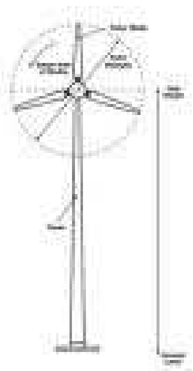
Wigan Council



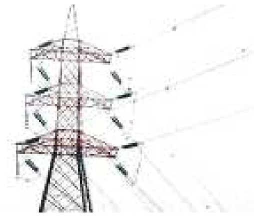
Low Carbon Energy Study

Wigan Borough

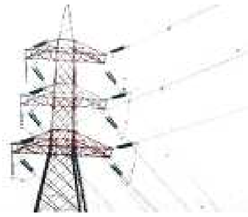
August 2010

Environmental Services Department

Contents



Wigan Borough
Energy Evidence Paper



1.0 Introduction and background

This report has been produced to inform Wigan Local Development Framework and to help formulate an energy strategy for the borough.

It supplements the AGMA Decentralised Energy Study (2010), which already sets out a City Region context to planning for a low carbon economy.

The evidence we have collected takes the AGMA study a step further by identifying specific opportunity areas and targets for low carbon technologies.

It should be noted that the areas highlighted in this study are only broad opportunity areas and the energy targets are only indicative. Further work will be necessary at a site-specific level to progress opportunities, tackle constraints and deliver infrastructure.

Nevertheless, the study will help to inform our broad level policies on energy in the Core Strategy and will feed into out Infrastructure Delivery Plan and scheduled Area Action Plans.

A number of assumptions have been made during the collection and analysis of the data used in this study. We have largely followed the guidance document 'Renewable and Low-Carbon Energy Capacity Methodology for the English Regions'. This allows a degree of comparison and consistency with other areas.

1.1 Policy

Traditionally we have relied upon fossil fuels such as coal, oil and gas to heat our homes, generate electricity, manufacture products and for transportation. For a long time we have acted as though these fuels are limitless and have largely disregarded their environmental impact.

However as fossil fuel prices continue to rise and the threat of climate change becomes increasingly evident, it is clear that we cannot continue with these trends.

Fossil fuels will not be readily available forever. They are already becoming more expensive to extract and demand for them is rising, leading to higher costs and making shortages more likely.

Burning fossil fuels also releases carbon dioxide and other greenhouse gases into the atmosphere, which is causing the planet to warm up much faster than is natural. We are already seeing some of the effects of climate change (such as melting ice, floods and droughts) and scientists say that if we do not act quickly the earth could heat-up to very dangerous levels.

It is clear we can no longer rely upon fossil fuels, but we still need energy to sustain our modern lives. Therefore, to meet the dual challenge of climate change and energy security, we need to start using alternative fuels and technologies to meet our needs, and to use energy and other resources much more efficiently.

In recognition of these challenges, there are international efforts to limit carbon emissions to a level that will not result in a temperature rise of over 2C. The Copenhagen Accord is the first step in moving towards international agreement on climate change, but there is a long way to go.

At the European and national level, policy is developing much quicker, with increasingly tougher standards on energy efficiency in buildings, requirements to produce more energy from renewable sources, and the promotion of decentralised, low carbon energy supply.

The Publication of the UK Low Carbon Transition Plan and the passing of the Climate Change Act (2008), and the first Annual Energy Statement underline cross party commitment to tackling these issues.

Lowering demand for energy, using it more efficiently and diversifying supply is also essential for a strong modern economy, because it leads to financial savings for businesses (especially those that are energy intensive) and reduces instability.

1.2 Energy and Climate Change Targets

The European Union has committed itself to a number of targets relating to energy and the reduction of greenhouse gases:

- 20% reduction in greenhouse gas emissions by 2020
- 20% improvement in energy efficiency by 2020
- 20% of energy is generated from renewable sources by 2020
- 10% bio fuels content for transportation.

The UK share of this target is for 15% of our energy to be generated from renewable sources by 2020. This is broken down as 40% from electricity, 12% heat production from renewables, and 10% of transport fuel.

The UK government has also set itself ambitious renewable energy targets through the Low Carbon Transition plan and Renewable Energy Strategy, aiming for 10% renewables by 2010, and 15% by 2020.

These are very challenging targets given that renewable energy generation in the UK was just 2% in 2005, 5% in 2007 and 5.3% in 2008.

The UK Government has also set formal carbon emissions reduction targets through the Climate Change Act 2008. These complement the energy targets as the two agendas are intrinsically linked.

- 34% reduction in carbon emissions by 2020
- 80% reduction in carbon emissions by 2050
- 5 yearly budgets to be set with interim targets.

1.3 Action on Climate Change and Energy

The Coalition Government has outlined its' intent to continue the pursuit of a low carbon economy.

The targets set by the Climate Change Act and the Low Carbon Transition Plan are still relevant, and we will need to work towards meeting these challenges:

Greater Manchester has recently been designated as a Low Carbon Economic Area for the Built Environment. This intends to make use of the regions expertise and partnership working credentials to fast-track carbon reductions from new and existing buildings across the districts. Clearly planning has an important role to play.

As outlined in the introduction, the Association of Greater Manchester Authorities produced a Decentralised Energy Study in January 2010 that outlined the broad opportunities for the sub-region and also sets out a framework for achieving carbon reduction targets.

Our work locally takes forward this broad level study and intends to implement the recommendations made by the Decentralised Energy Study.

Additionally, Wigan Council has produced a Climate Change Strategy and Action Plan that will need to be closely related to the energy planning work that needs to come forward as part of the Local Development Framework and at the City Region scale.

The Local Strategic Partnership has chosen National Indicator 188 on Adaptation to Climate Change as a priority in the Local Area Agreement. Naturally, this will involve elements of mitigation, which will be measured through progress against NI 185 and 186. The estimated per capita carbon savings that should be realised for the borough by 2020 is 13.3%.

Although funding may now be a major issue, opportunities have also been recognised to make big reductions in carbon emissions from schools. For example, this could be achieved through the replacement of oil heating systems with wood pellet or biofuel, increasing the use of solar systems, improving lighting controls and the further integration of the school and Trust estates with Building Energy Management Systems for centralised control and monitoring.

1.4 Energy trends

International trends

The International Energy Agency forecasts that the world will need 40% more energy in 2030 than 2007. (Source: IEA, 2010)

Although the rate of growth is expected to be much lower for the UK over the same time frame, global changes will have a profound impact on our economy as demand for resources pushes up fuel prices and destabilises supply.

Due to the global financial crisis and ensuing recession, global energy use is actually set to fall in 2009 for the first time since 1981. However, it is expected to quickly resume its long-term upward trend once the economy recovers if we continue with today's policies. How quickly it rebounds depends largely on how soon the economy recovers.

The majority of future demand for energy is anticipated to be from developing countries such as China and India, and this is likely to be fossil fuel based.

We know that fossil fuel combustion contributes massively to climate change, and it is now widely acknowledged that we need to make drastic cuts in emissions if we are to limit its impacts to an 'acceptable' level.

This means increasing investment in low carbon technologies, but energy investment has plunged in the face of a tougher financing market. New funding mechanisms and government support will therefore be critical to achieving low carbon growth.

Despite these challenges, the recession, by curbing the growth in greenhouse gas emissions, has made the task of transforming the energy sector somewhat easier by giving us a narrow window of opportunity to concentrate investment of low carbon technologies.

UK trends

Indigenous production of primary energy was 4.9% in 2008 compared to 2007, continuing a year on year decline for each year since 2000. This means we are becoming ever more dependant upon imported energy, which is often located in volatile countries and is under increasing demand from growing economies such as China and India.

Although growth in energy demand in the UK is expected to be low, if we keep using energy at the same rate as today (taking into account population and economic growth) final energy demand could almost double between 2005 and 2021.

The demand for electricity is expected to rise, particularly if we start to increase its use for heat and transport as anticipated.

A positive trend is the growth in renewable energy generation of 14% between 2007 and 2008, with most coming from biomass and being consumed as electricity.

However, the total contribution to national consumption is still minimal at only 5.3% (Source: Energy In Brief, DECC, 2009).

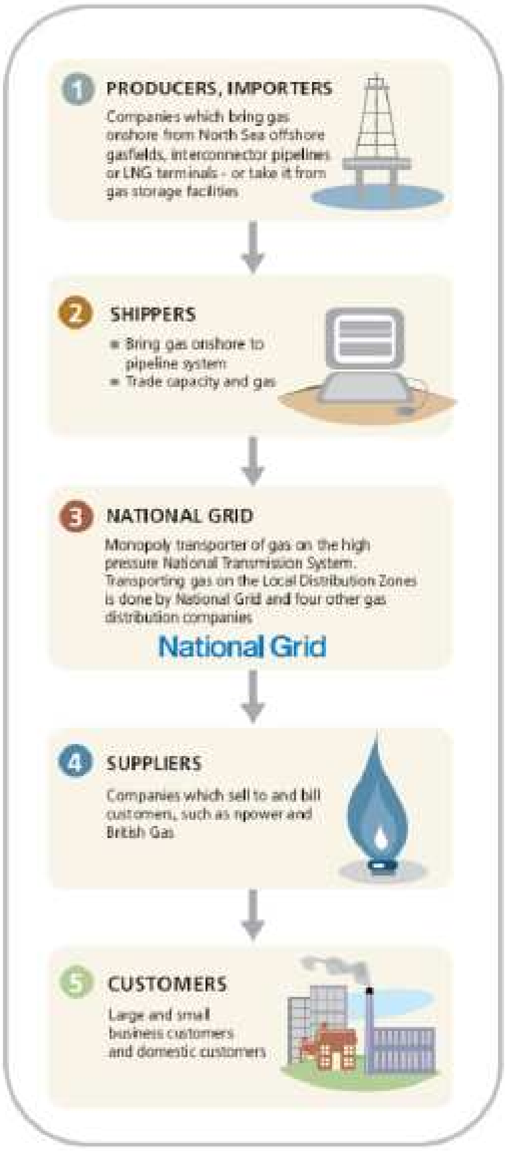
UK energy prices have risen for commercial domestic, transport and industrial sectors between 2007 and 2008, continuing a long term upward trend in fuel prices.

All these trends put the scale of the challenge into perspective and make it clear that it is imperative to reduce carbon emissions and increase the share of renewable and low carbon technologies in our energy generation mix.

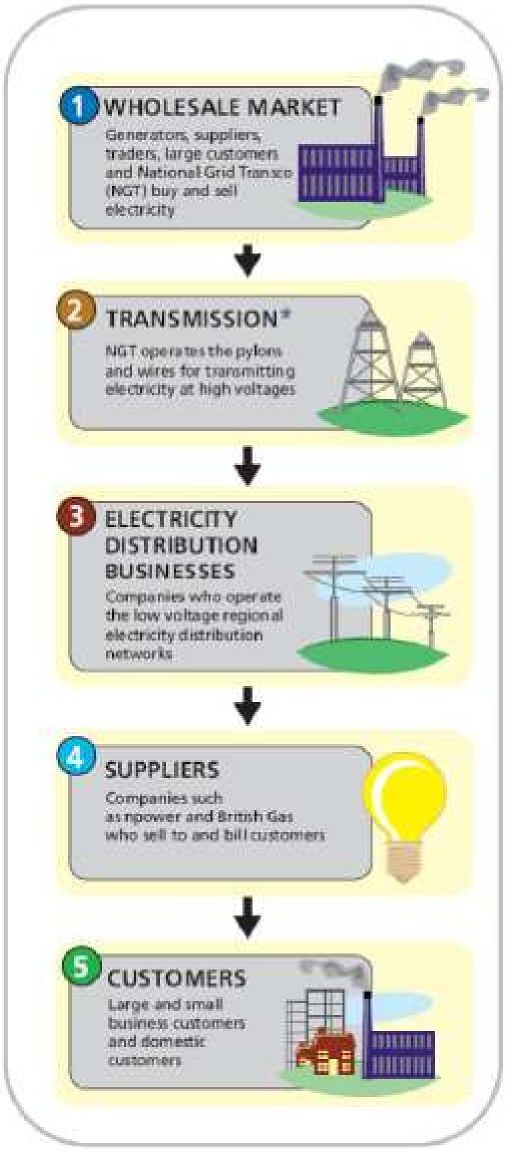
1.5 Energy Generation and Supply

Wigan's businesses and households are highly dependant on energy imported from outside the borough. This is mainly petrol/diesel for transport, electricity generated from large power stations and distributed via wires at differing voltages, or gas supplied through a network of underground pipes at various pressures.

Although most customers only deal with energy suppliers, complete supply chains are often complex, as illustrated below.



Sources: Securing Britain's Gas Supply (Ofgem 26.06.07)



Securing Britain's Electricity Supply (Ofgem 13.06.05)

Electricity

Electricity is generated almost solely from large scale power stations that are fired from fossil fuels, nuclear, and to a lesser extent renewable energy sources.

The National Grid then transmits the electricity at high voltage, and Distribution Network Operators reduce the voltage at various substations to convey it through the local network to customers.

Electricity North West is responsible for the electricity infrastructure in Wigan.

The National Grid is supplied from a variety power stations around the UK. But, there is a general flow of energy from north to south, because the 'north' has significant generation resources and the 'south' tends to have a higher demand in comparison.

The major electricity generating power stations in the North West region are Fiddlers Ferry in Cheshire (coal/biomass-fired), Rocksavage in Cheshire (gas-fired), Heysham 1 and 2 (Nuclear) in Lancashire, Roosecote (gas-fired) and Fellside (Gas combined heat and power) – which are both in Cumbria. There are also a number of smaller installations including a growing number of wind farms both on and offshore.

Nuclear power is strongly represented in the North West too, accounting for over 10,000 jobs and 44% of the region's energy generation mix. The two generating plants in Heysham are anticipated to be decommissioned in 2014 and 2023 retrospectively, so it is important that capacity is replaced.

The former government carried out strategic siting assessments for nuclear power and published these in a draft National Planning Statement for Nuclear. The preliminary conclusions are that 4 sites in the North West are potentially suitable for the deployment of new nuclear power stations by the end of 2025. These are Heysham (Morecambe) Sellafield (Cumbria), Braystones (Cumbria), and Kirksanton (Cumbria).

It is also important to note the plans for significant offshore wind development around the UK coast, including the potential for over 4GW in the Irish Sea from the Round 3 Offshore Wind Zone allocation. This will include significant development along the North West coast line.

Although there is adequate installed capacity to meet current demand for powering the North West, a number of large power stations are due to be decommissioned. It is important to note that there are significant time lags associated with the construction of new power plants, and this may affect supplies of energy in the future.

Gas

The majority of our gas is supplied to large terminals on the UK's coast where it is then distributed by National Grid through its High Pressure Network.

Gas pressure is then reduced through a network of intermediate high, medium and low pressure gas mains as it is distributed to consumers.

Summary of supply networks

A feature of our current energy networks is that they are heavily reliant upon fossil fuels. They are also highly centralised, which means that a lot of heat is produced during combustion that goes to waste and energy is also 'lost' during transmission over long distances.

The Government intends to decarbonise the grid by increasing the mix of renewable energy, nuclear and 'clean fossil fuel' technologies into the generation mix.

It also recognises that local decentralised energy generation will play an important part, and seeks to increase the amount of local energy schemes.

2.0 Local baseline

2.1 Energy Generation

Although most of the energy used in the borough is imported via gas pipes and the National (electricity) Grid, there is some local generation of electricity within the borough; which is mostly fed back into the national grid.

Energy type	Name/location	Installed capacity	Status
Landfill Gas	Kirklees	2.08 mw	Operational
Landfill Gas	Ince Moss Landfill Scheme	0.62 mw	Operational
Landfill gas	Whitehead Landfill / Astley	5.3 mw	Operational
EfW (CHP)	Blakeley's EfW proposal / Bickershaw	8 mw electricity 24 mw heat	Planning proposal
Small scale wind	Wigan North Western Train Station	12 kw	Operational
Small scale wind	Abraham Guest High School	30 kw	Planning Proposal
Small scale CHP	Various (4 sites)	0.41 mw	Operational
Small Scale Wind	Swan Lane Industrial Estate	12kw	Planning Proposal

Landfill gas is currently classed as 'renewable' energy generation for the purposes of obtaining Renewable Obligation Certificates. These three operational plants in Wigan have a total capacity of 8MW, which makes up just 0.8% of Greater Manchester's current installed capacity of 94.3MW (Source: 4NW,2008).

The waste heat produced at these installations is currently unused.

Given policy restrictions on landfill, generation from these sources may be expected to peak within the next few years. However, future energy generation may be feasible from sewage gas, sludge and municipal waste.

There is some additional local energy generation through the installation of micro-generation technologies such as solar panels, wind turbines and biomass boilers. However, it is difficult to measure the contribution these make to local renewable energy generation, as many schemes will be permitted development and the energy is often used on site for heat and power. Furthermore, installations to date have been very small in scale and not widespread, so they do not contribute a great deal to local generation at the moment.

With the introduction of the Feed in Tariff for electricity, and the proposed Renewable Heat Incentive, we would expect a sharp increase in the number of these technologies being installed in the borough.

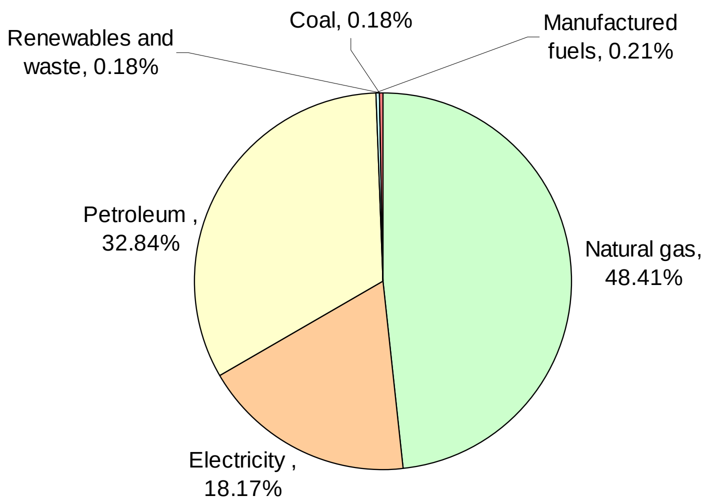
2.2 Energy consumption in the borough

Energy consumption in Wigan in 2007 was almost exclusively via fossil fuels, with 3,316 Gigawatt hours (Gwh) from natural gas, 2,250 Gwh from petroleum and 1,244 Gwh from electricity (which is also mainly fossil-fuel based). Direct use of renewable energy and waste only made up 12.4 Gwh (0.18% of the total).

