the property, so in different sectors the benefits accrue differently. Householders who retrofit will bear the capital cost as well as realise the benefits of the incentives and avoided fuel costs to set against this capex. Housing providers such as Local Authorities or other registered social landlords would bear the capital cost and realise the benefits of the incentive, but the tenant or householder would

[3] current renewables penetration is approximately 4%.

[4] in an arrangement with the relevant electricity supplier.

realise the avoided fuel costs. Developers who install technologies at the design/construction stages would face the capital cost (which would likely be lower than retrofit) but would accrue no benefit once the property is sold, with the new owner realising the benefits of the incentives and avoided fuel costs.

FITs will compliment the existing incentive mechanism, the Renewables Obligation (RO), which will continue to support large scale renewable generation. The new generation tariffs are generally higher than the equivalent incentives through the RO, though this depends on the capacity size and the market value of the ROC.

Feed in tariffs came into effect on the 1st of April 2010 in the UK for anyone who has or installs a renewable energy systems producing electricity from July 15th 2009. The FITs will provide long term incentive support. Most technologies will receive support for 20 years, but this will be 25 years for solar PV and 10 years for micro CHP, where that technology will be re-assessed.

ANNEX 5 – MCA SCORING MATRIX

The table below lays out how criteria were scored for the multi-criteria analysis

- Criteria with quantitative evidence have the evidence source and relevant figures cited.
- Criteria with qualitative evidence have the scoring rationale stated and then a comment on how this rationale applies to each technology.

Criteria \ Technology	Biomass (single building heating)	Biomass (district heating)	Biomass CHP	Hydropower	Large wind (>1.5MW)	Medium wind (500kW – 1.5MW)	Small and micro wind
High quality affordable housing	H	M	M	L	L	L	M
Rational	**Is a measure of the potential to alleviate fuel poverty in a cost effective manner, and he** **High score**: the most cost effective single building technologies, which have potential to reduce fuel o **Medium score**: single building technologies, which are less cost effective, but still have potential to reduce **Medium score**: district heating technology, which could alleviate fuel poverty **Low score**: large scale technologies that are not district or house **Evidence**: installation cost per kW, as used for renewable potential curve, used to d						
Technology comment	One of most cost effective single building technologies	District heating technology	District heating technology	Not typically house specific and micro hydro not particularly cost effective	Large scale technology	Large scale technology	Single building technology, but not particularly cost effective
Green infrastructure / open spaces	H	L	L	M	M	M	H
Rational	**Effect on green infrastructure will be related to land take from eac** **High score**: Single building technologies will have low impact on green infrastru						

Criteria \ Technology	Biomass (single building heating)	Biomass (district heating)	Biomass CHP	Hydropower	Large wind (>1.5MW)	Medium wind (500kW – 1.5MW)	Small and micro wind
CO_2 Savings	L	M	H	H	M	M	L
Rational	**Is a measure of a technologies carbon abatement potential and hence its impact in terms of cli** A combination of carbon offset by fuel displaced and typical load factor **High score**: technology has higher carbon saving potential per kW **Medium score**: technology has mid-range carbon saving potential per **Low score**: technology has lower carbon saving potential per kW						
Technology comment	Lower carbon offset potential	Mid range carbon offset potential	Higher carbon offset potential	Higher carbon offset potential	Mid range carbon offset potential	Mid range carbon offset potential	Lower carbon offset potential
Energy / heat delivered	L	H	H	M	H	H	L
Rational	**This is a measure of the relevant energy and heat that can be delivered** **High score**: Larger scale technologies will deliver relatively large amounts **Medium score**: Medium technologies or single building technologies which have a high typical load factor **Low score**: single building technologies with lower load factors will delivery lower a						
Technology comment	Single building technology with lower load factor	Large technology	Large technology	Medium technology	Large technology	Large technology	Single building technology with lower load factor
Natural resources and waste	M	L	L	H	H	H	H
Rational	This is a measure of fuel use and waste produced by certain tech **High score**: Technologies that produce energy/heat while using no finite natural resources a **Medium score**: Technologies that use some natural resources and produce son **Low score**: Technologies that use some natural resources and produce some waste, as well as having significant trans						
Technology comment	Some resource	Some resource use/waste, plus	Some resource use/waste, plus	No resource	No resource	No resource	No resource

Criteria / Technology	Biomass (single building heating)	Biomass (district heating)	Biomass CHP	Hydropower	Large wind (>1.5MW)	Medium wind (500kW – 1.5MW)	Small and micro wind	
Green jobs	L	H	H	M	H	M	L	
Rational	**Is a measure of potential for green job creation** **High score** technologies have high estimated employment worldwide and provide o **Medium score**: technologies have medium to high estimated employment worldwide, but do not **Low score**: technologies do not have significant employment figures globally and/or do not provide employ Employment figures: Green Jobs: Towards decent work in a sustainable, low-carbon world. Table 2, estimate http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---webdev/documents/							
Technology comment	Single building – no employment	1,174,000 employed globally	1,174,000 employed globally	39,000 plus employed globally	300,000 employed globally. Most job creation potential in large scale wind	300,000 employed globally. But less job creation potential than large scale wind	300,000 employed globally, but local, small scale technology	1
Capital costs	M	H	H	L	H	M	L	
Rational	**Is a measure of typical capital costs per kWh installe** **High score**: lower cost per kW installed **Medium score**: mid range cost per kW installed **Low score**: higher cost per kW installed **Evidence**: renewable energy cost curve data							
Technology comment	Capital costs mid-range	Capital costs at lower end of scale	Capital costs at lower end of scale	Capital costs at higher end of scale	Capital costs at lower end of scale	Capital costs mid-range	Capital costs at higher end of scale	
Commercial viability	M	L	L	H	M	M	L	
Rational	Is a measure of commercial viability, taking into account development risk, how proven the technology is **High score**: proven, lower risk technology with secure fuel so **Medium score**: newer technology, but with low risk or proven technology with high **Low score**: riskier and/or newer technology							

Criteria / Technology	Biomass (single building heating)	Biomass (district heating)	Biomass CHP	Hydropower	Large wind (>1.5MW)	Medium wind (500kW – 1.5MW)	Small and micro wind
Historic character and cultural heritage	M	M	M	H	M	M	L
Rational	**Cultural heritage effects are related to the impact each technology may have on designated bui** High score: technologies that have little or no impact. Medium score: technologies that may have some impact, depending on site circumstances and scale. This will include t external facade. Low score: technologies that are installed on buildings and would therefor						
Technology comment	Installed within buildings	Could have visual impact in cultural heritage areas depending on siting	Could have visual impact in cultural heritage areas depending on siting	Not installed near historic character and cultural heritage areas – should not imapct	Could have visual impact in cultural heritage areas depending on siting	Could have visual impact in cultural heritage areas depending on siting	Installed on building
Landscape and visual effects	H	L	L	M	L	L	M
Rational	**Landscape and visual effect are related to the visibility of each t** High score: technologies that have little or no visual impac Medium score: technologies that will have some visibility, but only in the i Low score: large or multi-building technologies that have a high vis						
Technology comment	Single building – no visibility	Visible from a distance	Visible from a distance	Visible locally	Visible from a distance	Visible from a distance	Visible locally

ANNEX 6 – INFORMATION ON BUILDING STANDARDS

Code for sustainable homes ◈ BRE Environmental Assessment Method ◈ Leadership in Energy and Environmental Design

DOMESTIC

CODE FOR SUSTAINABLE HOMES

In April 2007 the Code for Sustainable Homes (the Code) replaced Ecohomes for the assessment of new housing in England and Wales. The Code aims to protect the environment by providing guidance on the construction of high performance homes built with sustainability in mind. Authors of the Code have ensured that the Code addresses issues that emerged from an industry-wide consultation.

The Code is an environmental assessment method for new homes based upon the Building Research Establishment's (BRE's) Ecohomes and measures the sustainability of a new home against nine categories of sustainable design, rating the 'whole home' as a complete package. The nine categories are:

- Energy and CO_2 emissions
- Water
- Materials
- Surface water run-off
- Waste
- Pollution
- Health and wellbeing
- Management
- Ecology

The Code has a rating system of six levels. The different levels are made up by achieving both the appropriate mandatory minimum standards together with a proportion of the 'flexible' standards. In order to achieve a 6 star rating, the required level by 2016, homes are required to incorporate a large range of sustainable features, with effectively net zero carbon emissions over a year.

The standardised approach of application of the Code has a number of benefits to stakeholders. Likely user groups are homebuilders, social housing providers, consumers and householders. Homebuilders and other construction industry stakeholders have the benefits of the mark of quality, regulatory certainty and flexibility. Social housing providers get the benefits of knowing that lower running costs, improved comfort levels and raised sustainability credentials are achieved. Consumers and householders have the benefits of assisted choice, reduced environmental footprint, as well as lower running costs and improved comfort levels.

A study carried out on behalf of the DCLG[5] in 2010 considered the additional cost which the Code will impose to building homes in excess of complying with the 2006 Building Regulations. The report created development scenarios which considered four dwelling types combined in a variety of ways (in terms of number of dwellings, dwelling mix and dwelling density). The cost data for housing construction was obtained through consultation with the house building industry. These costs were analysed to determine the costs of building to each Code level.

The minimum costs associated with achieving each level of the Code are tabulated below for each dwelling type and in a range of development scenarios. The costs are reported as the extra-over cost from a baseline of building a 2006 Building Regulation compliant dwelling.

