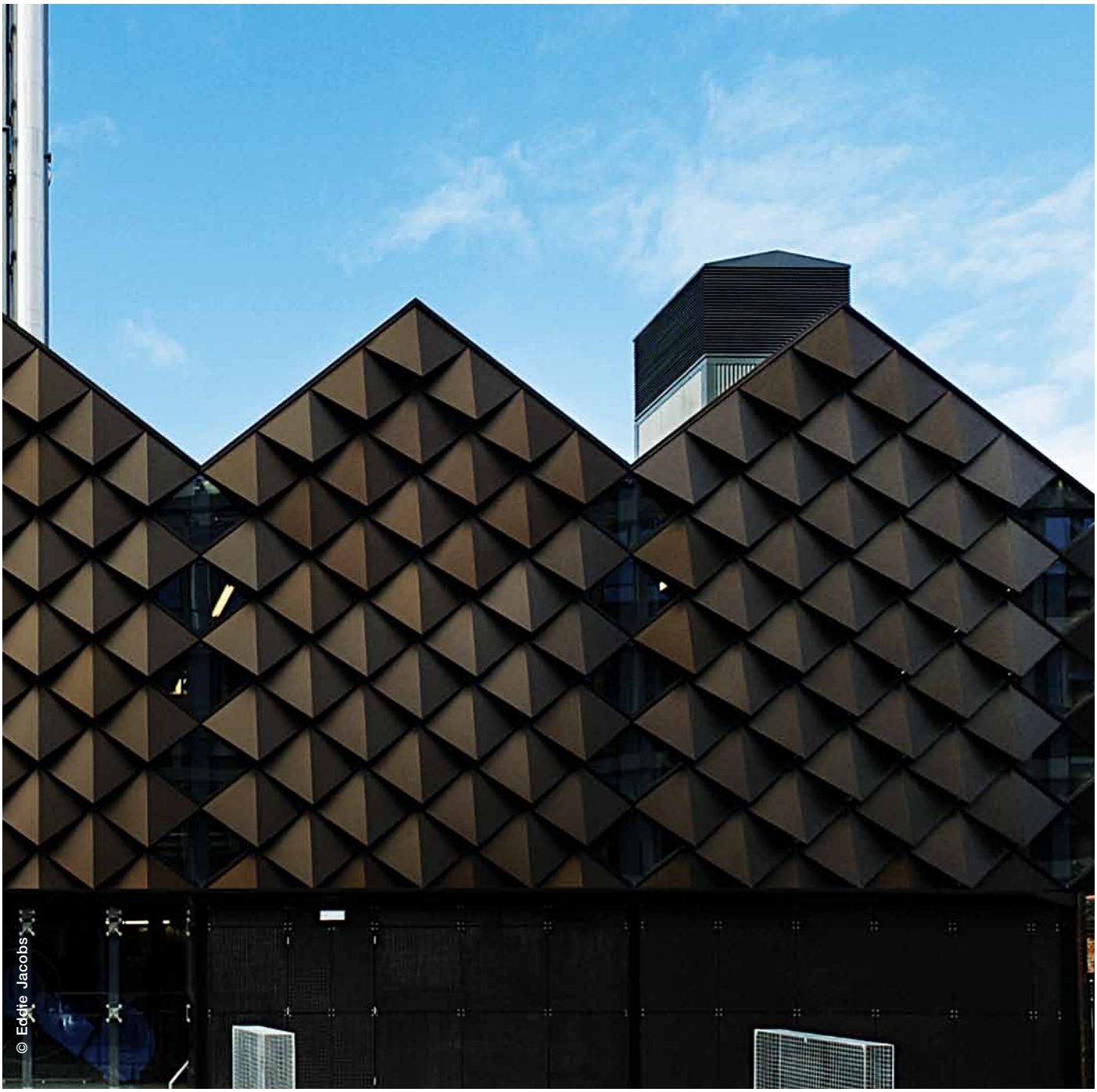
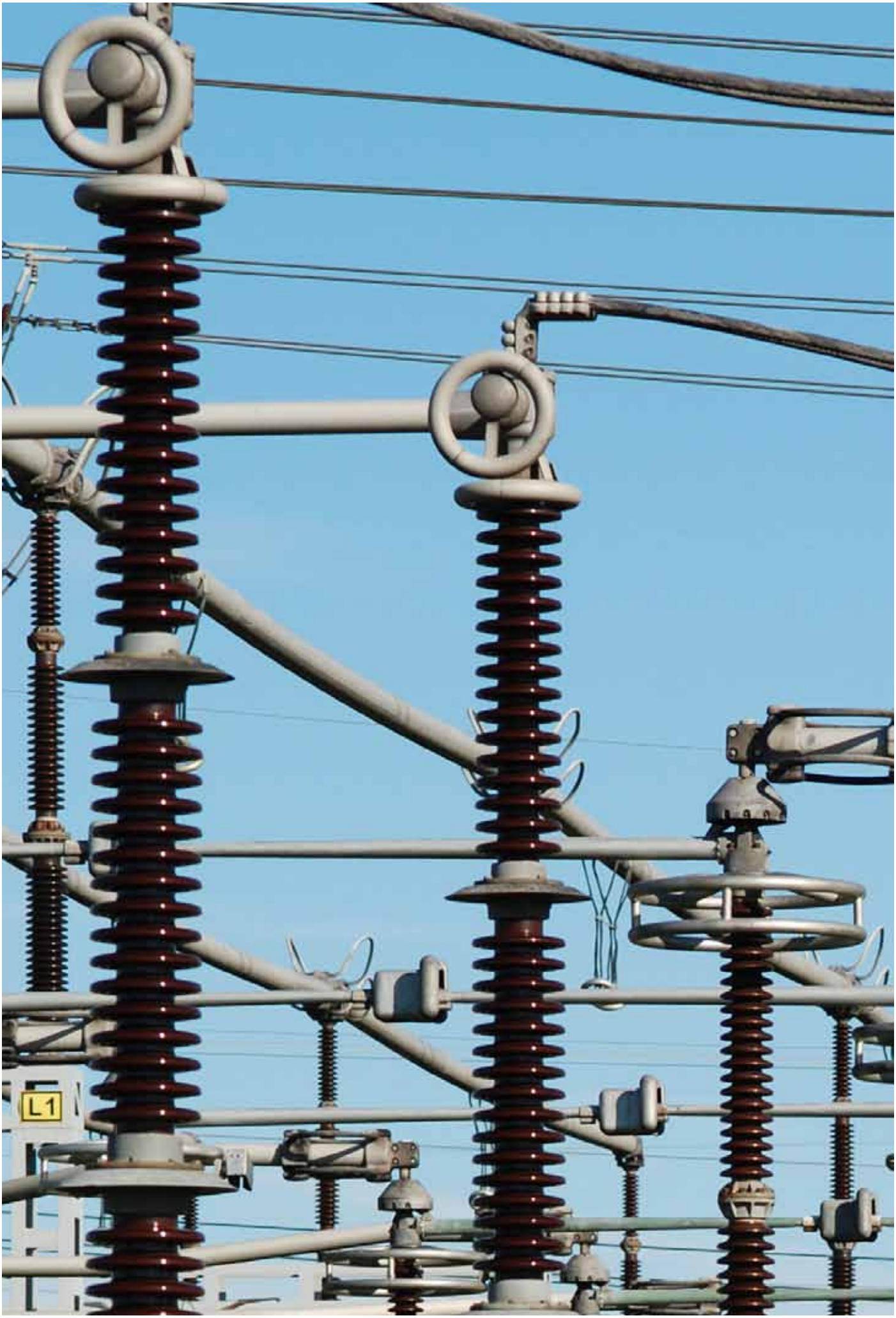
RENEWABLE ENERGY CAPACITY STUDY

LIVERPOOL CITY REGION
STAGE TWO REPORT

ARUP

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GLOSSARY

Anchor Load	A term referring to a single heat load within a development which, in isolation, provides a maintained level of heat demand. Whilst district heating networks can be viable with a suitable combination of a number of complimentary heat loads, the presence of an identifiable anchor load is preferable when the use of CHP equipment is being considered.
Biomass	Biomass is biological material derived from living, or recently living organisms. In the context of biomass for energy this is often used to mean plant based material, but biomass can equally apply to both animal and vegetable derived material (Biomass Energy Centre)
CHP	Combined Heat and Power
Distribution system	The system consisting of electric lines owned or operated by the DNO and used for distribution of electricity (SP Manpower)
DH	District Heating
DNO	Distribution Network Operator – responsible for electrical infrastructure
DE	Decentralised energy – energy supplied in a local area not sourced from the National Grid network
EHV	Extra High Voltage Networks – networks for serving large regional substations. These are more than 22kV but not more than 72kV (SP Manpower)
Electricity Substation	Term for equipment which transforms voltage within a transmission or distribution system from high to low (or vice versa) using transformers
Fault Level	The maximum prospective current or power that will flow into a short circuit at a point on the network, usually expressed in MVA or kA (SP Manpower)
HV	High voltage more than 1kV but no more than 22kV (SP Manpower)
LV	Not more than 1kV (SP Manpower)
Load capacity	The level of energy or electrical demand which a given system can meet
MVA	Mega Volts Amps – measure of electricity demand/available capacity
MWth	MW thermal heat – thermal capacity of CHP plants in MW
MWe	MW electrical – electrical capacity in MW
Metering panel	Comprises equipment which measures electricity consumption (or generation) at a given point within a distribution system
Transformer equipment	Enables the transfer of electrical energy between different circuits/systems
Switchgear	A combination of equipment which facilitates the isolation of electrical equipment or circuits, allowing for maintenance and/or connection works to take place

1. INTRODUCTION

1.1 INTRODUCTION

Arup was commissioned to undertake a Renewable Energy Study in July 2009 for a partnership of eight local authorities to provide the technical evidence base to support local planning authorities in setting out a policy framework for low and zero carbon development. Halton Borough Council; Knowsley Metropolitan Borough Council; Liverpool City Council; Sefton Metropolitan Borough Council; St Helens Council; and Wirral Metropolitan Borough Council are the core members of the Liverpool City Region, and Warrington Borough Council and West Lancashire District Council have also partnered with the project.

Following completion of Stage One, this second stage study was commissioned in February 2010. This document should be read in combination with the Stage One report and is complemented by a further study carried out in 2009 looking at 'Renewable and Low Carbon Energy Options' for Knowsley Borough Council.

It should be noted in reading this report that at the latter stages of development of this technical report, significant political changes at national, regional and sub-regional scale have taken place with the establishment of a new government and changes to regional planning structures. The implications of these changes for this study have been emerging throughout the development process including the abolition of Regional Spatial Strategies. Further details on how this relates to the study are set out in the report where appropriate, however it is important to note up front that, for the purposes of this technical report, it has been agreed by partner authorities, to continue to work with the evidence based RSS targets for renewable energy.

1.2 PURPOSE

The primary aim of this study has been to prepare a technical report that provides evidence to support the emerging Local Development Frameworks (LDF) for the eight participating authorities. The commission has been split in to two distinct stages to ensure that each local authority has a robust, credible and consistent level of evidence to move their LDFs forward. Stage One provided an introduction to renewable energy technologies and targets, the key issues associated with them and how suitable they are in the context of the partner authority areas. Heat mapping for the eight partner authority areas was also carried out. The report output was designed to provide planners and other professionals and stakeholders with an introduction to energy technology and infrastructure and the strategic planning and development context for low and zero carbon energy in the study area.

The purpose of Stage Two is to provide more detailed spatial evidence for each local planning authority by identifying priority zones for delivery of low and zero carbon energy technologies and to identify broad areas of potentially least constraint for wind energy development. The study will inform planning policy in terms of promoting low and zero carbon technology delivery and provide part of the evidence for informing future land allocations. A guiding policy structure for energy and low carbon development has also been developed to enable partner authorities to develop a consistent policy approach that supports the principles set out in national policy and enables the results of this study to be actively promoted by the planning system. Whilst this policy wording is unlikely to be reproduced exactly, it provides a framework from which partner authorities can work to achieve consistency at a strategic sub-regional level.

1.3 STAGE TWO APPROACH

The Stage Two project team worked with each local planning authority to identify priority zones for low and zero carbon energy technology, taking account of existing heat demand information (Stage One heat mapping) and linking that to future growth potential identified through emerging Strategic Housing Land Assessments and Employment Land Studies. This exercise has been complemented by an update on electricity grid capacity. Broad areas were also considered for wind energy development and whilst all areas presented some levels of constraint, three broad areas have been identified as having least constraint. Other areas across the partner authorities may also be suitable subject to further detailed site specific research.

Alongside this, a viability assessment tool has been developed to assist each local planning authority consider potential for low and zero carbon energy generation associated with new development proposals.

Stage Two has been developed working closely with the local planning authorities through one to one interviews, a policy workshop and regular steering group engagement.

1.4 KEY ISSUES

Below is a short summary of the key issues that have emerged through the development of the Stage Two report:

- The Building Regulations are quickly driving targets towards zero carbon development;
- Plans for growth across the eight partner authority areas up to 2025 amounts to potential future demand for energy to increase by approximately 200,000 tonnes of CO_2. To enable sustainable growth, serious measures will be required to ensure that new development can access the infrastructure necessary to meet energy needs without contributing to growth in carbon emissions;
- Without the right infrastructure in place there is a risk that developers will seek to prioritise other authority areas for investment;
- Planning authorities will need to support and promote the delivery of infrastructure for district heating to enable developers to achieve demanding future Building Regulation targets;
- Planning policy requiring investment in low and zero carbon energy needs to be balanced with other planning objectives for development;
- Consultation on a new planning policy statement for planning for a low carbon future in a changing climate was published at time of writing which provided a useful guide to policy development. However more recent government plans are for all planning policy statements to be rationalised and replaced. The PPS documents would be replaced by a consolidated national planning framework covering all forms of development and setting out national economic environmental and social priorities;
- The targets identified in this report for delivering low and zero carbon energy technologies are set out as guidelines and should not be interpreted as maximum targets for energy delivery. Nor should they be considered restrictive in terms of what technology is proposed, for example a spread of smaller scale wind energy technologies across a wider area may achieve a similar or better result than focusing a single large scale array in one location;
- Whilst 10 priority zones have been identified, not all will be developed. Instead the priority zones are indicative areas where, based on available data, the critical mass of heat demand and development growth would indicate potential;
- Other areas across the eight partner authorities will also have good potential for DH and larger scale energy schemes. However, without access to consistent and detailed data, it is difficult to pin point all opportunities;
- Availability of suitable wind energy sites in the study area is limited by a range of constraints, including, for example, proximity to natural environment designations. The exact nature and scale of a wind energy proposal may mean that schemes will be acceptable beyond the broad areas identified in this study and similarly some proposals may not be acceptable within the broad areas, dependant on the outcome of further detailed impact assessment;
- Officer training is needed to improve technical skills in relation to energy planning.

1.5 KEY RECOMMENDATIONS

The following key recommendations have emerged from this study. Further details of these recommendations are presented in Section 8:

- Partner authorities are encouraged to find a mechanism to coordinate future partner working to help create the right environment for low carbon development and to develop effective monitoring systems;
- 10 priority zones have been identified for delivery of District Heating (primarily CHP but other low and zero carbon energy technologies also have the potential to contribute to energy delivery in these and other areas). Further site specific investigation is now required into the feasibility and viability of these zones;
- Other areas are also potentially suitable for delivery of District Heating and partner authorities are encouraged to actively seek out opportunities through the development planning process (the content of this report provides support to facilitate this);
- Opportunities to create wider 'low carbon economic zones' could be investigated and areas ear marked with potential to link into the wider agenda for economic growth and regeneration. The principles of such zones would need to be investigated further as part of a more focussed delivery strategy for low and zero carbon energy;
- All eight partner authorities should seek to incorporate a consistent planning policy for energy into their Local Development Frameworks;
- A pilot planning application should be used to test the draft policy;
- Investment is required in the resources and skills necessary to deliver low and zero carbon energy;
- Support for planning departments across the Local Authorities will be necessary to deliver a low carbon future;
- Further detailed appraisals of the broad areas of least constraint for wind will be required before any wind scheme could be considered acceptable;
- An economic impact assessment to consider the implications of changes to the Building Regulations is recommended.

2. DEVELOPMENT CONTEXT FOR RENEWABLE ENERGY

2.1 INTRODUCTION

This section presents a brief overview of the context for future low and zero carbon development in the partner authority areas, including estimated projections for future energy demand growth and associated carbon emissions. It includes a brief update on planning policy context following on from the Stage One study plus presents details on forthcoming changes to the Building Regulations in relation to energy performance of buildings. This is followed by an overview of key development projects identified by the partner authorities.

The purpose of this section is to firstly highlight the wider context for future development standards (and justification), which is particularly relevant to planning policy wording discussed in Section 5.

2.2 POLICY AND DEVELOPMENT MANAGEMENT CONTEXT UPDATE

Since publication of the Stage One report there have been developments in national policy and legislation as well as the regional and local context. The key changes are summarised here. This review is relevant to 'Appendix B1 Review of Local Authority Renewable Energy Policies' in the Stage One report.

The **UK Renewable Energy Strategy** was adopted in 2009 and the requirement for generation of electricity from renewable sources is reduced to 30% from 35% as previously set out in the draft strategy.

The **Climate Change Act 2008** has set a target for the UK to reduce carbon emissions by 80% by 2050 from the 1990 baseline. The **Household Energy Management Strategy** now sets out the current strategy to help people make their homes warmer, more energy efficient and encourage greater use of small scale use renewable energy sources. A target has been set to reduce carbon emissions from the household sector by 29% to help meet national targets.