There has been little change in the breakdown of fuel types used between 2003 and 2007.

Energy use is broken down by sector as follows

Transport 28% | Domestic 37% | Industry 35%



Wigan residents used an average of 1,840kwh of electricity and 9,231 kwh of gas per person per year in 2007. This is less than the North West and UK averages over the same time period.

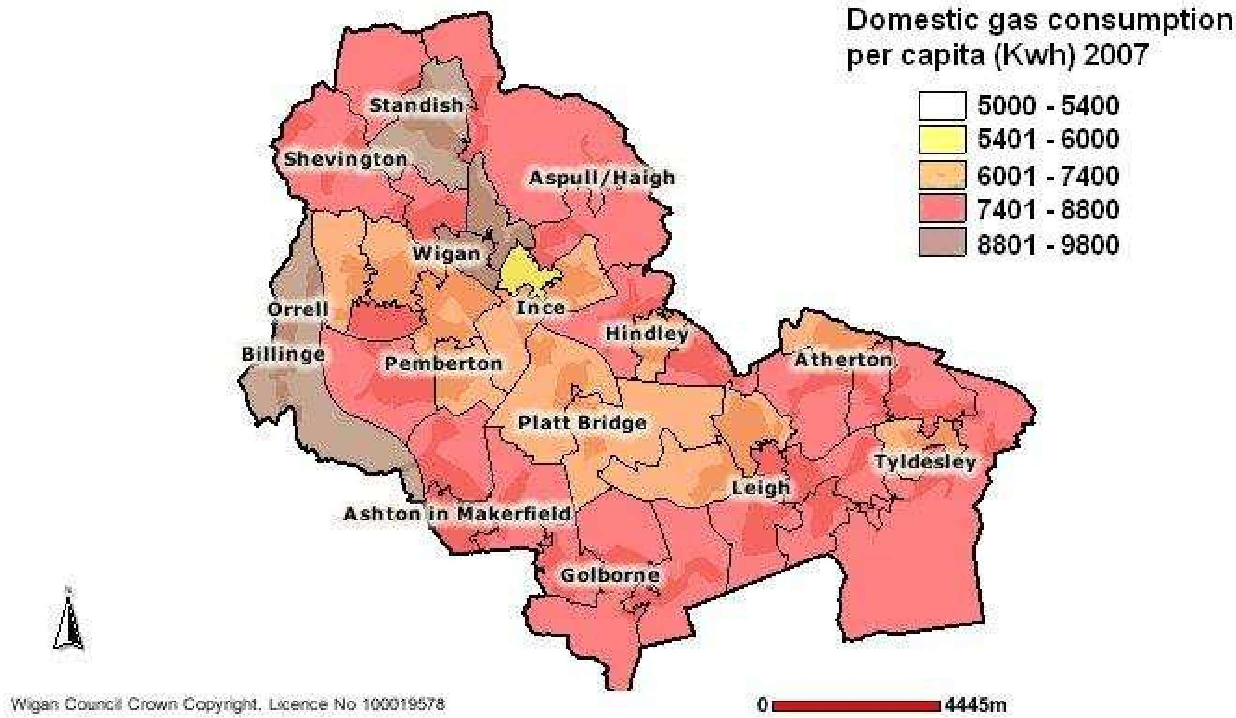
Between 2005 and 2007 there has been an overall decrease in total energy use by 3.5%. This is largely due to big reductions in gas across the board. Electricity use has risen in both domestic and commercial/industrial sectors over the same time period. Interestingly, we noted a particular increase in energy consumption in Wigan Town Centre and at Leigh Sports Village, illustrating the impact that new development has on energy demand in particular areas.

The maps that follow illustrate the consumption of gas and electricity across the borough using 2007 trend data (DECC, 2007).

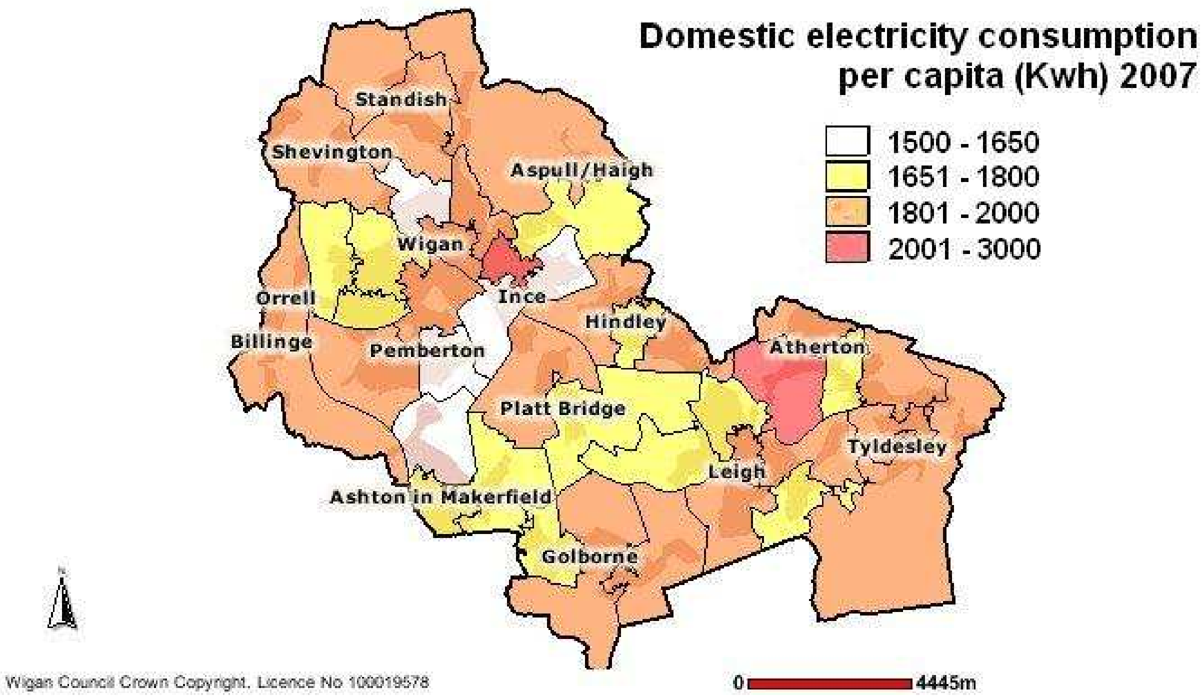
2.2.1 Domestic energy consumption

As illustrated in the maps below there are spatial differences in the consumption of gas and electricity in our homes. Gas consumption per person is clearly higher in the outer areas of the borough, with lower consumption levels across the 'east-west core' of the borough.

Domestic electricity consumption is also generally higher in the outer parts of the borough, although there are one or two exceptions.

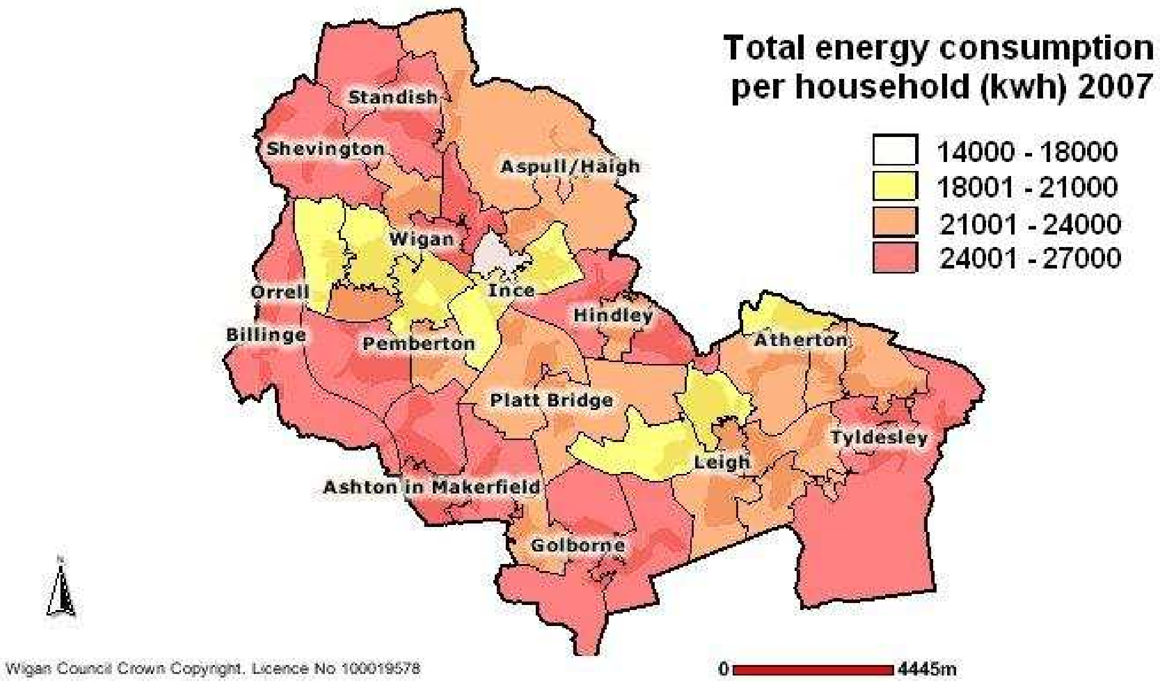


Map 1: Domestic gas consumption per capita 2007



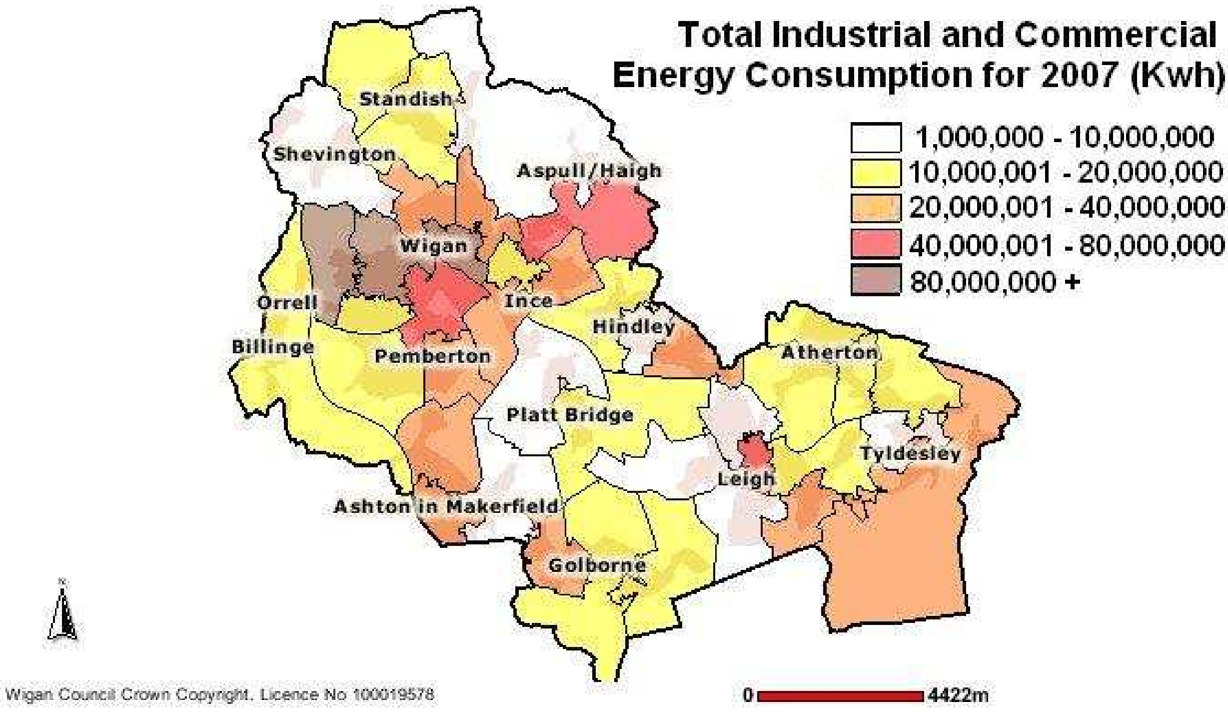
Map 2: Domestic electricity consumption per capita 2007

Total domestic energy use per household is generally higher in the outer areas of the borough, with lower levels in the centre of the borough and where there are higher concentrations of industrial / commercial activities (such as Martland Park)



Map 3: Total energy consumption per household, 2007

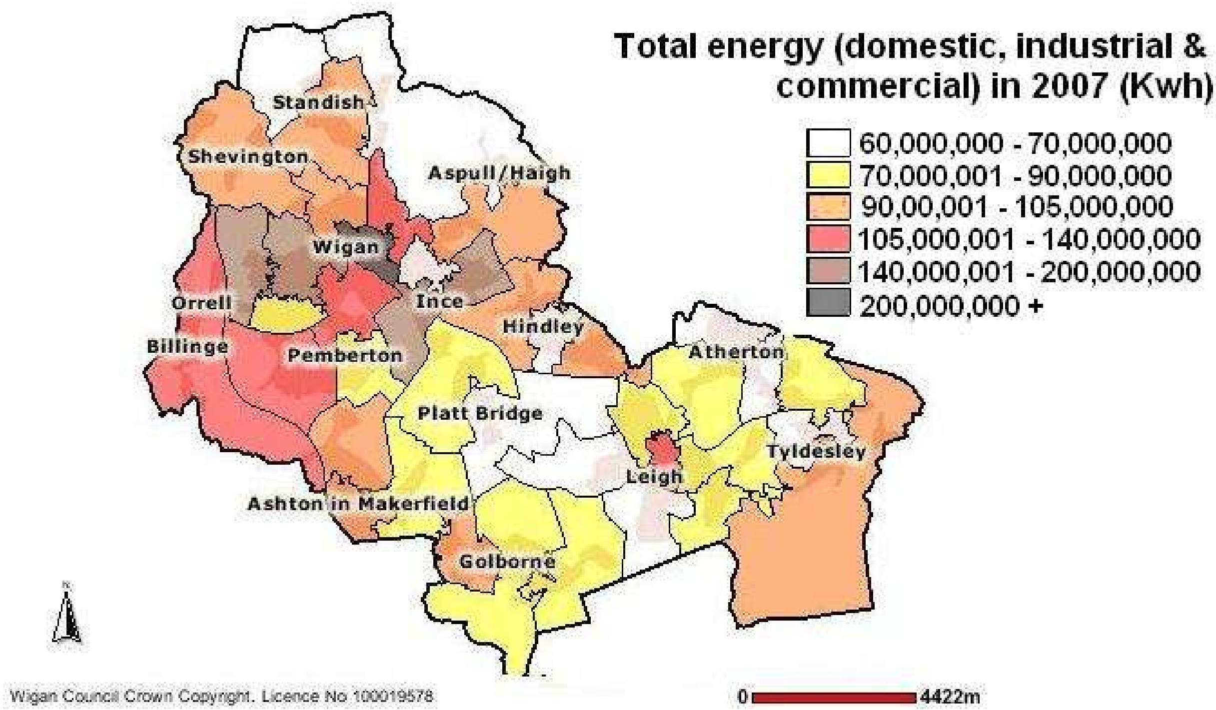
2.2.2 Industrial and Commercial Energy Consumption



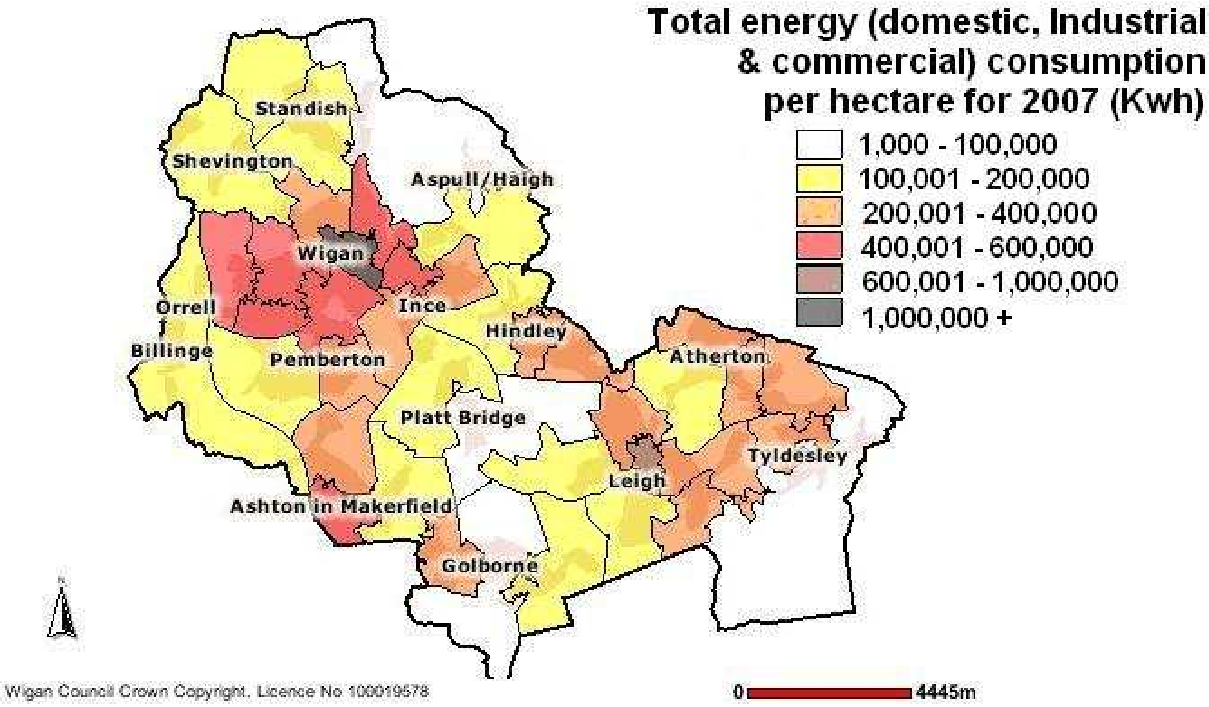
Map 4: Total industrial and Commercial Energy Consumption, 2007

2.2.3 Total energy consumption

The map below illustrates the total amount of energy (domestic, commercial and industrial) used in different parts of the borough. There are concentrations of consumption in the town centres of Leigh and Wigan, and surrounding Wigan - particularly in the Wigan South Central area.