Table 3: Costs associated with achieving Code Levels

Code Level	2b-Flat		2b-Terrace		3b-Semi		4b-Detached	
	E/O cost	%	E/O cost	%	E/O cost	%	E/O cost	%
Small brownfield (20 dwellings at 80 dph)								
1	£310	0.5%	£230	0.3%	£360	0.4%	£310	0.3%
2	£1,670	2.8%	£1,620	1.9%	£1,040	1.1%	£970	1.0%
3	£2,460	4.1%	£2,420	2.8%	£3,020	3.2%	£2,680	2.7%
4	£5,610	9.4%	£7,360	8.5%	£8,140	8.7%	£6,030	6.0%
5	£17,740	29.7%	£24,370	28.2%	£26,830	28.6%	£30,130	30.1%
6	£28,510	47.7%	£34,810	40.3%	£38,730	41.2%	£42,770	42.8%
Medium Urban (350 dwellings at 80 dph)								
1	£260	0.4%	£170	0.2%	£260	0.3%	£270	0.3%
2	£1,560	2.6%	£1,500	1.7%	£890	0.9%	£810	0.8%
3	£2,340	3.9%	£2,000	2.3%	£2,900	3.1%	£2,510	2.5%
4	£5,440	9.1%	£7,190	8.3%	£7,970	8.5%	£5,860	5.9%
5	£17,570	29.4%	£24,200	28.0%	£26,650	28.4%	£29,960	30.0%
6	£19,580	32.8%	£26,550	30.7%	£28,390	30.2%	£31,230	31.2%
Large Urban (3600 dwellings at 80 dph)								
1	£250	0.4%	£160	0.2%	£250	0.3%	£260	0.3%
2	£1,550	2.6%	£1,490	1.7%	£890	0.9%	£810	0.8%
3	£2,340	3.9%	£2,000	2.3%	£2,890	3.1%	£2,510	2.5%
4	£6,360	10.6%	£6,200	7.2%	£6,580	7.0%	£6,470	6.5%
5	£16,640	27.9%	£23,210	26.8%	£25,580	27.2%	£28,790	28.8%
6	£23,210	38.9%	£29,920	34.6%	£32,390	34.5%	£36,040	36.0%
Small greenfield (10 dwellings at 40dph)								
1	£320	0.5%	£230	0.3%	£330	0.4%	£320	0.3%
2	£1,620	2.7%	£1,560	1.8%	£990	1.1%	£880	0.9%
3	£2,160	3.6%	£2,120	2.5%	£2,720	2.9%	£2,380	2.4%
4	£5,350	9.0%	£7,150	8.3%	£7,860	8.4%	£6,910	6.9%
5	£17,310	29.0%	£26,970	31.2%	£29,260	31.1%	£32,270	32.3%
6	£27,650	46.3%	£37,400	43.3%	£40,800	43.4%	£45,230	45.2%
Medium edge of town (650 dwellings at 40 dph)								
1	£270	0.5%	£190	0.2%	£370	0.4%	£290	0.3%
2	£1,560	2.6%	£1,500	1.7%	£920	1.0%	£810	0.8%
3	£2,090	3.5%	£2,060	2.4%	£2,650	2.8%	£2,310	2.3%
4	£5,280	8.8%	£7,080	8.2%	£7,800	8.3%	£6,840	6.8%
5	£17,240	28.9%	£26,900	31.1%	£29,190	31.1%	£32,200	32.2%
6	£24,080	40.3%	£31,250	36.1%	£33,090	35.2%	£36,180	36.2%
Large edge of town (3,300 dwellings at 40 dph)								
1	£270	0.5%	£180	0.2%	£370	0.4%	£290	0.3%
2	£1,550	2.6%	£1,490	1.7%	£920	1.0%	£810	0.8%
3	£2,090	3.5%	£2,050	2.4%	£2,640	2.8%	£2,310	2.3%
4	£5,280	8.8%	£7,080	8.2%	£7,790	8.3%	£6,830	6.8%
5	£17,230	28.8%	£26,890	31.1%	£29,190	31.1%	£32,200	32.2%
6	£27,710	46.4%	£34,620	40.0%	£37,090	39.5%	£40,990	41.0%

Source: DCLG

The calculations in Table 3 suggest that the best opportunity with lowest additional cost implications for requesting a higher level of Code could be achieved in medium urban developments. However, even here the percentage increase in build cost per dwelling of achieving Code Level 6 is in excess of 30%. It is unlikely that this level of increase would be acceptable to developers ahead of the timescale required by Central Government.

5 DCLG, March 2010, Code for Sustainable Homes: A Cost Review, Department of Communities and Local Government

At present there is no requirement for developers to attain a lower level of Code, however the consultation implies that a stepped timescale will come into force soon.

There would therefore be scope for a Local Authority to introduce a specification for developers to achieve a lower level of code, or simply set out requirements for meeting higher levels of the Energy category - with an overall weighting factor of 36.4%, the Energy category represents a major source of Code credits. The report provides sufficient detail to allow Local Authorities to make informed choices ranging from specifying a dwelling emission rate (DER) above the required building regulations target emission rate (TER); to specifying required Code Levels for dwelling types or development types.

For example, Table 4 shows the calculated extra-over cost associated with applying improved fabric packages (including costs of improving U-values, reducing air permeability and thermal bridging, and MVHR systems where necessary).

Table 4: Total fabric package costs

Fabric package	*Flat*	*Terrace*	*Semi*	*Detached*
Reference – base cost	£5,266	£17,260	£25,516	£36,165
Good – E/O cost relative to 'Reference' package	£215	£42	£186	£243
Better – E/O cost relative to 'Reference' package	£1,358	£1,992	£2,539	£3,066
Best – E/O cost relative to 'Reference' package	£4,268	£6,845	£8,642	£10,334

Source: DCLG

Table 5 and Table 6 provide a breakdown of the costs associated with packages of improved fabric and measures that could be stipulated as options to achieve the requirements under the Energy category within various levels of Code, and the percentage improvement of DER over TER. In summary, these are:

- Code Level 1 requires a 10% improvement of the Dwelling Energy Rate (DER) over the Target Energy Rate (TER: i.e. that required by 2006 building regulations)
- Code Level 2: 18%
- Code Level 3: 25%
- Code Level 4: 44%
- Code Level 5: 100%
- Code Level 6: zero carbon (150%)

Table 5: Ene1 options for meeting required improvements in DER

Option no.	Target %	Description	Actual % improvement (DER on TER)			
			Flat	Mid-terrace	Semi	Detached
1	10%	'Good' fabric – flat, semi, detached 'Good +' fabric – terrace (see Note 1)	11%	10%	11%	11%
2	18%	'Better +' fabric – flat 'Better' fabric – terrace 'Good+' – semi, detached	18%	19%	19%	20%
3	25%	'Good' fabric, PV	30%	27%	26%	27%
4	25%	'Better' fabric – detached 'Best' fabric, MVHR – flat, terrace, semi Add SHW for flat	25%	29%	36%	27%
5	25%	'Good' fabric, ASHP	30%	27%	30%	31%
6	25%	'Better' fabric – detached 'Better' fabric, PV – flat, terrace, semi	26%	26%	30%	27%
7	25%	'Better' fabric – detached 'Better' fabric, SHW – flat, terrace, semi	25%	25%	27%	27%
8	44%	'Better' fabric, ASHP Add PV for flat, terrace, semi	48%	46%	46%	45%
9	44%	'Best' fabric, MVHR, biomass block heating – flat 'Best' fabric, MVHR, individual biomass boilers – houses	73%	71%	74%	75%
10	44%	'Best' fabric, MVHR, PV	47%	48%	45%	44%
11	44%	'Good' fabric, community gas CHP	67%	67%	68%	68%
12	44%	'Good' fabric, micro gas CHP	73%	76%	79%	80%
13	100%	'Best' fabric, MVHR, PV, biomass block heating – flat 'Best' fabric, MVHR, PV, individual biomass boilers – houses	101%	101%	101%	101%
14	100%	'Best' fabric, MVHR, PV, community gas CHP	100%	101%	101%	101%
15	ZCH	'Best' fabric, MVHR, PV, community gas CHP	185%	172%	163%	151%
16	ZCH	'Best' fabric, MVHR, PV, community biomass CHP	186%	173%	162%	152%
17	ZCH	'Best' fabric, MVHR, PV, biomass block heating – flat 'Best' fabric, MVHR, PV, individual biomass boilers – houses	185%	172%	161%	151%

Source: DCLG (2010) Code for Sustainable Homes; cost review

Table 6: Technology sizes and costs (2009) for a medium urban development

Table 54: Technology sizes and costs (2009) for a medium urban development

No.	CL	Short name	Technology size				Total E/O cost of Ene 1 option (£k / dwelling)			
			F	T	S	D	F	T	S	D
1	1	Good fabric	N/A				0.2	0.1	0.2	0.2
2	2	Good+ / Better fabric	N/A				1.4	1.3	0.7	0.6
3	3	Good, PV	0.5kW	0.75kW	0.75kW	1kW	2.5	4.3	4.4	5.4
4	3	Better/Best (SHW)	0.7kW	No SHW required			6.1	6.8	8.6	3.1
5	3	ASHP	5kW	5kW	9kW	9kW	1.6	1.4	2.0	2.0
6	3	Better, PV	0.25kW	0.25kW	0.25kW	0kW	2.5	4.4	5.0	3.1
7	3	Better, SHW	1.6kW	1.6kW	0.7kW	0kW	3.9	4.6	4.4	3.1
8	4	ASHP, PV	0.4kW PV	0.35kW PV	0.25kW PV	0kW PV	4.5	6.1	6.8	4.9
9	4	BM heating	Block heating (flats) – 4kW per flat Individual BM boilers for houses				10.5	15.3	16.9	18.6
10	4	MVHR, PV	0.75kW	0.75kW	0.5kW	0.25kW	7.6	11.1	12.0	12.8
11	4	Community gas CHP	190kWe				6.6	6.8	7.0	7.6
12	4	Micro gas CHP	1kWe unit per dwelling				Not available in 2009			
13	5	BM heating, PV (100%)	Block heating (flats) – 4kW per flat Individual BM boilers for houses				13.8	20.7	23.0	26.0
			0.75kW	1.05kW	1.25kW	1.6kW				
14	5	Community gas CHP, PV	130kWe gas CHP				14.8	18.9	21.4	24.7
			0.95kW	1.15kW	1.35kW	1.75kW				
15	6	Community gas CHP, PV	130kWe gas CHP				24.9	28.1	32.0	36.1
			3.2kW	3.65kW	4.25kW	4.85kW				
16	6	BM CHP, PV	c.100kWe				15.9	19.5	21.4	24.1
			1.3kW	1.4kW	1.4kW	1.6kW				
17	6	BM heating, PV (ZCH)	Block heating (flats) – 4kW per flat Individual BM boilers for houses				23.7	29.9	33.3	37.4
			2.95kW	3.55kW	4.05kW	4.7kW				

No. = Ene 1 option number. CL = Target Code Level.

Source: DCLG (2010) Code for Sustainable Homes; cost review

At Code levels 1 and 2, the mandatory reductions of DER are most cost-effectively met by improving the fabric package. At Code level 3 the lowest cost energy strategy is achieved through the Good fabric package with an Air Source Heat Pump (ASHP). At Code Level 4 the lowest cost energy strategy varies between Better fabric with an ASHP and the Good fabric with community gas CHP, depending on the development type. At Code Level 5 in the higher density brownfield developments the least cost strategy is gas CHP linked to a district heating system, with photovoltaics to provide the additional CO_2 reduction. In the lower density Greenfield development scenarios, this energy strategy is favoured for the large sites, but in the smaller scale developments a strategy of biomass boilers within individual properties is favoured (block-scale boilers for blocks of flats). At Code Level 6, the lowest cost approach is provided by a site-wide biomass CHP and district heating systems.

With up to 15 credits available, the DER issue (Ene 1 in Table) accounts for the majority of credits in this category.

