RENEWABLE ENERGY CAPACITY STUDY

Liverpool City Region
Stage One Report

ARUP

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1. INTRODUCTION

1.1 INTRODUCTION

The need for action to tackle climate change, reduce carbon emissions and improve the security of energy supplies is immediate. Arup was commissioned to undertake a Renewable Energy Capacity Study for Liverpool City Region and Warrington in July 2009.

This commission represents the first stage of an ongoing commission and has been prepared to help inform the development of Local Development Frameworks and other relevant plans, policies and strategies prepared by local authorities in the study area. Consequently, this stage is aimed at planning professionals when developing planning policies and determining planning applications for distributed and building integrated energy developments. It also aims to provide information that can be used by other professionals and stakeholders that are involved in the planning, delivery and operation of such infrastructure.

There is growing evidence that renewable energy will play an increasingly important role in the future of the UK. The unit cost of energy is likely to increase to cover the costs that are necessary to de-carbonise grid supplied electricity. It is anticipated that this will be achieved through a range of approaches that will involve more efficient and sustainable energy generation. Energy price volatility and issues with supply are forecast to worsen in future years. The implementation of renewable energy technology could potentially mitigate the negative effects of climate change and at the same time lead to considerable economic benefits.

The potential for renewable and low carbon energy has been recognised in a number of plans, strategies, policies and programmes that have implications for the Liverpool City Region and Warrington. The North West of England Regional Spatial Strategy (RSS) sets out targets for renewable and low carbon energy options and provides the starting point for this study.

1.2 STUDY AREA

The geographic coverage for this project includes a total of eight local authority areas. Each local authority forms part of a sub region. The geographic area for this study covers three sub regions. Each sub region is defined in the North West Regional Spatial Strategy (RSS) which sets the targets for renewable energy generation. The sub regions included in this study are:

- Merseyside: this sub region is made up of the local authority areas of Liverpool, Wirral, Sefton, Knowsley and St Helens.
- Halton & Warrington: this sub region is made up of the local authority areas of Halton and Warrington.
- Lancashire: this sub region contains a number of local authority areas, however West Lancashire is the only local authority contained in this study.

These local authority areas, with the exception of Warrington make up the Liverpool City Region. For the purposes of this study we will need to refer to local authorities individually and to their sub regional groupings. However in instances where all eight local authorities are being referred to together we have used the term ‘the study area’.

FIGURE 1: THE STUDY AREA

1.3 PURPOSE OF THE STUDY

This study has been developed to provide a sound and robust understanding of renewable and low carbon technologies. It does this by providing an insight into renewable energy technologies, the key issues associated with them and how suitable they are across the study area.

Many renewable technologies require specific resources being available to make them work effectively and be commercially viable. It is not realistic, fair or effective to assume sub regional targets can be split equally between each local authority area.

One of the main issues that this study begins to explore is the extent to which each of the local authorities that make up the study area can meet the targets set in the North West Regional Spatial Strategy (RSS) for renewable energy generation. These targets are set at a sub regional scale, but do not provide an indication of what each individual local authority should be doing to meet them, what the best approach would be and whether the target and/or the renewable energy technologies they relate to are feasible.

Consequently, this study begins to address these issues by identifying the relevant targets, establishing the extent to which they are already being met through installed and anticipated energy schemes. The study also assesses the study area in terms of potential resource capacity and energy demand and is used to determine the suitability for certain technology options.

This is then used to provide an initial indication of whether targets are likely to be met, and provides the basis for indicating the suitability of technologies for each local authority and strategic options. This will ensure that each local authority will eventually have a clear understanding of what targets they should be prioritising, the proportion of each target they should be meeting and which targets will be difficult to meet and the reasons why this is the case.

1.4 IMPORTANT CONSIDERATIONS FOR THIS STUDY

A critical issue when considering the potential for renewable energy is that some technology options that will help reduce carbon emissions are not strictly renewable. This means that the resource the technology uses to create energy is not a renewable source and will, at some point in time run out. For example, at present an effective technology for creating low carbon energy is decentralised gas fired Combined Heat and Power (CHP).

It should therefore be recognised that in order to lower carbon emissions and provide secure energy supplies, there will be no single solution. Instead a combination of technologies will be needed in order to meet short, medium and long term energy demand.

When considering renewable and low carbon energy as alternative means of energy provision, it is essential that measures are also taken to reduce energy use in order to maximise the carbon reductions that can be achieved and optimise the effectiveness of low and zero carbon energy systems.