The **Infrastructure Planning Commission** (IPC) is now active and will make decisions on nationally significant energy infrastructure proposals, including onshore electricity generation stations with a capacity of 50MW or more. National Policy Statements (NPS) have been produced to guide decision making by the IPC on applications for energy infrastructure. Draft NPSs were produced by the previous government subject to public consultation and parliamentary scrutiny. The Coalition Government has announced that it will publish revised drafts for further consultation and the revised draft Energy NPS was published for consultation in October 2010. Of the seven draft NPSs produced there are three that are of particular relevance to decentralised energy. These are:

- **Overarching National Energy Infrastructure Policy** - This draft recognises that Combined Heat and Power is technically feasible for all types of thermal generating stations, including nuclear, energy from waste and biomass.
- **Renewable Energy Generation** - This draft applies to large generation from on shore wind, biomass and waste plants (over 50MW generating capacity). Combustion plants which generate electricity using waste or biomass are also included.
- **Fossil Fuel Electricity Generating Infrastructure** – This draft covers nationally significant electricity generating infrastructure over 50 MW of electricity generating capacity.

The IPC is soon to be replaced with the **Major Infrastructure Planning Unit**. This will be established within the Planning Inspectorate to continue fast-tracking major infrastructure projects. Ministers will take decisions on applications within the same statutory fast-track timeframe as the current regime. In addition, all NPS will be subject to ratification by Parliament.

'**Planning for a Low Carbon Future in a Changing Climate'** was consulted upon in early 2010. This draft proposed to bring together the Planning and Climate Change supplement to PPS1 and PPS22 on Renewable Energy. It was envisaged at the time of writing this report that the PPS would become a consolidated supplement to PPS1. In the latter stages of completing this study however the new government identified plans to streamline the policy into a wider, less detailed, National Planning framework.

In the absence of further information on how the more streamlined policy will emerge, reference to the draft is maintained for the purposes of this study and has been helpful in developing the policy recommendations set out in Section 5.

There were several key changes in the document relevant to this study:

- Targets: upon introduction of the proposed 2013 revisions to Part L of the Building Regulations, targets for a minimum level of decentralised energy use in new developments should be considered to be unnecessary. However, up until 2013 targets should be expressed in a DPD. Targets should also be expressed as either:
  - The percentage reduction in CO_2 emissions to be achieved. In doing so, local planning authorities should set out how the target relates to standards for CO_2 emissions set by Building Regulations; or
  - An amount of expected energy generation expressed in kWh.

The draft PPS proposed that when setting out local requirements for decentralised energy, including those expressed as a target, a local authority would seek to ensure that the requirements:

- Relate to identified development areas or specific sites;
- Be consistent with giving priority to energy efficiency measures;
- Focus on opportunities at a scale which developers would not be able to realise on their own in relation to specific developments; and
- Are consistent with national policy on allowable solutions set out in support of the zero carbon homes and buildings policy.

Local authorities would also have been encouraged to assess their respective areas for opportunities for decentralised energy with a focus on securing:

- decentralised energy to meet the needs of new development;
- greater integration of waste management with the provision of decentralised energy;
- co-location of potential heat suppliers and users; and,
- district heating networks based on renewable energy from waste, surplus heat and biomass, or which could be economically converted to such sources in the future.

The Draft PPS indicated that local planning authorities should ensure that their development management policies should not prevent, delay or inhibit proposals for renewable and low carbon energy; and associated infrastructure. In assessing planning applications, authorities would have had to only require information which would have been proportionate and not require specific stand alone statements regarding energy.

The draft PPS also provided guidance for local authorities in determining planning applications for the development of renewable or low carbon energy and associated infrastructure. Of particular note were the following considerations:

- Give significant weight to the wider environmental, social and economic benefits of renewable or low-carbon energy projects whatever their scale;
- Do not require applicants for energy development to demonstrate the overall need for renewable or low-carbon energy;
- Expect developers of decentralised energy to support the local planning approach for renewable and low-carbon energy set out in the LDF;
- Do not refuse planning permission for a renewable energy project because a renewable energy target set out has been reached.

2.2.1 Regional

On the 6th July 2010 Eric Pickles, Secretary of State for Communities and Local Government announced that Regional Spatial Strategies would be revoked with immediate effect. Further to this Government has also announced that England's Regional Development Agencies (RDAs) are to be scrapped and replaced with a new network of Local Enterprise Partnerships (LEPs) headed up by locally-elected leaders.

In light of the abolition of the statutory basis for Regional Strategies the government has placed decision-making on planning and housing matters solely in the hands of local authorities.

Despite this emerging position, to enable this study to proceed, the relevant energy targets in the North West of England RSS have been retained. Similarly, regional targets for housing and employment have been referred to for the purposes of illustrating the energy demand and carbon emissions potentially associated with new development, described below.

2.2.2 Local

Local Development Frameworks and local planning remain in place and planning authorities now have a further role in setting the policy context and framework for development. A review of local authority policy was carried out as part of Stage 1 and is detailed in Appendix B2 of the Stage 1 report. Since publication of the Stage 1 report local authorities have progressed production of their LDFs. As progress continues at pace with each local authority, for the latest information on LDF progress, please refer to the relevant planning website page for each local authority.

The table below is current as of time of writing (October 2010).

LOCAL AUTHORITY	STAGE 2 UPDATE
St Helens	Amended Core Strategy re-published in January 2011. Examination in Public is now expected to be in August 2011. Target adoption date is August 2012.
Halton	Core Strategy Preferred Options stage completed end of 2009. Consultation on Proposed Submission Document scheduled for November 2010. Target adoption date is October 2011.
Liverpool	The Submission version of the Core Strategy is currently (October 2010) being prepared for publication, following consultation on the Core Strategy Preferred Options Report in March 2010. The target date for adoption is November 2011.
Sefton	Core Strategy Preferred Options is to be determined in Autumn 2010 with a possible further consultation period in Summer 2010.
West Lancashire	Core Strategy at options stage and due to publish Preferred Options early 2011. Target adoption date Summer 2012.
Knowsley	The Core Strategy is currently at the Issues and Options stage. Target adoption date is September 2012.
Warrington	Consultation on the Core Strategy Preferred Options is targeted for August 2010 with adoption targeted for Winter 2011.
Wirral	Consultation on the Core Strategy Preferred Options is due to commence in November 2010. Target adoption is 2012.

2.3 REGULATORY CHANGE

Regulations 17A, 17B and 17C of the Building Regulations Part L implement Articles 3, 4 and 5 of the Energy Performance Directive. These specify the Secretary of State's right to approve the methodology for calculation of the energy performance of buildings and approve the minimum energy requirements for new buildings in the form of Target CO_2 Emission Rates (TER). Emission factors are given for each fuel to allow the calculation of the Building CO_2 Emission Rates (BER)[1].

Progress towards the 'zero carbon' development will be made through progressive tightening of the Building Regulations. Over time these changes will replace the energy related elements of the Code for Sustainable Homes (CSH) standards and the Building Research Establishment Environmental Assessment Method (BREAAM) standards for non domestic buildings *(note, these standards cover other sustainability criteria such as water use and ecology which will not be covered by changes to Part L)*.

Changes will improve energy performance requirements based on reducing carbon emissions relative to the standards set out in 2006. The target improvement rates for all new homes are as follows:

2010	2013	2016
25% Improvement	44% Improvement	Zero Carbon Homes

Proposals are also in place to introduce improved energy efficiency standards for new non-domestic buildings, with net zero carbon target from 2019[2].

The changes to the Building Regulations will have direct implications for growth trajectories for all local planning authorities whereby, beyond 2013, new developments that will come forward will need to achieve very high efficiency standards. Where frameworks are not in place locally to support these higher standards there is a risk that growth targets will not be achieved.

[1] When systems are capable of being fired by more than one fuel then for biomass-fired systems rated at greater than 100kW output but where there is an alternative appliance to provide standby, the CO_2 emission factor should be based on the fuel that is normally expected to provide the lead. This is to encourage biomass (either solid or liquid) systems, but which are often backed up by fossil-fuelled standby plant.

[2] Communities and Local Government, 2007, Building Regulations Energy efficiency requirements for new dwellings, A forward look at what standards may be in 2010 and 2013

2.3.1 Smart grid

A key factor relevant to promoting the wider agenda for a low carbon energy future is the Smart Grid approach to energy management. Smart Grids are anticipated to transform energy use and management by delivering electricity to residents and businesses using two-way digital technology. This technology will facilitate control of appliances at consumers' properties, recognising when energy is not needed and switching appliances off (subject to prior arrangements), making the most of available electricity capacity in the existing electricity supply network. A nationally significant initiative is taking place in the study area at Toxteth where the Mersey Partnership, with EA Technology Limited, is working to establish a major smart grid scheme.

2.4 ENERGY AND CARBON TRAJECTORIES

The table below summarises the estimated heat and electrical consumption data for housing and employment per partner authority based on potential future growth as set out in the RSS with adjustments as described in the footnote below[1].

SUB REGION	AREA TYPE	PROJECTED ADDITIONAL ENERGY CONSUMPTION ON (MWh)								
		2015			2020			2025		
		HEAT	ELECTRICITY	**TOTAL**	HEAT	ELECTRICITY	**TOTAL**	HEAT	ELECTRICITY	**TOTAL**
Halton	Residential	17,387	15,648	**33,036**	31,992	31,645	**63,637**	34,915	34,846	**69,761**
Knowsley	Residential	10,946	9,851	**20,797**	20,140	19,921	**40,061**	21,981	21,938	**43,919**
Liverpool	Residential	56,904	51,213	**108,117**	104,703	103,565	**208,268**	114,264	114,037	**228,301**
Sefton	Residential	12,161	10,945	**23,105**	22,376	22,132	**44,508**	24,420	24,371	**48,791**
St Helens	Residential	19,821	17,839	**37,660**	36,471	36,074	**72,545**	39,800	39,721	**79,521**
Warrington	Residential	13,215	11,894	**25,109**	24,316	24,052	**48,368**	26,539	26,486	**53,025**
West Lancashire	Residential	7,297	6,568	**13,865**	13,427	13,281	**26,708**	14,654	14,625	**29,279**
Wirral	Residential	14,590	13,131	**27,721**	26,846	26,554	**53,400**	29,297	29,239	**58,536**
Warrington	Employment Land	6,060	6,387	**12,447**	11,625	12,186	**23,811**	12,712	13,314	**26,026**
Merseyside and Halton (minus Warrington)	Employment Land	36,360	38,323	**74,683**	69,751	73,114	**142,865**	76,273	79,887	**156,160**

To put these figures into context:

- A typical three bedroom house will consume 9.5 MWh of heat and 4.5MWh of electricity per year;
- A typical four storey office block (accommodating around 160 people) will consume approximately 250MWh of heat and 350MWh of electricity per year;
- Fiddlers Ferry power station produces at peak output a quantity of electricity equivalent to the combined demand of some 750,000 homes.

These projected energy consumption figures are important because they demonstrate the challenge ahead in terms of achieving decreases in carbon emissions as described above. If growth is to proceed in each of the eight partner authority areas, then serious measures will be required to ensure that new development can access the infrastructure necessary to meet energy needs without contributing significantly, if at all, to growth in carbon emissions.

[1] For clarity, the data herein has been derived from the following sources:

Residential data

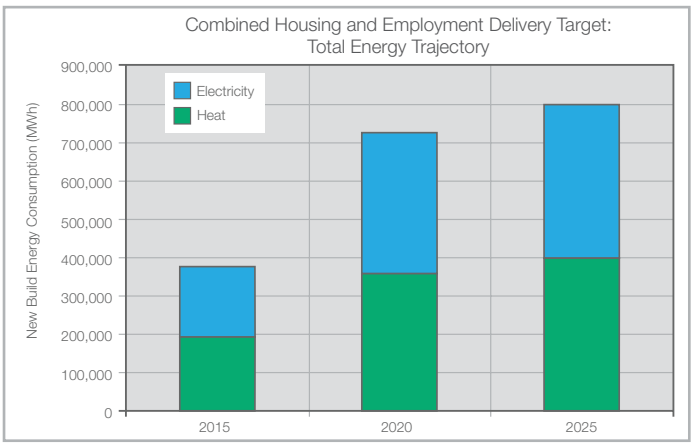
- provided sub-region specific RSS figures of new homes from 2005-2021 plus 'Growth Point' percentages used to compile a total figure for new homes
- associated build-out per year derived, assuming even spread over 16 years and taking account of possible building regulation changes
- according figures of 'already completed' homes calculated (i.e. 2005-2010 = 5 years of build-out at the assumed even rate)
- these figures removed from total and remaining build-out per year used alongside Arup consumption benchmarks to reach final figures

Employment Land data

- a figure of planned additional RSS employment land for Merseyside and Halton plus Warrington (in hectares) was provided and was equally split between the 7 relevant local authorities
- assumptions were made as to how these hectares will be sub-divided between space-types to be built (i.e. B1, B2, B8 and 'General') and Arup consumption benchmark figures applied to reach final figures
- figure shown for Warrington represents a 7th of the calculated total for Merseyside and Halton, with the remaining 6/7ths attributed evenly between the remaining 6 authority areas

2.4.1 Combined Energy Trajectory

The following figure displays a combined total of additional energy consumption trajectories for the eight partner authorities:



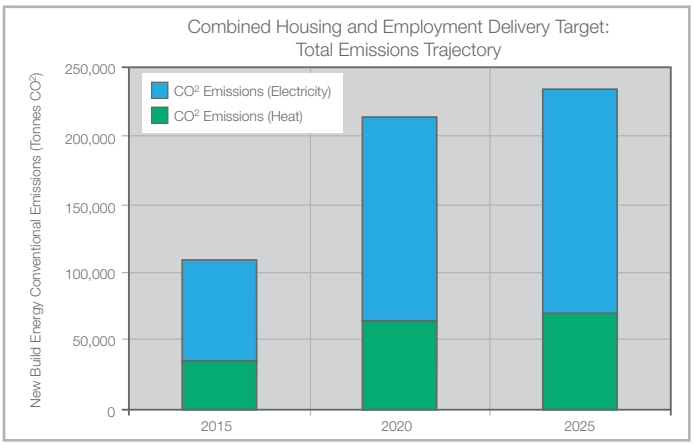
2.4.2 Combined CO_2 Emissions

In order to relate projected additional energy requirements to potential CO_2 emissions, the following figures plot "business as usual" emissions for each partner authority area, on the basis of all electricity notionally being imported from the grid and all heat being derived from conventional gas-fired plant.

The following emissions factors for these fuel-types have been used, sourced from Defra (at the time of writing);

- Natural Gas - 0.204 kg/CO_2/kWh
- Grid Electricity - 0.541 kg/CO_2/kWh

The following figure displays a combined total of projected combined CO_2 emission trajectories for the eight partner authorities.



2.5 KEY DEVELOPMENT PROJECTS

Priority Zones for delivery of district heating (DH) have been identified in this study based on local planning authority housing and employment land data and taking into account existing heat loads based on heat mapping carried out at Stage One. These are presented in Section Three of this report. However, there are other development projects in the study area that may have potential for delivery of district heating that have not been identified through the growth trajectories data provided.

In developing the study, partner authorities were asked to provide information on other major projects that may have potential to support DH development and also specific energy projects such as the Mersey Tidal scheme.

A schedule of all identified major developments is presented in Appendix B. It is important to note however that, as the source of data is somewhat ad hoc, the information provided could not be used as part of the overall evidence base to identify priority zones for DH. In addition to the Priority Zones identified the following schemes are also considered as having potential for delivery of DH and would merit further investigation both through the use of the pilot viability tool developed as part of this study and through direct dialogue with relevant developers:

• Liverpool Waters	• 3MG (Mersey Multimodal Gateway)
• Sefton Business/Commerce Park	• Butts Green
• Mersey Docks and Harbour	• Omega
• Lea Green Colliery	• Greenalls Brewery Site
• Worsley Brow	• Derby Street
• Vulcan Works	• Biossense, Eastham
• Triplex Housing (ex Triplex Site)	• Bromborough Masterplan
• United Glass Site (New Rugby Stadium)	• Woodside Masterplan
• Widnes Waterfront	

There will be genuine value in taking steps to review these sites further and to develop a consistent methodology for monitoring in order to create a comprehensive listing of major schemes and proposals. By having access to up to date and consistent listing of schemes, planning authorities will be much better placed to identify opportunities for joining up projects to promote district heating.

A key innovative project at Knowsley Industrial Park is also discussed further in a little more detail below to highlight the potential to lead the way for low carbon project delivery.

2.5.1 Knowsley

In July 2009, the Knowsley Renewable and Low Carbon Energy Options report was published (see http://www.knowsley.gov.uk/residents/environment,-recycling,-waste/sustainable-development/environmental-policy.aspx). The study identified that Knowsley already has a thriving Renewable Energy sector. Though still in its infancy, with effective and timely support, there is considerable scope to ensure that the area becomes a key location for employment in the energy sector. The study identified that the local business community is one of the main drivers to help make Knowsley self sufficient in its energy needs in the long term.

The study also identified potential for the creation of a biomass hub (see below) as well as potential for district heating and large scale wind (four potential options). Options for building integrated energy solutions and micro generation were also highlighted.

Site specific recommendations have included:

LOCATION	RECOMMENDATION
Kirkby Shopping Centre	Creation of a notional district heating network based on a cost of some £30-40m connecting the shopping centre to adjacent dwellings
Huyton Business Park	District heating linking the business park and adjacent dwellings and commercial buildings. Estimated capital cost of £50-65m
Whiston Hospital	Heat distribution with estimated capital costs of £20-25m
Jaguar Land Rover plant in Halewood	Heat network to serve factory and neighbouring residential area with estimated capital cost of £15-20m
Knowsley Industrial Park	See below.

These areas of potential were identified through a local authority specific study and whilst not all have been picked up as priority zones for the purposes of this study, the nature of the sites provide a helpful indication of how other potential sites can be identified through a combination of local knowledge and developer engagement. Further advice on how to identify other areas of potential is provided in Section 3.8.

2.5.2 Knowsley Industrial Park

A masterplan for Knowsley Industrial Park is currently under development. As part of the masterplanning process, a number of opportunities for low carbon innovations, including energy generation are being investigated. The potential for introducing renewable technologies has been, in part, identified by the 2009 Knowsley Energy study and Stage One of this study. This has demonstrated the value of developing evidence and skills to support local authorities to drive forward initiatives. The options currently being considered at the Industrial Park include:

- Installation of a heat network using waste heat from Park occupant Sonae to supply space heat and potentially process heat to initially a small cluster of neighbouring units;
- Installation of a heat network using waste heat from Energos site to supply space heat and potentially process heat to initially a small cluster of units;
- Establish a site for a biomass hub that would receive biomass fuel from a variety of northwest sources and blend it to provide a consistent fuel stream for potential customers inside and outside the Park;
- To partner with Scottish Power to invest in upgrading the electricity supply to smart grid standards.