However, there are a further 14 credits allocated against the remaining eight issues, which are summarised in Table .

Table 5: Credits available in the Energy category

Issue	Credits available	Scoring criteria
Ene 1 – DER	15	Credits awarded based on percentage improvement of DER over TER.
Ene 2 – Building Fabric	2	Credits for achieving a heat loss parameter below given levels: HLP ≤ 1.3 = 1 credit, HLP ≤ 1.1 = 2 credits.
Ene 3 – Internal Lighting	2	Credits based on percentage of internal light fittings that are dedicated energy efficient: ≥40% = 1 credit, ≥75% = 2 credits.
Ene 4 – Drying Space	1	Provide adequate drying space (see Technical Guide).
Ene 5 – Eco-labelled White Goods	2	1 credit if fridges and freezers have an A+ rating. 1 further credit if washing machines/dishwashers have an A rating and/or washer-driers have a B rating. If such goods are not supplied, 1 credit is awarded for supplying information on the benefits of selecting efficient white goods.
Ene 6 – External Lighting	2	1 credit if all external lighting is provided by dedicated energy efficient fittings. 1 credit if all security light fittings are designed for energy efficiency and are adequately controlled.
Ene 7 – LZC Energy Technologies	2	1 credit if LZC technology leads to 10% (or greater) reduction in carbon emissions. 2 credits if LZC technology gives a 15% (or greater) reduction in carbon emissions.
Ene 8 – Cycle Storage	2	Up to 2 credits for providing adequate safe, weatherproof cycle storage facilities.
Ene 9 – Home Office	1	1 credit for providing sufficient space and services to allow a room to be set up as a home office.

Source: DCLG

Table 6: Cost of credits in the energy category

Issue	Requirement	Cost/dwelling
Ene 1 – DER	Meet DER improvement target for given dwelling	For cost of Ene 1 options see appendix 2
Ene 2 – Building Fabric	Achieve given HLP targets	Dependent on fabric improvement package – see appendix 1
Ene 3 – Internal Lighting	Increase proportion of dedicated energy efficient light fittings	£10 per additional energy efficient fitting
Ene 4 – Drying Space	Provide adequate drying space	£15 for internal tidy-dry over bath
Ene 5 – Eco-labelled White Goods	High efficiency ratings	£150 Assume £50 per unit and three units per dwelling[11]
	Information on benefits of efficient white goods	£5
Ene 6 – External Lighting	All energy efficient fittings	£0
	Sensors, timers etc	£45
Ene 7 – LZC Energy Technologies	Reduce CO_2 emissions by 10% or 15%	Cost included in cost of Ene 1 options
Ene 8 – Cycle Storage	Provide adequate storage	£200 for flat (communal storage) £650 for terrace / semi (shed) £900 for detached house (shed)
Ene 9 – Home Office	Provide space and services	£80

Source: DCLG

The Cost/dwelling detailed in Table refer to the combination of materials and technologies that could be adopted to achieve the Code levels.

The cost of each energy strategy varies between the house types, due to fabric costs, sizing and costs of LZCTs. The overall energy strategy cost will be largely independent of development scenario where the strategy involves fabric improvements and LZCTs at the individual dwelling scale (i.e. microgeneration technologies). However, where the energy strategy involves shared infrastructure, such as a district heating system, the cost will be dependent on the development type. This is summarised in the following Table .

Table 7: Lowest Cost Energy Strategy at each Code Level

<table>
<tr><th rowspan="2">Development Scenario</th><th colspan="6">Lowest cost energy strategy at each Code Level</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>City Infill</td><td rowspan="6">Good fabric (F, S&D),

Good+ fabric (T)</td><td rowspan="6">Better+ fabric (F),

Better Fabric* (T)

Good+ fabric (S,D)</td><td rowspan="6">Good fabric + ASHP</td><td>Best fabric + ASHP</td><td rowspan="6">Best fabric + Community gas CHP + PV</td><td rowspan="2">Best fabric + gas CHP + PV</td></tr>
<tr><td>Small brownfield</td><td>Good fabric + Community gas CHP</td></tr>
<tr><td>Medium brownfield (mixed)</td><td>Best fabric + ASHP</td><td rowspan="4">Best fabric + community BM CHP + PV</td></tr>
<tr><td>Medium brownfield (flats)</td><td rowspan="3">Good fabric + Community gas CHP</td></tr>
<tr><td>Large Urban (flats)</td></tr>
<tr><td>Large Urban (mixed)</td></tr>
</table>

<table>
<tr><th rowspan="2">Development Scenario</th><th colspan="6">Lowest cost energy strategy at each Code Level</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>Small infill</td><td rowspan="6">Good fabric (F, S&D),

Good+ fabric (T)</td><td rowspan="6">Better+ fabric (F),

Better Fabric* (T)

Good+ fabric (S,D</td><td rowspan="6">Good fabric + ASHP</td><td rowspan="6">Best fabric + ASHP</td><td rowspan="3">Best fabric + block BM (F)

BM boilers (T,S,D) + PV</td><td rowspan="3">Best fabric + block BM (F) + PV

BM boilers (T,S,D) + PV</td></tr>
<tr><td>Small Greenfield</td></tr>
<tr><td>Medium Greenfield</td></tr>
<tr><td>Medium edge of town</td><td rowspan="3">Best fabric + Community gas CHP + PV</td><td rowspan="3">Best fabric + community BM CHP + PV</td></tr>
<tr><td>Large edge of town</td></tr>
<tr><td>Strategic Greenfield</td></tr>
</table>

* To achieve Code Level 2 standard in flats, a fabric package slightly in advance of 'Better' would be required.

Figure 4: Summary of lowest cost energy strategy at each Code level for each development scenario

Source: DCLG

The extra cost of Code Level 3 compliant energy strategies varies in the range from £1,500 to £2,000.

The least cost energy strategy at Code Level 4 (Best fabric with an air source heat pump or good fabric with community gas CHP, depending in the development scenario) has an associated extra cost of in the range from £4,750 to £6,000.

The extra cost of Code Level 5 compliant energy strategies is more than £15,000 for all development scenarios, with the exception of the flats, for which the extra cost of energy strategy in most development scenarios is in the range of £10,000 to £15,000. The highest energy strategy costs for Code Level 5 are found in larger house types in small greenfield developments, where the energy strategy is biomass heating in individual properties combined with photovoltaics (energy strategy extra costs of ~ £23,500 in the semi-detached dwelling type and just over £26,000 in the detached dwelling type).

The greatest variation in energy strategy extra cost is found at Code Level 6. The highest Code Level 6 energy strategy costs (more than £30,000 in large houses) are associated with the small-scale sites, particularly where density is low.

The extra-over costs of Code Level 6 compliant energy strategies are significantly reduced on sites where there is adequate scale. i.e. sufficient heat load, to justify the installation of a biomass CHP system.

The ranges of total extra costs for each Code level, as assessed by the DCLG report, are tabulated in Table , for each dwelling type.

Table 8: Upper and Lower bound on overall Code extra-over cost (assuming the energy strategy that gives the lowest overall compliance cost is selected in each development scenario)

Code Level	2-bed flat		2-bed terrace		3-bed semi		4-bed detached	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
1	£230	£320	£160	£350	£250	£430	£260	£320
2	£1,550	£1,770	£1,490	£1,840	£890	£1,260	£810	£1,090
3	£2,090	£2,760	£2,000	£2,420	£2,640	£3,020	£2,310	£2,680
4	£4,290	£6,360	£6,200	£7,410	£6,580	£8,150	£5,860	£7,190
5	£14,690	£17,740	£23,210	£27,250	£25,580	£29,550	£28,790	£32,560
6	£17,650	£28,510	£26,550	£37,690	£28,390	£41,090	£31,230	£45,510

Source: DCLG

Over time, as the Building Regulations are tightened the extra-over cost associated with building to the Code will drop, as costs that are currently Code costs will be incurred just to meet the minimum regulatory standards..

NON DOMESTIC:

BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

BREEAM is a widely used environmental assessment method for non domestic buildings within the UK. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Unlike the Code, the certification rating is from ‘Pass’ to ‘Good’ to ‘Very Good’ to ‘Excellent’ and finally ‘Outstanding’. A certificate is subsequently awarded to the development.

BREEAM provides users with a way of indicating the environmental credentials of their building via an evidence based scoring system based on standardised parameters for the building’s performance. Users can achieve:

- recognition for low environmental impact buildings
- incorporation of best environmental practice into a building
- in many cases a benchmark that is higher than regulation
- an indication of the way to help reduce running costs and improve working/ living environments

BREEAM addresses the same wide-ranging environmental and sustainability issues as the Code, and enables developers and designers to prove the environmental credentials of their buildings to planners and clients. It:

- uses a straightforward scoring system that is transparent, easy to understand and supported by evidence-based research
- has a positive influence on the design, construction and management of buildings
- sets and maintains a robust technical standard with rigorous quality assurance and certification

To allow for comparison of similar building types, various separate BREEAM categories have been established:

- BREEAM Healthcare
- BREEAM Industrial.
- BREEAM Multi-Residential
- BREEAM Prisons
- BREEAM Offices
- BREEAM Retail
- BREEAM Education can assess new schools, major refurbishment projects and extensions at the design stage and post construction

BREEAM Buildings can be used to assess the environmental performance of **any** type of building (new and existing). Less common building types can be assessed against tailored criteria under a Bespoke BREEAM version. Buildings outside the UK can also be assessed using BREEAM International. There is also a BREEAM in use evaluation that can now be carried out to certify the environmental performance post construction

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, was developed by the U.S. Green Building Council (USGBC. Since its inception in 1998, LEED has grown to encompass more than 14,000 projects in the United States and 30 countries. LEED is an open and transparent process where the technical criteria proposed by the LEED committees are publicly reviewed for approval by the more than 10,000 membership organizations that currently constitute the USGBC.

LEED has evolved since its original inception in 1998 to more accurately represent and incorporate emerging green building technologies. Today, LEED consists of a suite of nine rating systems for the design, construction and operation of buildings, homes and neighbourhoods. Five overarching categories correspond to the specialties available under the LEED Accredited Professional program. That suite currently consists of:

- **Green Building Design & Construction**
  - LEED for New Construction and Major Renovations
  - LEED for Core & Shell Development
  - LEED for Schools
  - LEED for Retail New Construction (planned 2010)
- **Green Interior Design & Construction**
  - LEED for Commercial Interiors
  - LEED for Retail Interiors (planned 2010)
- **Green Building Operations & Maintenance**
  - LEED for Existing Buildings: Operations & Maintenance
- **Green Neighbourhood Development**
  - LEED for Neighbourhood Development

- **Green Home Design and Construction**
    - LEED for Homes

Buildings can qualify for four levels of certification, from ‘certified’ up to Platinum.