1.5 APPROACHES FOR IDENTIFYING RENEWABLE ENERGY CAPACITY

This study has been developed to provide a strategic understanding of the delivery of renewable energy infrastructure across the study area. To achieve this, two initial exercises have been completed. These are:

Identifying Sub regional Renewable Energy Targets: The starting point for this study has been to identify the study area and compare this against the geographical coverage of the sub regional targets set out in the RSS.

Refining Sub regional Renewable Energy Targets: It provides the starting point for understanding how each component local authority will contribute to meeting targets set out in the North West of England

Regional Spatial Strategy (RSS). The refinement process is achieved by:

- Identifying the original sub regional targets set out in the North West RSS that affect the study area.
- Establishing the extent to which targets are already being met i.e. schemes that have been installed and are providing an energy output.
- Identifying additional schemes that are being brought forward and/or have been approved through the planning system and the potential contribution they would make to meeting sub regional targets.

Following this, the study seeks to provide indications of suitable and viable technologies, broad locations for delivery and discussion on the technical and commercial viability for technologies across the study area as a whole, and on an individual local authority level. This is based on a number of strategic assessments.

These include:

Strategic Planning Assessment: This identifies the most relevant national and regional renewable energy policies and considers the implications for each local authority in the study area and how they can develop policies in the future. In addition to the policy review an overview of strategic planning issues is provided. This is based on constraints mapping and an assessment of issues related to delivering technologies and schemes in Appendix D.

Review of Economic and Employment Issues: This includes a discussion of the key drivers for renewable and low carbon energy and the potential for a renewable energy sector. This element of the study also sets out the findings of a survey of local businesses in each local authority. This builds on an approach used for the Knowsley Renewable Energy and Low Carbon study completed in June 2009. The findings of the surveys are set out in Appendix G, and are touched upon throughout the discussions in this report and reflected in our recommendations.

Review of Renewable Technologies, Strategic Energy Resource and Energy Demand Potential: The following methodology has been set for identifying scenarios for achieving the renewable energy targets identified for each sub region (i.e. Merseyside, Halton & Warrington and Lancashire):

- Compile wind maps, in order to correlate regions of highest wind speeds to those that the NWRA compiled of technically constrained /unconstrained areas for potential wind turbine development[1].
- Compile heat maps in order to identify areas of intensive heat use for potential suitability with achieving biomass CHP and AD targets.
- Identify scenarios for achieving the updated renewable energy targets identified.

Appraisal of Renewable Energy Technology Options: This includes use of an Integrated Risk Management (IRM) tool and is complemented by the planning appraisal in Appendix D. These have been used to broadly assess the relevant options applicable to each local authority areas and the study area as a whole. This has helped provide an indication of the potential for renewable energy in each borough and provide a steer on some of the key issues that each borough will face when delivering renewable energy in short, medium and long term for the existing built environment and future development proposals. This work results in a series of conclusions and recommendations that each local authority will need to consider individually and collectively.

Following consideration of the recommendations in this report, Stage 2 of the commission will be developed a more 'bottom up' approach that provides more specific evidence on delivering schemes to meet strategic and local needs and objectives.

1.6 STRUCTURE OF THIS STUDY

Section 2: Summary of Findings

Section 3: Review of Renewable Energy Targets for the Study Area

Section 4: Strategic Planning Assessment

Section 5: Renewable Energy and the Economy

Section 6: A Review of Renewable Technologies

Section 7: Strategic Review of Energy Resource and Energy Demand Potential

Section 8: Distributed Energy Potential

Section 9: Building Integrated Energy Potential

Section 10: Sub-Region and Local Authority Options Appraisal

Section 11: Conclusions and Recommendations

1 4NW Towards Broad Areas for Renewable Energy Development

2. SUMMARY OF FINDINGS

2.1 INTRODUCTION

This section provides an overview of the main findings of the Stage 1 study. It summarises:

- the first indications of the potential capacity in the study area to meet renewable and low carbon energy sub regional targets;
- strategic direction on the most suitable technologies for local authorities in the study areas and prioritised options that should be considered;
- indications of where targets for technologies are unlikely to be met by local authorities in the study area; and
- planning issues for consideration.