In identifying such opportunities the masterplan team, including Knowsley Metropolitan Borough Council and the Mersey Partnership, will collectively seek to investigate the development of innovative financing arrangements to facilitate investment in green energy.

A considerable amount of further work is required to deliver projects including, for example: identifying what individual businesses have relevant heat requirements, work with companies producing waste heat to identify constraints on heat supply, identify funding sources; establish partnerships and agreements with land holders, energy providers and energy customers; establish the business case for projects; and establish appropriate governance structures (e.g. who will construct, own and manage the pipe network, how much will heat be sold for etc.)

2.6 BUILDING SCHOOLS FOR THE FUTURE

A number of Building Schools for the Future (BSF) initiatives have been proposed in the partner authority areas (although further to recent government cuts, the number of schools to be developed under this scheme will have been dramatically reduced) and have been suggested as having potential to support priority zones. However, in isolation, schools are unlikely to constitute a DH opportunity at a significant scale without access to neighbouring heat loads.

This is due to the frequency of use of school buildings and levels of occupancy outside of term time. As such, it is recommended that schools be assessed individually as proposals are being developed.

2.7 LOCAL DEVELOPMENT ORDERS

In addition to the above development context information, this report refers to Local Development Orders (LDOs) in Section 5 as a way for planning authorities to take action to help initiate the delivery of decentralised energy. An LDO is an order made by a local planning authority extending permitted development rights for certain forms of development (Planning and Compulsory Purchase Act 2004, S40). PPS1 supplement for Climate Change states that:

"Planning authorities should give positive consideration to the use of local development orders (LDO) to secure renewable and low-carbon energy supply systems. LDOs could be used to provide additional permitted development rights across the whole of a planning authority's area. LDOs could also be used to grant permission for certain types of development in parts of a planning authority's area."

The London Development Agency (LDA) is currently running a project with the Planning Advisory Service and Arup to set up LDOs to help tackle cross-boundary issues and test complex issues of adoption and implementation at a multi-authority level. The LDO is intended to cover two Boroughs, possibly extending to a third.

Works permitted will include: site investigations, enabling works and temporary works and development below-ground works, (e.g. trenching and laying of pipe and other apparatus above ground apparatus and street furniture small buildings and building extensions works in the public highway).

In the context of the eight partner authorities engaged with this study, it has been discussed and agreed that opportunities for setting up LDOs will be considered and investigated further in connection with the identified priority zones and or in the context of other areas of potential that are identified in the future. The current masterplan for the Knowsley Industrial Park presents a clear opportunity to consider the use of an LDO.

3. PRIORITY ZONES AND AREAS OF SEARCH

3.1 INTRODUCTION

This section includes descriptions and locations of identified priority zones (PZ) suitable to support District Heating Biomass CHP and identifies areas of search for wind energy.

It also includes details of the methodology employed to select these zones and provides guidance on how future zones may be identified.

In reading this section and the subsequent recommendations, it is important to note that the identified priority zones are based on CHP and wind energy only. The identified areas do not preclude other areas from being identified for energy development, nor do they preclude the delivery of other technologies in these particular areas including for example, building integrated solar PV and or wind.

Having highlighted these areas it would be worth considering what other types of coordinated investment would be appropriate to create a critical mass of investment supporting investment in 'low carbon economic zones'. Further investigation into where and how such zones could be developed could help to drive further innovation and investment and is suggested as a recommendation of this report.

3.2 APPROACH

Of the renewable energy technologies discussed at Stage One that support aspirations for delivering low carbon decentralised energy, onshore wind turbines and biomass CHP represent the two most proven technologies. They are also the most dependent upon the location of:

1. Related demand for the energy produced (in the case of CHP and specifically the heat it generates); and
2. Required resource (in the case of wind).

The methodologies applied in identifying areas have reflected these different criteria and are described below.

3.3 BIOMASS CHP AND DISTRICT HEATING

The successful implementation of biomass CHP requires that use of the heat produced is maximised. This can be achieved either via direct use of heat energy within a localised process (most commonly in an industrial setting) or via the production and subsequent distribution of hot water via district heating (DH).

The priority zones selected for biomass CHP during this stage of work relate directly to the opportunities for district heating within the areas of the eight partner authorities.

Further details of the link between biomass CHP technology and district heating are included within Appendix D.

3.3.1 Heat Density

Stage 1 featured the mapping of existing heat density within each of the partner authority areas, allowing the identification of a number of locations with high existing heat densities, potentially offering opportunities for district heating.

At Stage 2, these areas have been considered further to determine more precisely the nature, location and suitability of the heat demands present and likely to emerge based on possible growth trajectories for employment and housing land. This process featured the following steps:

- Establishing of existing and future potential space-types present (i.e. residential, commercial etc);
- Removal of areas for which heat demands are primarily process driven;
- Identification of any potential "anchor" loads (eg hospitals and leisure centres with swimming pools);
- Division of approximate total build floor area by type based on Employment Land and Strategic Housing Land Availability Assessment data; and
- Assessment of likely level of maintained heat demand.

A subsequent appreciation of the location and physical distance between key potential load centres within each area provides an indication of applicable heat density for a potential heat network.

3.3.2 Approximate Plant Capacity

For all identified PZ's, broad indications have been given as to the likely viable capacity of CHP plant which could be sustained. These capacities have been based on a number of assumptions relating to the proportion of identified space-types and related heat loads which may connect to any heat network.

Details of these assumptions are presented within Appendix D of this report.

3.3.3 Gas Demand

It is worth noting that the provisional capacities provided for biomass CHP arrangements do not represent an estimated maximum heat demand for these zones, rather the likely maintained level of demand against which CHP plant might operate.

As such, peak heat demand figures would be in excess of the proven capacity figures and would necessitate supplementary heat generation plant to operate alongside and CHP arrangement, most commonly gas-fired boilers.

3.3.4 Priority Zones

The following tables provide a summary of the Priority Zones (PZs) identified in relation to potential CHP applications, via district heating, along with details of their key features and approx viable plant capacity.

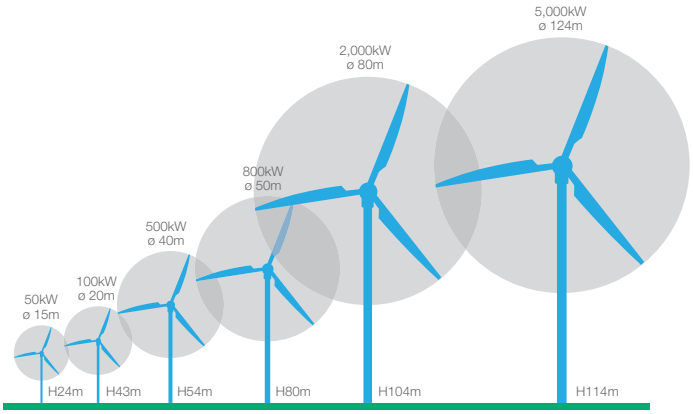
Note that the Priority Zones are identified as areas of search and specific sites are not defined although grid areas are shown on plan for illustrative purposes.

TABLE 1: CHP PRIORITY ZONES

PRIORITY ZONE TYPE AND REF NO.		SUB REGION	STATUS	LOCATION DESCRIPTION	MIX OR SPACE TYPES POTENTIAL CUSTOMERS/ PARTNERS	APPROX. VIABLE CHP CAPACITY	POTENTIAL CONSTRAINTS	COMMENTS
DH	**1**	Liverpool	Existing	City centre area to West of Lime Street station and East of Prince's Dock	• Commercial buildings • Retail (shopping centres) • Hotels • Town Hall • Law Courts and prisons • Leisure facilities • Residential buildings (flats)	**≈ 3 MWe**	• Likely costs of pipework installation in dense urban area • Mix of land ownership • Built heritage • Air quality	• Any CHP capacity will depend heavily on take-up within identified area • SHLAA plans feature new build-out areas in close proximity to priority zone • *Need to identify potential energy centre sites*
DH	**2**	Warrington	Existing	Area including and adjacent to the South and South-East of Warrington Hospital	• Hospital • Commercial units • Retail Park • School • Residential area	**≈ 4.5 MWe**	• Linking to Retail Park would entail crossing an A-road	• Warrington Hospital represents key anchor load
DH	**3**	Liverpool	Existing	Royal Liverpool Hospital & University of Liverpool	• Hospital • University Campus	**≈ 3.5 MWe**	• Requirement to cross Lime Street rail cutting to link to South of University Campus	• Royal Liverpool Hospital represents key anchor load
DH	**4**	West Lancashire	Existing	Ormskirk Town Centre	• Commercial Park • Supermarket • Retail Park • College • Swimming pool	**≈ 1 MWe**	• Separation between main load centres	• Swimming pool represents a key anchor load
DH	**5**	Knowsley	Emerging	Knowsley Business Park & South of Industrial Park	**Existing** • Commercial buildings • Light Industry **Emerging** • New employment land build-out • Energos energy from waste-plant	**≈ 9 MWe** *(proposed by Energos)*	• Potential requirement to cross East Lancashire road to access emerging Industrial Park load centres	• Significant benefit offered by the commitment of Energos to install generation plant • Heat availability not necessarily limited by emergence of related demands
DH	**6**	Sefton	Emerging	Development areas around Southport & Formby District General Hospital	**Existing** • Hospital **Emerging** • New college • Residential • Light Industry • Hotel	**≈ 1.5 MWe**	• Planned Kew Southport residential development is awaiting cleanup of contaminated land • Build-out dates for new King George V College not known	• Southport and Formby District General Hospital represents key anchor load • Good mix of space-types planned within close proximity to Hospital
DH	**7**	St Helens	Emerging	Area around Sutton Leisure Centre and Lea Green Distribution Centre	**Existing** • Leisure Centre • Sports College • Distribution Centre **Emerging** • New employment land built-out	**≈ 0.5 MWe**	• Viability will depend on build-out phasing on employment land	• Leisure Centre represents potential anchor load
DH	**8**	Halton	Emerging	Green-field area in Daresbury to West of A56	**Existing** • Business Park • Science Park **Emerging** • New employment land built-out • New residential	**≈ 0.6 MWe**	• Planned build-out area is relatively large at approx 2km in length	• Existing load centres are at either end of planned development area, with feasibility of connection dependent upon new-build elements and precise types • New-build scheme providing opportunity to introduce DH from the start
DH	**9**	Wirral	Potential	Wirral Waters	**Planned** • Commercial/Office space • Retail and Leisure • Residential • Hotels	**≈ 3.5 MWe**	• Extent to which heat network could serve entirety of site could depend on timing and phasing of scheme • Any anchor load(s) would ideally emerge early within scheme build-out	• Potential to size plant against sizeable and mixed heat loads • New-build scheme providing opportunity to introduce DH from the start
DH	**10**	Halton	Potential	Runcorn Docks	**Planned** • Large residential area • Likely requirement for complimentary non-residential spaces	**≈ 0.2-0.7 MWe** *(based solely on residential build-out of between 1,200-4,000 homes)*	• Pure residential would not provide suitable mix to maximise plant size	• Scheme at this scale is likely to require provision of associated additional Community, Commercial and Retail spaces • New-build scheme providing opportunity to introduce DH from the start

3.4 ONSHORE WIND

The following image (below) displays the indicative physical size of wind turbines and their approximate relevant generation capacity. To help put these into context, the Port of Liverpool turbines (2.5MW capacity) have hub heights of around 80m (second from the right).



Highlighting the indicative physical size of wind turbines and their approximate relevant generation capacity

Unlike the installation of CHP technology, wind turbines have a lesser requirement to be located in close proximity to areas of high demand for generated energy (although all generation is best located near demand as it reduces the need for higher capacity infrastructure at all voltage levels as well as reducing the losses created by moving electricity across distribution networks). The key technical driver is that of resource availability, i.e. local wind speeds, and the proximity of electrical distribution network infrastructure.

3.4.1 Approach

It is wind speeds, in combination with local topography considerations that ultimately influence the potential electrical output from turbines. For the purposes of the Stage 2 study, wind speeds exceeding 6.5m/s, plus local constraints, have been referred to in order to identify areas of least constraint for large scale wind energy development.

Table 2 below presents the elements considered in identifying constraints to wind energy development.

3.4.2 Wind Speed Data

The wind speed data used to identify wind potential in this study is taken from the NOABL database produced by Department for Energy and Climate Change (DECC). Whilst it is acknowledged that other sources of data exist, and there is a margin of error with this tool, including the fact that it does not take account of local wind obstacles, use of the NOABL database was felt to be appropriate, as a recognised industry standard, for the purposes of deriving relative wind potential.

TABLE 2: CONSTRAINTS

CONSTRAINT TYPE	CLASSIFICATION	PRESENT IN AREAS IDENTIFIED	RATIONALISATION
Scheduled Monuments	Prohibitive	No	
Parks & Gardens	Prohibitive	No	
Conservation Areas	Prohibitive	No	
100m Listed Building Buffer	Prohibitive	No	
500m Address Buffer	Non-prohibitive	Bordering all areas identified	Whilst not considered wholly prohibitive, extents of these buffer areas have been used to limit borders
Deep Peat Areas	Prohibitive	No	
Bird Migratory Zones	Prohibitive	No	
SPA	Prohibitive	No	
SAC	Prohibitive	No	
LNR	Prohibitive	No	
NNR	Prohibitive	No	
SSSi	Prohibitive	No	
Ramsar	Prohibitive	No	
Green Belt Land	Prohibitive - unless very special circumstances are demonstrated	Yes - all 3 areas	Use of Green Belt land to site wind turbines is not without precedent

The outline quantification of associated potential wind turbine capacity and output within Stage Two work has featured the rationalising of NOABL data to account for realistic wind speed availability, including potential obstacles.

Note that industry standard guidance is that average wind speeds in excess of 5 - 6m/s are required to generate worthwhile quantities of electricity. Given the relative imprecision of the data available, the areas of least constraint identified in this study have shown wind speeds equal or greater than 6.5m/s. This shows a best estimate of suitable locations, subject to identified constraints, including Green Belt.

It is highly recommended that further study into the suitability of recommended areas take place, including site-specific wind studies in the event that development proposals come forward. Without these, localised effects produced by factors such as prevailing wind directions, proximity and height of buildings, cannot be determined.

3.4.3 Areas of Least Constraint

The following table provides a summary of the areas of least constraint identified in relation to potential wind turbine installations. Note that all sites are within Green Belt areas and all are constrained to a greater or lesser extent.

Table 3 does not identify these sites as being most suitable for wind energy development, but presents a best estimate of where wind energy generation may be most effective in the study area.

TABLE 3: WIND AREAS OF LEAST CONSTRAINT

BROAD AREA AND REF NO.		SUB REGION	LOCATION DESCRIPTION	LOCAL WIND CONDITIONS	APPROX. ANNUAL ELECTRICAL OUTPUTS	POTENTIAL CONSTRAINTS	PROXIMITY TO TRANSPORT LINKS
Wind	**1**	West Lancashire	Adjacent to River Alt, South of Great Altcar	Approx. average wind speed at 45m AGL = 6.5-7.0m/s	**15kW ≈ 10.6MWh/year**	• Flood risk zone 3a (essential that any development would be designed to remain operational and safe for users in time of flood) • Green Belt • Other environmental considerations	Area is adjacent to A565, just South of Little Altcar
Wind	**2**	Sefton	Adjacent to River Alt, South of Great Altcar	Approx. average wind speed at 45m AGL = 6.5-7.0m/s	**15kW ≈ 10.6MWh/year** **2.5kW ≈ 1,100MWh/year**	• Site is closer to residences within and around Great Altcar than adjacent PZ 1 • Other environmental considerations	Area is adjacent to A565, just South of Little Altcar
Wind	**3**	West Lancashire	Adjacent to A5209, between Burscough and Newburgh	Approx. average wind speed at 45m AGL = 6.3-7.0m/s	**15kW ≈ 10.6MWh/year**	• Green Belt • Adjacent to conservation area • Other environmental considerations	Area is adjacent to A5209

3.4.4 Interpretation

It is important to note that whilst this desk based study has helped to identify areas of least constraint for onshore wind in the study area, it has not provided a full viability assessment. Major potential constraints, such as landscape character, flood risk and cumulative impacts of development have not been accounted for. The findings of the study therefore do not identify preferred areas and do not preclude the requirement for detailed assessment should a development proposal come forward. Similarly the broad areas, whilst showing least constraint do not preclude other areas from having protential for wind development. For example, the study did not identify areas of potential in Liverpool, however, wind energy development is already taking place on the water front, demonstrating that whilst there may be constraints, these do not have to be show stoppers.

In recognition of this, partner authorities demonstrating most potential for wind energy were asked to identify if there were any over-riding issues of local importance that might constrain this type of development. In the case of Wirral, the project team was asked to consider local valued landscapes as an additional key constraint and therefore no area of least constraint has been identified in this area. In West Lancashire, it was noted that the site adjacent to A5209, between Burscough and Newburgh neighbours a conservation area and whilst the area continues to be identified, implications of a development on the character of the conservation area will be a key consideration should any development proposal come forward.

The results showing broad areas of least constraint demonstrate that there will be particular value in assessing in more detail whether or not wind development in these areas can be considered acceptable by the planning authority. The broad areas should in no way be considered as either a designation or a conclusion that wind energy elsewhere in the study area is unsuitable.

To illustrate this point further, in the 2009 Knowsley Study, opportunities for wind energy were also identified to the north of Halewood. These sites have not come through in the current assessment due to the constraints considered, however there will still be potential to promote these sites, subject to further detailed site investigation.

Landscape and the Green Belt: a key question raised by stakeholders is whether or not the provision of wind energy may cause harm to the Green Belt and or sensitive landscape areas.