Table 9: Comparison of BREEAM vs. LEED

Scheme	Weaknesses	Strengths
BREEAM	• Very exact requirements • Complex weighting system • Market profile • Cost of compliance	• Allows comparison and benchmarking of different buildings • Independently audited • Adjusted to UK legislation and UK culture • Can assess any building with the Bespoke version
LEED	• Based on US systems • Intense documentation required • No independent audit of the assessment • Mixing building function and form is difficult to assess	• Strong marketing gets the message through • Lots of information available • No need for an assessor and training

At present BREEAM is a more appropriate approach for UK buildings, however BRE and LEED are currently in the process of drawing together a common standard to allow organisations to apply a similar certification scheme globally. Furthermore, in the USA, work is underway to formulate an International Green Construction Code (IGCC). This will be based on the LEED system, developed by the US Green Building Council, which already goes beyond the requirements of Standard 189 in the USA. However, the IGCC is not expected to be produced until the end of 2010.

In addition, the UK Government definition of zero carbon for non domestic buildings is yet to be agreed.

The table below summarises the extra-over cost findings of a report by the UK Green Buildings Council in December 2007, of building low carbon non domestic buildings.

Table 10: Cost Low Carbon Non-domestic new buildings[6]

6 Report on carbon reductions in new non-domestic buildings: Report from UK Green Building Council (Dec 2007)

Table 8: Cost of low carbon dynamically modelled buildings

	Shallow Plan Office £/m≤ GIFA	Deep Plan Office £/m≤ GIFA	Retail Warehouse £/m≤ GIFA
Net base building cost	1640	1520	480
Extra over cost of enhancements to:			
1. External envelope and windows	270	230	230
2. Thermal mass (exposed soffit etc)	60	60	–
3. HVAC	70	50	110
Revised net cost without renewables	**2040**	**1860**	**820**
3. Renewables	90	90	230
Revised net cost for all measures	**2130**	**1950**	**1050**
Preliminaries and contingencies	510	460	220
Total cost	**2640**	**2410**	**1270**
Percentage extra over cost without renewables	**24%**	**22%**	**71%**
Percentage extra over cost for all measures	**30%**	**28%**	**119%**

Source: UKGBC

The more recent DCLG zero carbon for new non-domestic buildings consultation[7] modelled the potential increases in capital costs, to give an indication (based on Scenario 2 - Scenario 2 –balancing onsite and off-site renewables) of the impact on costs for different building types, shown in Table .

Table 11: Modelled capital cost increase for non-domestic new builds of achieving zero carbon

	Base build cost – 2006 standards per m²	Increase in capital cost (relative to 2010) in 2019 for Scenario 2 – 54% aggregate improvement	
		Stand alone	With district heating
2* Hotel	£1,120	12%	n/a
3* Hotel	£1,830	7%	4%
5* Hotel	£2,375	4%	2%
Convenience store	£1,315	8%	38%
Large office	£2,250	6%	5%
Medium office	£940	14%	16%
Shopping centre	£3,560	6%	6%
Small office	£865	15%	n/a
Supermarket	£1,325	9%	5%
Distribution warehouse	£320	28%	30%
Retail warehouse	£745	17%	17%

Source: DCLG

In summary, the results of the analysis suggest that innovation in the external envelope, exploiting improvements in physical performance whilst maintaining internal comfort conditions represents a very important area for LZC progress, but also that there are risks of diminishing returns as thermal performance requirements intrude on other aspects of value

Although not unexpectedly high, the above figures demonstrate significant cost increases associated with energy efficiency measures. However, these primarily relate to fabric improvements which, as insulation technology advances, are likely to reduce in cost rapidly,

7 Zero carbon for new non-domestic buildings Consultation on policy options: DCLG November 2009

particularly given the driver that the Code for Sustainable Homes is having on fabric and air tightness[8].

There is little market evidence to show that occupiers of commercial buildings (and domestic buildings) or investors are prepared to pay a higher price for low or zero carbon buildings. The property market is currently characterised by a combination of high construction costs and historically high capital valuations, driven in part by low finance costs. Construction cost inflation is currently running at 1.5 to 2 per cent higher than RPI. Looking forward, there is little prospect of a significant reduction in the pressure on prices, and as a result, construction will continue a long-term trend of increasing in cost at a faster rate than the general economy. This will increase pressure on affordability and viability. With commercial property valuations at very high levels, there is little prospect for further upward growth – future rental increases and so on already having been taken into account in the calculation of the investment yield. As a result, an increase in cost related to low carbon construction is likely to affect either levels of rent, developer profitability or the price paid for land in the first instance. In the context of commercial development cycles, requirements for enhanced sustainability which result in significantly higher construction costs could delay a recovery if the balance between cost and income/value adversely affected viability.

In developing policy in this area, we also need to take into account the way in which the market currently provides non-domestic buildings. Many non-domestic buildings are built speculatively, in that they are built without a clear idea of who will be occupying the building or the manner in which it will be used. It may not be possible for a developer to ascertain in advance what level of emissions might need to be dealt with. There is also far more chance that a non-domestic building will be subject to a change of use (e.g. from a warehouse to offices) or a change of occupier (e.g. hardware shop to coffee bar) that would impact on the energy use. This may make it difficult for the developer to take pro-active decisions towards, for instance, installing renewable energy systems.

In addition, much of the non-residential sector is leased. This means that the capital costs are borne by the developer and / or landlord, whereas the benefits of lower fuel bills are received by the tenant. The short-term nature of many leases, coupled with the fact that fuel costs may only be a small proportion of business running costs, provides less incentive for the tenant to invest in energy-saving equipment and the developer may find it difficult to recoup the costs of their investment through increased rents. A ‘green lease’ can enable landlords and tenants of business premises to achieve environmental improvements for mutual benefit, generally, by landlords investing in more efficient buildings and tenants carrying out their business operations more efficiently. However, ‘green leases’ are relatively new concepts; the degree of appetite and rate of future take up from industry is uncertain at this time.

If the cost of building certain types of non-domestic building increases significantly, there could be consequential impacts on business competitiveness. Businesses could choose to relocate to an area where more cost-effective solutions were available. This could potentially result in certain locations not having an appropriate mix of building types to support the local community.

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[8] Further example costs of achieving carbon neutrality (regulated energy, which would be equivalent to Code for Sustainable Homes level 5) and zero carbon (including occupier loads such as small power, what would be equivalent to Code for Sustainable Homes level 6) using on-site renewables can be found within the DCLG report

Or, businesses could choose to stay in existing, less energy-efficient buildings rather than build properties to the new zero carbon standard.

With a number of zero carbon projects which include non-domestic buildings being planned or constructed at present, further understanding of these figures could be gathered imminently. However, much of this work is still in the early stages of design and further experience is needed before these figures can be published with confidence. Indeed, such developments generally contain a favourable mix of building types and uses and therefore cannot be extrapolated across the whole non-domestic sector. This means that the cost estimates should not be used as the basis for policy making or investment decisions, and considerable work in building a knowledge base which matches cost premiums with building type and building performance will be required to enable a confident and contextually confident assessment to be made.

As set out in the Government's zero carbon consultation, the belief is that the starting point should be that the zero carbon standard for non-domestic buildings should recognise the variability of energy use as between different buildings. The guidance that underpins the energy efficiency requirements of the Building Regulations already acknowledges the diversity of the non-domestic stock and the impact this has on a building's carbon intensity.

At this conjecture the preferred approach, therefore, for establishing zero carbon standards in non-domestic buildings should be through the tightening of the Building Regulations. The technical detail of the amendments to Part L in 2010 will come into force from October this year. A consultation on the detail of the 2013 amendments will follow in due course which will need to take account of the initiatives currently being developed in Europe, such as the proposed revisions to the Energy Performance of Buildings Directive in December 2010. The trajectory after 2013 will be influenced by the feasibility and viability of the solutions to reach zero carbon, particularly renewable energy and the range of allowable solutions. Our analysis, and evidence from the work carried out by UK GBC, suggests that moving beyond the 44 per cent reduction on 2006 Part L levels to cover all emissions will require a significant step-change in the availability of technical solutions capable of delivering the reduction and cost effectiveness of such measures.

ANNEX 7 – GUIDING PRINCIPLES FOR DESIGNERS

Guiding principles for designers

PRODUCT AND MATERIALS SPECIFICATION

Priority should be given to the use of sustainable materials, with the lowest embodied pollution and embodied energy. Where possible, give preference to reused, reclaimed and recycled materials. Life cycle analysis should be used to compare the impact of construction materials and to ensure that buildings can be deconstructed effectively. We would recommend that designers are directed to preferred materials and components based on information derived from the latest editions of the Green Guide to Specification, LEED (USA) and EU eco-labelling programmes. In the Green Guide to Specification building materials and components are assessed in terms of their environmental impact across their entire life cycle – from 'cradle to grave', within comparable specifications. This accessible and reliable information is based on full, quantitative Life Cycle Assessment studies, and is presented in the form of A+ to E environmental ratings for over 1200 different materials and components and will help York immediately reduce the environmental impact of their properties.

In addition developers should:

- Encourage the in-situ reuse of existing building façades; and re-use of existing structures that previously occupied the site
- Encourage the specification of responsibly sourced materials for key building elements.
- Encourage adequate protection of exposed parts of the building and landscape, therefore minimising the frequency of use of replacement materials
- Where possible, give preference to reused, reclaimed and recycled materials.
- In addition developers should be encouraged to purchase/install products with A or B rated energy labelling.
- Specify materials and processes in order to minimise pollution caused by chemicals emanating from the building when in operation, avoiding refrigerants which have a global warming potential
- Maximise the use of local suppliers and minimise disruption to local road networks
- Encourage the specification of materials for boundary protection and external hard surfaces that have a low environmental impact.

SPECIFICATION OF SERVICES & CONTROL – HEATING, VENTILATION, LIGHTING

Developers should specify energy efficient lighting, heating, ventilation and air conditioning systems. And prioritise use of passive ventilation, natural daylighting and low carbon technologies, such as air/ground-source heat pumps and heat recovery.

In addition developers should:

- Optimise efficiency of all other energy-consuming equipment, including IT, and recover waste heat for use in space heating.
- Ensure that a Building Management System[9] is installed.
- Encourage an appropriate level of building services commissioning that is carried out in a co-ordinated and comprehensive manner, thus ensuring optimum performance under actual occupancy conditions – project manager with specific role for commissioning is appointed; seasonal commissioning scheduled.