Map 5: Total energy consumption, 2007



Map 6: Total energy consumption per hectare, 2007

When we look at the amount of energy consumed compared to the size of the middle super output areas, the picture is slightly different.

Again, the hotspots of consumption are in Wigan town centre (over 1 million kwh per hectare) and Leigh centre (over 600,000 kwh per hectare) where densities are higher. There is also a ring of higher consumption around Wigan town, reflecting relatively dense residential development and concentrations of businesses.

Residential areas with little industrial / commercial activity tend to have lower consumption overall compared to mixed use areas.

The outer parts of the borough are generally less dense, and energy consumption per hectare reflects this, particularly in areas such as Aspull / Haigh and Astley.

Identifying the areas with the greatest demand for energy highlights where we may need to target infrastructure reinforcements and the development of suitable low carbon technologies.

2.3 Carbon dioxide emissions

Total carbon dioxide emissions from road transport, homes, industry and commerce have been estimated at 1,701,000 tonnes for 2007, which equates to 5.6 tonnes per resident. This is a reduction since 2005 and 2006 of 5.7 tonnes per resident

In Wigan the emissions break down into 639,000 tonnes for industry and commerce (38%), 706,000 tonnes for domestic (42%), and 357,000 tonnes for road transport (21%) (Source: NI 186 dataset for DECC)

The spatial concentration of Carbon emissions by end user is closely correlated to the energy consumption maps in the previous section. However, those areas that use more electricity will have higher emissions by comparison to those that are more reliant on gas.

2.4 Fuel Poverty

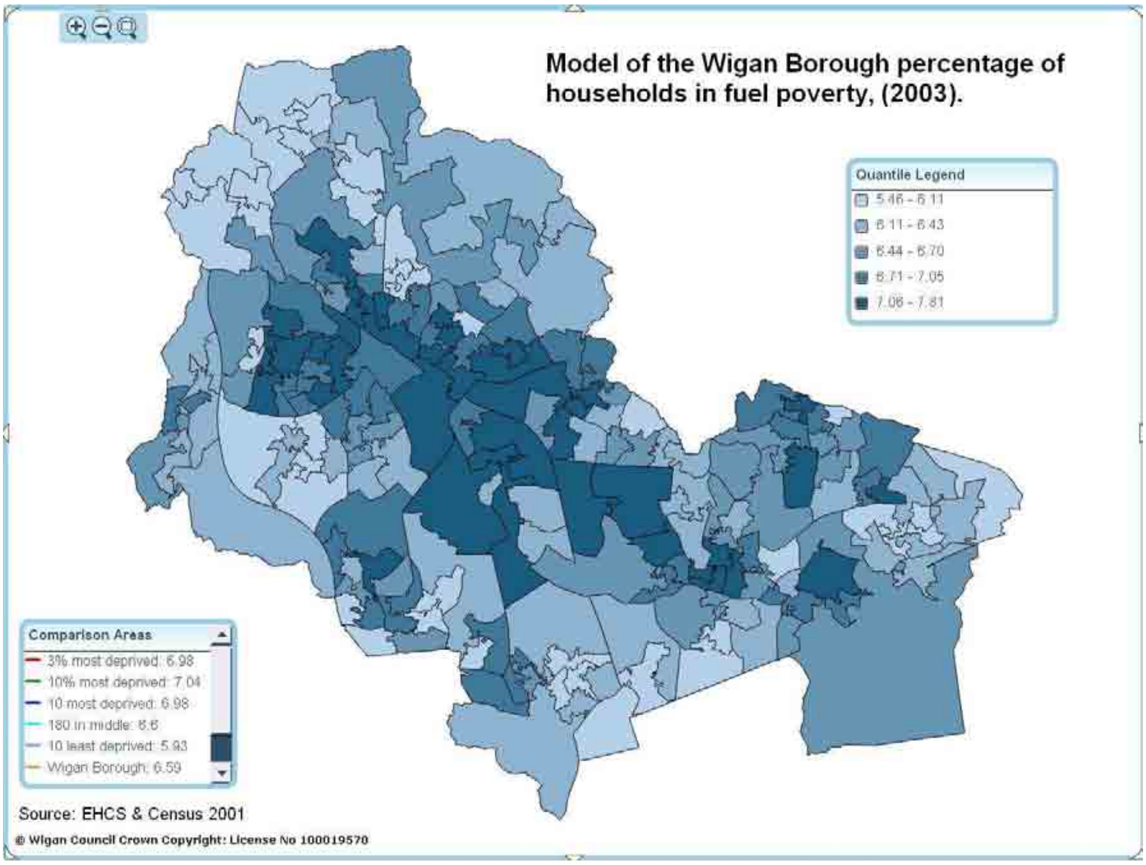
Fuel poverty is difficult to measure, because it is a product of a complex interaction between income, health and the standard of homes.

Using the 2001 census and 2003 Home Condition Survey, there are an estimated 8,000 households in Wigan in fuel poverty. Between 2004 and 2007 (inclusive) there were 108 excess winter deaths in Wigan a year.

With the recent economic downturn coupled with rising fuel costs we anticipate a larger number of households to be in fuel poverty now. In fact, the most recent estimates suggest a 14.5% increase in the number of people living in fuel poverty in the North West. Applied to Wigan this would equate to an increase of 1,160.

Despite these trends, levels of energy efficiency are relatively high in Wigan, with the local authority stock within the top quartile nationally. Energy efficiency in the private sector is also above average, although there are 8% in poor standard (SAP below 40).

Spatially, households in fuel poverty fall within the 'east west core' of the borough. These are deprived areas, so it is likely that income and poor health are important factors rather than simply household standards (which are generally satisfactory).



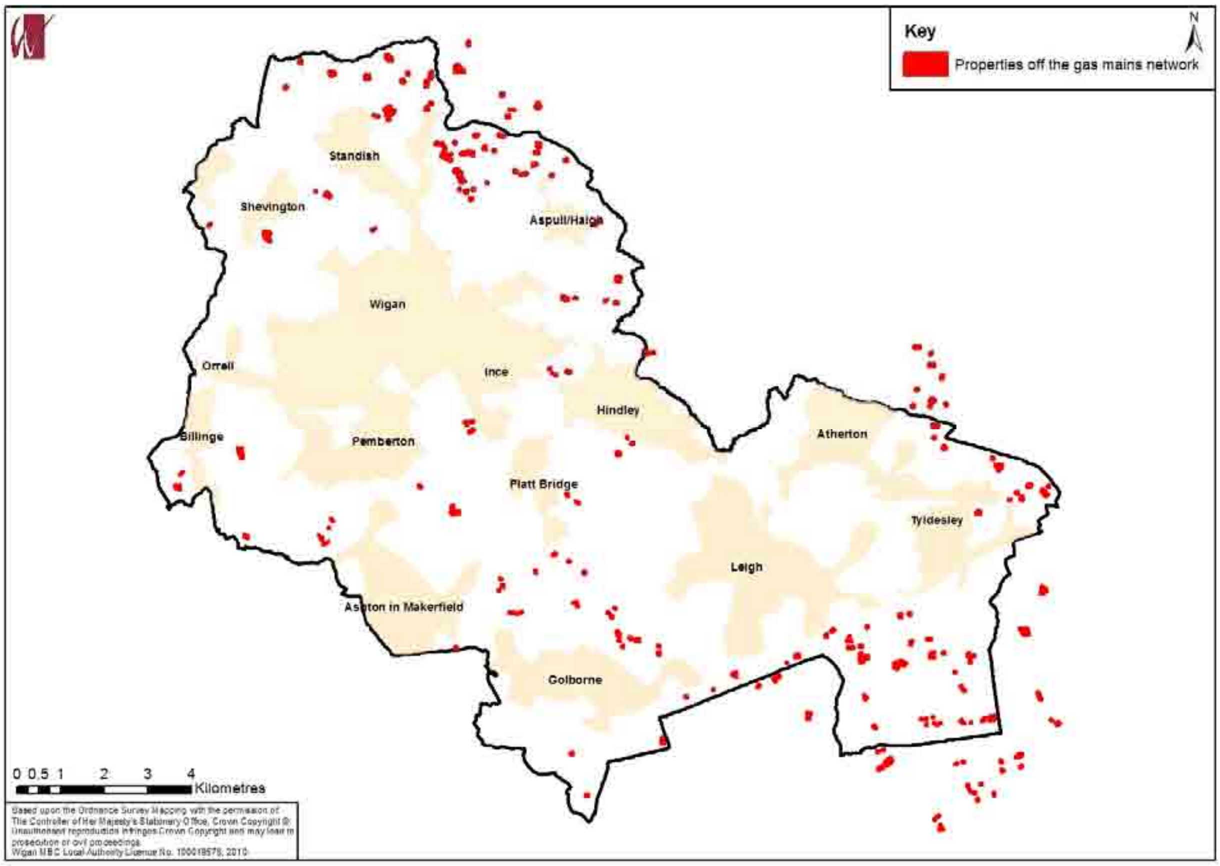
Map 7: Fuel poverty model, 2003

2.5 Grid Connection

The majority of properties and areas in the borough are connected to the national grid electricity network, and the 'mains gas' network.

However, there are some 'rural' areas where connection to the gas mains is absent. These properties are mostly farms, domestic properties in less urbanised areas and some industrial units.

The following map highlights areas in the borough where properties are not in close proximity to the gas mains and hence are not connected. There are notable clusters in the North of the Borough near Haigh / Standish and to the South East around Astley. (Data obtained from GLnoble Denton, 2010).



Map 8: Properties off the 'gas grid'

Typically, 'off-gas' properties use a combination of gas bottles, LPG and/or oil for heating requirements. These are usually more costly ways of providing fuel needs, and resources such as coal and oil produce more carbon emissions than gas.

With the proposals for a Renewable Heat Incentive from 2011, such properties may be ideal for fuel switching to low-carbon alternatives such as heat pumps, biomass boilers and solar panels.

There may also be opportunities for collaborative procurement, for example if there was enough interest from a group of local farm owners. Rural Carbon Challenge may be a useful source of financing such projects.

3.0 Potential for decentralised and low carbon energy

Continued reliance on mostly oil, gas and coal means we are vulnerable to changes in the price and availability of fossil fuels. In the medium to long-term this would result in a very negative impact on our economy due to rising costs and potential disruptions to supply.

As outlined in previous sections of this report, there is little in the way of renewable energy generation in the borough. However, national policy, guidance documents and other strategies strongly support a move towards decentralised, renewable and low-carbon energy generation to provide heat and power more efficiently and with fewer carbon emissions.

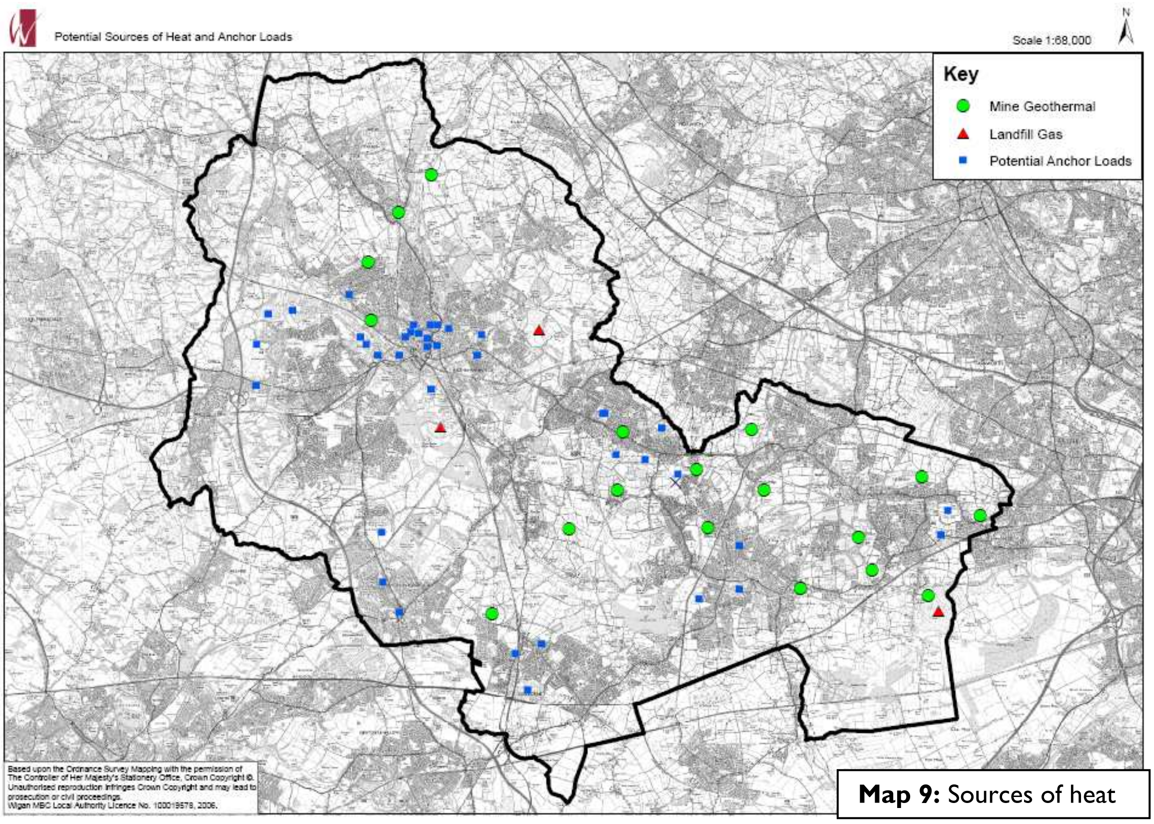
3.1 Sources of Heat

At present, we rely mainly on centralised gas and electricity for our heating needs. There are exceptions at a smaller-scale when businesses produce their own electricity and/or heat using combined heat and power networks.

Decentralised heat networks can be an efficient way of providing heat and electricity as it avoids transmission losses and makes use of 'waste heat' that is often unused.

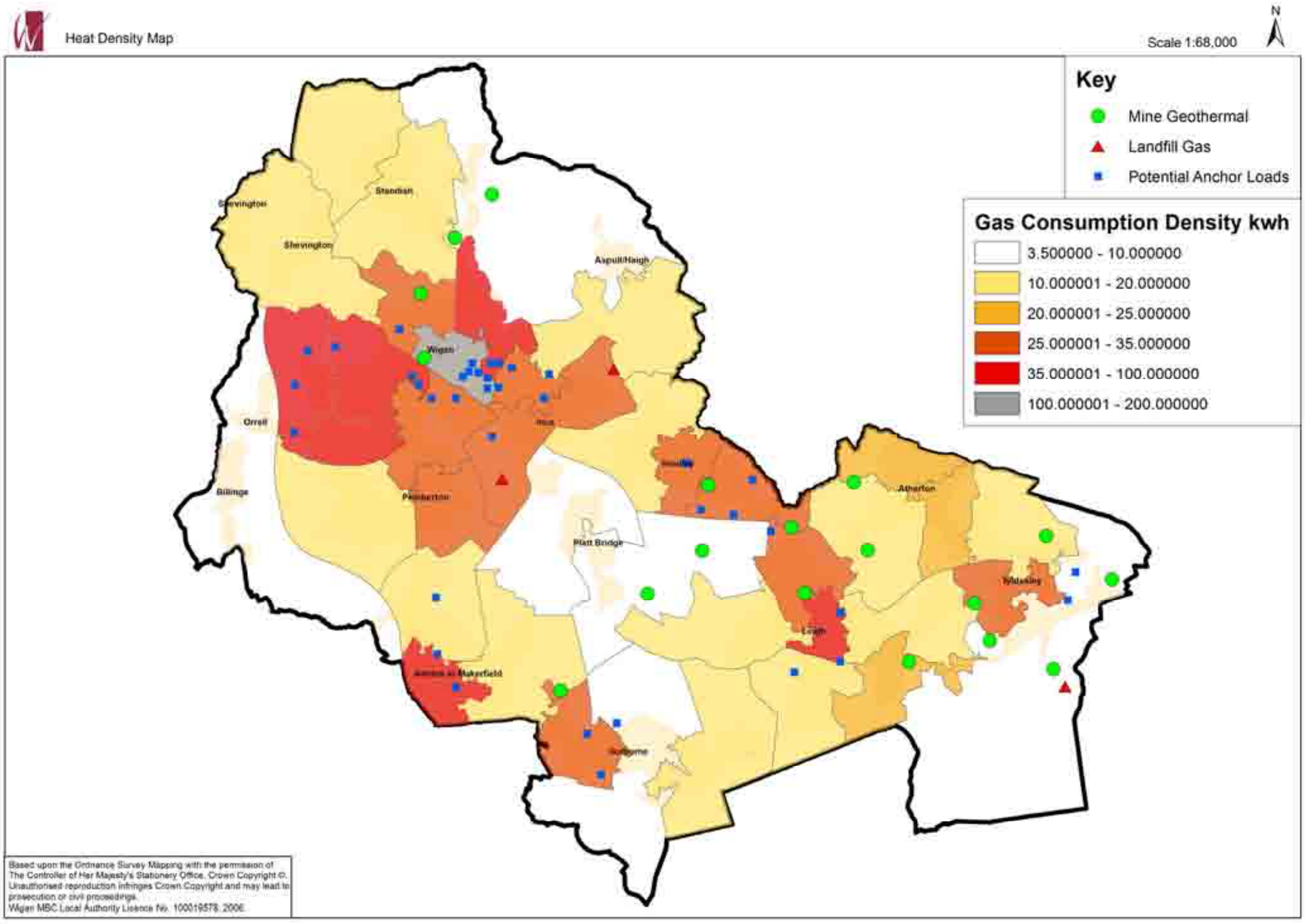
For networks to be attractive, it is necessary for there to be a source of heat and adequate demand for the heat. The map below shows where the significant potential heat sources are located across the borough. This is not an exhaustive list, and new sources of heat can be created such as energy from waste plants.