2.2 CAPACITY AND POTENTIAL TO MEET SUB REGIONAL TARGETS

This section sets out the headline findings of the Stage 1 study in terms of energy capacity, suitability of technologies and key issues for the study area. This should be used to help each local authority area to prioritise areas for further investigation for the next stage of the study. Key findings include:

- Altogether, the boroughs that make up the study areas have the capacity to meet, and potentially exceed, the refined renewable energy targets on a technological basis. It should be noted that the targets set in the RSS are a minimum requirement and that local authorities should be seeking to implement these requirements through the Local Development Framework and the Development Control system to maximise the use of renewable energy generation and ensure that the energy needs of existing and new development can be met.
- In particular, initial assessments of the wind resource have shown that West Lancashire provides the greatest potential for wind energy generation in the study area. Wind resources in Sefton and Wirral are also good and have the capacity to far exceed the targets for the whole of the Merseyside sub-region. However, whilst have good wind resource the dleivery of wind generation, local planning could limit this potential.
- In all regions, district heating via biomass Combined Heat and Power (CHP) should meet and potentially exceed the targets in each authority, subject to the identification of a localised network of intensive heat users. However in the Halton and Warrington region, sufficient heat loads have not been identified to meet the capacity targets within this study at such high level; however it is anticipated that the area does have the potential to achieve the targets.
- Building integrated wind turbines and photo-voltaic installations have the ability to meet the targets. However, at present these technologies are not deemed commercially attractive.
- It is unclear to date whether anaerobic digestion (AD) targets can be achieved until a review of farmland and associated livestock wastes have been identified. However based on the number of agricultural holdings (over 24,000 based on 2007[1] statistics) in the North West region, it is likely that the targets can be achieved.

There is potential to utilise other sources of energy generation that could meet and significantly exceed the total energy output set in the RSS targets for the study area. In particular, Energy from Waste (EfW) infrastructure could provide significant energy output, however careful consideration would need to be given to the planning of energy from waste

1 DEFRA AGRICULTURE AND HORTICULTURE SURVEYS (HTTPS://STATISTICS.DEFRA.GOV.UK/ESG/JUNESURVEY/JUNE_SURVEY.HTM)

SUB REGIONAL TARGET AREA	LOCAL AUTHORITY	ONSHORE WIND	BUILDING INTEGRATED WIND	BIOMASS CHP	AD	PV
Merseyside	Liverpool					
	Wirral					
	St Helens					
	Knowsley					
	Sefton					
Halton and Warrington	Halton					
	Warrington					
Lancashire	West Lancashire					

KEY	
	Anticipated to make a significant contribution to the sub regional target
	Anticipated to make a good contribution to the sub regional target
	Anticipated to make a moderate contribution to the sub regional target
	Anticipated to make a limited contribution to the sub regional target

FIGURE 2: SUMMARY OF ANTICIPATED ENERGY GENRATION CONTRIBUTION TO SUB REGIONAL TARGETS FOR STUDY AREA

facilities to ensure that they are located and secure their feedstock/ resource supply as sustainably as possible.

2.3 TRANSLATING RENEWABLE ENERGY OPTIONS IN TO DISAGGREGATED TARGETS

The study has provided the initial, strategic assessment of renewable energy potential and feasibility for the study area in the context of the sub regional targets set in the North West RSS.

The table above provides an indication of the likely contributions each individual local authority will make in meeting these targets. This provides the starting point for further investigation in Stage 2, where refined proportions of targets will be identified for each local authority. The refined proportion will be based on more detailed area, site and building specific analysis.

2.4 RENEWABLE ENERGY OPTIONS FOR THE SUB REGION

This section sets out a series of options that provide an initial indication of the most suitable and viable renewable energy options across the study area. This is based on the initial broad assessments completed for this stage of the study and provides the basis for prioritising future areas of research and actions.

2.4.1 Merseyside

Option 1: Large scale wind farm development: The Merseyside areas of Sefton and Wirral have areas of technically unconstrained land that have associated wind speeds above that deemed commercially attractive by the British Wind Energy Association (BWEA). Both authorities are potentially able to site small clusters of large scale wind turbines (i.e. turbines with a capacity of 2.3MW per turbine), which could allow the Merseyside sub region to exceed its target.

Option 2: Large scale wind singular turbine development: If the Merseyside regions of Sefton and Wirral reveal that small cluster wind farm development is unsuitable then singular wind turbine development sites may be viable.

Option 3: District Heating: The district heating potential (i.e. the infrastructure required for delivering heat to multiple buildings from a central heat and power source such as Biomass (CHP) is deemed most applicable to the regions of Liverpool and St Helens, where there are identified heat loads of up to 20MW.

Option 4: Development of Biomass Hub: The study has identified that there is potential to build on the recommendation set out in the Knowsley Renewable and Low Carbon Energy Report for developing a biomass hub. Our research for stage one has identified a number of biomass fuel producers throughout the study area and potential for developing other biomass resources. This option would need to be developed in conjunction with a range of other strategic planning and economic matters such as related to transport and intermodal freight movements in the study area to ensure that the harvesting, processing, transportation and use of biomass fuels is sustainable.