WATER USE

Developers should be encouraged to :

- Minimise the use of potable water, and ensure that water consumption is measured and monitored.
- Use water efficient taps, WCs, urinals, showers and white goods such as washing machines and dishwashers with A ratings for efficiency and water consumption.
- Introduce greywater recycling and/or rainwater harvesting systems if safe and financially viable.
- Fit audible water leak detection systems, presence detection shut-off to sanitary areas and other controls as appropriate.
- Carry out a drainage impact assessment and, if land conditions are appropriate, use permeable surfacing materials or harvesting and attenuation methods to reduce the burden on local drainage systems and reduce the risk of flooding, and create an amenity where possible.
- Ensure that surface water run-off is free from contamination.

WASTE MINIMISATION

- Use a site waste management plan to minimise waste during the (demolition and) construction phase.
- Encourage the use of recycled and secondary aggregates in construction, thereby reducing the demand for virgin material
- Ensure provision of dedicated storage facilities for a building’s operational-related recyclable waste streams, so that such waste is diverted from landfill or incineration; and/or facilities which enable efficient and hygienic waste sorting and storage
- Outside space, landscaping and boundary treatment
- Encourage the reuse of land that has been previously developed, or contaminated land that otherwise would not have been remediated and developed, and discourage the use of previously undeveloped land for building
- Alternatively, encourage development on land that already has limited value to wildlife.
- Carry out an ecological survey (using accredited ecologist).
- Protect existing ecological assets, particularly trees, shrubs, watercourses and habitats on and near the site.

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[9] BMS will improve control options for energy use in the building. As such, it can help reduce energy use compared with buildings that do not have these installed.

- Enhance the ecology of the site by means of the landscaping scheme, using species which contribute to biodiversity.

TRANSPORT

- Develop a travel plan and transport information points.
- Ensure that sites are easily accessible by public transport for the majority of employees and visitors and encourage car sharing.
- Provide sufficient facilities for pedestrians and cyclists including, secure covered bike parking, showers, lockers and safe pedestrian routes.
- Ensure that key facilities (food, cash machine) are available on or near site.
- Limit car parking spaces on site to encourage the use of alternative means of transport to the building other than the private car.
- Design vehicle access areas to ensure adequate space for manoeuvring delivery vehicles and provide space away from manoeuvring area for storage of refuse skips and pallets.
- Contractor choice and raising awareness.
- Ensure that contractors adopt agreed environmental and social objectives (review requirements of Considerate Constructors Scheme) – including onsite energy & resource use, and pollution monitoring and policies.

RENEWABLES

- Provide the maximum amount of renewable energy on site, where practically, environmentally and financially viable. Make best use of locally available renewable energy resources and any district heating systems.
- Provide evidence of feasibility assessments for all renewable technologies even where no technologies are subsequently installed.

PROMOTING THE MESSAGE

- Encourage the provision of guidance for the non technical building user so they can understand and operate the building efficiently.

METERING & MONITORING

- Ensure that a BMS is operated and that sub-metering is provided for all major energy consuming items[10].

[10] CIBSE (2009) TM39 Building energy metering provides best practice guidance for those responsible for the design, installation, commissioning, operation and maintenance of building services energy metering systems. http://www.cibse.org/index.cfm?go=news.view&item=103

HEALTH & WELLBEING

Provide a comfortable and healthy environment for employees by:

- Maximising daylight and views from windows, minimise glare from natural light and flicker from artificial light, with appropriate, easy and accessible local control available.
- Provide adequate heating and ventilation with local control.
- Minimise pollutants such as VOCs to ensure optimal indoor air quality.
- Ensure risk of legionellosis has been minimised.
- Acoustic performance is appropriate for the building purpose
- Aim to achieve a positive impact on the local community. Minimise impact on neighbours from pollution from debris, dust and noise.

SUMMARY

Establishing these Guiding Principles will help provide:

- Recognition for low environmental impact buildings
- Assurance that best environmental practice is incorporated into a building
- Inspiration to find innovative solutions that minimise the environmental impact
- A benchmark that is higher than regulation
- A tool to help reduce running costs, improve working and living environments
- A standard that demonstrates progress towards corporate environmental objectives
- Sets and maintains a robust technical standard

Planning and passive solar design

Passive solar design (PSD) seeks to optimise the use of solar heat, daylighting and natural ventilation in a development, so reducing the need to provide these requirements by artificial means. A key priority in PSD is to enhance occupant comfort in buildings.

PSD considerations are often evident in vernacular buildings from the pre-industrial era, when energy was a scarce commodity for most households.

PSD influences the following aspects of the planning and design of buildings:

- Siting
- Site layout
- Landscape and planting
- Built form
- Window design
- Internal layout
- Roofs, walls and floors
- Insulation

- Airtightness
- Internal controls

It is noteworthy that town and country planning decisions can exert a significant influence on the first six of these design elements.

In residential development, PSD requires houses to have a principal (i.e. front or rear) glazed elevation oriented within 25 degrees of south, to collect the light and warmth of the sun for most of the day. This requirement represents a 50 degree tolerance, within which there is substantial scope for introducing variety in the townscape. Rigid ranks of dwellings are not required, and the passive solar orientation of housing need not even be noticeable at street level.

PSD requires also that the south-facing elevation of a house is not overshadowed by adjacent buildings, trees or terrain, and that high standards of thermal insulation are used within the house. Further energy efficiency benefits can also be derived by ensuring that kitchens – a significant source of heat – are placed on the cool northern side of a dwelling, with the principal living quarters placed on the sunny southern side where heat and daylight are required for more of the day.

The energy efficiency benefits of these measures can be illustrated by the example of a standard ‘estate’ house orientated on an east-west axis and with 50% of its windows on the eastern elevation and 50% on its western side. Simply by turning this design of house towards the south and changing the distribution of windows so that 75% of the windows are on the south elevation to gain solar heat and daylight, with the remaining 25% on the north elevation to provide for daylight, ventilation and surveillance, demand for space heating inside the house would be reduced by 15%.

A further passive solar design objective for housing is to reduce exposure to cold northerly winds. This can be achieved by limiting glazing on northern elevations to an area commensurate with daylighting standards and passive surveillance requirements. The effects of northerly exposure can also be reduced by physical barriers such as other buildings or the planting of a tree belt around the northern side of the development. By ensuring that the exposed northern side of a house is sheltered from cold northerly winds, whether by terrain, vegetation or neighbouring buildings, space heating demand would be reduced by between 5% and 7%, depending on whether the house is terraced or detached.

There are passive solar solutions for most building types. In other types of development, such as schools and offices, the emphasis of PSD moves away from heat gain towards cooling and daylighting, as a means of reducing dependence on air conditioning and artificial lighting – which itself can contribute to overheating.

ANNEX 8 – CASE STUDIES

The case studies in this annex have been selected to demonstrate a number of key topics around the delivery and development of renewable and low carbon energy strategy, including retrofitting existing building stock, development of renewable energy, job creation and skills development; community engagement, sustainable design and construction and eco-settlements.

KIRKLEES COUNCIL'S WARM ZONE

Key topics: *Retrofitting building stock; reduction in carbon emissions; employment creation; skills development; development of renewable energy*

In 2002, Kirklees joined the UK emissions trading scheme setting challenging carbon reduction targets. At the time 26% of its households experienced fuel poverty and there had been a number of cases of carbon monoxide poisoning.

Kirklees Council launched the Warm Zone project in 2007 to tackle its fuel poverty and other issues, as well as to contribute to further reducing emissions. Warm zone offers help to every household in Kirklees to improve the energy efficiency of their home, including free loft and cavity wall insulation, regardless of household income.

The initiative, which has financial support of over £20m confirmed, aims to visit and assess 170,000 houses. It is anticipated that insulation will be installed in 53,000 lofts and 35,000 cavity walls.

After its first eighteen months of operation Kirklees Council's Warm Zone had:

- Installed Loft Insulation in 10,520 and Cavity Wall insulation in 5,858 properties
- 35,596 had households requested energy saving light bulbs
- Estimated carbon dioxide reduction from the first year's installations is 10,537 tonnes CO_2/per annum (against its 55,000 tonnes CO_2/per annum target by 2010)
- Created 84 FTE jobs for the whole programme
- Resulted in the opening of a new local insulation depot and a training centre to address limited local fitter capacity
- Developed the UK's largest solar village on 5 locations involving around 500 householders and accounting for around 5% of the domestic solar PV installed in the UK in 2005.
- Reduced tenants' fuel bills – solar installations provide about 20% of electricity needs and 50-60% of hot water.

- Saved approximately £1m a year on household energy bills.
- Increased the Council's capacity to deliver large scale renewables initiatives on domestic properties.
- Developed local skills in Modern Methods of Construction.
- Achieved Ecohomes 'Very Good' and 'Excellent' status for new build elements.

The overall economic benefit to the area is calculated at over £50m. It helps contribute to the Kirklees Council's target of a 30% reduction in community carbon emissions per capita relative to a 2005 baseline by 2020.

ECO-TOWN: FREIBURG (GERMANY)

***Key topics**: Eco-settlement; reducing energy consumption; community engagement; development of renewables*

Freiburg, a historic town in South-Western Germany, has been leading environmental policy and practice for over two decades in Europe. The eco-town concept started with the decision to expand Freiburg through two new urban extensions, Vauban and Rieselfeld. The vision for both settlements was to produce low energy developments. Rieselfeld's focus was to create better neighbourhoods for families. Vauban's vision was to minimise the use of non-renewable energy sources. Both sought to include small shops and community facilities.

Both schemes share key general principles:

- Pedestrians and cyclists are given primacy, with car speeds kept below 15 mph and parking away from the centres, or underground.
- Housing is at relatively high densities, with most people living in maisonettes or town houses, enabling high quality public transport systems and walk-able neighbourhoods.
- Housing design minimises energy consumption.
- A high proportion of land is given over to nature. In Rieselfeld only 70 hectares out of a total of 320 ha is used for housing, and the rest is a nature reserve.
- The shops are kept small and can be used for a multiplicity of purposes (for example providing community facilities).

Achievements

- There is now a third less energy consumption than is required by current German law.
- The people of Freiburg have developed increasingly progressive attitudes to public transport.
- Renewables account for 10% of electricity consumed in the city.

- Energy consumption is cut through high levels of insulation and careful siting of homes.
- Half of the energy is produced locally, doubling the overall efficiency from 40% to 80%, and enables waste heat to be reused through Combined Heat and Power.
- Freiburg has taken the lead in promoting solar energy from Photovoltaic panels. The target is to increase the amount of renewable energy from solar power from 10% to 40%.
- Through returnable packaging and recycling, waste has been reduced by a factor of six over 17 years.
- Small renewable energy producers are incentivised through funds obtained from taxing traditional energy suppliers.
- Communities were engaged from the start in the design and management of public spaces.
- The new settlements have a very low turnover. Only 22 of the 2,000 homes in Vauban have been resold so far.
- Schools function as community hubs and are not cut off by walls and fences.
- Both developments share a predominantly green landscape with communal public areas where children play safely. None of the buildings are more than 12.5 metres high to keep them lower than the trees and assist air circulation. Extensive use is made of balconies (to give everyone private outdoor space) and colour.