The map also illustrates potential 'anchor loads' for the heat, which is large buildings that have a relatively large and constant demand for heat. Such buildings can help to support the development of heat networks.



Map 9: Sources of heat

Map 10 below uses gas consumption data to illustrate the areas of the borough where demand for heat is greatest. When we overlay the sources of heat map, it allows us to identify areas that may be attractive and viable for the development of district heat and power networks. These networks could be fuelled by gas, waste or biomass.



Map 10: Indicative potential for combined heat and power networks

Areas with a density of 25 kilowatt hours per metre squared are generally viewed as commercially viable for combined heat and power networks.

On this basis, there are several areas in Wigan that may be suitable for heat networks, particularly in and surrounding Wigan town centre, where densities exceed 100kwh per metre squared.

When we overlay potential sources of heat to this data, it reveals a number of areas that should be explored in more detail.

Wigan Town centre – The town centre has a very high heat density (over 100kwh per m2), and several public buildings that could act as anchor loads. There is a potential mine geothermal heat source too.

Leigh Town Centre – Has a high heat density (over 35kwh/mw) and potential anchor loads. There is a potential mine geothermal heat source to the north of the town centre. Potential to link to new developments at North Leigh, 'South of Hindley' and Bickershaw to create a much larger network.

Ashton in Makerfield – No identified sources of heat, but the demand for heat is at suitable densities. A smaller-scale network may be appropriate.

Strategic development sites (The Bell) - Existing commercial and industrial uses around Robin Park and Martland Park create a significant demand for heat at suitable densities. Combined with domestic use (mainly social housing), there is potential for new development in this area to act as a catalyst for the development of a heat network. 'The Bell' has been identified in the Core Strategy Preferred Options Document as a potential site for employment development. Should the site be brought forward, an energy infrastructure plan should be developed to explore the opportunities for heat networks further. Links to social housing could potentially have a positive impact on fuel poverty, which is an issue in these areas.

Strategic Development Sites (South of Hindley / North Leigh) – Mixed use development on these two sites could act as a catalyst for the development of a heat network. The existing area already has desirable heat densities and one or two anchor loads. There is a potential mine geothermal source of heat. Plans for a waste plant south of Hindley could also provide a significant source of heat if the plant was approved. There may be potential to create a large network that links to Leigh town centre and Bickershaw in the longer term.

Should the sites be brought forward, an energy infrastructure plan should be developed to explore the opportunities for heat networks further.

Strategic Development Sites (Garrett Hall) – This area in Tyldesley has adequate heat densities, and there is potential for new mixed-use development at Garrett Hall to act as a catalyst for heat-network development. Whitehead Landfill gas plant is a potential source of heat and is located roughly 800metres away.

Other parts of the borough may also be suited to heat and power schemes, particularly those where demand is anticipated to rise and/or sources of heat become available.

It is difficult to estimate the contribution that heat networks could make towards the boroughs energy targets. However, on the assumption that several medium scale schemes may be brought forward over the plan period in suitable locations, we have estimated that **gas** district heat and power networks could contribute 10 mw of thermal energy. We have not accounted for the benefits gained by reducing transmission losses in electricity.

It is important to note that there can be significant constraints with the development of large scale heat networks. In particular there are long lead in times for connection to the gas distribution system, particularly at high pressures.

It should also be noted, that schemes will be more viable, and achieve higher carbon emissions reductions when the demand for heat is constant throughout the day, week, month and year. This may mean supplying absorption chillers in the summer when demand for space heating is not as great for example.

Gas networks could also be replaced in the longer term by other fuels such as biomass.

3.2 Biomass Fuel supplies

Biomass fuel is derived from a range of sources, including woodland, waste timber and paper, energy crops, agricultural waste, commercial waste, and waste gases.

It is low carbon fuel source, because carbon is taken from the atmosphere when the fuel is ‘growing’. However, energy use associated with processing and transport of biomass fuels, and the land-use impacts they can have raise debate about their overall sustainability.

An important factor in the carbon reduction achieved using biomass is proximity to an adequate source of fuel. Whilst imports are common place, and can be made more carbon efficient through bulk transfer along canals and by rail, a local source of fuel is much more appropriate to support the development of a biomass supply chain.

The AGMA energy study outlines the resources available at a larger scale, and Wigan will need to be involved at this level if such technologies are to be utilised.

This study only focuses on the resources identified within Wigan’s boundaries, but we recognise the importance of making links to the wider region.

3.2.1 Woodland and grounds maintenance

Some woodland will be suitable for managed programmes to provide a source of fuel for biomass boilers. Map 11 below outlines the boroughs standing woodland resources. Although this is an old map, it gives a general picture of coverage, because new resources are not considered.

Much of our woodland resources may not be suitable due to biodiversity concerns. However, there may be potential for woodland coverage to be increased in other areas through managed schemes.

It is very difficult to calculate what proportion of this resource could be utilised for wood fuel, because there are different types of wood, competing markets and price fluctuations and a lack of up to date information on managed resources.

Significant bio-waste may also arise from grounds maintenance procedures. Greenspace owned and managed by the Leisure and Culture Trust is a particular source which should be explored further.

3.2.2 Energy Crop Production

Crops such as short rotation coppice and miscanthus can be utilised as a biomass fuel source. These crops can be grown on agricultural land of relatively poor quality (albeit at a lower yield), so it is not necessary for them to compete with food crops, which should be grown on higher quality agricultural land.

Under a medium scenario, one could expect ‘business as usual’, which assumes that energy crops are planted only on land no longer needed for food production, i.e. all abandoned arable and pasture. We do not have this data to hand.

With this in mind, we have only mapped agricultural land classified as grade 4 on the map below to outline potential sites for energy crops. This does not exclude land classified as grade 3c, or 3b from being used for energy crops though, but provides an indicative yield.

Using available grade 4 land as a proxy for potential energy crop growth, we have calculated that 420 ha could be set aside for energy crops. If we assume a mix of miscanthus and short-rotation coppice a yield of 12.5 oven dried tonnes (odt) per hectare is an acceptable estimate.

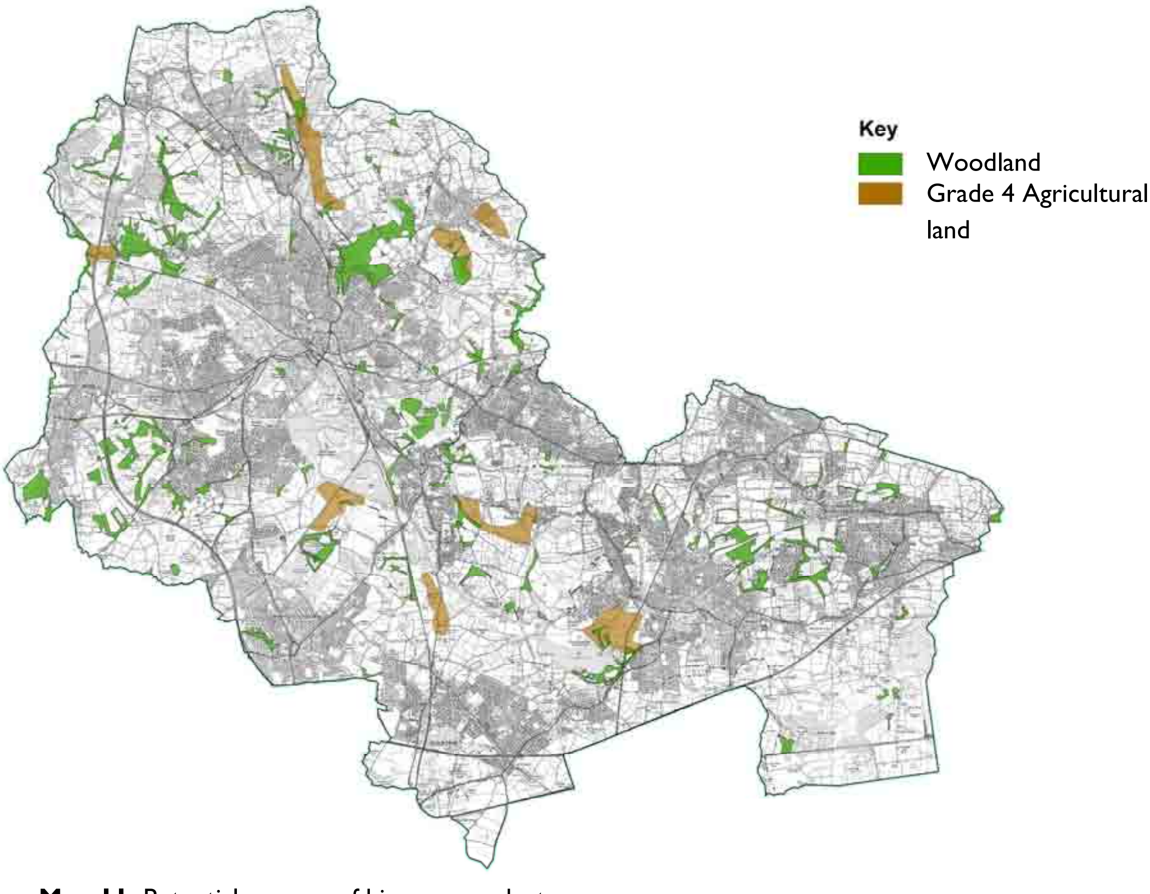
Taking into account constraints such as public rights of way, environmental designations etc, we have estimated that there could be a yield of 5250 odt/year. This equates to almost 1 mw of installed capacity in a biomass boiler producing electricity (benchmark of 6000odt/year per 1mw installed capacity). Thermal energy could also be utilised from any power plant.

It should be noted that our agricultural land maps are fairly old, so the data is purely indicative.

3.2.3 Energy from Waste

A number of waste streams have untapped potential to provide energy in the form of electricity and heat through the development of 'Energy from Waste' plant. This includes animal biomass such as slurry, poultry litter and manure, biogas from landfill and sewage plants, and commercial / municipal waste streams.

We do not have accurate enough information to make estimates on the agricultural waste arising. We have used existing landfill gas resources to estimate potential from biogas resources, but a number of new facilities may come forward too.



Map 11: Potential sources of biomass products

As well as the electrical energy created, energy from waste schemes can also provide a source of heat to supply a district heat network.

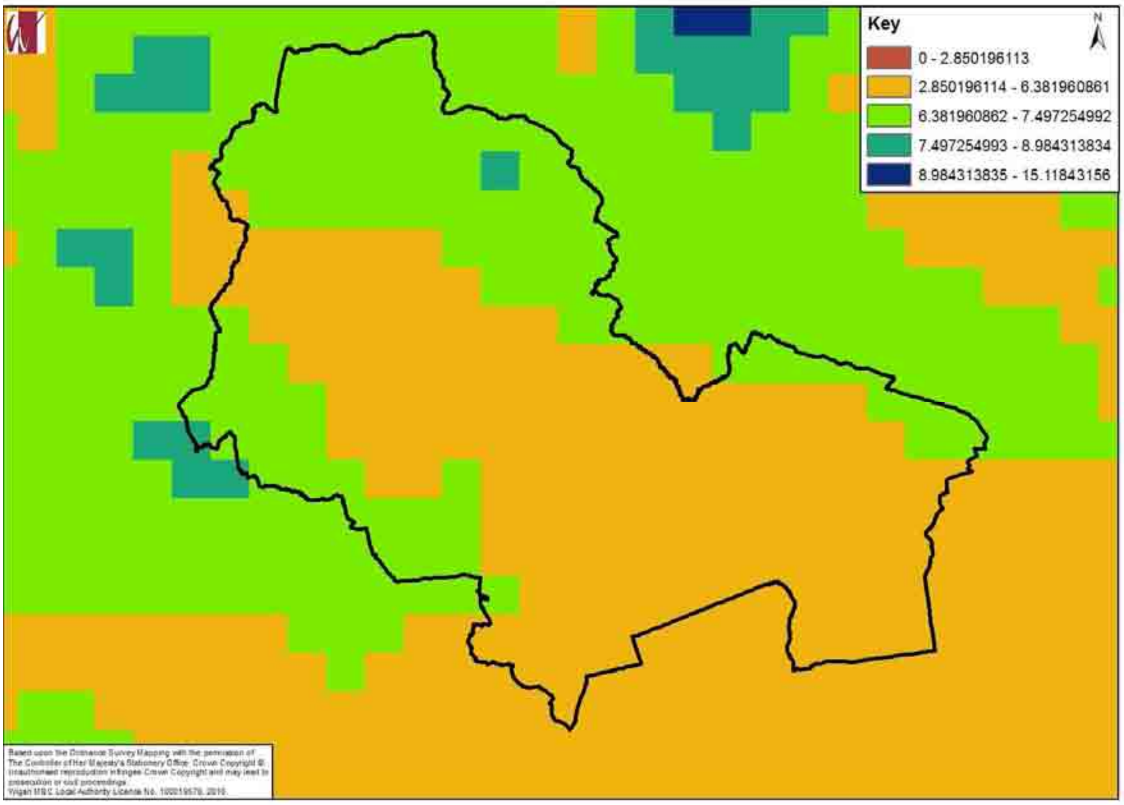
On the assumption that at least one fairly large energy from waste scheme will come forward, we have calculated that a further 8mw of electricity and 20mw of heat could be produced through a combined heat and power network. As mentioned earlier, there is already an application for such a scheme, but customers for heat would need to be established should this scheme be granted permission.

There may be a number of other schemes that are attractive if a renewable heat incentive is introduced. However, we have been conservative with our estimates at this stage.

Technology	**Theoretical potential**	**'Realistic' potential**
Energy from waste (Electric) Landfill, sewage & commercial	16 mw *potentially more*	16mw (8 mw already installed)
Energy from Waste (Thermal) Landfill, sewage & commercial	20 mw	20mw

3.3 Opportunity Areas for Large-Scale Wind

Large scale wind turbines can be anything from 1mw up to 10mw for the latest designs. There is no standard definition of what is ‘large scale’ but for the purposes of this assessment we are assuming a standard turbine size of 2.5mw installed capacity in line with the Renewable and Low Carbon Energy Capacity Methodology for the English Regions.



Map 12: Average wind speed data at 45 metres height

The map above is reproduced from the national wind speed database and illustrates the broad speeds that could be expected across the borough at 45m height. The majority of the borough falls into wind speeds between 2.9 and 6.4 metres per second. The outer parts of the borough have higher wind speeds between 6.4 metres per second and 7.5 metres per second. There are some small pockets were the speed is between 7.5 metres per second and 9 metres per second.

For wind power to be technically feasible and economically viable, higher wind speeds are desirable. It is generally accepted that areas above 5m/s have good potential for larger turbines and schemes to be located. Therefore, the areas with the greatest technical potential are those to the northern and south western edges of the borough where speeds exceed 6.4m/s.

Although much of the borough falls within the 2.8 – 6.4 m/s category, much if this could fall below 6 m/s, so further investigation would be necessary.

It is also crucial to consider a range of constraints, as practicalities can make wind unfeasible or unattractive, even if speeds are adequate.