2.4.2 Halton and Warrington

Option 1: Large scale wind singular turbine development: Halton and Warrington is highly constrained technically and has comparatively average lower wind speeds of approximately 6.0m/s, in comparison to the rest of the region. Therefore, it is likely that the remaining target would come from stand alone large scale wind turbine development.

Option 2: District Heating: The district heating potential (i.e. the infrastructure required for delivering heat to multiple buildings from a central heat source such as Biomass CHP) is deemed most applicable for the Warrington area, where there are relatively small but identified heat loads of up to 0.75MW.

2.4.3 West Lancashire

Option 1: Large scale wind farm development: West Lancashire has a relatively high unconstrained land area suitable for wind turbine development that is associated with wind speeds of 6.6m/s – 7.2m/s. It is likely that the remaining target for wind turbine development in this region will come from clusters of large scale wind turbines and possibly a wind farm development.

Option 2: Large scale wind singular turbine development: In the event that further investigation reveals that if West Lancashire is not suitable for wind farm development, then singular wind turbine development sites may be a viable option.

Option 3: District Heating: The district heating potential (i.e. the infrastructure required for delivering heat to multiple buildings from a central heat source such as Biomass CHP) is deemed most applicable for the Ormskirk area, where there are identified heat loads of up to 10MW.

2.5 PLANNING AND STRATEGIC ISSUES

This section sets out the main findings of the Stage 1 study in terms of strategic planning and other corporate considerations for each local authority area. This should be used by each local authority to inform the preparation of their LDFs, prioritise areas for further research and allocate and develop resources to ensure effective delivery. For more details please refer to Section 11. In summary, the issues include:

- The initial IRM assessment demonstrates several opportunities for windfarm and standalone wind turbines in locations that are relatively unconstrained.
- The initial planning assessment has identified that there are inconsistencies across the study area in how each LPA approach the determination of planning applications.
- There are opportunities and challenges for the study area in terms of infrastructure. Local authorities should work in partnership with utilities providers; both individually and collectively to ensure that delivery of sites is as effective as possible and that renewable energy infrastructure is delivered in parallel with other forms of infrastructure.
- There is potential for policy making for planning and in documents that fall outside the planning system remit such as action plans developed for tackling climate change and community strategies.
- Consideration should be given to developing renewable energy and/or CO_2 reduction targets in documents such as Corporate Strategies, Core Strategies, Local Area Agreements and Multi Area Agreements. For Core Strategies and other Local Development Documents (LDD), it is important to understand that the North West Regional Spatial Strategy (RSS) targets for decentralised renewable energy are minimum requirements and must be delivered in order to meet regional and national requirements.
- Each local authority should consider the benefits of standardised approaches to monitoring renewable and low carbon energy schemes across the study area.
- Each local authority should consider the local authority service, financial and labour resource implications of increases in numbers of developments involving renewable and low carbon energy technologies. Local Planning Authorities should clearly set out the extent to which and how they will promote the use of renewable and low carbon technologies. Guidance for developers and householders on the most viable technologies for each borough should also be provided.
- The development of Energy Service Companies (ESCos) is strongly recommended to assist in delivering and operating distributed and integrated building infrastructure. In addition Multi Utility Companies (MUCos) should also be investigated as a mechanism for delivering integrated infrastructure (e.g. energy, utilities, transport and Green Infrastructure).

3. REVIEW OF RENEWABLE ENERGY TARGETS FOR THE STUDY AREA

3.1 INTRODUCTION

One of the critical tasks of Stage 1 is to identify the relevant renewable energy targets. The North West Regional Spatial Strategy (RSS) sets out the original renewable energy targets that affect the study area.

As discussed in section 1.2, the study area is affected by three sub regional areas, each with their own set of targets for different scales and types of renewable energy technologies. Each target provides an energy output (MW) to meet and an indication of the number of schemes required to meet that energy output. The RSS also refers to technologies without setting targets but could make contributions to the overall energy targets.