CODE HOMES: NORBURY COURT

***Key topics**: Achieving Code for Sustainable Homes; incorporating renewables and energy efficiency measures into new developments*

Norbury Court is a housing development, developed by Staffordshire Housing Association in partnership with Staffordshire Moorlands District Council and LHL Developments to meet the area's need for more family accommodation for rent. This was the first social housing in the Staffordshire area to be awarded Code for Sustainable Homes Level 3.

The new build units were constructed using factory fabricated timber frame construction (using FSC timber), with cement particle board external sheathing and brick outer cladding. Phenolic foam insulation was injected into the external wall panel void and was supplemented with cut block foam insulation. The floors were constructed from a concrete beam system using polystyrene infill with concrete screed.

Sustainability features were solar thermal water heating, passive solar design strategies, the use of water butts to collect rainwater for the garden, the use of more environmentally benign materials, high levels of insulation, low energy lighting, internal recycling bins and low water use sanitary ware.

The design of the housing was typical for the area and caused no problems during the planning phase of the development. The low energy merits of the housing were considered a very desirable attribute for this social housing development.

There were some site construction complications associated with the installation of the renewable energy systems and energy reduction measures. It was considered that in future these should be integrated with the architecture from the earliest design phases so that site construction complications could be avoided.

While the project was low budget, meaning little time spent research and development, additional training was necessary for the installation of the solar thermal water heating.

It was not considered necessary or desirable that this development should achieve a higher Code rating than Level 3, mainly due to anticipated extra costs for higher Code levels.

This is one of the case studies from a list available at the DCLG website[11]. A number of lessons can be drawn from these Code homes case studies. Firstly, it is clear that Code compliance can be achieved using a wide range of build systems and technologies. The Code can also be used on a wide range of building types, from flats/apartments through to large, detached dwellings. Furthermore, the Code can be a valuable tool for any type of project, whether private or social housing, and can cover rental, affordable and private sale properties.

BREEAM: ELTHAM HILL TECHNOLOGY COLLEGE

***Key topics**: Achieving BREEAM excellent rating; incorporating energy efficiency measures into new developments; sustainable design*

Eltham Hill Technology College is undergoing major refurbishment and extension as part of Building Schools for the Future (BSF), a government programme worth £2.2bn a year that aims to rebuild or refurbish every secondary school in the country by 2015.

BDP Sustainability worked closely with BDP Environmental Engineers, Civil & Structural Engineers, Lighting Designers and Acousticians on all aspects of design, enabling the team to draw on skills and expertise from a number of specialists to achieve the highest environmental rating. This is a clear demonstration of successful integrated design within BDP.

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11 http://www.communities.gov.uk/publications/planningandbuilding/codecasestudies

The environmental features included in the design are:

- Natural ventilation strategy applied to classrooms and sports hall
- Night-time cooling
- Effective use of thermal mass
- A rainwater collection tank that has been sized based on the 5-day flush demand of the whole school
- Storage for recyclable waste in excess of BREEAM requirements

The Green Strategy for Eltham Hill Technology College specifies that the environmental technologies and systems incorporated in the design will be accessible to students to use as a learning resource. The building elements to be used as a learning resource include:

- Extensive biodiversity green roofs.
- A wood pellet boiler with technology description and live data display.
- Exposed transparent rainwater pipes with technology description and live data display in science labs to illustrate rainwater harvesting.
- Using energy metering the energy consumption and the CO_2 emissions saved by the biomass boiler in lieu of gas boiler plant will be calculated and publicly displayed.
- Monitoring of water storage for recycling is proposed for recording use and will be of educational value.

- Key landscape features will include an allotment that can be accessed by pupils to create and manage a natural habitat.

The development has received a BREEAM rating of 'Excellent', scoring 74.95%. The ‘Excellent’ rating was a difficult target, but proved achievable through the integrated design approach and inherent sustainable design from the outset of the project.

Thamesmead Ecopark

***Key topics**: Ecopark; sustainable housing design*

At Thamesmead Ecopark, Gallions Housing Association has developed an environmentally friendly form of housing construction, suitable for wide scale replication. The Ecopark is a development of 39 two-, three- and four-bedroom houses for rent. Each of the four housing types incorporates different combinations of features, as detailed in Table 0-1.

Table 0-1: Sustainable features of housing blocks in the Ecopark

Feature	Details
Timber frame	Chosen as it is a renewable resource unlike brick or concrete.
Insulation U-values:	Walls 0.25W/m^{2}K. External doors 2.0W/m^{2}K. Ground floor 0.30W/m^{2}K Roof 0.18W/m^{2}K.
Advanced glazing	Double glazed argon filled windows. U-value of 1.1W/m^{2}K (measured at the centre of the pane).
Condensing boilers	Gas condensing boilers (SEDBUK band A) Class 5 NO_X emissions.
Solar water heating	Solar collectors on the roof supplying twin coil hot water cylinder, reducing gas required to heat water.
Water saving features	Smaller sized baths with showers over. Dual low-flush toilets (2.5/4 litres). Spray taps to hand basins. Water butt provided to harvest rainwater.
Energy efficient lighting	All habitable rooms have dedicated low energy light fittings.
Internal finishes	Water-based paint.
Sheds	Garden sheds are provided with sufficient space to store a family's bicycles.

Waste management	Internal storage bins for recycling. Can crusher in the kitchen. Central external underground recycling facilities on site for glass, paper, aluminium and plastics. Compost bins provided.
Landscaping	Public landscape designed to maximise the environmental potential of the scheme, incorporating native flora.
Sun spaces	Houses in blocks A and C feature a two-storey sun space on their south elevation. Provides passive solar gains, a bright living space and also preheats air entering the house.
Underfloor heating	Block B has underfloor heating.
Mechanical ventilation heat recovery	Block B has mechanical ventilation heat recovery.

The aim of the development was to show that energy efficient sustainable housing need not be high-tech - and can be built within realistic budgets. The houses achieved an EcoHomes Excellent rating and a Standard Assessment Procedure (SAP) rating of 100.

In general, the tenants of the Ecopark are happy with their homes. Most have experienced significant reductions in energy bills compared to their previous properties and all have expressed an improvement in quality of life.

ANNEX 9 – LOAD FACTORS FOR RENEWABLE TECHNOLOGIES

Technology	Load factor applied	Sources					
		Source 1	Stated load factor	Source 2	Stated load factor	Source 3	Stated load factor
Biomass for single building heating	**0.10**	Compliance costs for meeting the 2020 target. http://www.bis.gov.uk/files/file45238.pdf	0.38	'The UK Supply Curve for Renewable Heat - Technology assumptions and issues' DECC 2009. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx	Domestic 0.7-0.12		
Biomass (district heating)	**0.75**	Compliance costs for meeting the 2020 target http://www.bis.gov.uk/files/file45238.pdf	0.65	'The UK Supply Curve for Renewable Heat - Technology assumptions and issues' DECC 2009. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx	0.8		
Anaerobic digestion	**0.61**	Compliance costs for meeting the 2020 target http://www.bis.gov.uk/files/file45238.pdf	0.61				
Landfill gas	**0.70**	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.6	Source: http://www.bwea.com/energy/rely.html	Landfill gas assumed to have a load factor of 80% (typical = 70-90%)		
Gas CHP	**0.80**	AEA expert knowledge and experience					

Energy from waste	**0.90**	Input data for MACC work for Committee on Climate Change, not published	0.9				
Wave/tidal	**0.30**	Compliance costs for meeting the 2020 target http://www.bis.gov.uk/files/file45238.pdf	0.3/0.35				
hydro < 100kW	**0.37**	Compliance costs for meeting the 2020 target http://www.bis.gov.uk/files/file45238.pdf	0.37	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.37		
Hydro	**0.50**	Explanatory memorandum to the Electricity and Gas (Carbon Emissions Reduction) Order 2008'. https://opsi.gov.uk/si/si2008/em/uksiem_20080188_en.pdf	0.5				
Large wind	**0.30**	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.3	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.27		
Medium wind	**0.30**	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.3	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.27		
Small and micro wind	**0.02**	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.02				
Solar PV domestic	**0.10**	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.1	Compliance costs for meeting the 2020 target http://www.bis.gov.uk/files/file45238.pdf	0.08	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.09

Solar thermal domestic	**0.05**	'The UK Supply Curve for Renewable Heat - Technology assumptions and issues' DECC 2009. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx	0.05	Analysis of renewables growth to 2020, unpublished	0.07			
Ground/air source heat pumps domestic	**0.18**	'The UK Supply Curve for Renewable Heat - Technology assumptions and issues' DECC 2009. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx	0.1-0.24 domestic					

Large wind	0.30	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.3	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.27		
Medium wind	0.30	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.3	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.27		
Small and micro wind	0.02	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.02				
Solar PV domestic	0.10	Design of Feed-in Tariffs for Sub-5MW Electricity in Great Britain' Quantitative analysis for DECC July 2009	0.1	Compliance costs for meeting the 2020 target http://www.bis.gov.uk/files/file45238.pdf	0.08	http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx	0.09
Solar thermal domestic	0.05	'The UK Supply Curve for Renewable Heat - Technology assumptions and issues' DECC 2009. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx	0.05	Analysis of renewables growth to 2020, unpublished	0.07		
Ground/air source heat pumps domestic	0.18	'The UK Supply Curve for Renewable Heat - Technology assumptions and issues' DECC 2009. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx	0.1-0.24 domestic				

ANNEX 10 – CONSTRAINTS APPLICATION IN YORK

Constraints applied to buildings technologies ◈ Constraints applied to freestanding and district technologies

This appendix sets out the constraints to potential in our assessment and how we have applied local character and situation of York to ensure we have a picture of potential that is specific to the City of York.

We have applied planning constraints that are standardised across the planning area, and should be considered regardless of the technology. These have a material effect when limiting potential. Some technologies are constrained in their potential by a combination of these planning constraints and further technical or practical barriers, such as wind speed in the case of wind power, or physical space around a building for fuel deliveries and storage, in the case of biomass boilers. Some technologies are not constrained by planning but are limited technically and practically, such as solar technologies limited by the available suitable installation area (roofs of buildings south facing). Most of the technical and practical constraints applied are based on DECC's 'Renewable and Low-carbon Energy Capacity Methodology', which sets out a standardised methodology for assessment of renewables potential across an area.