The Green Belt is in place to, amongst other things, safeguard the countryside from encroachment and avoid harm to visual amenity by development that would be conspicuous.

PPS22 for Renewable Energy recognises the potential for wind turbines to have *"the greatest visual and landscape effects".* However the policy requires that local authorities recognise that the impact on the landscape will vary according to the size and number of turbines and the type of landscape involved.

To this effect, the approach recommended is that Green Belt is considered to be a constraining factor for wind energy development. Very special circumstances need therefore to be demonstrated before a wind energy proposal could be deemed acceptable in the Green Belt.

3.5 PRIORITY ZONES AND BROAD AREAS KEY POINTS

It should be noted that the identified Priority Zones and broad areas of least constraint are not intended to represent an exhaustive list of all potential areas where biomass CHP and onshore wind turbines may be employed. Instead, these zones represent areas where suitable (relevant) resources for each technology have been identified and which represent the "quickest wins" in terms of implementing them. Potential sites for energy centres have not been identified and where the relevant planning authority wishes to promote a Priority Zone, a key task will be to identify potential energy centre sites.

The map overleaf displays the locations of all identified Priority Zones for decentralised heat and the broad areas of least constraint for wind, with reference numbers linked to the summary tables presented in this section.

3.6 CAPACITIES

The following summarises the potential capacities for biomass CHP with district heating and onshore wind within the identified Priority Zones. See Table 4 overleaf.

3.7 DISAGGREGATED TARGETS

One of the original aims of the study was to provide the partner local authorities with an indicative breakdown of the renewable energy targets based on those identified for sub-region by the Regional Spatial Strategy (RSS). As has been explained elsewhere, RSS has now been rescinded and these targets, which were in any case indicative, do not carry any statutory weight. However, the partner local authorities elected to proceed with this exercise as an aide to developing their own approaches to the setting of goals for renewable energy and in anticipation that new targets may emerge in time.

In examining this issue, the key aim is to achieve growth in the installed capacity of renewable energy generation generally, rather than prescribing an exact mix of renewable energy technology to be pursued. This study has sought to suggest how suitable particular technologies might be for implementation within the study area, but it remains for the partner local authorities to determine for themselves the particular mix that is locally suitable.

The approach taken here is to suggest how RSS might be divided between individual local authority areas, and then to provide an indication of the contributions that might be made by the technologies under principal consideration within this report, which are biomass CHP and on-shore wind. All of the figures presented below draw on the work undertaken in Stage 1 of the study.

The targets suggested here are indicative and do not imply any binding commitment on the part of the partner local authorities to achieve them. It is also the case that they are not maximum targets. It may be that the gathering of further local evidence during the LDF process will lead local authorities to make adjustments before any targets are finally incorporated into policy. In that respect, the figures provided below should be seen as a starting point rather than as a definitive position.

Presenting in this way demonstrates the total renewable energy potential and does not compromise the targets by imposing technology specific reasoning.

The targets on Table 5, do not equal the identified technology specific potentials identified later in this section as they are based on the weighted disaggregation of refined RSS targets.

TABLE 4: APPROXIMATE CAPACITIES OF IDENTIFIED OPPORTUNITIES

APPROXIMATE CAPACITIES OF IDENTIFIED OPPORTUNITIES	BIOMASS CHP		ONSHORE WIND (MWh)
	ELECTRICAL (MWe)	THERMAL (MW)	
Halton	0.7 - 1.0	0.8 - 1.3	-
Knowsley	9.0	9.9 est	-
Liverpool	5.4	6.5	-
Sefton	1.3	1.5	up to 1,100
St Helens	0.4	0.5	-
Warrington	3.8	4.5	-
West Lancashire	0.8	1.0	up to 2,000
Wirral	2.9	3.5	-
TOTAL	**24.3 - 24.6**	**28.2 - 28.7**	**up to 3,100**

TABLE 5: COMBINED BIOMASS CHP AND ONSHORE WIND TARGETS

COMBINED BIOMASS CHP AND ONSHORE WIND TARGETS		MERSEYSIDE			HALTON AND WARRINGTON			WEST LANCASHIRE		
		2010	2015	2020	2010	2015	2020	2010	2015	2020
Original RSS Target (MW		28.24	39.36	39.36	12.66	14.19	54.19	No additional capacity required		
Refined Target (MW)		16.74	27.86	27.86	10.54	12.07	30.67	23.27	28.42	28.77
Disaggregated Targets (MW)	Knowsley	3.26	5.35	5.35						
	Liverpool	3.81	6.66	6.66						
	Sefton	5.68	8.75	8.75						
	St Helens	2.89	4.48	4.48						
	Wirral	1.11	2.61	2.61						
	Halton				5.27	6.04	12.24			
	Warrington				5.27	6.04	18.44			

3.7.1 Biomass CHP Potential

Local authority suggested goals for biomass CHP have been disaggregated from the RSS targets in consideration of the following (see Table 6 below):

- Results of heat mapping work;
- Derived energy trajectories;
- Number and scale of identified DH priority zones; and
- Cognisance of potential biomass/SRF sources.

3.7.2 Onshore Wind Potential

Suggested goals for onshore wind have been disaggregated from the RSS indicative targets in consideration of the following (see Table 7 below):

- Results of wind speed mapping work;
- Number and scale of identified areas of least constraint for wind; and
- Cognisance of constraints.

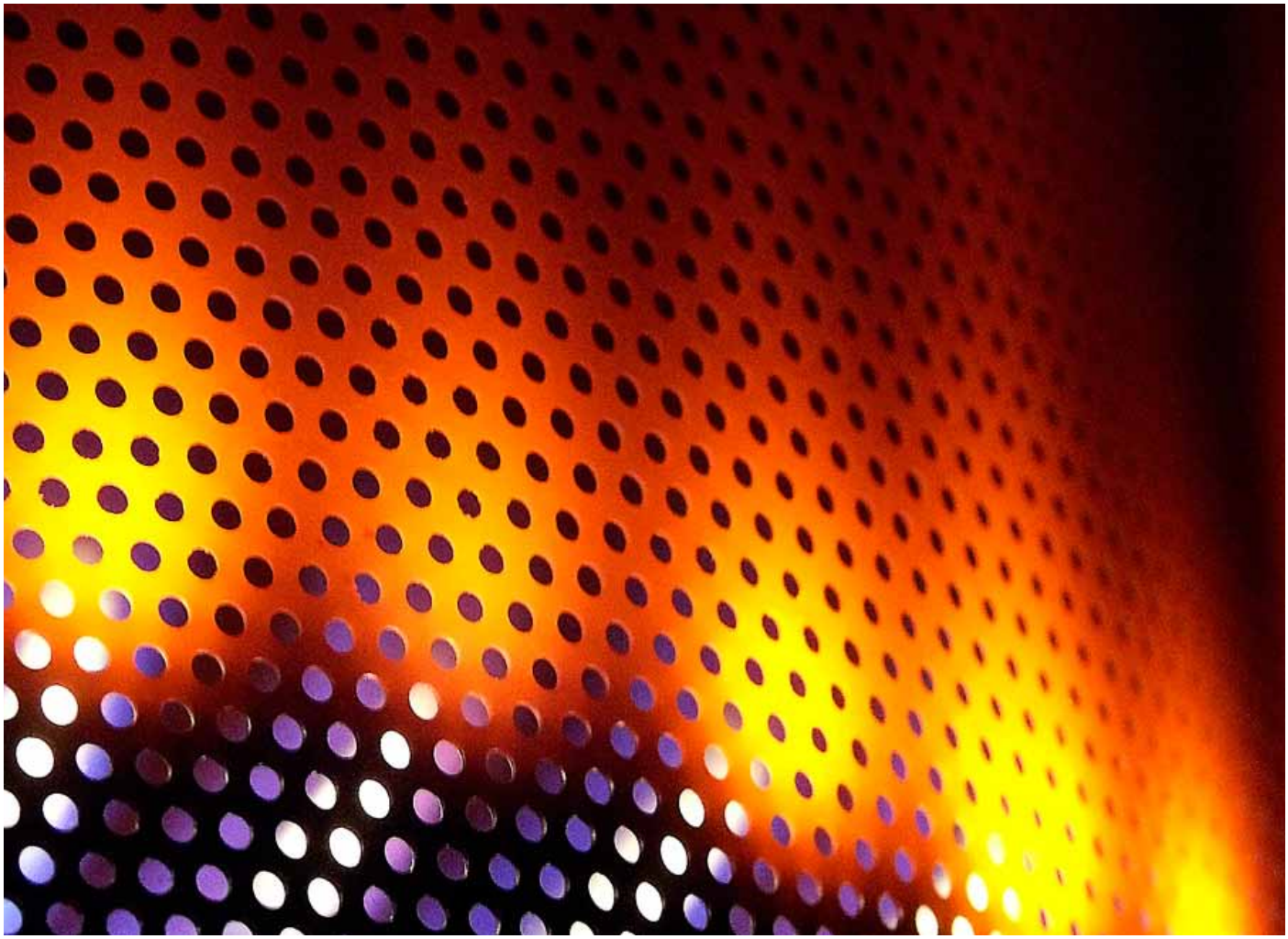
TABLE 6: CHP TARGETS

BIOMASS CHP TARGETS		MERSEYSIDE			HALTON AND WARRINGTON			WEST LANCASHIRE		
		2010	2015	2020	2010	2015	2020	2010	2015	2020
Original RSS Target		4.00	9.00	9.00	2.10	2.10	42.10	Targets were Lancashire-wide		
Refined Target		3.70	8.70	8.70	No additional capacity required		18.60	0.63	0.98	1.33
Disaggregated Targets	Knowsley	0.65	1.52	1.52						
	Liverpool	1.20	2.83	2.83						
	Sefton	0.46	1.09	1.09						
	St Helens	0.28	0.65	0.65						
	Wirral	1.11	2.61	2.61						
	Halton				No additional capacity required		6.20			
	Warrington						12.40			

TABLE 7: WIND ENERGY POTENTIAL

ONSHORE WIND TARGETS		MERSEYSIDE			HALTON AND WARRINGTON			WEST LANCASHIRE		
		2010	2015	2020	2010	2015	2020	2010	2015	2020
Original RSS Target (MW		24.24	30.36	30.36	10.56	12.09	12.09	No additional capacity required		
Refined Target (MW)		13.04	19.16	19.16	10.54	12.07	12.07	22.64	27.44	27.44
Disaggregated Targets (MW)	Knowsley	1.63	2.40	2.40						
	Liverpool	1.63	2.40	2.40						
	Sefton	3.26	4.79	4.79						
	St Helens	1.63	2.40	2.40						
	Wirral	No goal set, Wirral will pursue other renewable energy opportunities in preference to on-shore wind								
	Halton				5.27	6.04	6.04			
	Warrington				5.27	6.04	6.04			

NOTE: with no information on potential within the rest of Lancashire, the refined target resulting from our Stage 1 work has not been altered, however West Lancashire specific potential for wind energy output (MW hours) is shown in table 1 of this section at up to 2,000MWh.



3.8 IDENTIFICATION OF NEW POTENTIAL ZONES

As existing development proposals progress and new ones arise, it is appropriate that their suitability for decentralised energy generation be assessed. The broad methodology used to identify zones in this stage of work may be applied to these future opportunities and uses the following steps:

1. Establish use class(es) of developments and related split of floor areas;
2. Project level of heat consumption, in combination with suitable benchmark figures;
3. Use knowledge of use classes to gauge level of maintained heat demand;
4. Identify distance between buildings on site (in order to gauge heat density); and
5. Take account of any major constraints to potential DH infrastructure (e.g. major roads or watercourses).

This process serves as a suitable 'first-pass' approach to initially highlight potential opportunities for district heating (and in turn biomass CHP).

A Viability Tool, provided alongside this study and summarised in Appendix E, can be used to determine many of these parameters, given a suitable level of input information, and will return initial information about: heat consumption; heat density; and outline suitability for district heating.

Further detailed analysis of suitability is likely to comprise the following additional steps:

1. Identification of potential sites for locating energy centres;
2. Undertaking heat demand profiling, to confirm site base heat load;
3. Identification of any phasing of site build-out, to understand development of heat load scale and locations (e.g. does site development radiate from a central point);
4. Sizing of potential district heat network to serve site, either with knowledge of or to determine Energy Centre location; and
5. Sizing of likely heat generation plant (both CHP and supplementary heat generators).

This level of detail would ultimately be required in order to perform a complete commercial appraisal of a potential DH scheme.

4. INFRASTRUCTURE CAPACITY

4.1 INTRODUCTION

In the context of the energy technologies being considered in this report, the key infrastructure element is that of the existing electricity network.

There are two incumbent Distribution Network Operators (or "DNO's") in the Northwest who are responsible for the electrical infrastructure:

1. Scottish Power Manweb (SP Manweb)
2. Electricity North West (ENW)

SP Manweb is responsible for the majority of the electrical infrastructure for the eight partner authorities; however ENW does also have a role. In the case of ENW, physical infrastructure is operated and maintained by United Utilities.

This section provides an introduction to the existing energy infrastructure in the eight authority areas, including details of existing infrastructure and electricity network constraints. Guidance on how new development can connect to the network is provided in Appendix F.

4.2 EXISTING INFRASTRUCTURE

4.2.1 Voltage Levels

Electricity infrastructure operates at a range of voltages, depending upon its position within the overall network.

The Great Britain National Grid features electrical transmission at either 400kV or 275kV and links power station generation to Grid supply points, where power is transformed to lower voltages.

Beyond these points, regional distribution networks operate at up to 132kV and provide either direct connection to heavy industry or to primary substations.

These substations transform the incoming 132kV feed to either 66kV or 33kV, at which level additional industry applications connect and Extra High Voltage (EHV) networks serve large regional substations.

A further voltage drop occurs to establish localised "High Voltage" (HV) 11kV and 6.6 kV networks which distribute electricity around towns and cities, via either overhead or buried cables.

A final stage of transformation to Low Voltage (LV) subsequently occurs before distribution to residential, commercial and light industrial buildings.

4.2.2 Networks within Study Area

DNO's publish 5-year Long Term Development Statements (LTDS) which feature, amongst other information, snapshots of demands on available load capacity within their networks.

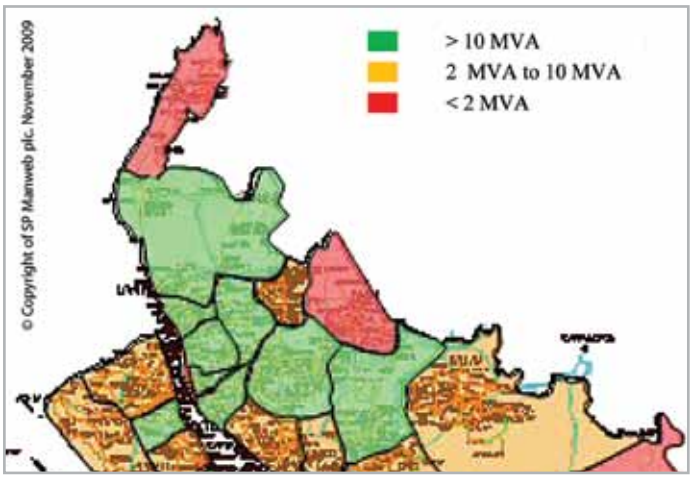
The following image is taken from SP Manweb's LTDS and displays their 132kV network within the study area. The original LTDS document can be viewed online via the following link: http://www.manweb.co.uk/uploads/SPM2009LTDS.pdf

4.3 NETWORK CAPACITY

The DNO within a given area maintains records of network capacity within their systems and can determine where available capacity exists to meet the demands of any new requested connections.

4.3.1 33kV system

The following image and data table are taken from SP Manweb's LTDS. The map shows indicative available load capacity within their Northwest network at 33kV level.



33kV Load Spare Capacity Map (2009)

This map indicates that the majority of the electricity network within the study area contains in excess of 2 MVA capacity at 33kV for new connections. This can be equated to between approximately 750 - 1,000 new homes. Many areas have access to spare capacity of more than 10 MVA (or supply for up to 4,000 homes). However it is important to note that single large scale developments such as an industrial/commercial development could knock out significant volumes of spare capacity.

The following areas are where outline network capacity is below 2 MVA:

- North Sefton
- North-west Liverpool
- Much of St Helens
- Bromborough

For the area within the study area not covered by this map, specific information has been obtained from Electricity North West in reference to their 33kV substations within West Lancashire.

The information, displayed in the table below, identifies the capacity of the substation and the recorded maximum existing demand (for the year 2008/09). It also forecasts demand for a 5-year period (2009-2014) based upon known planned addition (or removal) of connected load. This information suggests that available load capacity at 33kV within much of West Lancashire is within or beyond the 2-10 MVA level.

4.3.2 Local Distribution Networks

Whilst information is available from DNO's regarding capacity within 132 kV and 33 kV substations, a corresponding level of detail is not published for local 11 kV substations. DNO's will only reference capacity at this level upon receipt of a new connection enquiry, with a resulting connection quote reflecting ability of the local infrastructure to provide the demand requested.

ENW SUBSTATION NAME	VOLTAGE LEVEL	SUBSTATION CAPACITY	MAX. LOAD (2008/09)	FORECAST LOAD (MW)					APPROX. AVAILABLE CAPACITY		
	kV	MVA	MVA	2009/10	2010/11	2011/12	2012/13	2013/14	<2 MVA	2 10 MVA	> 10 MVA
Burscough	33	17.5	13.3	12.7	12.7	12.7	12.7	12.8			
Ormskirk	33	22.9	13.9	13.1	13.1	13.2	13.2	13.2			
Pimbo	33	30.0	18.9	18.4	18.4	18.4	18.5	18.5			
Scarisbrick	33	5.0	5.7	5.7	5.7	5.7	5.7	5.7			
Skelmersdale	33	22.9	18.1	17.7	17.7	17.7	17.8	17.8			
Tarleton	33	17.5	16.9	16.9	16.9	16.9	17.0	17.0			
Willow Hey	33	22.9	14.8	13.8	13.8	13.8	13.9	13.9			
Woodfield	33	22.9	22.1	21.0	21.1	21.2	21.2	21.3			
Wrightington	33	22.9	15.1	14.8	14.9	14.9	14.9	14.9			

This information suggests that available load capacity at 33kV within much of West Lancashire is within or beyond the 2-10 MVA level.