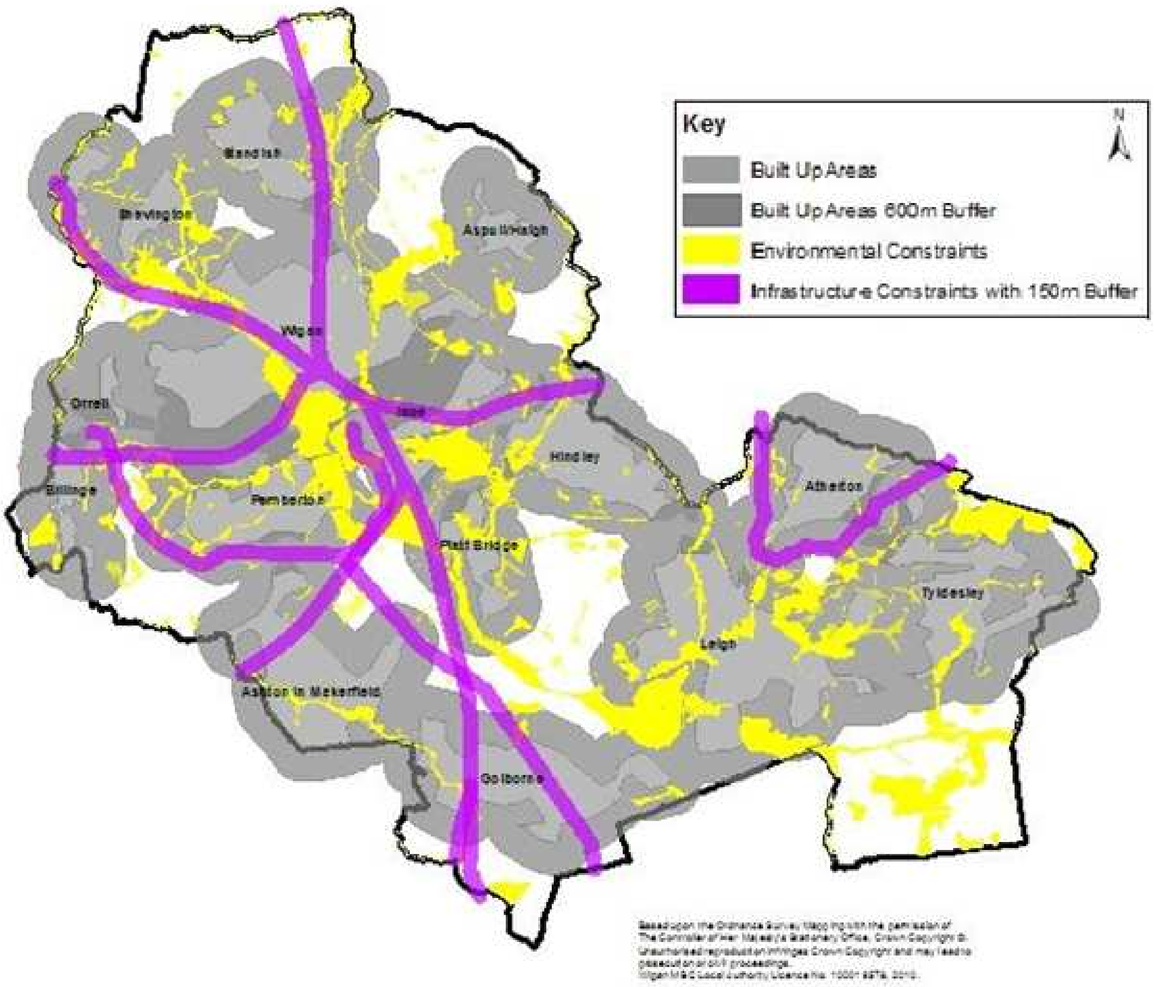
3.4 Wind Constraints

Map 13 below illustrates some 'absolute' constraints for the development of large scale wind in the borough. These factors need to be taken into account, as looking at wind speeds alone does not identify opportunity areas.

Urban / Residential areas - Large wind turbines are generally constrained by built up areas, with the exception of some industrial areas. We have mapped all urban areas with a 600m buffer to illustrate this constraint. Wind speeds tend to be lower in urban areas too.

Environmental Constraints – There are a number of natural resources and features that would make it very unattractive for wind development. We have mapped features such as nature conservation sites (SSSIs and SBIs), Water courses and flood zones, ancient woodland and remnant mossland. Development is extremely unlikely on or near such sites.

Infrastructure constraints – Features such as railway tracks and overhead lines are constraints for Wind. A 150m safety buffer has been applied to account for issues such as 'topple'. In some instances, greater distances may be sought as a safety guarantee, for example on major roads (not mapped).



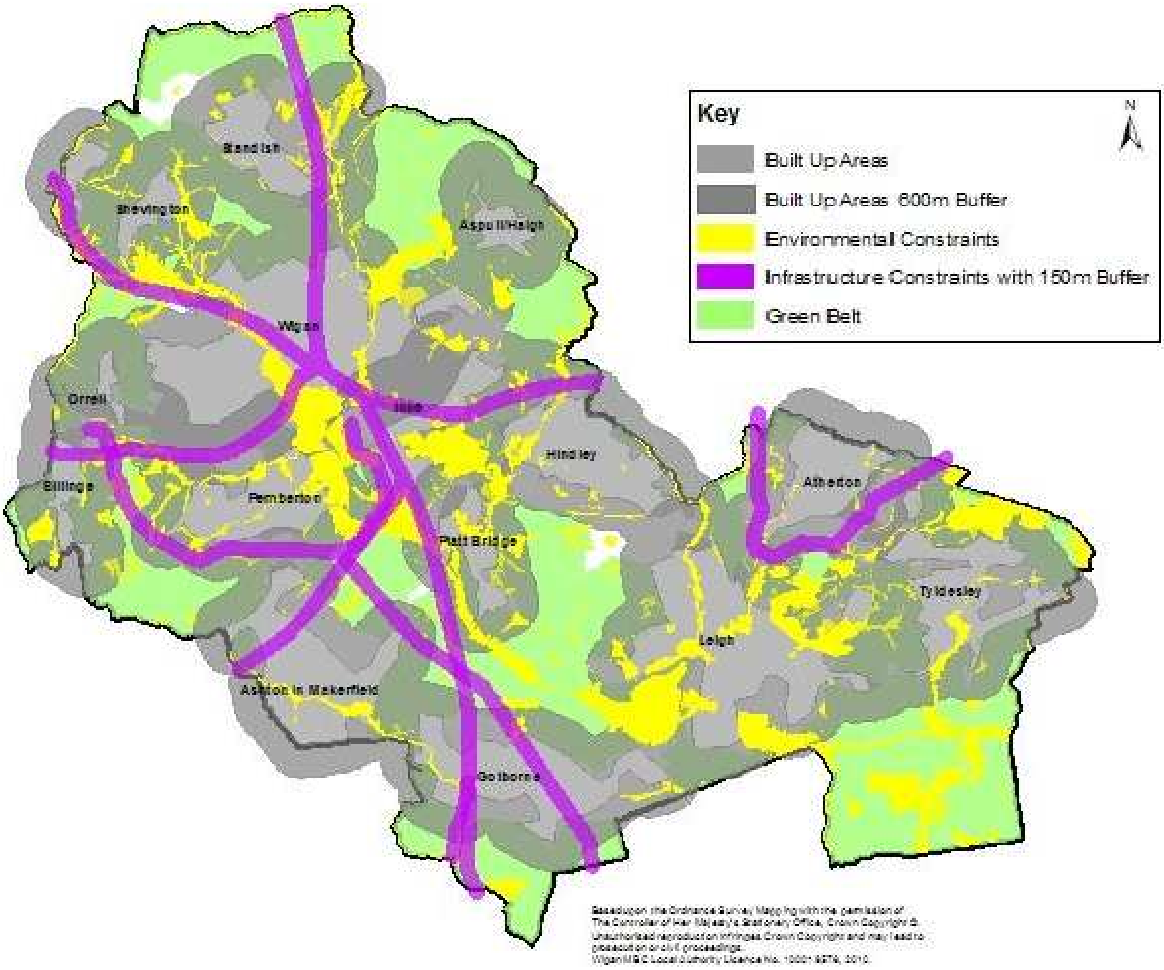
Map 13: Large scale wind constraints

As can be seen, large parts of the borough are not suitable for wind when these constraints are added to the equation.

3.4.1 Greenbelt as a constraint

Development in the greenbelt can be difficult to gain planning permission. Although this is not an 'absolute' constraint, it is important to highlight as a constraint as it may affect opportunity areas significantly.

As the map below illustrates, the vast majority of the land remaining free from other major constraints is classified as greenbelt.

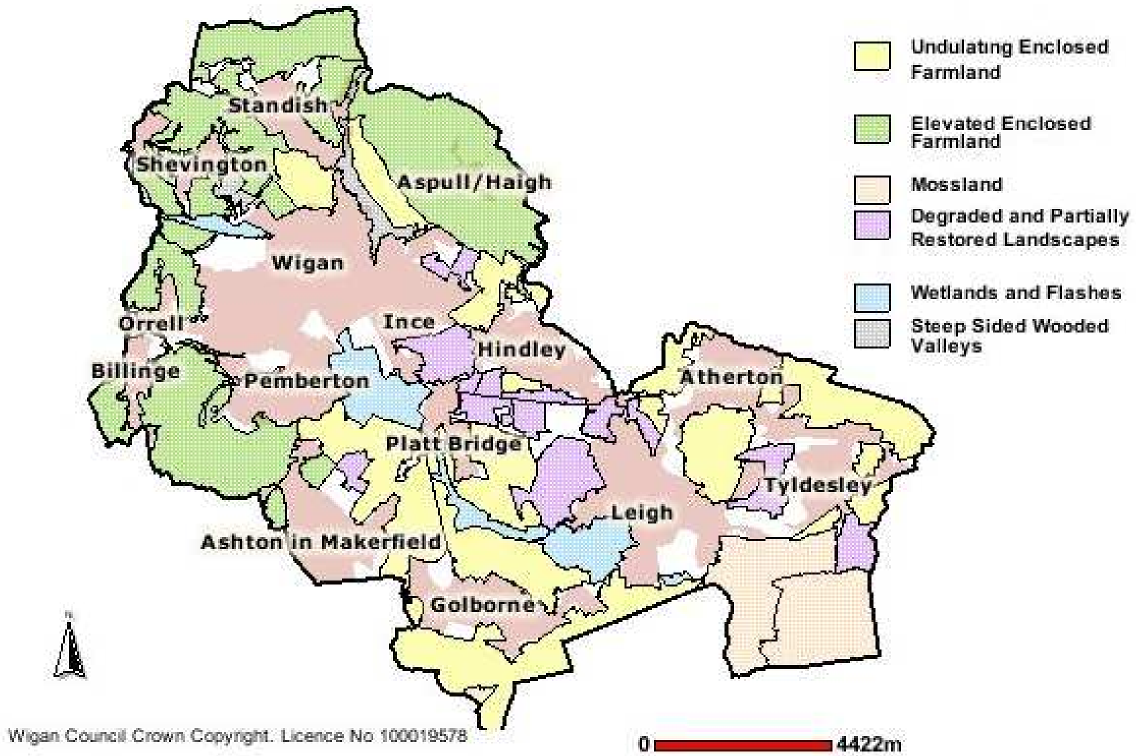


Map 14: Large scale wind constraints plus greenbelt

3.4.2 Landscape character as a constraint

Impacts upon landscape character are a common issue with large scale wind developments. Even where other constraints do not pose a problem, it is almost certain that landscape character will need to be considered.

Wigan has been classified into broad character areas as part of an Open Space Study and Landscape Character Assessment.



Map 15: Landscape character appraisal

If we overlay these character types with our large scale wind opportunity areas, it is clear that those landscapes that would be most heavily impacted are *Elevated Enclosed Farmland* and to a lesser extent *Undulating Enclosed Farmland.* Elevated Farmland is considered some of the best quality landscape in Wigan.

Degraded and Partially Restored landscapes would generally be less sensitive to wind development, but these areas do not have the highest wind speeds of the opportunity areas identified.

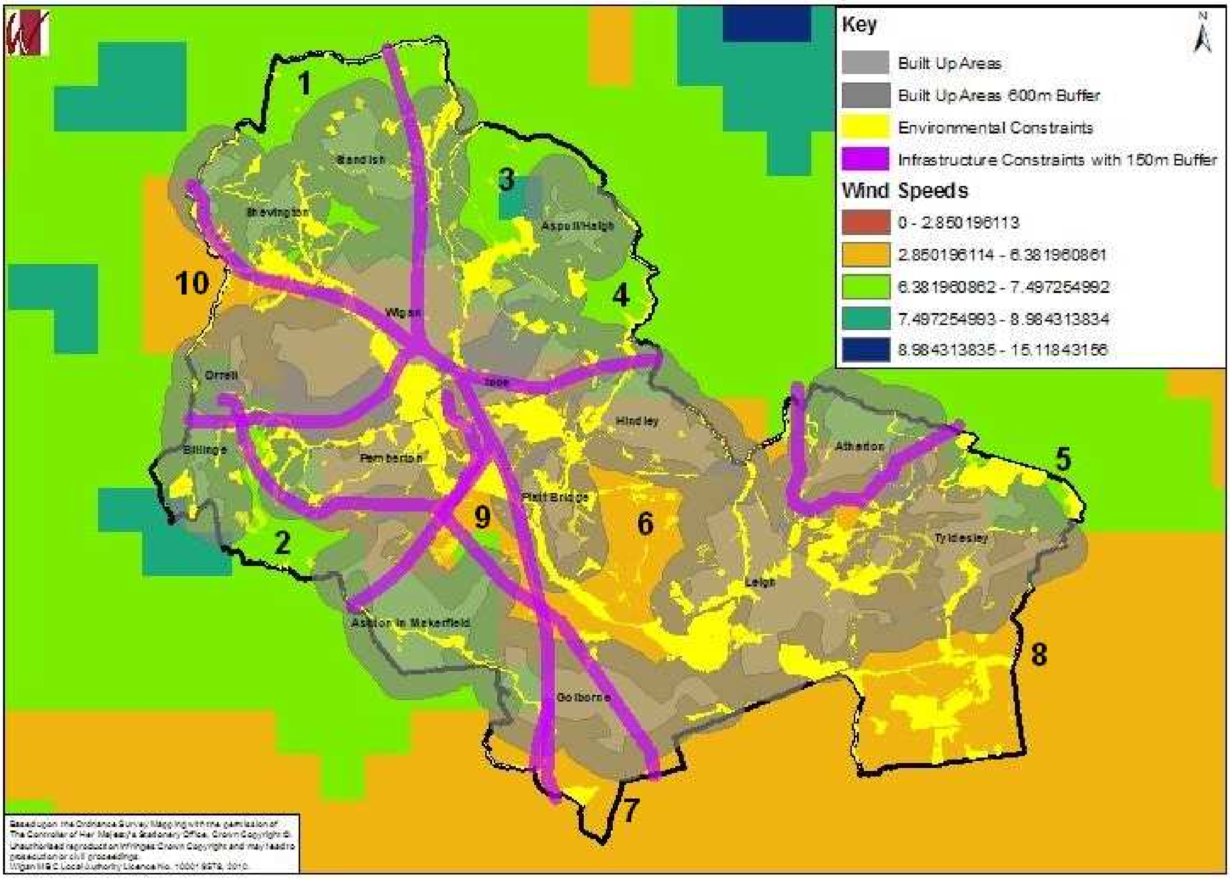
As we will see in the following section, the areas of the borough with the highest technical potential for wind schemes are generally those with the higher quality landscapes. If the impacts are seen as unacceptable, a compromise may have to be made to focus on areas with lower potential output but fewer environmental impacts, such as in *Degraded and Partially Restored Landscape*.

We need to make reasoned judgements to decide whether the benefits of a scheme outweigh the impacts, or whether resources elsewhere in the region and Greater Manchester can be harnessed for wind if we choose to focus on more appropriate solutions.

3.5 Identifying broad opportunity areas for large scale wind

Where there are areas that are not heavily constrained and the wind speeds are relatively high, these have been outlined as broad opportunity areas for Wigan.

The following areas have been identified by overlaying the constraints and wind maps presented earlier. We have outlined some of the issues that need to be explored further.



Map 16: Broad opportunity areas for large scale wind

3.5.1 Areas with higher wind speeds *(Between 6.5 - 9.0 m/s at 45m height)*

<u>**1.** Standish / Shevington Crest</u>

There is a swathe of land to the north of Standish and Shevington that may be suitable for wind development. However, the majority of this land is greenbelt, privately owned and has considerable landscape value.

The landscape has been characterised as Elevated Enclosed Farmland (Standish Crest), which features open, exposed landscape on the skyline. This area would be very sensitive to development, particularly of tall structures.

Bradley Hall Industrial estate is nearby and could potentially benefit from wind power. There may also be cross boundary issues.

2. Billinge / windy arbour

View from Windy Arbour farm

There are good wind resources to the South West of the Borough at the border near Billinge and Garswood. However, some of this is good quality agricultural land and there are likely to be significant cross-boundary issues. Areas identified as opportunities are classified as Greenbelt too.

Much of the landscape (Elevated Enclosed Farmland) in this area is sensitive to change and highly visible to the east. Therefore, skyline development would tend to be resisted.

3. Haigh

View from Dodd's Farm Lane, Aspull

To the north of the borough just north-west of Haigh Hall there is a small parcel of 'unconstrained' land where wind speeds exceed 7.5m. The surrounding areas also have speeds above 6.4 m/s and are broadly unconstrained. However, it should be noted that these areas are greenbelt, valued landscapes and access may be an issue. There are a number of farms and small settlements that would be affected. The council owns much of the 'opportunity area' so this would not be a constraint in itself. Smaller schemes may be more appropriate.

4. Aspull / Pennington Green

Greenbelt land to the south of Aspull may be suitable for wind development, although access and cross boundary impacts may be an issue. This area, along with 'Haigh' is part of the 'Aspull Ridge' landscape character area (as illustrated in the picture above). This landscape provides excellent views and is particularly sensitive to development on west facing slopes and the ridge skyline.

5. Mosley Common / Shakerley

There are a number of small parcels of 'unconstrained land' to the far east of the borough on the boundary with Bolton. However, there are several Sites of Biological Interest in close proximity that may be a concern. If suitable, these Sites would probably be limited to single turbines.

3.5.2 Opportunity areas with lower wind speeds *(5.0 - 6.4m/s at 45m metres)*

The following areas may also be attractive for wind, but wind speeds are not anticipated to be as favourable as the sites outlined above. It is important to remember that as height increases, so too does wind speed.

6. South of Hindley / Bickershaw

This area is a relatively open central part of the borough on previously degraded land. There are some Sites of Biological Importance scattered throughout the area, but landscape quality is less likely to be an issue as it is degraded and regenerating in parts. Having said this, much of the area is classified as greenbelt.

Development of two strategic sites nearby is earmarked in the Core Strategy, which may provide an opportunity for funding. Wind turbines may be most suitable in the areas allocated for employment.

A high level feasibility study has been carried out for a 2MW (100m tip height) turbine in this area, demonstrating that wind power would be feasible.

This study and previous research highlights a number of constraints in this area, including public rights of way, ground conditions and spoil heaps. However, the land is largely council owned.

An application was submitted at an earlier date for a 125m turbine, but the Civil Aviation Authority objected on safety grounds as it falls within the MAN QNH low level flight path. A shorter turbine or series of shorter turbines may be seen as acceptable, but ground conditions make the siting of more than one turbine difficult.