The generic constraints are applied in consideration of York's specific situation and its particular character. Tables A9-1, A9-2 and A9-3 below set out the technologies that have potential in York, state their constraint(s) applied and how we have applied these specific to York.

Table A9-1 Building integrated technologies and application of constraints

	Building Integrated Technologies	York focussed considerations
Technology	Practical consideration when determining capacity	
Small and micro wind	Separation distance of 50m between turbines	as generic
	Assumed majority of flats would not be suitable due to shared external areas	homes to flats split of 70:30 applied, as per section 8 of the Core Strategy Preferred Options document

	Assumed that at least 50% of remaining properties will have potential for micro wind (exclude urban)	Analysis of development areas carried out to estimate urban v non-urban, as per information cross referred between The Core Strategy Preferred Options key diagram, table 11 and para 8.3.
	Assumed that it would not be installed with another electricity producing technology (discount half)	as generic
Solar PV	Assumed either solar PV or solar thermal installed (discount 50%)	as generic
	Assumed that it would not be installed with another electricity producing technology (discount half)	as generic
	Assumed that majority of flats are not suitable due to shared roof areas	homes to flats split of 70:30 applied, as per section 8 of the Core Strategy Preferred Options document
	Assumed 50% of new domestic building stock suitable	As generic

Solar thermal	Assumed that majority of flats are not suitable due to shared external areas	homes to flats split of 70:30 applied, as per section 8 of the Core Strategy Preferred Options document
	Assumed that it would not be installed with another heat producing technology (discount 75%)	as generic
	Assumed 50% of remaining properties have a southerly orientation suitable for solar thermal	as generic
Ground source and air source heat pumps	Assumed that it would not be installed with another heat producing technology.	as generic
	Assumed 50% of new domestic building stock suitable	Analysis of development areas carried out to estimate urban v non-urban, as per information cross referred between The Core Strategy Preferred Options key diagram, table 11 and para 8.3.

Biomass for single building heating	Assumed that majority of flats are not suitable due fuel store needs (discount 10%)	homes to flats split of 70:30 applied, as per section 8 of the Core Strategy Preferred Options document
	Assumed 50% of remaining dwellings have density that inhibits use due to vehicle access and fuel store land needs	as generic
	Assumed that it would not be installed with another heat producing technology e.g. heat pumps (discount 66%)	as generic

The main issues affecting potential from building integrated technologies when York specifics are applied, are:

- The numbers of flats likely to occur in new developments.
- The developments that can be considered as urban or non- urban

The Core Strategy Preferred Options document contains info on the likely numbers of flats in new developments (Table 1 on page 61). The indicated split of 70% homes to 30% flats is used in our potential assessment calculations to estimate relevant numbers.

On page 65 of the Core Strategy document a diagram indicates (figure 11) a general split of York's areas by sub-market density levels. The split is given as city centre, urban, suburban and rural. When this is cross referred against the Core Strategy key diagram, it can be seen that key diagram areas 3, 6, 7 and about half of 1, are neither city centre or urban. Whilst the definitions are non-specific in terms of application of an 'exclude urban' constraint, we applied the logic that areas where developments will be too dense to practically allow the relevant technology, will be either city centre or urban. Using this logic we see that Heslington East, Germany Beck, Derwenthorpe and about half of York Northwest are included with the rest of the areas excluded. When the calculation is worked through, this excludes approximately 53% of developments.

Table A9-2 Freestanding and larger scale technologies and application of constraints

	Freestanding technologies	York focussed considerations
Technology	Practical consideration when determining capacity	
Large and Medium Wind	Sites that have acceptable constraints (e.g. noise, roads, designations etc.)	mapping of constraints in local context
Hydro	The Environment Agency (EA) has published a report looking at the opportunities for hydropower alongside the environmental sensitivity associated with exploiting hydropower opportunities . Constraints and sensitivities are those considered within.	as per source
Landfill gas	Assessment of available fuel sourced from MSW in York	York's Waste Strategy consulted for volumes and standard metrics applied to assess potential output
	AQMA impacts	Mapping of AQMAs in York

The main issues affecting potential from freestanding and larger scale technologies when York specifics are applied, are:

- Planning constraints as set out and discussed in section 4.1 of the report.

- Technical constraints of energy input availability, such as wind speeds or fuel from waste.
- Constraints specifically set out in source documents.

These are applied as set out in the main report.

Table A9-3 District Network technologies and application of constraints

	District Network technologies	York focussed considerations
Biomass DH	assessed against heat loads	mapping of heat loads
	AQMA impacts	Mapping of AQMAs in York
Community scale Biomass CHP	Ditto	Ditto

The main issues affecting potential from building integrated technologies when York specifics are applied, are:

- The planning constraint of an Air Quality Management Area, as set out and discussed in section 4.1 of the report.
- The technical constraint of how likely is it that the technologies will meet a heat load in a cost effective way.
- The practical constraints around fuel delivery and storage on site.

The AQMA constraint is set out as described in the main report.

Heat loads were mapped as were settings where mixed use could occur and are set out in section 4.4 of the main report.

ANNEX 11 – SUSTAINABLE DESIGN AND CONSTRUCTION

Building standards and establishing appropriate standards ◈ Guiding principles for designers ◈ Additional carbon saving in the built environment

An important influence on the ability of new development to achieve a lower carbon footprint is the sustainability of its design and construction. By reducing the overall carbon footprint of new developments from the outset, the amount of renewable generation required to meet targets can be more easily achieved.

This chapter therefore assesses the scope for sustainable design and construction to be supported through LDF and other planning policy and guidance.

BUILDING STANDARDS

The Government has set a requirement for all new homes to be zero-carbon by 2016, which ties in with Code Level 6. One of the key features of Level 6 of the Code is that the home should be zero-carbon. In addition, all public buildings are to be zero-carbon by 2018 and all other non-domestic buildings by 2019 – however, the definition of zero-carbon for non-domestic properties is yet to be finalised[12]. The Government sees the delivery of zero-carbon homes as part of a wider policy agenda to:

- Reduce national CO_2 emissions.
- Future-proof new homes.
- Achieve strong national standards for housing.
- Achieve fuel savings.
- Stimulate innovation.
- Encourage renewable and distributed energy.
- Demonstrate international leadership on low carbon economy.

With less than 300 weeks until 2016, achieving the zero-carbon targets presents a significant challenge. There is a general recognition that, in order to achieve this ambitious target, a step change in construction techniques at all levels is needed, assisted by a supportive planning policy context and positive guidance and advice for developers.

[12] Level 6 is not the same as zero-carbon, as zero-carbon will have 'allowable on-site carbon levels' which can be offset by off-site generation. Level 6 requires zero carbon on-site production. i.e. all energy must be generated by on-site generation.

Given the relatively northerly location of York, meeting the targets for new buildings and achieving fuel savings in existing buildings in the city will be particularly challenging. The northerly location reduces average temperatures, increasing the demand for space heating and reduces the available daylight in winter, increasing the demand for artificial lighting.

This study focussed on the suitability and applicability of the three building standards referred to in Table 11-1.

Table 11-1: Building standards

Standard	Applicable sector	Owned by/created by
Code for Sustainable Homes[13]	Domestic	Buildings Research Establishment (BRE)
BREEAM - BRE Environmental Assessment Method[14]	Non-domestic	Buildings Research Establishment (BRE)
LEED – Leadership in Energy and Environmental Design[15]	Non-domestic	United States Green Buildings Council (USGBC)

A full discussion of each of these building standards can be found in Annex 6. BREEAM and the Code are UK applicable standards that have been adopted into policy in a number of ways. This is most predominant in the public sector, which has building standard requirements for all new buildings:

- All new government buildings must achieve BREEAM – Excellent.
- All new public sector homes must achieve the Code level 3 or better.
- The government has a target for all new homes to be zero-carbon by 2016 – The former minister John Healey defined a zero-carbon home as *"one whose carbon dioxide emission is zero or negative across the year. This includes energy regulated by building regulations and other energy used in the home"*.

ESTABLISHING APPROPRIATE STANDARDS FOR DEVELOPMENT SITES WITHIN YORK

The standards and tools discussed already have good levels of up-take, currently at an estimated 50 per cent of new non-domestic buildings and in excess of 20 per cent of domestic new builds[16,] and the demand is leading to their ongoing refinement.

Whether there is a single assessment tool or not, the core criteria, which would seem to capture best practice across existing industry tools and meet the Government's aims in terms of sustainability, include the following:

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13 http://www.communities.gov.uk/planningandbuilding/buildingregulations/legislation/codesustainable/

14 http://www.breeam.org/

15 http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

16 LEED is an international standard that originates in the United Stated and has been adopted by a number of countries; http://www.communities.gov.uk/housing/housingresearch/housingstatistics/housingstatisticsby/housebuilding/livetables/

- The process surrounding the use of any standard should (where appropriate) be fully accredited (e.g. by UK Accreditation Service).

- The process should include a post-construction check before any final certificate is issued.

- The standard should allow for a rating to be awarded at construction and post-construction stages where appropriate (for example, base-build and fit-out).

- The standard should focus on the building's environmental performance both in construction and use.

- The standard should include energy and, potentially, water efficiency standards that are non-tradable at all levels.

- In order to provide consistency with regulatory standards, the standard should include the energy efficiency standards and trajectory set in the Building Regulations and should be based on the national calculation methodology.

Holistic sustainability assessments for buildings might also set standards for:

- Carbon emissions and renewable energy.

- Products and materials used for construction.

- Waste minimisation during construction.

- Waste strategy once the building is occupied.

- Biodiversity.

- Recycling facilities

- Encouraging greener transport (e.g. facilities for cycling).

The following variables will need to be considered if establishing a required minimum attainment standard:

- The practicality and cost-effectiveness of measures available to be installed in different building types will vary.

- The size and location of the development will have an impact on the range of near-site or offsite solutions that may be available. For example, urban infill / mixed development would be likely to have greater opportunities for connecting to district heating networks than a lone building on a remote industrial estate. But the latter may have more scope for onsite renewables.

- A very large development may benefit from synergies between building types and economies of scale that a small building, such as an individual retail unit, may not be able to access.

- Moreover, buildings with large heat demand offer the potential to act as anchor loads from which district heating networks could grow and develop.

- An additional, but important consideration in the context of new buildings will also be the need for cooling.

Very few true zero-carbon buildings have been constructed in the UK; as a result there is little empirical evidence as to what a cost premium might be. Furthermore, due to performance and quality drivers, there is a wide range of costs associated with functionally similar non-residential buildings.

Due to the absence of an established knowledge resource and the high variability in baseline costs, the reporting of the extra cost of zero-carbon on the basis of a percentage addition runs the risk of significant error, and misrepresenting the factors that drive the cost premium.