4.4 PLANNING POLICY AND INFRASTRUCTURE CAPACITY

Published in 2008, PPS12 sets out the importance of spatial planning in creating strong, safe and prosperous communities stating that planners need to *"collaborate actively with the wide range of stakeholders and agencies that help to shape local areas and deliver local services"*.

The PPS requires that the Core Strategy, as the key plan in the Local Development Framework (LDF), is supported by evidence of what physical, social and green infrastructure is needed to enable the amount of development proposed for an area to occur.

The priority for a planning authority is to gather information to enable constructive dialogue with stakeholders to facilitate development supportive of a spatial strategy and vision. This includes building relationships with infrastructure delivery partners such as utilities companies, to align processes and strategies and also building sufficient flexibility into plans to take account of areas where certainty or strategic alignment cannot be achieved.

This section has identified that there is existing capacity in the electricity network for the study area. It also highlights however that there are some constraints, in particular in North Sefton, North-west Liverpool and much of St Helens.

In terms of LDFs, the key message is that it should be assumed that growth targets can be pursued but that developers, in particular for larger scale schemes, will need to factor in costs for connecting to the electricity network where capacity is limited to access energy. Similarly, where creating new energy sources, connection to the grid may result in system reinforcement costs that will need to be given consideration in terms of overall viability and feasibility.

Further to this the exercise of gathering comprehensive data on existing, forthcoming and planned development has the potential to establish an invaluable source of knowledge and information about infrastructure delivery. Where gathered in a comprehensive way, connections between development opportunities can be made and areas of infrastructure constraint can be anticipated effectively.

Comprehensive understanding of both infrastructure and development will enable authorities to tackle queries such as:

- How is the demand for infrastructure changing from existing parts of the area such as increasing electricity demand for air conditioning, or an increase in demand for residential care for elderly residents?
- Where is technology change bringing in new infrastructures, such as high speed broadband or smart grids?
- What will be the impact of the need to reduce carbon emissions, such as the provision of heat networks, or electric vehicle charging points?

5. PLANNING POLICY

5.1 INTRODUCTION

This section of the report provides a suggested model policy wording for low and zero carbon energy, taking account of the earlier technical elements of the study. It presents recommendations for wording to be integrated with all partner authority Local Development Frameworks (LDFs). It provides supporting narrative to explain the policy context and highlights opportunities for promoting low and zero carbon development, including district heating.

Given the identified potential for growth in carbon emissions associated with growth trajectories shown in Section 3, the policy recommendations set out an expectation that the partner authorities will commit to driving forward the agenda for low carbon development. Policy and supporting text are not therefore simply based on setting out expectations for new development proposals but require each authority to take action to create the right environment that will support a low carbon future.

The wider economic implications of creating a low carbon infrastructure across the authority areas are not yet fully understood, however, it is likely that as Building Regulations change, developers will be dependant on having access to decentralised energy networks to achieve low and zero carbon targets. This will be particularly the case after 2013 when carbon reductions targets for housing development will require a 44% improvement over 2006 standards. It is understood that the Building Regulations are likely to be the preferred mechanism for delivering carbon savings in new development.

This section of the report assumes that the changes in Buildings Regulations will proceed as expected at the time of writing. However, it is recognised that these assumptions could be affected by Government reviews of Planning and Energy Policy and that any such change may have implications for policy at the LDF level.

Currently, a number of emerging Core Strategies within the study area rely significantly, at least as an interim measure, on direct continuity from policy EM18 of the former RSS and/or on local UDP Policies requiring 10% renewable energy provision or carbon reduction in new development. Monitoring of the implementation of these policies has not been comprehensive, though the approach is considered to have been generally successful. However, the need to improve monitoring is a key recommendation of this report.

The latest indications are that a target-setting approach will be supported only up to 2013 when Building Regulations are due to be updated. However it is possible that the policy approach suggested may prove to be a useful fall-back position should significant changes in the direction of Government policy occur. However, in the current context, assembling a suitable evidence base to support a specific carbon reduction requirement may not be cost-effective for the short period the target would be in effect. The policy wording suggested below does not therefore include a specific carbon reduction target for new development. That said, where authorities do have development specific experience of successfully applying a 10% target, there remains scope to retain this policy on the basis of the current Building Regulation standards. Any target would have to be taken through the statutory Local Development Framework adoption process.

5.2 PLANNING POLICY

Prior to abolition, the Northwest Regional Spatial Strategy sought to promote sustainable energy production, and energy efficiency and conservation. The eight partner authorities have agreed to continue to seek to create a positive planning framework that supports both low carbon development proposals and facilitates the accommodation of new energy infrastructure.

Planning policies for energy need to be developed with consideration of a wide range of factors from detailed and robust evidence base of what is suitable and acceptable, understanding of geographical opportunities and what can be expected of developers as well as what local authorities have to facilitate. Planning policies must be supported by a credible evidence base, flexible over approximately a 15 year period and be:

- Justified;
- Effective; and
- Consistent with national policy.

Further to this, local planning authorities must be able to demonstrate that policies are deliverable and results can be monitored into the future.

A useful reference for testing good policy is to be able to ensure that the following questions can be answered:

- What?
- Why?
- Where?
- When?
- How?

Whilst in the policy wording it may not be immediately apparent what the answers to these questions will be, it is important that the supporting context of the policy can respond effectively to these questions either through supporting text or as part of supporting baseline evidence. A summary note of questions (ie what, why and where?) is provided at the end of the section.

5.2.1 Local Development Framework

The proposed Local Development Framework (LDF) policy wording set out below is presented to be relevant to all types and scale of development (subject to certain exclusions set out in 5.2.4 below). It is presented on the basis of including the entire policy in a single Development Plan Document (DPD).

It is recommended that the wording is included in the Core Strategy, not least as this will help the policy to be adopted in the shorter term. However, it may be appropriate for some authorities to include policy within a separate Development Management DPD where one is proposed. If the policy is not included in the Core Strategy then an appropriate policy hook will be required for inclusion in that document.

Note that it would not be appropriate to include this type of detailed policy within a Supplementary Planning Document (SPD). However supporting guidance, for example in relation to the viability tool, could be provided in an SPD.

It should also be noted that there are links between this energy policy and policy for broader issues related to sustainable design. This is particularly relevant where Code for Sustainable Homes (CSH) or Building Research Establishment Environmental Assessment Method (BREEAM), or similar, standards are required to improve all aspects of building sustainability, for example in relation to water consumption and biodiversity.

In relation to energy, the CSH standards achieve the following:

- CSH Level 3 = 25% carbon saving on the 2006 Building Regulations standards = new Part L Building Regulation standard 2010;
- CSH Level 4 = 44% saving on 2006 Building Regulations standards = proposed Part L Building Regulation standard 2013; and
- CSH Level 6 = 100% saving on 2006 Building Regulation standards = proposed Part L Building Regulation standard 2016.

Where relevant, it is important that this relationship is consistent across different policy areas.

5.2.2 Carbon Reduction Targets

In developing the policy approach, a key question has been raised regarding how achievable specific carbon reduction targets are for developers and how appropriate it might be to use these in the policy wording of LDFs. In this context, experience of using targets elsewhere in the UK has been considered and examples from Greater London and Sheffield are presented below.

Greater London experience

The report 'Monitoring the London Plan Energy Policies Phase 3' was published by London South Bank University in December 2009. Produced to analyse and report on the energy and CO_2 savings achieved through the GLA's planning process and application of the London Plan energy policies.

The report identified that since the publication of the draft Further Alteration to the London Plan in September 2006, more than half of the planning applications analysed achieved CO_2 savings (over Building Regulations standards) of at least 30% and approximately a quarter met or exceeded 40% CO_2 savings through the use of a combination of energy efficiency, CHP and renewable energy measures.

A quarter of the sample met or exceeded the Plan's 20% CO_2 savings from renewable energy technologies policy, a third of developments achieving between 10% and 20% CO_2 savings, and a further 38% achieving up to 10% savings.

It is noted that the contribution that energy efficiency, CHP and renewable energy can make varies from development to development. For example in some applications renewable energy was able to contribute well over 30 per cent of savings, but in some cases contributed under 10%.

This analysis has shown that, in the context of development in the Greater London area, percentage targets over and above Building Regulation standards have been relatively successful.

However, in the context of the partner authority areas for this current study, the results, whilst optimistic, cannot be assumed to be directly relevant. This is due to the significant differences in land and development values. That said, whilst targets to achieve 40% improvement over Building Regulations may be too ambitious without specific local testing, the results indicate that some improvements over minimum Building Regulation standards could be considered to be achievable at least until Regulations change.

Sheffield City Council experience

In the case of Sheffield City Council a planning policy is in place to reduce carbon emissions associated with the development by 20%. The City Council's policy team has advised that at the time of producing their energy policy, the detail of evidence to support the percentage improvement was limited to a strategic level energy study carried out in 2006. To support the percentage target position the authority instead referred to experience in its Housing Market Renewal areas where there was already evidence that high standards for carbon reduction were achievable.

Subsequently, it has been found by the Council that delivery of the policy has not generated any serious issues with developers, in part due to the viability/feasibility clause that enables developers to avoid meeting the targets where satisfactory evidence is provided to show it is not possible.

In looking back, the Council has advised however that, based on their experience to date, if re-writing the policy, a percentage target for carbon reduction on Building Regulations may be too onerous in the future given the emerging changes to Building Regulations (whereby a 20% improvement over a higher standard in 2013 or 2016 will not be as achievable).

In conclusion, both examples from London and Sheffield indicate that a target to improve carbon emissions associated with development is realistic and achievable. However, the exact extent of what that target might be needs to be linked to evidence of successes elsewhere in the local area, in particular if a target of 20% or above is to be set. Further to this, in the context of forthcoming changes to Building Regulations (see 5.2.1) and significant improvements in minimum standards for energy efficiency, an achievable target in today's context may not be achievable in the future.

5.2.3 Policy Suggestion

The following text presents suggested policy wording for renewable and low carbon energy that reflects the findings of the priority zones study and responds to the existing and emerging national and regional planning policy context.

It is recommend that all authorities consider this text and seek to incorporate this, or similar, wording to ensure that there is a consistent policy framework for low and zero carbon development. The wording has been set up to be linked directly to the findings of this study to ensure that policies are evidence based and robust.

Policy title: Low carbon development and renewable energy

a) All development

Using contemporary Building Regulations standards as the baseline for carbon (CO_2) reduction standards, all applicants for development (subject to exclusions set out in the supporting text) should seek to achieve additional reductions in carbon emissions associated with the development.

How improvements are achieved should be set out in an energy plan as part of the planning application. The energy plan will quantify improvements to the CO_2 emissions savings over the required baseline standard associated with the following:

- All energy efficient building design solutions that ensure future occupiers will have reduced energy requirements; and
- Energy supply from decentralised low and zero carbon sources.

Development not achieving improvements above the baseline will not be approved unless applicants can demonstrate that it is not feasible or viable to do so.

b) District heat (DH)

Where a DH network is in, or scheduled to be, in place, developers will be required to enter into a commercially acceptable connection agreement, as part of a planning obligation.

Where it is not considered to be viable or feasible to connect to an existing or scheduled DH network, and where exceeding baseline energy targets is shown to be unfeasible and or unviable, applicants will be required to make a financial contribution towards the development and operation of a local DH network where technically and commercially feasible plans are in place.

Within 1,000m of an identified priority zone, but where a network is not yet in place, development proposals will be required to make provisions to enable future connectivity in terms of site layout, heating design and site-wide infrastructure design, where there is a clear prospect of a viable and realistic scheme coming forward.

c) Large scale grid connected energy and offshore energy

Subject to successful assessment and mitigation of impacts of development proposals, the Planning Authority will seek to support proposals for grid-connected renewable energy infrastructure and equipment, including, but not limited to wind, solar PV and biomass CHP.

Development proposals to create on-shore infrastructure for off-shore energy will also be supported in principle by the Council subject to the appropriate mitigation of significant environmental impacts.

5.2.4 Supporting Text

The above recommended policy wording is relatively lengthy in order to cover all aspects of promoting low carbon development. In setting out the wording, we have sought to keep the detail as limited and clear as possible, however it will be important that the policy is read in the context of supporting text. The following paragraphs set out what is proposed.

SUPPORTING TEXT

The planning system has a key role to play in delivering targets for low and zero carbon development in the UK as part of working towards energy security and mitigating the causes of climate change through reducing greenhouse gas emissions.

Policy has been set out to ensure that, through effective Development Management, the planning authority influences the quality of development proposals to promote energy efficiency and sustainable sources of energy supply. The policy also sets out a supportive framework for delivering low and zero carbon energy infrastructure to demonstrate to investors the authority's commitment to supporting the right types of development in the right locations.

The above policy wording has been developed with direct reference to Planning Policy Statement (PPS) 1 supplement for climate change and also to the Draft PPS, 'Planning for a Low Carbon Future in a Changing Climate'. Note that whilst the draft PPS is no longer being progressed by Government, it has been used as a basis throughout the development of this study and provides a clear guiding framework for promoting low and zero carbon development through the planning system.

The following paragraphs provide further advice to developers on how the planning authority will implement this policy framework:

- **Local Development Orders:** the planning authority may use its Local Development Order (LDO) powers to help speed up the development process and to encourage the creation of heat networks (as part of a DH scheme) in identified priority zones. This will be where a strategy has been developed to demonstrate deliverability and where key development partners are engaged in the process. The intention will be provide confidence to developers and energy services companies that potentially viable schemes will be supported by the planning authority and that schemes will not be delayed by the planning system unnecessarily. This commitment will have a key role in ensuring that the council area is ready for the emerging low carbon economy and the tough emerging targets for new buildings that will come into force through the Building Regulations.
- **Connecting to future networks - 1,000m threshold:** the distance to any connecting network or generation plant has the largest single effect on the related capital costs, through provision of both DH pipe-work and (most critically) related trenching and installation costs. A notional upper limit for likely viable connecting distance has been set at 1,000m, with distances larger than this deemed prohibitive from a commercial perspective except in special cases.

Continued overleaf

- **Connecting to future networks - measures for developers:** measures that developers will be expected to consider include:
  - provision of communal heating systems;
  - safeguarding routes for laying network infrastructure; and
  - providing an undertaking to enter into negotiations with future network operators to agree to connect to such a network.
- **Planning contributions** referred to in this policy will be in line with the Planning Contributions policies and will take account of the type and scale of development.
- **Energy conservation:** The planning authority will consider favourably proposals that also provide targets for CO_2 savings that can be achieved through influencing conservation behaviours amongst building occupiers and users and set out a framework for ensuring targets will be met.
- **Energy development and Environmental Assessment:** for all energy development proposals (note minor schemes would be covered by permitted development rights and therefore automatically excluded) the planning authority will require the submission of an environmental impact screening opinion request in advance of applications being submitted. The request for a screening opinion should be accompanied by sufficient information to enable the planning authority to determine whether or not a full Environmental Impact assessment is required before an application is made.
- **Viability and feasibility 1:** Where it is considered by the developer that it is not viable or feasible to exceed baseline carbon reduction targets, this should be raised with the planning authority in advance of submitting a planning application as part of pre-application discussions and then explained in full as part of the application with reference to the factors set out in the supporting text for this policy. No improvement over the baseline target may be acceptable where evidence clearly demonstrates barriers to a higher target.
- **Viability and feasibility 2:** Where it is concluded that the connection to DH is not viable or feasible, the developer should provide the following information to the planning authority in advance of submitting a planning application for further appraisal by that authority:
  - Low energy targets for the development;
  - Energy options and costs considered;
  - Funding sources considered;
  - Total site area (m^2);
  - Combined building footprint area (m^2);
  - Related total building floor area(s) (m^2);
  - Number and type of residential properties; and
  - Schedule of non-residential floor areas by type (eg commercial or industrial).
- **Identifying Opportunities and Monitoring:** in order to optimise opportunities for joining up development proposals and to measure the relative success of energy policy and the commitment to preparing for a low carbon future, the planning authority will:
  - Require all applications to fill out the on-line DH viability tool; and
  - Monitor all energy projects developed or consented.

  The stakeholder forum established to promote low carbon energy delivery will also be responsible for monitoring.

Exclusions:

In certain circumstances the planning authority does not consider it appropriate to require applicants to submit energy plans as part of planning applications. These exclusions include applications for:

- Material change of use of land or buildings, unless it also involves operational development;
- All householder development;
- Advertisement control;
- Shop fronts;
- Tree preservation orders;
- Storage of hazardous substances;
- Minor operations not permitted under the General Permitted Development Order;
- Temporary buildings and uses; and
- Telecommunications equipment.

5.3 CROSS AUTHORITY COORDINATION

In order to push forward the agenda for promoting low and zero carbon energy solutions and in particular to initiate the creation of District Heating networks, the partner authorities recognise that it will be necessary to find a coordination mechanism for cross authority coordination to help promote District Heating and to initiate the delivery of heating networks. As development proposals come forward applicants could, for example, be invited to engage with this forum to test opportunities for connecting to existing and proposed schemes.

5.4 PLANNING POLICY TEST

As part of the process of preparing the above policy wording, a simple exercise of querying the policy has been carried out. The summary table below sets out the outcome of this.

TEST QUESTIONS:

What?

- All development is required to demonstrate how it can improve upon building regulation standards for carbon emissions;
- All applicants (subject to exclusions) are required to provide an energy plan setting out what is proposed;
- Where building regulation standards cannot be exceeded, developers are required to provide evidence that all options have been investigated and to provide key data to the planning authority to enable a further feasibility assessment to be carried out;
- Developers, where relevant, are required to connect to DH or contribute to its delivery;
- The policy encourages the delivery of energy applications subject to the normal tests of suitability and viability; and provides a prompt to ensure that all developers are aware of the need to screen and scope the potential for environmental impacts. This is particularly important as developers seek to take up on incentives for low carbon technologies such as the Feed in Tariff and begin to investing projects for which they may not have much previous experience.