Considering the wider area, there may be potential for other turbines, but these are likely to face similar constraints.

7. South of Golborne

Greenbelt land along the East Lancashire Road Corridor, some of which is agricultural land grade 3a. Cross boundary Issues with Warrington likely. Also falls within the low level flight path that affected the Bickershaw application.

8. Astley

Large areas of relatively open greenbelt, which is poorly drained. Sensitive habitats and landscapes and access may be significant constraints. Having said this there are parts of Astely Green that are degraded / recovering landscapes, which may be less sensitive to wind development. Also cross boundary issues with Warrington and Salford. Although technically possible, development of large scale turbines would not be attractive here. Smaller and medium scale turbines may be an alternative.

9. Edge Green to Landgate

Wind speeds in a small pocket exceed 6m/s at 45m whilst a large area falls within the 2.9 – 6.4 m/s category. Thus, further exploration may be warranted.

The area is mainly agricultural in nature, but features have been lost, creating a somewhat bleak and 'industrial scale' landscape. Thus, appropriate wind schemes may be acceptable. However, this area also falls in the MAN QNH low level flight path controlled by the Civil Aviation Authority, so turbines would be restricted in height to below100m at the least. Small and medium scale schemes may be more appropriate.

10. Gathurst

There may be limited opportunities in the north west of the Borough near the M6 between Gathurst Wood and Dean Wood.

3.5.3 Other Constraints

We have identified broad opportunity areas based upon wind speed data and by mapping a number of 'absolute' constraints.

Just because these areas have been identified as broad opportunity areas, it does not mean they will be suitable for wind. As well as confirming local wind speeds, there are a number of other factors that will also need to be taken into account before schemes are brought forward.

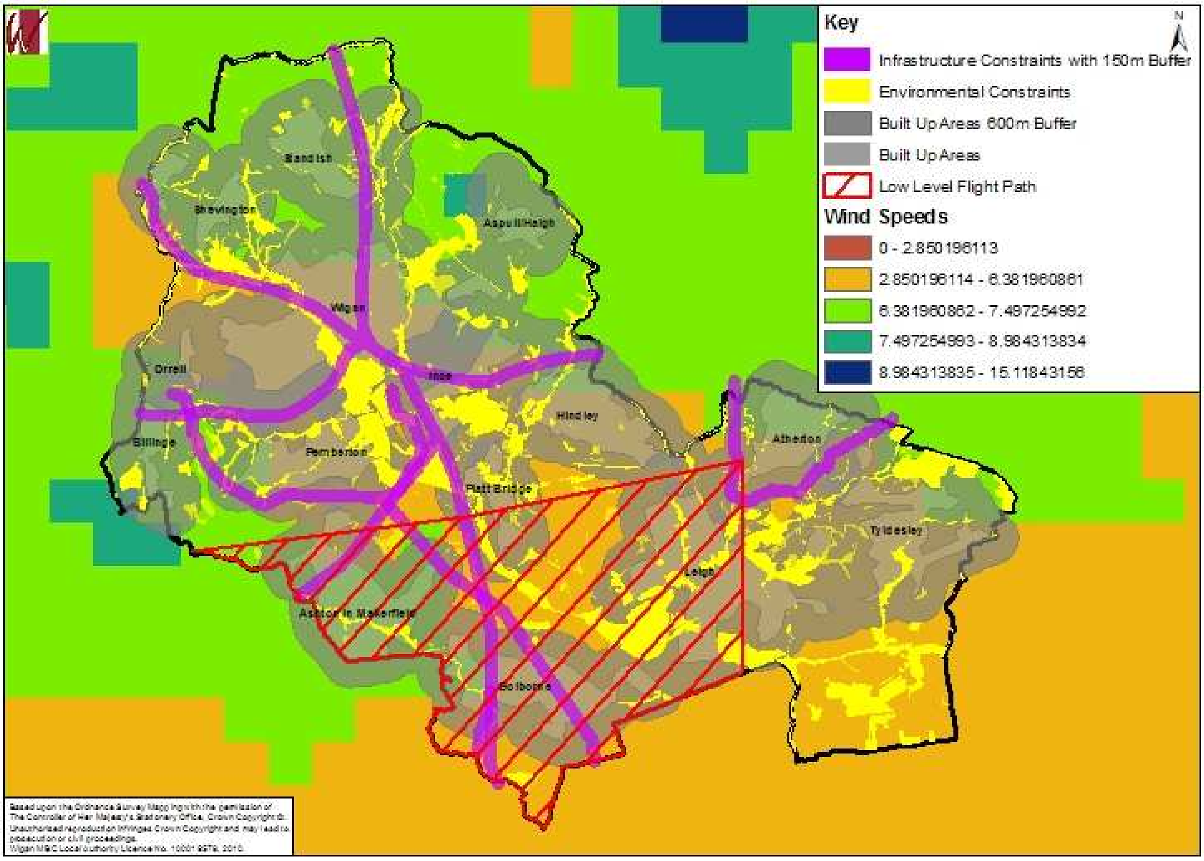
This includes the following

- Impacts on wildlife (as discussed)
- Impacts on landscape character (as discussed)
- Safeguards on safety
- Wind turbine density
- Radar – *Variable depending upon location and height.*
- Access restrictions
- Grid Connection
- Financing
- Land ownership

When we look at the broad opportunity areas more closely, it is clear that a number of other constraints exist that might make wind development unattractive. Therefore, the realistic potential for large scale wind development is not very high in the borough.

One additional constraint worth noting is the Manchester Low Level Flight Path, which affects some of the areas we have identified as broad opportunities to the south and south east of the Borough (see map below).

In these areas, turbines above a certain height (approx 100m) are not likely to be acceptable. Therefore, 1-2MW turbines would be the absolute maximum here.



Map 17: Opportunity areas for large scale wind after low level flight path

Summary

When all factors are considered, the opportunity areas for large scale wind are limited in the borough. Looking at the areas of opportunity in closer detail also highlights that there is limited potential for clusters of more than say 2-5 turbines because separation distances, ground conditions and other constraints would make it difficult to develop larger schemes.

It is also clear that where wind resources are the best, landscape value tends to be higher. In areas of lower landscape value, there are still some opportunities for wind (such as Bickershaw) but the power output is not anticipated to be as great.

Based upon the size of opportunity areas and the high-level constraints identified at these sites, we have calculated that the borough could realistically aim for about 15 MW of installed capacity from large scale wind by 2020.

This target could be achieved by placing clusters of turbines in one or two opportunity areas or single turbines at more sites across the borough. This would need to be explored through environmental assessment and public consultation. There may be opportunities to work with Bolton to create opportunity areas that 'cross the border' along the northern edge of the borough. This might make a 'wind farm' a more feasible option, rather than clusters of or single turbines.

It should be noted that 15mw is an ambitious and optimistic target, because all the opportunity areas identified have issues that would need to be addressed.

In conclusion, large scale wind schemes may be better focused in other parts of the region that are more suitable and attractive for investment.

Technology	Theoretical potential	'Realistic' potential
Onshore Wind (large scale)	55 mw	15mw

Assumptions

1. It should be noted that these are only broad opportunity areas and further exploration is needed to establish feasibility and viability.
2. Absolute maximum based upon benchmark of 9MW/km2 (Maximum take-up is highly unlikely). Assumes maximum use of land with attractive windspeeds (i.e. opportunity areas). Assumes turbines of 2.5MW.
3. Takes other 'variable' constraints into account such as public opinion, financing, landscape value etc… Takes an optimistic view of planning consent.

3.6 Medium and small scale wind

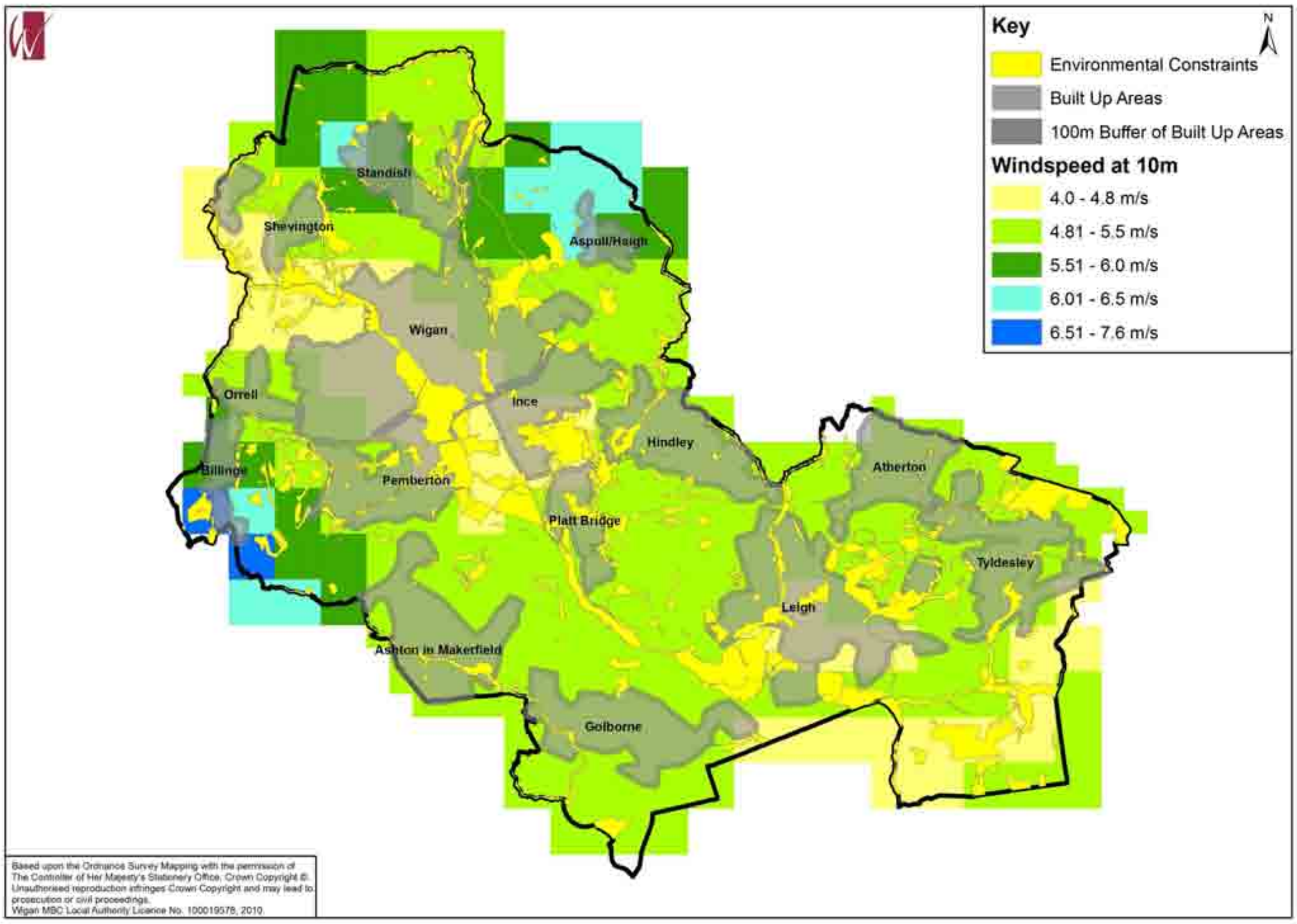
Small scale wind generation may be defined as anything under 100kw installed capacity. Medium-scale may be defined as slightly larger, bridging the gap between the larger schemes and what is classed as microgeneration.

As well as large scale turbines, there will be parts of the borough were medium and smaller scale wind is attractive.

As a starting point, the opportunities identified for large scale wind would also be applicable to smaller turbines - particularly if larger turbines are found to be unfeasible or unacceptable.

However, because smaller turbines are less visually intrusive and have smaller impacts than large scale wind, the scope of opportunity areas will be much wider. Smaller wind speeds can also operate effectively at lower wind speeds than the larger turbines. Wind speeds of 4.5 metres per second would typically be acceptable for smaller scale schemes.

In some instances, urban / industrial areas may be particularly suitable for medium scale turbines. Farmland is also generally suitable for such turbines due to open landscape and adequate windspeeds. These areas are also generally, 'off the gas mains' and may benefit from a range of renewable energy technologies.



Map 18: Wind speeds at 10m with constraints.

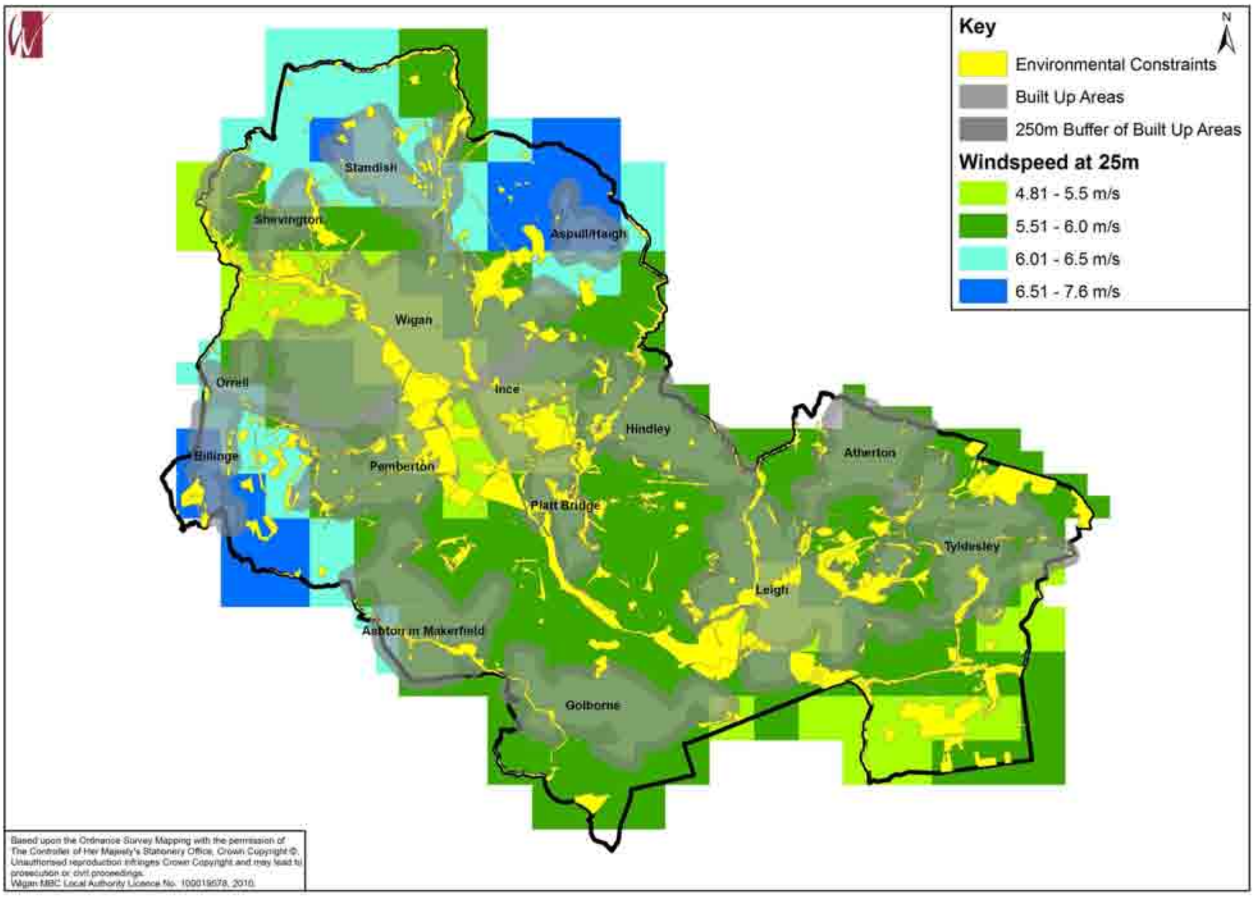
The map above illustrates wind speeds in the borough at 10m height. The majority of the borough has speeds above 5m/s, including some urban areas. There are particular opportunities in the North, North East and South Western edges of the borough where speeds are higher.

Although urban areas are still generally a constraint for wind development, there are greater opportunities in urban areas at a smaller scale; for example, at industrial estates, schools and other public buildings / land.

Large areas of greenbelt land would also be suitable for small scale wind development.

At 25m height, average wind speeds all exceed 5m/s across the entire borough. At this scale, we would be looking for speeds over 5.5m/s to identify the best resources. At this scale, however, urban areas become more of a constraint, so we concentrate more on rural and urban fringe areas.

Map 19 below illustrates that large parts of the borough has potential for wind at this scale, although much of this is greenbelt land. The best opportunities tend to be concentrated around the edges of the borough, with the exception of Astley Moss and just south of Shevington, where the average wind speeds are slightly lower, despite a relatively 'rural' landscape. There are also good opportunities in the Greenheart area.