The market is, however, already gearing up to achieve the challenging targets of the zero carbon buildings directives and this has been achieved by setting a clear road map for the whole industry to work towards. It is our perception that the industry will look to Local Authorities to help support them in attaining the goals already agreed, rather than to impose additional requirements.

It is our recommendation at this point in time that City of York Council does not need to set additional targets at this stage for new housing funded by the Homes and Communities Agency (HCA) or non-domestic buildings, for the following reasons:

- The requirements of meeting zero carbon domestic buildings by 2016 and equivalent zero-carbon standards for non-domestic buildings by 2019 will be challenging enough.

- The additional cost of achieving the higher levels could potentially damage economic generation and the development mix.

While the Code currently only applies to housing which is funded by the HCA, it is within the power of local authorities to require that private developers should meet specified code level as part of supplementary planning guidance and this is therefore a very useful tool for achieving sustainability in the built environment.

York could produce supplementary planning guidance for developers, supported by a set of guiding principles for developers, designers and planners. This SPD would specify a minimum construction standard for new housing developers. It is recommended that, if this approach were adopted, that the standard would be set at the same level as is required for housing funded by the HCA – i.e. the new SPD would be based on the HCAs for domestic[17]. This will be particularly challenging for private developers as they have not had to build these standards until now. However, other councils are adopting similar planning requirements elsewhere in the UK[18].

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[17] Non-domestic has not been referenced here as there is currently no national requirement in existence, other than the forecast for zero-carbon by 2018/19. However, the consultation on definition of zero-carbon is still ongoing.

[18] Overall the driver for applying the code to private developers is coming from local authorities, as can be seen in the article: http://www.sustainablehomes.co.uk/news_detail.aspx?nid=0fc19ac4-70d7-41eb-a42f-f97f7b52371d

York could also consider an engagement strategy designed to promote and deliver lasting change. This could include provisions for a support network and/or partnerships that would work with developers to identify opportunities for pilot or exemplar projects. One output could then be the development of case studies with the projects costs, which would subsequently be shared as good practice. Potential partners already working in this field within York include; Future Energy Yorkshire; Rydale Energy Conservation Group, Energy Saving Trust Energy Partnership Centre, and the Carbon Trust.

Currently, policies and proposals in the local development framework in the city of York are already subject to a sustainability appraisal. This is carried out in accordance with the core strategy sustainability appraisal scoping report (June 2006). This report stresses the historical importance of the city, the necessity to protect woodland cover, the importance of the three main rivers and the eight sites of special scientific interest. The City of York is also concerned to retain views across the landscape so new development needs to take into account the visual impact from all perspectives.

In addition to meeting national target standards such as specific levels of the code for sustainable homes, it is essential that new development takes all the above considerations into account. In particular, it is recognised that the unique heritage of the city continues to be the principal attraction for visitors and that the tourism industry provides a substantial proportion of the economic activity in the city. Measures to increase the sustainability of the building stock must not compromise the historic nature of the city centre and important buildings must be protected. Listing provides automatic exemption from some of the requirements of parts L1B and L2B of the building regulations concerned with the thermal performance of existing buildings. However, there may be other significant buildings which do not have this protection, although they may lie within conservation areas.

GUIDING PRINCIPLES FOR DESIGNERS

As discussed, there are several well-developed national green design standards already in existence, although most only refer to new buildings, but can be adapted to apply to existing buildings. Existing buildings present greater challenges than new buildings as many of their deficiencies are built-in and only a partial remedy is possible in many cases. As existing buildings vary so much in terms of their construction and condition, it is critical that general policies are sufficiently flexible to respond to the particular needs of widely differing building stock.

It is essential that a construction code provides a useful practical guide to enable realistic decision making by designers, developers and project managers. This guidance should also take into account the views of all stakeholders in the process and the impact that any work has on the environment, and that the building has on its occupants and the community that it serves.

It is important that the principles address the planning, design, construction and ongoing maintenance of buildings.

Annex 7 provides a guide of what should be considered for establishing a set of guiding principles for planners and designers, which would ensure that opportunities for site-wide sustainable construction and energy/environmental solutions are maximised at the planning stage.

York currently has a Sustainable Design and Construction Interim Planning Statement. A gap analysis could be carried out on this document to ensure that it contains all the key aspects discussed in Annex 7. The would then be updated and could subsequently be adopted as Supplementary Planning Guidance, designed to be applied to a wide variety of sites and signpost other good practice in the area.

ADDITIONAL CARBON SAVING IN THE BUILT ENVIRONMENT

Meeting renewable energy targets set out in the Renewable Energy Strategy lead scenario from new developments alone could prove a challenge, as can be seen from section 2 in the main report. Other carbon saving opportunities in the built environment, particularly in existing developments, will need to be considered by City of York Council.

Energy efficiency measures, such as insulation, are generally more cost effective than renewables in existing domestic housing stock. Table 11-2 and Table 11-3 below show typical costs and savings for retrofitting a range of carbon reduction measures[19,] alongside those for the retrofit of small-scale renewable energy technologies. A well planned programme of retrofitting has potential to make significant energy, and hence carbon, savings in the built environment.

If York decide to develop an engagement strategy that will help deliver and embed change and promote renewable and low carbon options. Measures on how to retrofit existing properties should be included as an element of this.

Table 11-2: Annual savings per electricity measure for the average 3-bed semi-detached house

Measure	Category	Net Savings				Lifetime	Unit cost of measure (£)
		Energy (kWh/yr)	Fuel Cost (£/yr)	Carbon (kg carbon/yr)	Carbon dioxide (kg CO_2/ yr)		
CFLs – retail	Lighting	8	£2.08	2.2	8.07	17.7	£2.00
Efficient halogens	Lighting	3	£0.83	0.88	3.24	6.51	£2.50
CFLs – direct	Lighting	8	£2.08	2.2	8.07	17.7	£3.20
Micro CHP	Heating/ electric	-1286	£97.85	57.3	210.12	15	£600
Micro Hydro (0.7 kWp, 50% LF)	Electric	3068	£278.89	360.5	1321.84	20	£1,890
Micro Wind (1 kWp, 10% LF)	Electric	877	£79.68	103	377.67	10	£3,200
Photovoltaic panels (2.5 kWp)	Electric	2115	£192.25	248.51	911.21	25	£6,338
Mini-wind 5 kW, 20% LF	Electric	8766	£807.40	1030.01	3776.69	22.5	£21,000

Source: http://www.opsi.gov.uk/si/si2008/em/uksiem_20080188_en.pdf

19 In an average 3-bed semi-detached house

Table 11-3: Annual savings per heating measure for the average 3-bed semi-detached house

Measure	Category	Net Savings: Energy (kWh/yr)	Net Savings: Fuel Cost (£/yr)	Net Savings: Carbon (kg carbon /yr)	Net Savings: Carbon dioxide (kg CO_2/ yr)	Lifetime	Unit cost of measure (£)
Tank insulation - top-up	Heating	800	£20.27	45.8	167.94	10	£14
Heating controls - upgrade with boiler	Heating	181	£4.30	9.57	35.09	12	£90
Draughtproofing	Heating	631	£16.30	36.22	132.81	20	£101
Loft insulation (DIY)	Heating	1277	£32.95	73.3	268.76	40	£120
Heating controls – extra	Heating	1457	£34.62	77.02	282.41	12	£148
Glazing E to C rated	Heating	389	£10.08	22.4	82.12	20	£212
A/B rated boilers (exceptions)	Heating	1866	£43.58	97.21	356.45	12	£212
Loft insulation (professional)	Heating	1489	£38.41	85.46	313.36	40	£286
Community heating with wood chip	Heating	-1135	£79.40	1034.11	3791.73	30	£350
Cavity wall insulation	Heating	3012	£77.86	173.01	634.36	40	£380
Log burning stoves	Heating	-482	-£13.05	58.9	215.98	20	£1,000
Wood pellet stoves (secondary)	Heating	313	-£42.17	163.99	601.31	20	£1,417
Insulated wallpaper	Heating	3417	£95.30	196.01	718.69	30	£1,660
Fuel Switching	Heating	7116	£502.19	1107.52	4060.92	20	£2,014
Solid wall insulation external to U value of 0.45 W/m^2K	Heating	9928	£256.45	569.93	2089.76	30	£3,000
Solar Water Heater ($4m^2$)	Heating	1548	£40.81	88.85	325.78	25	£3,500
Community ground source heat pumps	Heating	9216	£11.47	148.8	545.61	40	£4,250
Solid wall insulation external to U value of $0.35W/m^2K$	Heating	10502	£271.23	602.77	2210.16	30	£4,500
Wood pellet boilers (primary)	Heating	2103	-£93.17	1415.94	5191.77	20	£7,200
Community wood chip CHP	Heating	-2185	£254.43	937.67	3438.12	30	£9,281
Ground source heat pumps	Heating	10720	£239.26	708.95	2599.5	40	£11,360

Source: http://www.opsi.gov.uk/si/si2008/em/uksiem_20080188_en.pdf

As discussed in section 4-4 of the main report, there may be potential for district heating systems in existing locations or large public buildings, such as hospitals or leisure centres, which have high heat loads. Medium or small-scale wind may also be a viable option to supply existing developments adjacent to open and unconstrained areas of land.

PLANNING AND PASSIVE SOLAR DESIGN

Passive solar design (PSD) seeks to optimise the use of solar heat, daylight and natural ventilation in a development, so reducing the need to provide these requirements by artificial means. A key priority in PSD is to enhance occupant comfort in buildings.

PSD influences the following aspects of the planning and design of buildings:

- Siting
- Site layout
- Landscape and planting
- Built form
- Window design
- Internal layout
- Roofs, walls and floors
- Insulation
- Air tightness
- Internal controls

It is noteworthy that town and country planning decisions can exert a significant influence on the first six of these design elements. Annex 7 contains further guidance on how PSD can be best supported through the planning system, the elements that need to be considered when reviewing applications and the information that could be provided as part of supplementary planning guidance.

SUSTAINABLE DESIGN AND CONSTRUCTION – CONCLUSIONS

City of York Council should not set higher building standards for new housing funded by the HCA or non-domestic buildings.

Higher building standards could be set for new residential development (not funded by the HCA) though a supplementary planning document, which would include a set of guiding principles for developers, designers and planners.

A set of guiding principles for developers, designers and planners, as suggested above, should be published. This could be an update to the Sustainable Design and Construction Interim Planning Statement. Guidance on passive solar design could form a part of this.

An engagement strategy that would promote renewable and low carbon energy and deliver lasting change should be considered. This could include the development of good practice case studies with projects costs.

Guidance and a programme on the retrofitting of existing properties should tie in with the other actions that are taken around sustainable design and construction.

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