Why?

- The national and regional framework for delivering low and zero carbon development is set out in the main report (Stage One and Two) and is referred to in the supporting text.

Where?

- The policy has been phrased to avoid prescribing on site energy solutions but instead encourages various solutions including those that seek to connect to DH networks;
- The policy is linked, where appropriate, to the identified priority zones.

When?

- The policy promotes pre-application consultation to encourage developers to explore options for energy;
- At the application stage, it is clear that developers must provide clear evidence to the authority supporting the energy solutions that will be integrated into the development;
- The timescales for the effective delivery of the policy will be dependant on the effective promotion of DH networks and will only become truly effective once Priority Zones identified have been further investigated and technical projects are under development. For this reason it is recommended that the policy is built into the Core Strategy where possible, to ensure further delays are avoided.

How?

- There is a strong focus on how applicants will be required to achieve low and zero carbon development;
- The policy will benefit where the planning authorities can create an environment that facilitates low and zero carbon development;
- It is of importance that responsibility for creating low carbon infrastructure is not left entirely with developers. The local authority (including departments other than planning) has a key role in ensuring that there is infrastructure in place to prepare for the future low carbon economy. The policy framework has been worded based on the commitment by the Local Authority to create a modern energy infrastructure that will support future development as Building Regulations change.

6. SUMMARY CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

In developing this Stage Two report key areas with potential for promoting low and zero carbon energy solutions and developments have been identified and a supporting policy framework has been presented.

It is important to note however a number of key messages regarding how to move forward with the information provided. This final summary section highlights an overview of key issues that have emerged and presents recommendations on how to progress. The report is then completed with a short note of next steps that are recommended in the short term.

6.2 KEY ISSUES

- Whilst 10 priority zones have been identified, not all will be developed. Instead the priority zones are indicative areas where, based on available data, the critical mass of heat demand and development growth would indicate potential;
- Other areas across the eight partner authorities will also have good potential for DH and larger scale energy schemes. However, without access to consistent and detailed data, it is difficult to pin point all opportunities;
- The Building Regulations are changing and driving targets for zero carbon development by 2016 (housing) and are aligning with targets for Code for Sustainable Homes and sustainable buildings in terms of buildings and efficient energy supply;
- Planning authorities will need to not only promote sustainability in association with new development applications but also support, promote and develop procurement opportunities for the delivery of new decentralised energy infrastructure to ensure that in the future new development applicants can achieve demanding building regulation targets;
- Without creating a policy and infrastructure framework, that will support the establishment of low and zero carbon buildings, there is a risk that developers will seek to prioritise other authority areas where decentralised energy networks are emerging or in place;
- The skills and capacity of officers at most of the partner authorities are currently limited in relation to energy and low and zero carbon development. There is a need to create a realistic framework that enables planners to promote innovative solutions whilst minimising the amount of assessment tasks;
- Skills none the less need to be enhanced and it will be through application of policy in association with new development that this skills base will be enhanced;
- Planning policy requiring investment in low and zero carbon energy needs to be balanced with other planning objectives for development including affordable housing, school provision, safe and efficient transport network etc. Further understanding of the importance of creating a development framework for low carbon development will help to determine the relative importance of energy policies in this wider context;
- Availability of suitable wind energy sites in the study area is very limited. Three areas of least constraint have been identified by considering the constraints as detailed within section 4.2.5 of this report. However these areas still demonstrate levels of constraint, for example in terms of flood risk and cultural heritage. Of all areas in the eight authority areas, it is these areas that might be most likely to attract developer interest for wind. Further investigation of suitability is therefore recommended to ensure that the relevant authorities have confidence in knowing whether or not these sites to have potential.
- The identification of the broad areas indicate where pressure for development might occur and it is important to note that these areas are not prioritised for wind but enable authorities to be well placed to guide developer enquiries where these arise.
- In relation to identifying broad areas of least constraint for wind, partner authorities were asked to identify if there were any over-riding issues of local importance that might constrain wind energy development. Wirral suggested local valued landscapes as an additional key constraint to wind energy development. No other over-riding local constraints were identified by the partner authorities.

6.3 RECOMMENDATIONS

- All authorities are encouraged to find a mechanism to coordinate future partner work to help create the right environment for low carbon development in the future, providing the right infrastructure that future developers and investors will need to continue to invest in the area as Building Regulations change;
- 10 priority zones have been identified for delivery of District Heating. Further site specific investigation is now required into the feasibility and viability of these zones, including determination of the potential reach of a distributed network to ensure that there is a clear understanding locally of what and how development can contribute to and connect with networks plus, identification of potential sites for energy centres;
- Opportunities to create wider 'low carbon economic trade zones' could be investigated and areas ear marked with potential to link into the wider agenda for economic growth and regeneration;
- Whilst the identified priority zones offer the potential for significant contributions toward managing carbon emissions, Planning authorities should continue to identify other potential priority zones, for example at the Omega site in Warrington;
- All eight planning authorities should seek to incorporate a consistent planning policy basis for low and zero carbon energy generation in line with the recommendations set out in this report;
- If there is a risk that DPDs will be delayed coming forward, serious consideration should be given to using the recommended policy wording in the Core Strategy;
- The eight partner authorities should continue to work together to establish improved monitoring systems in order to enable future Priority Zone opportunities to be identified;
- There is value in testing the emerging policy recommendations with a pilot planning application, subject to cooperative working with a developer;
- Investment is required in the resources and skills necessary to deliver low and zero carbon energy. Opportunities for sharing demanding resource requirements should be investigated further.
- Support for the planning department from across the Local Authority will be necessary to deliver the ambitions of the recommended priority zones and policy wording. In the early stages, there may be value in the authorities working together to seek further support from a sub-regional and national level including from the Planning Advisory Service;
- Further detailed site appraisals for the broad areas of least constraint for wind should be carried out at the development application stage. This work should take into account of further constraints as noted above and a review of community impacts and sensitivities should be carried out; and
- In order to continue to demonstrate the value of creating a low carbon infrastructure network across the partner authority areas, it is recommended that an economic impact assessment is carried out. This study would consider the implications of changes to the Building Regulations on developer willingness to invest in areas with and without decentralised heat networks and supportive context for low carbon technologies. This could prove particularly helpful in circumstances where there is opposition to development proposals, in particular large scale energy facilities and infrastructure or where there is limited willingness to invest in front loading the creation of suitable infrastructure.

6.4 NEXT STEPS

- The eight partner authorities have agreed to run shared workshops to help disseminate the findings of this study to other planning authority officers. These workshops should seek to provide an overview of the key findings and recommendations, present examples of DH networks and promote commitment to creating low carbon infrastructure across all authority areas;
- The current project steering group for this study should seek to find a way to coordinate to promote delivery of District Heating and to coordinate development proposals. Coordination will also help to identify other potential priority zones. The partner authorities should also seek to identify how monitoring can take place to improve coordination. The partner authorities could take a lead on promoting the agenda for investment in the low carbon economy and seek to identify particular priority zones for establishing potential clusters for investment;
- The authorities should seek to make the viability tool an online resource so that developers will be in a position to upload application data quickly and effectively. It may be possible to secure funding to set this up through the emerging Local Economic Forums as announced by the new Government in July 2010;
- Planning policy teams should seek to review policy wording and take a view as to how to incorporate the policy into the LDF, with a view to achieving adoption as soon as possible. It is recommended that the project steering group continues to communicate to ensure that a consistent cross authority approach is achieved and where there are variations that these are complementary;

- Advantage should be taken of the free ESCo development advice offered by Energy Saving Trust. For the LCR participating Authorities a workshop is anticipated to be the most appropriate delivery of the advice. Details of MEAS have been passed to the programme manager in order to commence with the dialogue;
- One priority zone should be identified to further test the recommendations of this report and to develop officer skills, including financing and procurement skills for delivering decentralised energy, including setting up and running Energy Services Companies (ESCos). This would ideally incorporate both housing and commercial development proposals. Partner developers should be approached and opportunities discussed before establishing a more formal agreement for moving forward. This should be done in the context of a development proposal that the relevant planning authority is confident will secure planning consent.

APPENDIX A

STAKEHOLDER WORKSHOP

A1 STAKEHOLDER WORKSHOP

A1.1 INTRODUCTION

A planning policy workshop was held on the 12th April at the Arup Liverpool offices. The workshop started off with introductions and Arup providing a project update. Envirolink then presented on renewable energy applications and delivery in the Northwest, before Arup provided a planning policy overview. The second half of the workshop was divided in to three breakout sessions on delivering effective local authority Local Development Framework policies for renewable energy across the Liverpool City region. These were facilitated by Arup and the key purpose was to seek feedback from council staff on planning policy suggestions for low and zero carbon development and to discuss their capacity to follow through. Six discussion topics were set and lead with the following questions:

1. Are delegates confident that the three policy streams cover everything and link effectively with wider objectives? The three policy streams area:
   i. Grid connected
   ii. Decentralised energy
   iii. Other development proposals
2. What is the likely developer response where policies affect development proposals?
3. How will the political climate affect effective delivery of policy objectives?
4. How will the planning officers' skills need to be developed to deliver policy?
5. How can monitoring systems be adjusted to ensure that targets will be measured?
6. What actions will you take away from today?

The workshop was closed with a summary of the day from Arup.

A1.2 DELEGATES

ORGANISATION	DELEGATE
Halton Borough Council	Rachel Winstanley
	Andrew Plant
Knowsley Metropolitan Borough Council	Philip Monaghan
	Justin Wilson
	Jan Lourens
Liverpool City Council	Ray Bowers
	Dave Horton
Sefton Metropolitan Borough Council	Andrea O'Connor
	David Colbourne
	Sue Tyldesley
St Helens Council	Chris Page
	Alan Kilroe
Warrington Borough Council	Kevin Usher
	Mike Davies
	Dave Ringwood
West Lancashire District Council	Gillian Whitfield
	Peter Richards
Wirral Metropolitan Borough Council	Eddie Flemming
	Matt Rushton
Merseyside WDA	Carl Beer
Government Office for the North West	Paul Stower
Envirolink	Denise Oliver
Merseyside Environmental Advisory Service	Paul Slinn
Arup	Ruth Jackson
	Mark Anderson
	Steve Pimlott
	Alison Ball

A1.3 WORKSHOP DISCUSSION

A1.3.1 Question 1: Are the delegates confident that the three policy steams (grid connected; decentralised energy; and other development proposals) cover everything and link effectively with wider objectives?

There were a few issues that delegates felt were not covered or discussed in detail. More clarification on how infrastructure will be paid for was requested. The question of how existing property owners contribute to deliver targets was raised. It was asked whether it was possible for planning to influence existing land owners to link into decentralised energy and how forward planning policy can influence the partnership structures necessary to support the delivery of decentralised energy.

The scale of development thresholds was also raised as something not covered in detailed. It was suggested that a local authority could have different thresholds to those set in the RSS. It was noted that developers have been known to split applications to come in under the thresholds. To combat this it was suggested that policies could be applied to all developments rather than set a threshold, however this would need to be across the areas of all partner authorities to be successful.

There was a general discussion on what 'other development proposals' meant to the delegates. The issue of meeting targets in this area, including RSS targets and sustainability checklists was a concern, especially in light of the council officer skill shortage in this area.

A1.3.2 Question 2: What is the likely developer response where policies affect development proposals?

The key issue discussed here was cost and the economics in relation to installing renewable energy in a development. It was pointed out that developers are primarily concerned with the short term as the long term commercial viability of schemes is more often than not of no interest to the developer as they are not usually responsible for long term involvement in site management and operation. Some developers may not even want to get involved in the initial stage of delivering and/or connecting to a distributed or building integrated scheme, and would prefer to make a cash contribution. It was queried whether Arup could help in this area by providing information on the cost benefits that building occupiers would consider to give reassurance that the decentralised energy solution would be more attractive than linking into the national grid energy provider. It was also highlighted that the free Encraft online energy calculator provides a means of assessing technology viability for those with little knowledge.

It was thought that policy needs to be carefully worded and balanced in relation to developers. Development pressures need to be considered strategically and there is a need to ensure that the policy framework and the priority zones don't discourage investment in key areas. Developers need to have certainty as they have many considerations. LPAs need to keep it simple and clearly set out where energy sits as a priority against other requirements. Code for Sustainable Homes is currently an issue and it was thought energy requirements will add another layer of complexity for how applications are determined. It was pointed out that DC officers are looking at this study to provide clarity and certainty on how applications will be dealt with.

In terms of the financial implications of policy for developers it was highlighted that contributions requirements will need to be part of a contributions DPD. There was also concern that there could be conflicts with other priorities for contributions such as affordable housing. It was generally recognised that the policy options provide a real opportunity to link planning with economics; however in doing so any policy would need to recognise that the economics of proposed schemes can change rapidly.

Finally the issue of choice and prescriptive policy was raised. It was pointed out that planning cannot restrict where occupants source their energy from. It was also viewed that policies should recognise that at the point of delivery, an alternative renewable technology may provide improved options for the overall development. Consequently it was viewed that policies should focus on energy capacity and carbon savings only and not prescribes technology options.

A1.3.3 Question 3: How will the political climate affect effective delivery of policy objectives?

This question was not widely discussed, but a few points were made. It was pointed out that members are politically motivated and whilst they will support the broad vision for a low carbon future, we need to be confident that policy is mindful of factors that influence political decisions. It was suggested that if Arup provide wording on emissions targets that is not too technical, it will help support the case for supportive planning decisions. This could include overarching statement on Air Quality Management in relation to biomass – linked to the priority zones for example.

A1.3.4 Question 4: How will the planning officers' skills need to be developed to deliver policy?

There was a general acknowledgement that there are significant skills gaps in local planning authorities to implement policy in the determination of planning applications for low carbon energy. There was also a concern about officers having a sufficient skills base to understand information submitted by applicants and there is the danger that developers are likely to exploit this lack of knowledge. It was recognised however that the LCR Stage 1 report provides a starting point for understanding issues about specific technologies, though there are still difficulties understanding the commercial aspects of developments as a whole and how energy fits into this. Another specific knowledge concern was knowledge of the resource supply for biomass and other fuels for CHP. There was a worry that schemes would be given consent that then import their resources from outside the region/UK resulting in carbon increases.

The concern regarding skills is compounded by the fact that development control departments often work on a geographic basis and there could be resource issues if one part of a borough had more potential for low carbon energy than another.

It was therefore readily agreed that skills and education programmes are needed across councils. It is therefore important that the appraisal tool that Arup produces is user friendly and designed for use by planners. The tool should also limit the amount of resources necessary for it to function effectively. Knowsley and Sefton also acknowledged that pretty much everyone is likely to need a 3rd Stage study to cover ESCO and 3rd party model delivery vehicle development. A partnership approach to delivery would also help combat the skills shortage.

Another solution to the resource and skills problem suggested is outsourcing. Envirolink can provide an application overview role and there are application energy performance checking services such as Croydon Energy Network (CEN) and the CE appraisal certificate scheme (paid for). There was also the suggestion that applicants who cannot meet policy targets pay a fee to the Council to enable an independent viability assessment to be carried out.

A1.3.5 Question 5: How can monitoring systems be adjusted to ensure that targets will be measured?

The key concern expressed here was in relation to the capacity of local authorities to conduct the monitoring. It was thought that DC officers would not be able to carry out the monitoring without incentives or additional staff resources, and that this need should be communicated back to Government. It was viewed that central resources such as Merseyside Environmental Advisory Service would be useful in delivering grant assistance to enable monitoring.

The other discussion arising concerned process, with a reminder that the planning role is generally focused on applications not installations. It was stressed there is a need to request applicants provide information in a consistent manner. Envirolink stated that standardised monitoring and application questions should be used by all planning officers. It was suggested that for big schemes it would be possible to have conditions for providing post completion updates to the Council.

There was some discussion regarding enforcement with an acknowledgement by some local authorities that they have no powers or resources to enforce targets. Specifically, Sefton have to-date restrained themselves from requesting that developers installing renewable generation provide proof of operation by revealing their ROCs.

A1.3.6 Question 6: What actions will you take away from today?

Many of the authorities stated that they would be raising the issues discussed with their wider teams, including energy and policy specialists. Some believe it could have an immediate effect on their Core Strategy and they would be looking at policy wording in the Core Strategy as a result. Wirral thought that there was potential for the workshop discussions to influence a current major application and would Arup would contact them directly concerning this.

A1.3.7 Additional Discussion

Additional comments were made on viability. It was commented that there is a need to join up project viability models and ensure energy viability work is a key component. It was however noted that viability assessments could delay decision making periods and affect HDG. One way to avoid this is through the use of Planning Performance Agreements, but this is not a technique often used in the study area and may require further investigation.

A discussion on delivering Priority Zone projects was also held. Some thought it was hard to see a role in delivery as Priority Zones are currently outside of planning. However it was pointed out that Priority Zones provide direction and a starting point for knowing where the most commercially viable areas are.

The issue of potential oversupply was discussed i.e. current concerns with the amount of pipeline EfW and the sensitivities surrounding it such as in Cheshire at present.

There was also a discussion of the post planning process and who would take the implementation/development role. Utility companies or housing departments were highlighted as usually taking this role. Supply chain issues could be recognised in policy as a potential barrier to implementing consented schemes, however it was recognised that this was not within the planning remit and therefore other organisations would need to ensure the market could be serviced.

Other issues concerned finance. KMBC are initiating an asset management project for example, resulting from the earlier work Arup undertook to identify project potential. It was suggested that a Sustainable Infrastructure Fund (SIF) approach could be an interesting capital raising option, but development timing may prove to be a challenge. A SIF however might push developers into locating schemes in neighbouring local authorities where it is not required and renewable targets are low. Or it might encourage more effort to be put into exploiting a council's limited knowledge base. Any use of SIF and the creation of target setting policy should therefore be replicated across all local authorities.

A1.4 SUMMARY OF KEY MESSAGES

The key issue arising from the workshop was delivery; on the developer front as well as delivery by the local authority.

A1.4.1 Developer

The short versus long term viability of a scheme is an important consideration. Developers will mainly be concerned with short term gain and prefer just to make a cash contribution. If this is to be the accepted process then contribution levels need to be set out in a Planning Contributions DPD.