Map 19: Wind speed at 25m with constraints

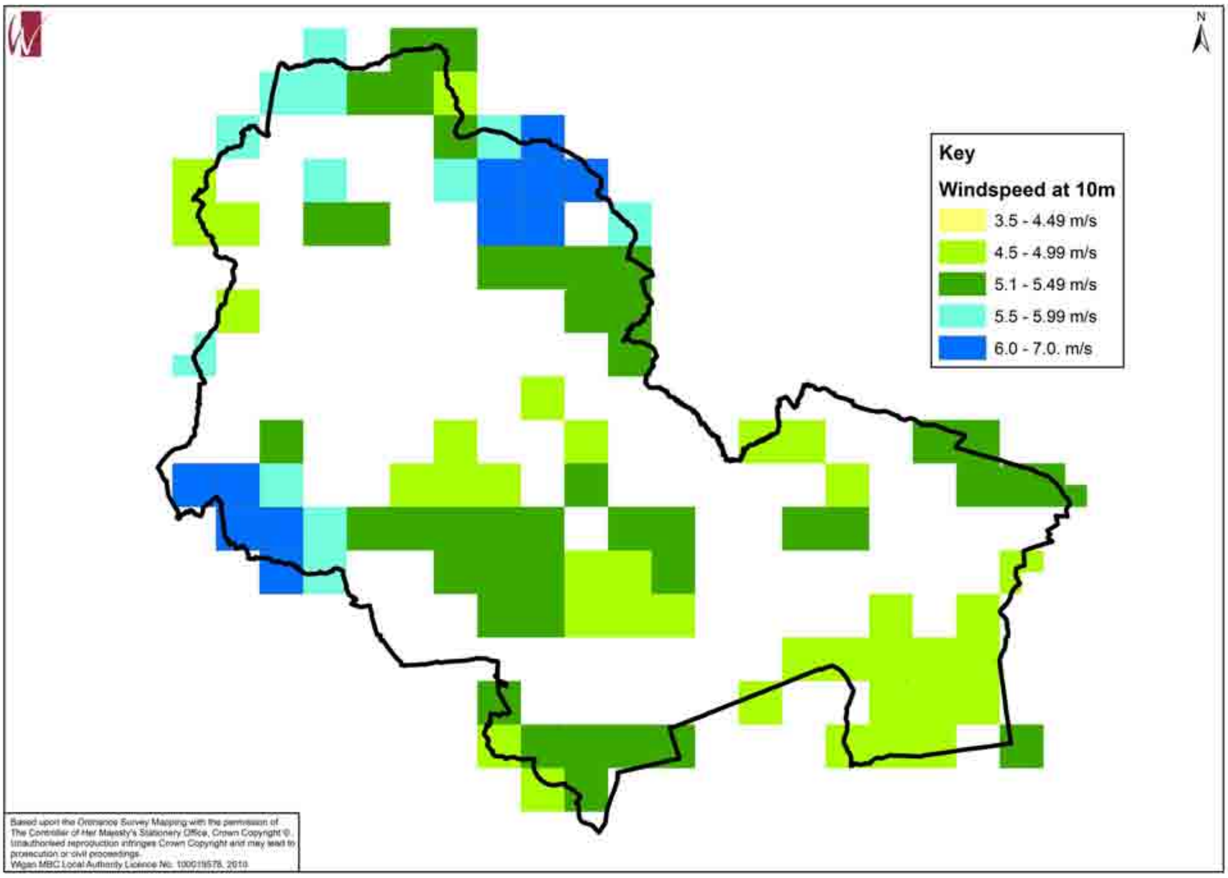
The maps above only outline the raw wind speed data and some broad level constraints. If we apply wind scaling factors to account for land classifications, the opportunity areas become more confined and probably give a more realistic picture of the wind resources.

We have broken areas down into 'urban', 'sub-urban' and 'rural', as wind speeds scaling factors need to be applied.

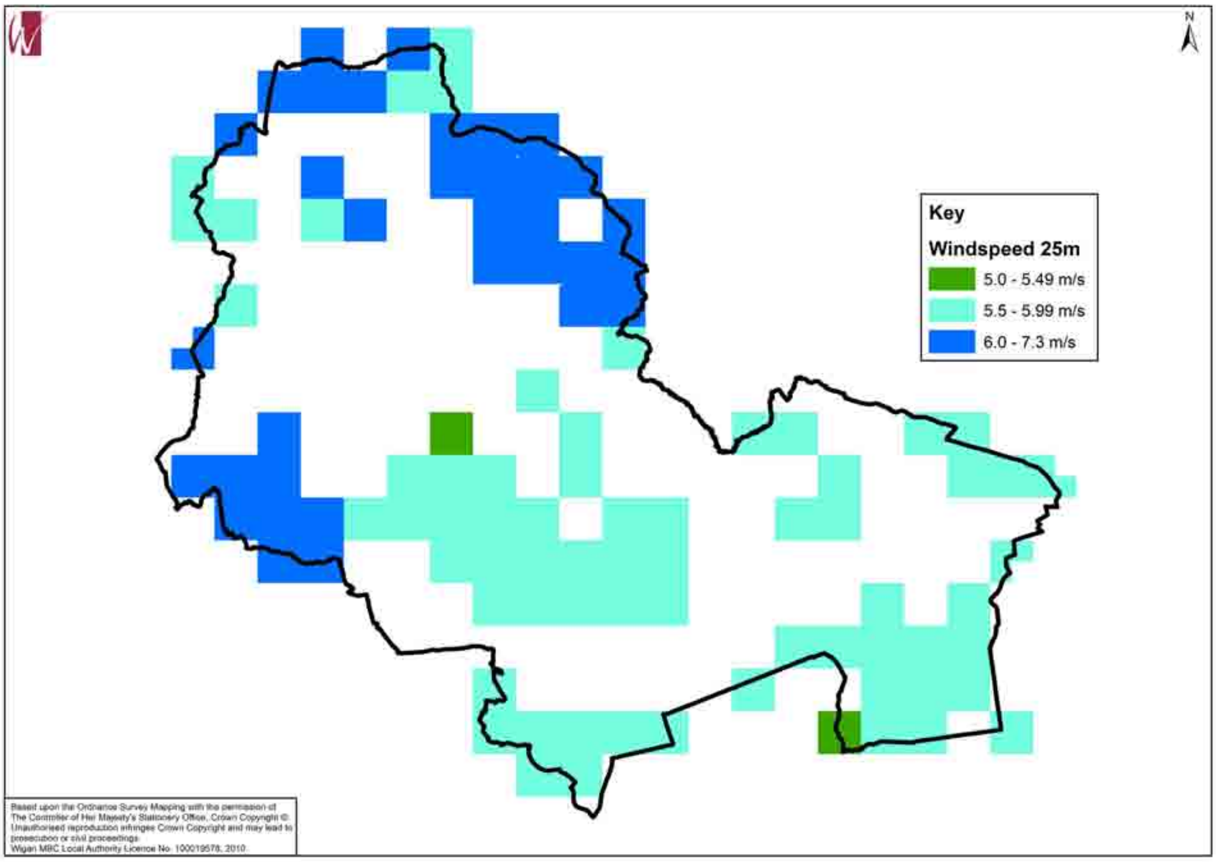
Urban areas have been adjusted to 56% of the raw wind speed data, suburban to 70% and rural to 100%.

The maps on the next page show 1km grid squares in the borough were wind speeds exceed 4.5 m/s at 10metres and 5.5 m/s at 25metres above ground level after wind scaling has been applied.

These areas form the basis of our calculations for the potential of small / medium scale wind.



Map 20: Wind speed at 10m adjusted for land classification – areas above 4.5m/s



Map 21 Wind speed at 25 metres adjusted for land classification – areas above 5.5 m.s

Assuming an average of 10kw installed capacity for suitable grid squares in urban and suburban areas (smaller scale), and 150kw at suitable grid squares in rural areas and sub urban areas (medium scale), we have calculated that the borough could theoretically support 10.9 mw from smaller scale wind.

However, this does not take into account site specific constraints. Such detailed assessment would be required at local level, but we can assume that constraints would reduce the number of viable locations for smaller scale wind.

Rates of take up also need to be considered, as all theoretical opportunities are unlikely to be pursued. We have assumed that 25% of opportunities would realistically be brought forward given the incentives offered by Feed in Tariffs.

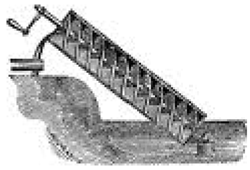
Technology	**Number of systems**	**Theoretical potential**	**'Realistic' potential** (Based upon 25% take up)
Onshore Wind (Small scale) 10kw average	115	1.15 mw	288 kw
Onshore Wind (Medium scale) 150kw average	65	9750kw	2.4 mw

We have taken care to ensure that there is no 'double counting' of the opportunities for wind, as there are crossovers between opportunities for small scale, medium and large scale turbines.

If no large scale schemes were brought forward, the potential for smaller and medium sized turbines would therefore increase.

For our calculations we have assumed an average turbine capacity for small scale of 10kw and 150kw for 'medium' scale. This makes it easier to calculate potential capacities and carbon savings, but in reality the range of turbines will vary greatly.

3.7 Opportunity areas for hydroelectric power



There are no existing hydroelectric schemes in the borough and the potential for hydro power to contribute a significant proportion of our energy needs is limited due to limited flow rates and head heights.

Having said this, there are a number of watercourses in the borough where there may be potential for some smaller-scale schemes. Although these schemes are at the lower end of output, the theoretical cumulative contribution of such schemes could contribute to a small proportion of our renewable capacity across the borough. Such schemes could be beneficial on a local level to community groups and businesses where opportunities are feasible and viable and there are suitable funding structures in place.

Map 22 illustrates a number of potential locations for small scale hydropower structures in the borough. The data is based on 'in-river features' which cross the Environment Agency's Detailed River Network and include waterfalls, weirs, dams, barrages and locks (sites with sufficient drop to provide power). Over 25,000 'barriers' were mapped and modelled nationally, including 38 in Wigan (some are cross boundary).

This data, combined with sensitivity analysis at each location, has allowed us to map broad opportunities for hydro schemes in the borough. Those that are most attractive are where there are low sensitivities and high output.

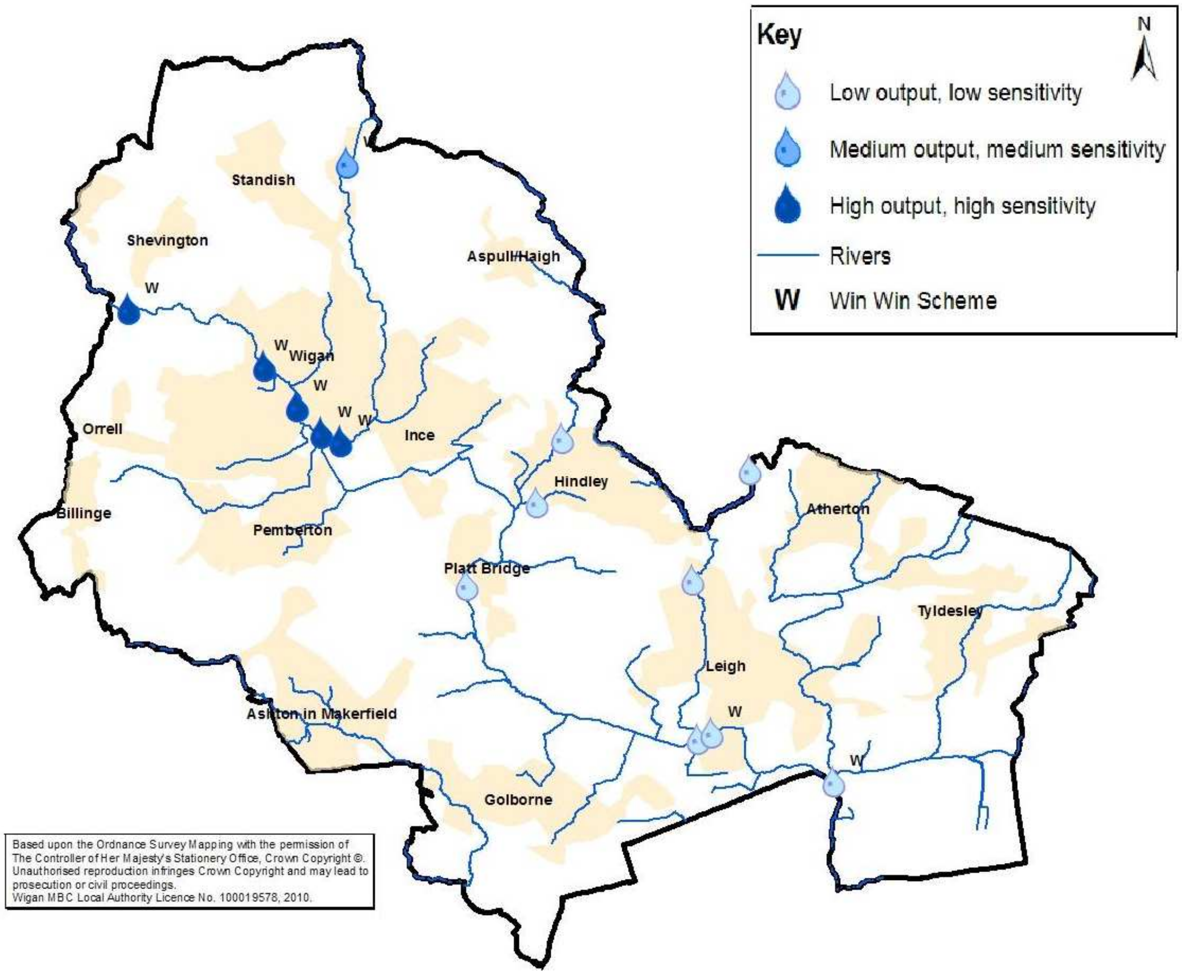
In Wigan, there are several 'barriers' that have low sensitivities, but the output is only in the order of 0-20kw capacity. Most of these can be found along the course of brooks such as Westleigh Brook, Hey Brook and Dog Pool Brook.

Whilst the river Douglas has several opportunities for schemes between 20-50kw (and one at 50-100kw) there are high sensitivities along much of the watercourse so these may be unfeasible.

3.7.1 'Win-Win schemes'

In 'heavily modified watercourses' there is potential for the creation of hydropower barriers that can also be beneficial to the passage of fish upstream. These locations are considered "win-win" opportunities by the Environment Agency as they could result in the delivery of a good hydropower potential and improve the ecological status of a river as well.

Map 22 below illustrates that there are a number of 'win-win' schemes in Wigan, especially along the river Douglas. Despite these locations being classified as 'highly sensitive', carefully designed schemes could actually have a positive impact on the environment.



Map 22: Broad opportunities for hydroelectric power identified by the Environment Agency

As illustrated above, there are 18 'win-win' schemes in Wigan, with a potential output of 0-10kw, 9 rated at 10-20kw, 5 at 20-50kw and 1 at 50-100kw. If all these 'win win' schemes were brought forward there is a potential for about 500kw of capacity to be harnessed.

In reality, some of these schemes may not be suitable or attractive for investment. Therefore, we have estimated a 'realistic potential' of 100kw.

Technology	Theoretical potential	'Realistic' potential
Hydro-electric	500kw	100kw

Overall, hydro power schemes are unlikely to make a significant contribution to renewable energy targets and carbon emissions reductions in Wigan.

However, under the feed-in-tariff, hydropower schemes could qualify for up to 20p for every kilowatt hour of electricity produced. Therefore, they may present the opportunity for communities to benefit from energy schemes.

It should be noted that the locations identified are only broad level opportunities based upon Environment Agency data, and do not replace the need for a site by site assessment. The data also only looks at locations with structures that are known barriers to fish movement. There may be a number of other locations that may also be suitable for hydroelectric schemes.

3.8 Opportunities for other microgeneration

3.8.1 Solar power

We have used SQWenergy's renewable energy calculation methodology to estimate that roughly a quarter of existing domestic roof spaces in the borough will be suitable for solar panels (PV assumed). 40% of all existing commercial hereditaments are also likely to be suitable and 80% of the existing industrial stock.

For new development it can be assumed that 50% of all roofs will be suitable for solar systems.

Domestic systems have been assumed to be an average 2kw, with commercial at 5kw and industrial perhaps 20kw (although this can vary significantly).

We have estimated commercial and industrial capacity using floor-space data for non domestic buildings. We had to make assumptions about roof space in relation to total floor space.

As the threshold for commercial systems is set at 5kw (*requiring an area of at least 40m^2 plus an additional 10m^2 per system to account for inaccessible areas*), any premises with a roof space under 50m^2 have been excluded from our calculations. N.B this does not mean to say a system under 5kw would not be installed at commercial premises.

As a first step, we used the total roof area assumed available and divided this by the area required for a 5kw system. We then accounted for orientation and shading issues before calculating the theoretical capacity. The realistic potential takes account of further issues such as market conditions.

Using these assumptions, the estimated potential for solar PV power in Wigan is as follows.

Type	Indicative Number of systems	Theoretical capacity	'Realistic potential'
Existing homes* (Excludes flats) *Housing Needs Study 2008	29,529 (¼ of 118,119)	59 mw	5.9 mw Based on 10% uptake level
Existing commercial	40% of 20,515 = 6564 Roof space = 820,591 m2 5kw system = 50m^2	32.8 mw	4.9 mw Based upon 15% uptake
Existing Industrial	1,584,716 * 0.8 / 200m^2 = 63339	126.8mw	12.6 mw Based upon 10% take up
New Homes (2026)	10,000 (half of 20,000)	20 mw	6mw Based upon 30% uptake
New industrial	Equivalent to 2396 at 20kw (479248m2 / 200m2)	47.9mw	4.8 mw Based upon 10% take up
New Commercial / industrial (2026)	478552m2 / 50m2 = 9,571	47.9mw	14.4 mw Based upon 30% take up
Overall Total		**334.4 mw**	**46.6 mw**

It is very unlikely that every home, commercial and industrial building that is suitable for solar panels will make use of the technologies. Other technologies may also be chosen as an alternative.

Therefore, whilst there may be the technical ability to install a total of approximately 334.4 mw of solar PV power, it is likely that only a fraction of this will be achieved. We have estimated conservative uptake levels of 10-15% for existing properties, and 30% for newer properties, that must conform to more stringent energy standards.

NB: We have based our calculations on potential for Photovoltaics due to their potential for income from the Feed in Tarriff, and ability to provide low carbon heat through other measures. However, in reality solar panels for thermal heating are also likely to be part of the mix.

3.8.2 Heat pumps

Heat pumps are an established technology that makes use of thermal energy stored in the ground, water or air. Using heat converters and pumps, they can provide space heating for homes and a wide range of other buildings.

Heat pumps require electricity to power their parts, but for every unit of electricity used, roughly 3 units of heat are produced, making an overall saving in energy and carbon when compared to conventional gas or electric heating.

Heat pumps are particularly useful in reducing carbon emissions when electricity is the main source of heat being used.

Type of building	**Number of systems**	**Total theoretical capacity**	**'Realistic potential'***
Existing detached and semi detached	64,187 75% of 85,582	320.9 mw 5kw systems	16 mw
Existing terraced	16,265 50% of 32,537	81.2 mw 5kw systems	4.06 mw
Existing flats	2,911 25% of 11,643	14.6 mw 5kw systems	728 kw
Existing commercial and industrial	c6500	61.5 mw	3.75 mw
New housing (to 2026)	10,000	50 mw	5 mw
New commercial and industrial	270 ha 50 kw per hectare on average	13.5 mw	0.7mw
Total domestic		466.7 mw	25.7 mw
Total commercial		75 mw	4.45 mw
Overall Total		**541.7 mw**	**30.2 mw**

* Based upon 5% take up rate over plan period, with exception of new homes at10%.

It is very unlikely that every home, public, commercial and industrial building that is suitable for heat pumps will make use of the technologies. Other technologies may also be chosen as an alternative. Therefore, whilst there is an estimated potential of 541.7 mw capacity (thermal) from heat pump technologies, it is anticipated that only 30.2 mw is likely be installed in the plan period (up to 2026).

4.0 Implementation

4.1 Network capacity constraints and other issues

New development in the Borough could have an impact on the capacity of the current electricity network to operate at required standards.

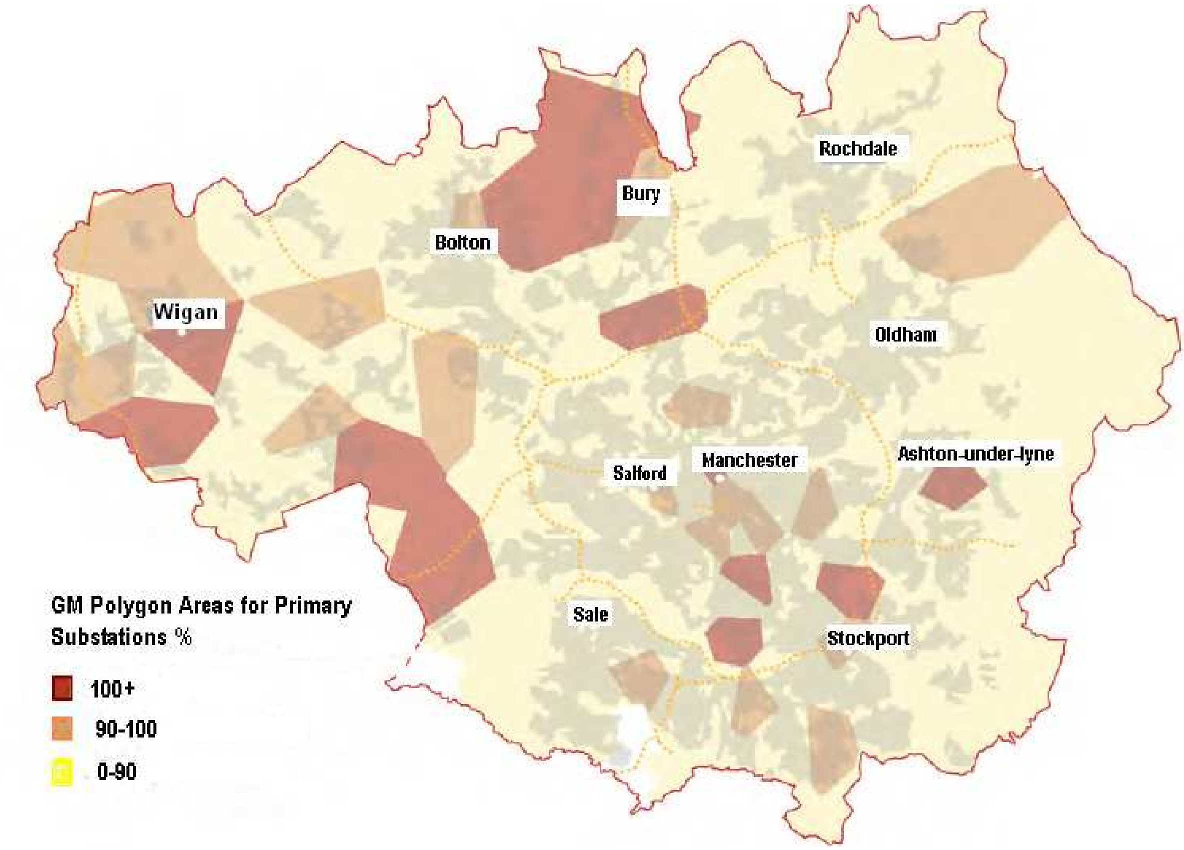
The move towards a low carbon economy and decentralised supply could also have significant impacts on the distribution network that need to be considered.

Although some policy actions will decrease the amount of carbon being emitted, the demand on the electricity network could increase to an unmanageable level without adequate infrastructure planning and reinforcement. A good example of this would be the promotion of electric vehicles and associated charging points.

As supply must follow peak demand, it may be necessary to consider demand management measures, or reinforcement will be necessary.

Experience in the electricity industry has shown that most supply issues to date have been due to distribution infrastructure problems.

Map 23 below illustrates at what level of capacity the primary substations are running at across Greater Manchester. (Taken from AGMA Decentralised Energy Study).



Map 23: Broad capacity constraints for primary substations

Although loads can be switched, the maps indicate that several of the Boroughs primary substations are running over or close to capacity, which can be a constraint when significant new developments are being proposed.

There appear to be potential issues in areas that are earmarked for future development (and growth in demand) such as ‘Wigan South Central’, Leigh Central and Ashton.

Loads of 5-10MW will generally require primary substation reinforcement, and a number of strategic sites in Wigan are anticipated to add this level of load over the plan period.

New primaries and cabling are expensive to install, so these issues need to be addressed in viability studies and infrastructure planning.

Wigan’s Bulk Supply Points are also expected to exceed their capacity in the future, so development may be expected to fund a proportion of the reinforcement costs incurred by the network operator in the longer term.

NB: It should be noted that this map is only a general indication of areas where there could be problems with the connection of significant new loads. There are a number of complex issues involved and a detailed system study is required to assess the situation for a specific development.

4.2 Connecting Decentralised Energy Capacity

The local distribution network is not designed for the connection of generating capacity that takes supply significantly over demand. Therefore, the connection of distributed capacity (particularly CHP) can often require reinforcement of the system.

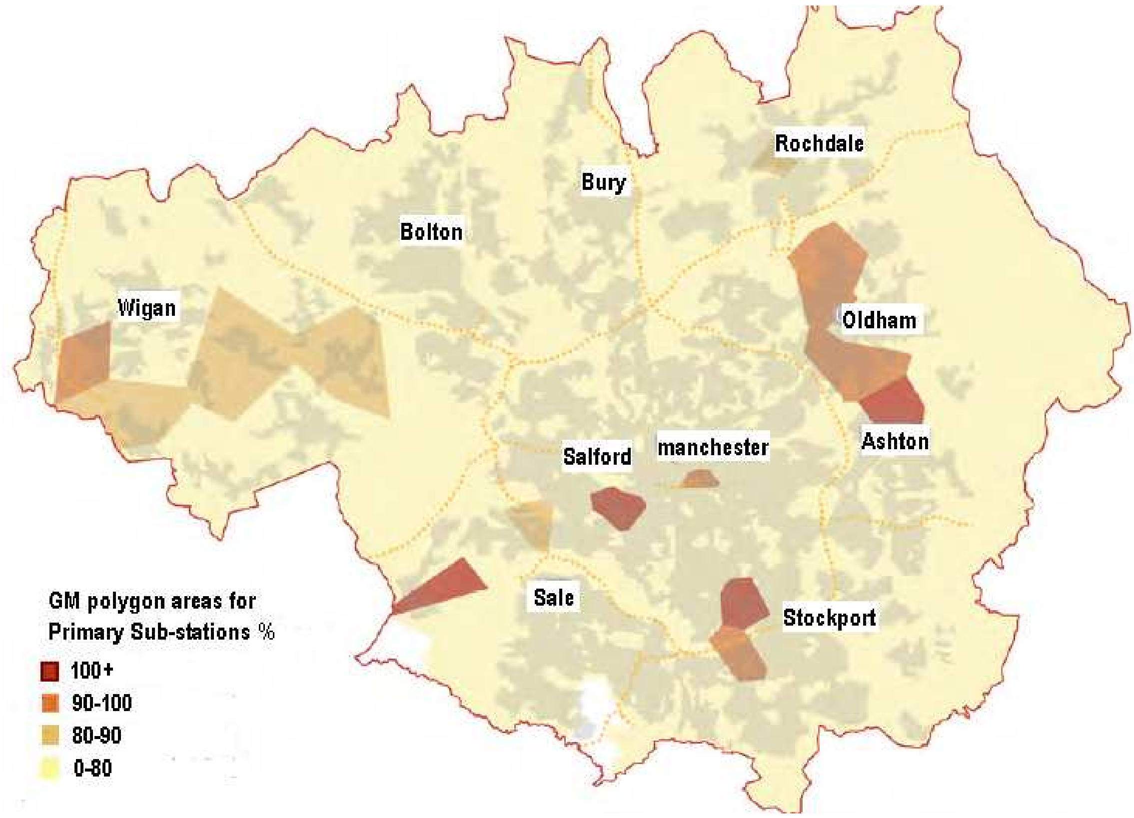
A particular issue with decentralised energy connection is related to the fault level ratings of switchgear at primary substations.

Map 24 illustrates that most of the borough is operating below 80% of capacity, so there should be no issues unless large schemes are brought forward. However, the ‘inner core’ of the Borough is operating at fault levels between 80 and 90 percent, whilst primaries around Orrell / Pemberton are operating between 90 -100%, so reinforcement is likely to be necessary.

It should be noted that the areas anticipated to experience new development overlap in terms of fault level issues and capacity issues.

It should also be noted that the map does not indicate the fault level rating of switchgear at distribution sub-stations fed from the primary sub-stations. Therefore, although the primary substation may be operating well within its capability it may be that there is some switchgear embedded in the network that is highly stressed and this would not be reflected in the map.

(AGMA decentralised Energy Study, 2010)



Map 24: Fault level rating of primary substations

4.3 'Micro' generation issues

Grid connection can also be an issue when low carbon technologies are being introduced at a smaller scale. At a smaller scale there are the issues of single or 3 phase cabling, which can affect costs greatly, especially in rural areas.

Single phase connections are common in domestic properties, which means that systems rated over 12kw are not typically suitable unless 3 phase cabling is introduced. This is more of an issue when there is no 3 phase cabling close to the property.

4.4 Viability of low carbon development

A major barrier to low carbon development is often cited as the cost of implementing higher standards of energy efficiency and utilising low carbon technologies. This raises issues of commercial viability, which are important, because policies to promote sustainability and carbon reductions often have viability clauses attached to them.

The Council has commissioned a study looking into the viability of a representative cross section of housing sites in the borough in order to test different affordable housing targets. Built into this study is an assumption that homes will be built to at least Code Level 3.

By adjusting the affordable housing target slightly it is clear that Code Level3 does not present a significant issue in terms of viability. However, as we move towards zero carbon development through changes to the building regulations, these costs are likely to rise and viability may be affected.

If housing development becomes 'unviable' due to prohibitive costs, then carbon reduction measures cannot be what 'gives way'. We need to start prioritising the achievement of carbon reduction targets in developments and making compromises elsewhere. That might mean lowering the proportion of affordable housing being required, allowing greater densities on sites, or lowering land prices.

It is also important to realise that developers can achieve carbon reduction targets at much lower costs if a strategic approach is taken to plan for low carbon infrastructure. This may mean developers contributing to larger site-wide energy schemes that incorporate several different phases (and perhaps owners) of development. Due to their complexity, such projects require forward planning and partnership working, as well as the involvement of energy service companies.

4.5 Financing

Capital costs for low carbon technologies are often the major constraint to low carbon development and energy schemes. The problem is that the occupants or investors do not often benefit immediately, with cost savings being accrued over the longer term.

It is difficult for developers to pass on the costs of low carbon technologies through price, as the market for such property is in its infancy. Investors also take a risk if technologies are not proven or sites have constraints, such as planning issues.

Feed-in-Tariffs will make it more attractive to implement low carbon technologies; but again, these are longer term investments, requiring capital input.

Interest free loans and pay-as-you-save schemes can help too, but more creative financing solutions will need to be explored to help fund low carbon development and energy schemes across the borough.

Energy Service Companies (ESCOs) are likely to play an important part in financing schemes, as they can make a return from the generation and sale of energy over the longer term in return for up front capital.

Coordination and partnership working between local authorities, energy companies and developers will be required.

There are examples of local authorities that have set up their own ESCOs to fund and implement energy schemes. This is an attractive model as it offers multiple benefits in terms of available land and property, carbon savings, reduced energy costs and improved working environments.

The close arrangement of the Greater Manchester authorities through AGMA also means that a city-wide ESCO could be an attractive proposition for coordinating and financing strategic projects.

4.6 The Role of Planning

Planning has an important role to play in managing low carbon development and energy projects.

In terms of new development, building regulations are seen as the main mechanism for driving zero carbon development. However, planning policies are necessary to guide appropriate development and to implement more challenging carbon reduction targets where opportunities exist.

Strategic energy plans for development sites also need to be delivered through the planning system, and this will help developers to achieve building regulation standards that may be difficult at the 'building' scale alone. For example district heat networks.

The planning system also provides the link between building regulations and wider sustainability standards such as the Code for Sustainable Homes and BREEAM.

For energy projects, planning policy needs to identify opportunity areas where low carbon technologies are likely to be acceptable. This will give investors greater confidence and highlight areas for further exploration.

To support these policies, there will need to be access to expertise in energy planning and assessment coupled with an overall improvement in the awareness and understanding of energy and climate change issues across the authority's development and regeneration teams.

5.0 Conclusions

5.1 Indicative technology capacity targets for Wigan

The table below summarises the estimated potential for implementing low carbon technologies in Wigan. These are only indicative and have some uncertainties, as discussed in the main body of this report. However, they do provide a starting point for focusing our efforts towards those technologies and opportunity areas where there is greatest potential.

This information also guides us away from focusing on technologies where the benefits of the energy schemes may not be significant enough to outweigh any negative impacts or competing interests. For example, energy crops and large scale wind in sensitive locations may not be attractive, and hydro is more likely to be community-led projects.

Technology	**Installed capacity**		**Carbon saving** (tonnes per year)	**Household emissions equivalent***
	Maximum potential	'Realistic' potential		
Onshore Wind (large scale >2.5mw)	55 mw	15mw	17,000	3200
Onshore Wind (Small scale) 10kw average	1.15 mw	288 kw	217	41
Onshore Wind (Medium scale) 150kw average	9750kw	2.4 mw	2,260	426
Solar PV (Micro Generation)	334.4 mw	46.6 mw	22,800	4294
Heat pumps (Microgeneration)	541.7 mw	30.2 mw	12,000*	2260
Hydro power	500 kw	100 kw	226	43
Gas District Heat Networks (Thermal energy only)	10mw *potentially more*	10mw	9,986**	1880
Energy from waste (Electric) Landfill, sewage & commercial	16 mw *potentially more*	16mw (8 mw already installed)	19,972**	3761
Energy from Waste (Thermal) Landfill, sewage & commercial	20 mw	20mw	19,972**	3761
Biomass fuel supply (Energy Crops)	1mw *Potentially more*	1 mw (equivalent)	3,013	567
Total	**989.5 mw**	**141.6 mw**	**107,446**	**20,235**

* Total domestic emissions per person in Wigan for 2009 = 2.3 tonnes. Average household size = 2.31 persons. Average household emissions therefore = 5.31 tonnes per year.

** Depends on fuel replaced, assumes gas is the main fuel replaced. Replacement of electric systems would generate even greater carbon savings. Performance also depends upon size of system (is it operational all year, cooling in summer for example)

It is important to remember that these are only *conservative estimates,* and do not take account of some of the opportunities that are difficult to make accurate estimates for.

However, if we take these 'realistic' figures as a starting point, the carbon savings we can generate per year by implementing all these technologies only amounts to approximately 6% of our total carbon emissions in a year (1,889,000 tonnes in 2007).

Importantly, these calculations do not account for the additional carbon emissions that new development can add. So whilst these measures could save the equivalent emissions of about 20,000 households, the Core Strategy has provisions for at least an additional 10,000 homes to 2026, and possibly more.

Whilst our figures are conservative, and there are limitations to the data, our estimates still highlight the scale of the challenge we are facing.

Even with all these measures in place, a number of national and regional energy projects will still have a big role to play if we are to achieve carbon savings in line with the 34% cuts set by government for 2020. Enhanced efficiency measures and behaviour change will also play a vital role.

What is clear if we are to contribute to targets and capitalise on the opportunities the low carbon economy is creating, is that we need to take a strong and positive stance on climate change and energy issues, promoting low carbon development, and taking forward as many of these opportunities as possible over the next 15 years and beyond.

5.2 Policy recommendations

- Introduce low carbon technology targets for new development following through the AGMA recommended carbon reduction framework.
- Produce energy plans for strategic development and areas of growth.
- Identify and allocate opportunity areas for low carbon energy schemes as part of the allocations DPD and Area Action Plans.
- Explore the potential to set up a Wigan Council-led ESCO.
- Infrastructure funding should come from third party investors, with development contributing to a proportion of capital costs.
- Prioritise low carbon infrastructure in the 'menu' of developer contributions.
- Focus on opportunities that are most appropriate to the borough, taking into account constraints, amenity issues and carbon reduction potential.
- Microgeneration has a very important role to play in helping us deliver carbon savings.