There needs to be a joined-up approach in policy of the mandatory requirements of developers. Policy should be kept simple both to enable the developer to deliver and the DC officer to interpret the policy. Careful consideration is needed of how prescriptive a policy can be on technologies and location. A realistic approach is needed to writing policy otherwise targets will not be met. A unified approach was also felt to be equitable in terms of ensuring that there is a level playing field in policy terms across the partner authority areas and preferably the region.

A1.4.2 The Local Authority

There is a very strong perceived lack of skills and resources to deal with applications and relevant low carbon energy requirements. Experience is needed in dealing with developers' viability and feasibility arguments as well as in understanding technical issues and opportunities. Officers will need to have a more in-depth knowledge of technologies and locational issues to process applications and monitor developments and targets. The resources to deal with applications and carry out monitoring is an ongoing concern. Two solutions are possible. Firstly local authorities can to develop skills of officers and the Stage 1 and 2 (and possibly 3) reports should help this. Secondly, outsourcing applications to specialists should help with dealing with technical/specialist issues.

APPENDIX B

OTHER PROJECTS

AREA	DEVELOPMENT PROJECTS	DETAILS	COMMENTS
Merseyside Wider Area	Peel Energy Estuary	Power from the Mersey scheme in the Mersey estuary that has the potential to supply up to 260,000 homes.	Not applicable to Stage 2 Priority Zones as this scheme is off-shore and consequently not subject to planning controls. However, policy recommendations have considered facilitating relevant on-shore infrastructure
Halton	West Point Energy from Waste	INEOS ChlorVinyls is a leading manufacturer of chlorine and PVC. This is a highly energy intensive site. The latest investment at the Runcorn Site will see the construction of £400 million Energy from Waste CHP plant.	INEOS website suggests that heat generated via EfW will be used to raise steam for use on site. Further details would be required before the amount of waste heat in the form of usable hot water could be derived.
	Runcorn Docks	Runcorn Docks will be subject to comprehensive redevelopment for a residential led, mixed use development with the capacity to deliver up to 4,000 households, delivered by Peel Ports.	Identified as a DH Priority Zone. Note that given the identified potential, it is recommended that opportunities are discussed with developers in advance of any planning application
	Daresbury	Largest single development area in Halton with potential to deliver significant amounts of housing and employment development. This includes an extension to the world class Science and Innovation Campus and Daresbury Park.	Identified as a DH Priority Zone. Note that given the identified potential, it is recommended that opportunities are discussed with the developer in advance of any planning application
	3MG (Mersey Multimodal Gateway)	Multimodal logistics and distribution facility in Ditton, Widnes (184 ha), focused on B8 employment development to deliver regionally significant logistics and distribution development.	Not identified as a Priority Zone, however future potential may exist.
	Widnes Waterfront	This area is an employment-led, mixed-use regeneration area (C3, D2, B1, B2, B8), encompassing 139 ha. The area also includes planning permission for the Hive Development on the Widnes Waterfront Venture Fields site (07/00011/OUT), a new leisure park with a mix of entertainment facilities, restaurants and hotel	Not identified as a PZ, however this may have potential and should be tested using the viability tool
Knowsley	Knowsley Industrial Park	Planning permission has recently been granted to build an Energy from Waste Gasification plant in Knowsley, through the technology supplier Energos.	Identified as a DH Priority Zone. See notes below regarding Knowsley Industrial Park
Liverpool	Liverpool Waters	Mixed use development at pipeline proposal stage.	Whilst not identified as a priority zone, given that a mixed use development is proposed, there would be merit in investigating further with the developer what opportunities may be available and how these could be linked to other existing and proposed development
	Royal Liverpool Hospital	To be redeveloped and to continue operation of on site CHP.	Identified as a DH Priority Zone. Note that given the identified potential, it is recommended that opportunities are discussed with the developer in advance of any planning application
	Liverpool University	Independent energy masterplan being prepared favouring city centre campus. Currently the University has a new £14m energy centre that aims to reduce the university's annual energy consumption.	Identified as a DH Priority Zone. Note that as works are ongoing looking at energy opportunities, there may be value in engaging further with the developer to seek opportunities for sharing knowledge and experience
	Dock Estate	Further information on these projects would be necessary to enable comment	However, should the planning authority consider that these schemes have potential, then the content of this report and the supporting viability tool should help to enable opportunities to be identified
	Stonebridge Business Park		
	Project Jennifer		
	Alder Hey Hospital		

AREA	DEVELOPMENT PROJECTS	DETAILS	COMMENTS
Sefton	Council own building stock energy review	Identification of specific areas of interest for renewable energy. Working with Capita investigating the details for potential of district heating in the borough. Information is not currently available to inform this study.	The opportunities being identified by the Capita study are not currently available, however, the policy framework recommended in this report should provide a supportive framework for results that emerge
	Southport Floral Hall	Has an existing CHP plant.	It can be assumed that existing CHP plant has been sized to meet existing building(s) demands. In lieu of any details of existing loads and age of plant (i.e. Likely replacement timescale), this is not felt to constitute a PZ at present.
	Kew Southport	New housing and small business units on a former landfill site. A gas fired CHP is being considered (for 10% renewables target) on this site which is close to Business/Commerce Park.	Identified as a DH Priority Zone. It is recommended that if the opportunity remains, then discussions could be had with the developer to investigate potential to broaden the scope of the energy element of the proposal.
	Sefton Business/ Commerce Park	Current connected grid electricity capacity is limiting development potential on this site. It could cost up to £2m to upgrade the connection according to Scottish Power.	Is adjacent to the above development and would best be considered as part of related identified PZ
	Mersey Docks and Harbour	Gasification EfW plant proposed to accept industrial waste.	Whilst not identified as a priority zone, this development proposal may offer an opportunity to provide heat to the local area as well as connect into the national grid. Opportunities may be investigated through the application process
	Sainsburys	Plan for new store at Crosby to feature biomass boiler.	In lieu of electricity generation, it is unlikely that a commercial case would exist to upsize any such boiler and deliver heat to additional buildings. This is due to the costs of infrastructure that need to be recouped
	Peel Ports	Mersey Docks and Harbour features a major steam raising CHP installation 10-12 years old.	It can be assumed that existing CHP plant has been sized to meet existing building(s) demands. In lieu of any details of existing loads and age of plant (i.e. likely replacement timescale), this is not felt to constitute a PZ at present.
	Pontins at Ainsdale	Existing leisure destination that may have potential as a key energy load.	Whilst site may feature maintained heat requirements during peak seasons, it is felt unlikely that such a requirement is present all-year round in order to allow plant to operate and serve any would-be connecting loads (most likely neighbouring residences).
St Helens	InterRail Freight Facility	In 2006 an application was made for a large scale inter-modal freight facility at the former Parkside Colliery. The developer has now withdrawn from the proposal and future development of the site is not uncertain.	It is understood that the timescale for this development remain unknown and that its implementation remains uncertain.
	Lea Green Colliery	650 homes proposed.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	Worsley Brow	1,200 homes proposed.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	Vulcan Works	650 units proposed.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	Triplex Housing (ex Triplex Site)	300 units proposed.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	United Glass Site (New Rugby Stadium)	18,000 seat rugby stadium, food superstore, sport and leisure facilities.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
Warrington	Butts Green	99 homes proposed with HCA support.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	Omega	233 hectare previously developed site (including some unimplemented consents) to the north west of Warrington town centre. The site is designated for employment use and it is being promoted for mixed use development	This site has good potential for a PZ. However, it has not emerged through the PZ identification process because specific intentions for this site (i.e. to include the relatively dense development of primarily Commercial buildings) were not known. Consequently the heat demand figures generated as part of the bigger employment land quantification work did not derive the types of results that would have emerged through specific research and assessment if the Omega scheme.
	Greenalls Brewery Site	Stockton Heath; 178 dwellings proposed.	This omission highlights to the importance of ongoing assessment of development opportunities as these come forward and highlights that the identified priority zones in this study are in no way a fixed set of priority areas but instead a first stop identification of areas of potential

AREA	DEVELOPMENT PROJECTS	DETAILS	COMMENTS
West Lancashire	Derby Street	Outline application for a mixed use scheme with approx 178 dwellings plus and B1 units (840sqm new space and 4000m2 intended for replacement Council building).	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	Skelmersdale Town Centre Regeneration	Masterplan is under development and supported by local planning policy.	Study has assumed that regeneration of existing sites is unlikely to greatly alter the existing heat density
	Edge Hill University	30 hectare site, 20,000 students and 2,000 staff	Previous heat density mapping work has suggested existing loads do not make this a Priority Zone at present. No confirmed expansion plans provided to help assess how this might change.
Wirral	Biossense, Eastham	Planning Permission granted for 30MW gasification plant.	Further information on this proposal would be required before potential could be identified
	Bidston HWRC	Methane recovery site.	Further information on this proposal would be required before potential could be identified
	Wirral Waters	Peel development proposed to include 10% renewable energy.	Identified as a DH Priority Zone.
	Bromborough Masterplan	Bromborough Energy Group (group of businesses) were keen for local energy generation which would provide consistent energy prices and be low in carbon emissions. A feasibility study has been carried out but no clear project has emerged to date.	Once a project emerges, this could offer a good opportunity for introduction of renewable energy of some form.
	Woodside Masterplan	Endorsed by Wirral Council Cabinet in August 2005. Major mixed use waterfront regeneration scheme currently subject to pre-application discussions.	Not identified as a PZ, however this may have potential and should be tested using the viability tool
	Tesco Heswall	CHP planning application recommended for approval.	Application is believed not to be in relation to biomass
	Wallasey Docklands	Land based infrastructure for receiving power generated by the off shore wind farm at Burbo Bank, which will have a capacity of up to 234 MW following expansion if allowed.	More details would be needed in order to build up a picture of heat requirements and related density.
	Port Sunlight	Close to the Bromborough Area (above) is the historic Port Sunlight Village. The Village Trust has recently applied for funding to create a small scale biomass facility to test potential for low carbon energy supply in the area.	There may be value in investigating further potential in this area.

APPENDIX C

ELR AND SHLAA ASSUMPTIONS FOR ENERGY TRAJECTORIES

C1 ENERGY TRAJECTORY WORK

C1.1 INTRODUCTION

The intention of the provided energy trajectory figures is to identify each partner authority's potential areas for housing and employment land and to quantify potential build-out in terms of additional heat and electricity requirements over the next 15 years in order to identify potentially suitable locations for District Heating

Stage 1 work considered existing levels of energy requirement within the areas of the partner authorities. For Stage 2, areas of potential energy demand change have been identified by taking account of areas for potential future growth as set out in:

- Strategic Housing Land Availability Assessment (SHLAA) data; and
- Employment Land Review (ELR)/Employment Land and Premises Study (EPLS) data

The areas of potential energy demand identified through this process have been used to identify areas potentially suitable for delivery of district heating which have been presented in Section Four.

C1.2 METHODOLOGY

Energy trajectory figures have been calculated using predicted kWh/m2/year (ie the amount of energy used, per m2 of a property in any one year) benchmark data. These benchmarks have been derived taking account of how building energy requirements will change in the future as a consequence of changes to Building Regulations and Code for Sustainable Homes (CSH) standards for energy use of new buildings.

The energy consumption estimates are broadly proportional to the amount of land (hectares) identified through SHLAA and Employment Land data. These areas have been rationalised to an extent to derive what may comprise the actual built floor area (m2). However for data which features no subdivision of area, either by intended use class or floor area build-out, this process has been, by necessity, somewhat imprecise and may result in some returned energy trajectory figures being higher than anticipated,

In lieu of more detailed information for sites of this size, more precise figures for future consumption cannot be derived with much accuracy. This is described in more detail below.

C1.2.1 Employment Land Data

The ELR data provided by some partner authority areas included specific figures of both space-types and related floor area that are penned for development. These details have been used alongside published and projected benchmarks of energy consumption for buildings on a kWh/m2 basis to derive outline energy consumption figures.

When provided information featured no indication of either intended built floor area and/or specific space-types, assumptions were required in order to derive any meaningful figures of potential energy consumption.

In these cases, the following assumptions were made;

- If no indication of space-types was provided, an even mix of A1, B1, B2, B8 and C1 was assumed
- Unless provided data stated otherwise, an even split of area build-out was assumed for 2015, 2020 & 2025
- If no figures of built floor area were provided, a floor area to floor area to land area factor of 0.46 was applied, i.e. for every hectare (or 10,000m2) of land it was assumed that around 4,600m2 of treatable building area would be developed

This figure was derived as an average of those calculated for the partner authority area information provided featuring floor area data

Whilst this final assumption is admittedly rather broad-sweeping and will result in very large energy consumption figures being derived for particularly large identified ELR area, such an assumption was necessary in order to project these figures.

Naturally, as greater levels of detail become available, specific site/scheme consumption figures can be refined.

C1.2.2 Housing Land Data

Provided housing land data from all partner authorities comprised number of residential units to be constructed, often divided by year or across a period of years.

In order to allow a similar consumption calculation to be undertaken, using benchmarks of heat and electricity use on a per m2 basis, the following assumptions were required;

- All units were assumed to comprise an even mix of 1, 2, 3, 4 and 5-bed properties
- The following figures were adopted from English Partnership guidance on minimum floor area per property type
- Where not specified otherwise, the build-out of properties was assumed to occur evenly over the 15-year period to 2025.

English Partnerships' Quality Standards
Delivering Quality Places
Revised: from November 2007

Space standards

English Partnerships requires homes to be built with minimum internal floor areas in relation to bedrooms and occupancy as follows:

1 Bedroom/2 person homes	51 sq m
2 Bedroom/3 person homes	66 sq m
2 Bedroom/4 person homes	77 sq m
3 Bedroom/5 person homes	93 sq m
4 Bedroom/6 person homes	106 sq m

English Partnerships Guidance on minimum floor area per property

C2 CONSUMPTION BENCHMARKS

C2.1 INTRODUCTION

In order to derive trajectories of energy usage against the provided SHLAA and ELR data, benchmarks of consumption were needed for each space-type.

The energy trajectory data has been used to identify the Priority Zones for District Heating and may subsequently be used to inform decisions about future housing and employment land allocations. It has not been used however to estimate future energy demand (and therefore carbon emissions) because this would be likely to present an over-estimate of potential future demand. When reading the main report therefore, please note that in Section 2.4, the table presented refers to Regional Spatial Strategy data to estimate future potential energy.

C2.2 BENCHMARK DERIVATION

Whilst benchmark data is broadly available for existing and recently constructed buildings, the periods of future build-out being considered herein (up to 2025) required the prediction of bespoke benchmarks for new construction following impending and incremental changes to Building Regulations requirements.

C2.2.1 Building Regulations (Part L)

2010

The recently published 2010 revision of Building Regs Part L stipulates that emissions savings of 25% be achieved above and beyond the previous (2006) requirements. This refers solely to "regulated" energy use under the regulations which includes the following:

- Heating
- Hot water
- Cooling
- Lighting

but excludes the following:

- Small power
- Pumps and fans

2013

It is currently proposed that the subsequent 2013 revision of Part L require a further 19% reduction against 2006 building emissions levels (so a total of 44% reduction).

2016

Though acknowledged that it may be refined based on industry performance, it is also proposed that the 2016 regulations push this total emissions reduction to 49% against 2006 levels.

C2.3 APPLIED BENCHMARKS

Based on a related reduction in building energy use, in response to the ongoing Building Regs requirements to reduce associated emissions, the following benchmarks were derived and applied for various space-types (Note: figures are annual and represent kWh/m2/year).

		2010 BENCHMARKS	
		HEATING	ELECTRICITY
A1: Retail	kWh/m²/year	85.0	265.5.
B8: Distribution & Warehouse	kWh/m²/year	109.1	47.0
B1: Office	kWh/m²/year	74.7	112.1
C1: Hotel	kWh/m²/year	147.7	102.8
C3: Residential	kWh/m²/year	80.0	42.0
D2: Leisure	kWh/m²/year	227.6	88.8
B2: Industrial	kWh/m²/year	83.6	58.7
D1: Libraries	kWh/m²/year	26.8	94.8

		2013 BENCHMARKS	
		HEATING	ELECTRICITY
A1: Retail	kWh/m²/year	81.7	255.2
B8: Distribution & Warehouse	kWh/m²/year	102.8	44.3
B1: Office	kWh/m²/year	67.2	100.8
C1: Hotel	kWh/m²/year	139.2	96.9
C3: Residential	kWh/m²/year	50.0	45.0
D2: Leisure	kWh/m²/year	216.7	78.8
B2: Industrial	kWh/m²/year	79.1	55.4
D1: Libraries	kWh/m²/year	25.3	89.4

		2016 BENCHMARKS	
		HEATING	ELECTRICITY
A1: Retail	kWh/m²/year	80.8	252.5
B8: Distribution & Warehouse	kWh/m²/year	101.2	43.6
B1: Office	kWh/m²/year	65.2	97.8
C1: Hotel	kWh/m²/year	137.0	95.4
C3: Residential	kWh/m²/year	42.0	46.0
D2: Leisure	kWh/m²/year	213.9	77.8
B2: Industrial	kWh/m²/year	77.9	54.5
D1: Libraries	kWh/m²/year	24.9	88.0

APPENDIX D

PZ PLANT CAPACITIES

D1 CHP PLANT CAPACITIES

D1.1 INTRODUCTION

As with all combined heat & power technologies, the selection and sizing of suitable biomass CHP plant is primarily dependent upon the nature of connecting heat loads.

Optimised operation of such plant (both technically and commercially) requires the presence of a maintained level of heat demand in order to maximise run hours and to ensure that any requirement to "dump" generated heat is eliminated or at least minimised.

In planning terms the nature and scale of biomass CHP plant can vary considerably and the suitability of schemes in planning terms would need to be reviewed on a case by case basis depending on the scale of energy generation required.

D1.1.1 Good Quality CHP

The dumping of heat reduces the overall operational efficiency of the plant and has financial implications, with the potential failure to maintain "Good Quality CHP", as determined via the Combined Heat & Power Association (CHPA) quality indexing system, denying access to the Climate Change Levy exemptions and Enhanced Capital Allowance offered to those achieving the required QI rating.

D1.1.2 District Heating

In order to access maintained levels of heat demand, buildings served by a CHP arrangement must either operate on an uninterrupted 24-hour basis or, more commonly, will comprise a mix of building and space-types, with complimentary usage patterns and related periods of heat demand.

The most common way of facilitating the combining of heat loads from a variety of building types & locations is via a district heating network.

The technical viability for such a network is based both around the scale of amalgamated heat demands plus the related "heat density".

D1.2 CAPACITY ASSUMPTIONS

In combination with the quantification of existing and potential future heat loads, further assumptions are required in order to estimate the achievable scale of CHP plant to serve potential DH networks.

This section describes and records the assumptions made in the analysis and selection of each of the DH Priority Zones identified within this report.

D1.3 MARKET PENETRATION

In reference to the proportion of identified heat load which could connect to a district heating network, bespoke market penetration factors were assumed for each space type within the Priority Zones.

These factors are included within the following tables and were derived based on a mix of considerations, including;

- Proportion of existing/projected heat load suitable to DH low temperature hot water
- Physical spread and related heat density of buildings present/emerging
- Cost consideration of connecting to existing buildings
- Proportion of heat load represented via new-build elements

D1.3.1 - DH1: Liverpool

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	1	Existing	Commercial	50%
			Retail	65%
			Hotels	35%
			Town Hall	80%
			Law Courts	80%
			Leisure	50%
			Residential	15%

D1.3.1 - DH2: Warrington

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	2	Existing	Hospital	60%
			Commercial Park	50%
			Light Industry	35%
			School	100%
			Retail Park	50%
			Residential	0%

D1.3.1 - DH3: Liverpool

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	3	Existing	Hospital	60%
			University (Academic)	60%
			University (Residential)	35%

D1.3.1 - DH4: West Lancashire

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	4	Existing	Commercial	50%
			Retail	50%
			College	65%
			Residential	30%

D1.3.1 - DH5: Knowsley

In the case of the Knowsley DH Priority Zone, the potential for district heating has been led by the implementation of the Energos Energy from Waste plant, thus providing heat rather than requiring it.

As such, the scale of heat available from the Energos plant has led the sizing of opportunity here, in combination with surrounding employment development land, rather than details of existing buildings.

D1.3.1 - DH6: Sefton

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	6	Emerging	Hospital	60%
		New	College	100%
			Residential	100%
			Light Industry	100%
			Hotel	100%

D1.3.1 - DH7: St Helens

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	7	Existing	Leisure Centre	100%
			College	100%
		New	Distribution Centre	80%
			New Employment Land build-out	100%

D1.3.1 - DH8: Halton

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	8	Existing	Business Park	25%
			Science Park	25%
		New	New Employment Land build-out	75%

D1.3.1 - DH9: Wirral

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	9	New	Retail	75%
			Commercial	75%
			Leisure	75%
			Hotel	50%
			Residential	50%

D1.3.1 - DH10: Halton

PRIORITY ZONE TYPE AND REF NO.		STATUS	BUILDING OR SPACE TYPES	ASSUMED MARKET PENETRATION
DH	10	New	Residential	100%
			(additional non-residential elements)	0% (no details yet available)

D2 WIND TURBINE CAPACITIES

D2.1 INTRODUCTION

With more detailed site analyses required in order to derive optimal turbine capacities, the work undertaken within this study in relation to wind PZ's has instead provided indications of potential electrical outputs for a small range of turbine sizes.

D2.2 TURBINE OUTPUTS

The methodology applied to determine potential turbine outputs followed the following steps.

D2.2.1 Local Wind Speeds

Wind speed data collated for each PZ area was used to derive average speeds for specific turbine hub-heights, as applicable for the capacities identified.

D2.2.2 Turbine Outputs

Achievable electrical outputs for each selected turbine capacity were calculated, using power curves as published by turbine manufacturers.

D2.2.3 Capacity Factor

Finally, a suitable capacity factor was applied to the calculated output figures, in order to reflect the annual proportion for which suitable wind speeds occur in order for turbines to operate.

APPENDIX E

VIABILITY TOOL

E1 VIABILITY TOOL

E1.1 INTRODUCTION

PPS1 supplement Planning and Climate Change, sets out that in dealing with development applications, planning authorities are expected to consider the potential viability of energy solutions.

A tool therefore has been developed as part of this study for use in reference to applications for district heating arrangements within identified priority zones, or for developments for which decentralised energy networks may be considered, potentially creating a new priority zone.

The tool provides an enhanced filtering process for developments that planning officers can use. It uses a combination of bespoke input development figures and relevant characteristics, alongside previously derived financial characteristics (e.g. plant-specific CAPEX (capital expenditure) and operation and maintenance (O&M) cost levels).

This is felt to be more appropriate than a tool designed to accept large amounts of detailed input data or to perform a complete commercial viability calculation, a task most often not feasible at the early concept stages at which developments proposals first reach planning departments.

Note that the effectiveness of the tool will be determined by the quality of input data. At the time of writing, key cost data has been provided, however the partner authorities should seek to keep this data as up to date as possible in order to reflect changing circumstances. Similarly, as additional priority zones are identified, this information should be built into the tool.

E1.2 HOW IT WORKS

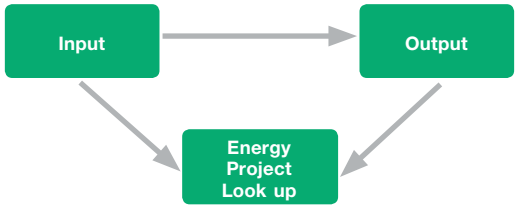
E1.2.1 Tool Structure

Comprising a look-up/searchable reference tool, this enables the user to relate development applications to particular priority zone energy infrastructure opportunities.

The tool consists of three key components:

1. Planning Application 'Input';
2. Priority Zone Reference Energy Project Look-up; and
3. 'Output' Summary.

Represented below as three spreadsheets worksheets where the 'tool' use process consists of:



E1.2.2 Inputs

Developers will be asked to provide quantitative data to input to the tool, including:

- Developer name, location, contact details;
- Development location;
- Low-energy targets for:
  1. Residential elements
  2. Non-residential elements
- Total site area (m^2);
- Combined building footprint area (m^2);
- Related total building floor area(s) (m^2);
- Number and type of residential properties (e.g. 2-bed flats, 3-bed houses etc); and
- Approx breakdown of non-residential floor area by space-type (e.g. Commercial, Leisure, Industrial etc).

These inputs will provide both a record of the application characteristics and information from which approximate energy load densities of the proposed developments can be derived.

E1.2.3 Additional Parameters

Intended to be applied alongside the provided input data/info, the following parameters are used to further filter development suitability for DH. These take the form of simple drop-down menus, with options: **YES, NO or UNKNOWN**;

- Is development within or immediately adjacent to an identified priority zone?
- Does development include or sit adjacent to a Hospital or Leisure Centre?
- Is development located within 25 miles of a potential biomass fuel supply point?

E1.2.4 Priority Zone Look-up

The priority zone reference energy project look-up consists of a table of priority zone project information, presented in a spreadsheet format hidden and fixed from the tool user rather than as a visible table.

This contains key tool searchable characteristics which are pulled together to form a descriptive output related to the developer application input:

- Priority Zone reference
- PZ characteristic description
- Energy infrastructure options classification
- Options vital statistics

E1.2.5 Outputs

The following output will be produced by the tool as a summary of developer details, priority zone characteristics and high level energy parameters appropriate to the developer:

- Development summary description;
- Applicable Priority Zone name/reference;
- PZ energy option characteristics summary;
- "Priority Zone proximity", displayed via simple traffic light system: **HIGH, MEDIUM or LOW**;
- "Development energy intensity (heat and power)", using a similar traffic light system: **LARGE CONSUMER, MEDIUM CONSUMER or SMALL CONSUMER**;
- "Development energy density characteristics": **HIGH, MEDIUM or LOW**;
- "Development suitability to centralised PZ options": **SUITABLE, POSSIBLY SUITABLE or UNSUITABLE**;
- "Incentive/Opportunity for technology to be biomass-fuelled": **YES or NO**;
- "Initial assessment of financial viability": **LIKELY VIABLE: Further study justified**, **POSSIBLY VIABLE: Viability largely dependent upon: a) linking to adjacent sites or b) sourcing of third-party Capital funding**, **LIKELY UNVIABLE: Would require significant additional heat loads or third-party Capital funding to improve commercial case**.

E1.3 NOTES

Whilst the tool is cognisant of certain cost inputs (as derived at time of writing) a large part of the tool is given over to deriving the likely levels and characteristics of development energy requirements. This tool is focussed on technological solutions and does not provide information on carbon savings.

The level of additional inputs and related provisional heat network details required in order to perform a full commercial appraisal are rarely available during the early stages of development masterplanning. As such, the provided tool seeks to allow a provisional assessment to be made, based upon a limited level of development details.

Whilst specific capital and operating costs will vary from year to year, the basic elements required to make consideration of district heating a viable strategy remain based on the heat demand characteristics.

Given the established nature of district heating technologies, marginal year-on-year cost changes are unlikely to affect the output from the tool. However, a function has been included within the tool whereby the sensitivity of economic viability to changes in the capital cost of installing a notional network is reported and can be manipulated via the inputs section.

In the cases where further study is recommended beyond the use of the tool, such studies will be able to incorporate more precise costs.

APPENDIX F

GRID CONNECTIONS

F1 GRID CONNECTIONS

F1.1 NEW SUPPLY CONNECTIONS

Requests for new connections are made directly to local DNO's and need to include details of precise site/development location and anticipated maximum level of demand. DNO responses will provide the costs for connection and the costs for any required reinforcement of the existing network to facilitate the connection of the new demand. Applicants will be required to pay the whole cost of and network extensions necessary to facilitate their connection.

In areas where available capacity within the network is low, the party requesting the connection may be required to share the cost of associated "reinforcement" of local infrastructure, in addition to the normal cost of connection, in order to increase the overall capacity whilst maintaining the security of supply of the distribution network.

Whilst not negating the need for individual infrastructure searches and connection applications, the provided SP Manweb map and ENW substation information can be used as a rough indicator as to where largely "unconstrained" capacity for new electrical connections exists (at the time of publishing), though the accessibility of this capacity is entirely bespoke depending on the location of new development and condition of local high and low voltage infrastructure.

F1.1.1 COSTS OF CONNECTIONS

Precise costs of new connection are determined on an individual basis and will depend upon a number of key factors. These considerations are included in the table below, along with related applicability to development types.

For areas where outline capacity is below 2MVA, such as North Sefton, West Liverpool and much of St Helens, it should be noted that the risk of related costs of connection for any new developments is likely to be higher than elsewhere due to the need to facilitate network reinforcement.

ASPECT OF CONNECTION WORKS	APPLICABILITY TO CONNECTION TYPE			DESCRIPTION
	DOMESTIC	COMMERCIAL	INDUSTRIAL	
Installation of HV cabling	Unlikely	Possible	Likely	HV cabling linking to local 11kV network
Provision of HV Switchgear	Unlikely	Possible	Likely	Provision for direct connection to HV network
Provision of Distribution Substation	Likely	Possible	Possible	Providing voltage transformation from HV to LV
Installation of LV mains cabling	Likely	Possible	Possible	On-site LV mains, typically within a housing development or small Commercial park. For apartment/flat developments, a metering panel may be required
Metering Panel	Unlikely	Likely	Possible	To allow for sub-metering of electricity use within shared buildings
Network Reinforcement Cost	Variable			Contingent on local network conditions

F1.1.2 inforcement Costs

Reinforcement costs can comprise a number of works required to facilitate a new connection, including:

- Upgrading of local transformer equipment;
- Replacement of HV switchgear; and
- Upgrading of HV underground or overhead HV lines.

Costs for such works will be unique to the site in question and condition of the existing local network. These costs are partially passed on to the connection applicant via use of a "Cost Apportionment Factor". There are two Cost Apportionment Factors; one based on capacity (shown immediately below) and one based on fault level (shown below in worked example on generation. The approach, used by both ENW and SP Manweb, is calculated as follows:

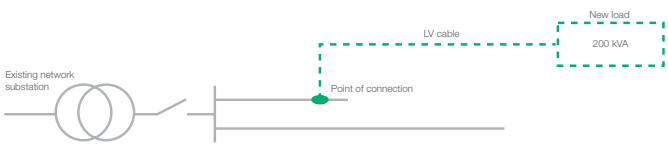
$$\text{Cost Apportionment Factor (CAF)} = \frac{\text{Customer Required Capacity} \times 100\%}{\text{New Network Capacity}}$$

This factor is applied to the total cost of any reinforcement works to determine the fraction to be paid by the applicant.

In order to demonstrate how costs for new connection requiring network reinforcement are distributed, the following worked example has been sourced from ENW's methodology document for connection charges.

F1.1.3 Worked Example: new commercial supply connection requiring reinforcement

In this example, a commercial customer requires a new 200kV connection. However, the 500 kVA transformer at the local network substation is fully loaded and will have to be replaced with an 800 kVA transformer. This arrangement is illustrated below, with the customer's point of connection indicated.



The following table shows how the various costs for new and replaced infrastructure would be apportioned between the DNO and the customer.

ASPECT OF CONNECTION WORKS	RELATED COST AND APPORTIONTMENT (£)		
	TOTAL	APPLICANT	DNO
Replacement of transformer	14,760	3,690	11,070
Jointing to existing LV Network	352	352	0
Installation of new LV cabling	9,550	9,550	0
Metering Panel	1,420	1,420	0
	26,082	**15,012**	**11,070**

All infrastructure and works associated solely with the new connection are charged in full to the customer. In this case, these comprise all works beyond the new transformer.

The costs of reinforcement, represented in this case by the replacement of an existing transformer, are attributed as follows:

Total cost of reinforcement = £14,760

$$\text{Cost Apportionment Factor (CAF)} = \frac{\text{Customer Required Capacity} \times 100\%}{\text{New Network Capacity}}$$

= (200 / 800) x 100% = 25%

Customer reinforcement charge = £14,760 x 25% = **£3,690**

F1.2 CONNECTION OF GENERATION

In the case of distributed generation, configured to feed electricity into a network, the level at which they connect is determined by the size of generation, the size of the site it is embedded within and the utility infrastructure available in the area.

Electricity generation from wind turbines and CHP arrangements will most commonly occur at 11 or 6.6kV, though larger installations may seek to connect at 33kV.

In most cases, the scale of wind turbines and CHP arrangements being targeted within the partner authority areas would likely connect to the local network at HV level, that is, into an 11 or 6.6 kV circuit.

F1.2.1 Costs of Connections

Physical connection of generators to local networks will occur either via dedicated switchgear (either existing or new) or via a primary substation. As such, the related cost of connection will be, as for a supply-only connection, dependent a combination of:

- Proximity of generator to local HV network;
- Condition of and available capacity within network;
- Presence of local HV substation; and
- Availability of existing switchgear.

Connections may also be subject to additional reinforcement costs.

F1.2.2 Reinforcement Costs

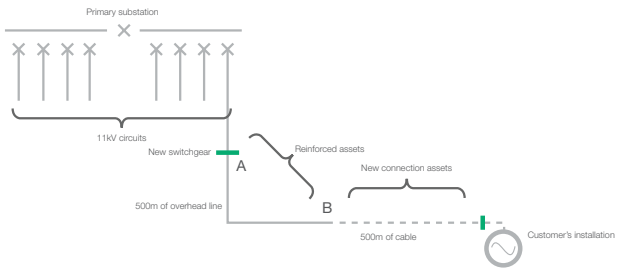
An important aspect of generation connection to existing networks is the resulting affect on power flow. This is directly related to the magnitude and location of the connecting generation.

If part of a network features more generation than demand, it is said to be an exporting area. The addition of any further generation within such an area will result in increased power flows and may require system reinforcement works, with an associated cost to be borne by the generator.

In order to illustrate how reinforcement costs are apportioned, another worked example follows, taken from ENW's charging methodology document.

F1.2.3 Worked Example: new connection for distributed generator requiring reinforcement

In this example, the connection of a 3 MW distributed generator involves the upgrading of 500 m of overhead line (between points A and B on the existing distribution network) to carry the export capacity of the distributed generator, the upgrading of the switchgear at point A for increase fault level on the distribution network and the laying of 500 m of new cable (between B and the customer's installation). Point B is the point of connection for the distributed generator



The following table shows how the various costs for new and replaced infrastructure would be apportioned between the DNO and the customer.

ASPECT OF CONNECTION WORKS	RELATED COST AND APPORTIONTMENT (£)		
	TOTAL	APPLICANT	DNO
New Switchgear	725,000	87,000	638,000
New 500m HV overhead line	57,180	34,308	22,872
HV pole top terminated	1,003	1,003	0
New buried 500m HV cable	100,840	100,840	0
	884,023	**223,151**	**660,872**

Once again, all infrastructure and works deemed directly associated with the new connection (termed the "new connection assets") are charged in full to the customer, while the costs of reinforcement works were attributed as follows.

New Switchgear

This upgrade is required to remove fault level constraints and facilitate electricity export from generator.

Fault level contribution from connection = 10 MVA
Connecting generator fault level = 250 MVA
Connecting generator capacity = 3 MVA

Total cost of reinforcement = £14,760

Cost Apportionment Factor (CAF) = $\frac{\text{Customer Required Capacity} \times 100\%}{\text{New Network Capacity}}$

= [(3 x 10) / 250] x 100% = 12%

Customer fault level charge = £725,000 x 12% = **£87,000**

New HV Overhead Line

This upgrade is required to remove capacity constraints.

New network capacity = 5 MVA
Connecting generator capacity = 3 MVA

New network capacity = £14,760

Cost Apportionment Factor (CAF) = $\frac{\text{Customer Required Capacity} \times 100\%}{\text{New Network Capacity}}$

= (3 / 5) x 100% = 60%

Customer fault level charge = £57,180 x 60% = **£34,308**

APPENDIX G

SUPPORTING MAPS

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