	2010			2015			2020		
	NUMBER OF SCHEMES (MW)			NUMBER OF SCHEMES (MW)			NUMBER OF SCHEMES (MW)		
	Merseyside	Lancashire	Halton and Warrington	Merseyside	Lancashire	Halton and Warrington	Merseyside	Lancashire	Halton and Warrington
On-shore wind farms/ clusters	2 (15)	11-16 (195)	1 (7.5)	2 (15)	13-20 (232.5)	1 (7.5)	2 (15)	13-20 (232.5)	1 (7.5)
Single large wind turbines	6 (9)	7 (10.5)	2 (3)	10 (15)	11 (16.5)	3 (4.5)	10 (15)	11 (16.5)	3 (4.5)
Small stand-alone wind turbines	8 (0.24)	10 (0.3)	2 (0.06)	12 (0.36)	15 (0.45)	3 (0.09)	12 (0.36)	15 (0.45)	3 (0.09)
Bldg.-mounted micro-wind turbines	190 (0.19)	205 (0.205)	65 (0.065)	1,900 (1.9)	2,050 (2.05)	650 (0.65)	3,800 (3.8)	4,100 (4.1)	1,300 (1.3)
Biomass-fuelled CHP/ electricity schemes	1(4)	1 (9)	1 (2.1)	2 (9)	2 (14)	1 (2.1)	2 (9)	3 (19)	2 (42.1)
Anaerobic digestion of farm biogas	1 (2)	1 (2)	0	1 (2)	3 (6)	0	2 (4)	5 (10)	-
Hydro power	0	2 (0.1)	0	0	2 (0.1)	0	0	2 (0.1)	0
Solar photovoltaics	190 (0.38)	205 (0.41)	65 (0.13)	4,750 (9.5)	5,125 (10.25)	1,625 (3.25)	9,500 (19)	10,250 (20.5)	3,250 (6.5)
Energy from waste									
Landfill gas	7 (13.5)	14 (20.2)	5(34.4)	3 (9.7)	7 (14.3)	2 (30.5)	0	0	0
Sewage Gas	2 (2)	4 (1.2)	2 (1)	2 (2)	4 (1.2)	2 (1)	2 (2)	4 (1.2)	2 (1)
Thermal Treatment of municipal/ industrial waste	0	0	0	0	0	0	1 (40)	1 (40)	1 (10)

TABLE 1: INDICATIVE MERSEYSIDE, LANCASHIRE AND HALTON & WARRINGTON TARGETS FOR GENERATION OF RENEWABLE ENERGY IN THE NWRSS (INCLUDING EXISTING SCHEMES)

NOTE: TECHNOLOGIES FOR WHICH SOLELY REGION-WIDE TARGETS EXIST HAVE BEEN REMOVED FROM THIS TABLE, AS REQUESTED. THESE COMPRISE; BIOMASS CO-FIRING, TIDAL ENERGY & WAVE ENERGY.

3.2 ENSURING A 'SYNERGY OF FIT' BETWEEN THE STUDY AREA AND SUB REGIONAL RENEWABLE ENERGY TARGETS

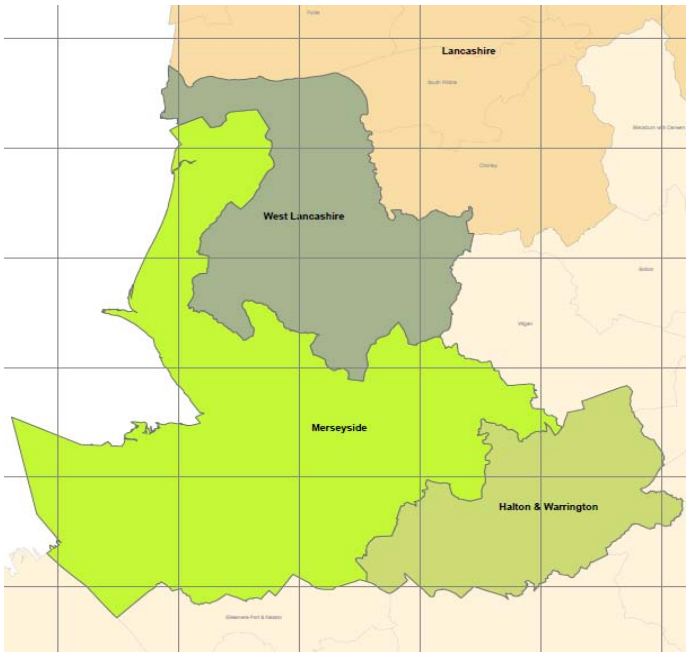


FIGURE 3: THE THREE SUB REGIONAL TARGET AREAS FOR THE STUDY AREA

One of the main issues the study has had to address is the 'fit' between the geographical coverage of the relevant sub regional targets compared to the geographical coverage of the study area.

This identified that the sub regional targets for Merseyside and Halton and Warrington matched the boundaries of the study area, however there was an exception in the case of West Lancashire. Although part of the Liverpool City Region, the local authority area relates to the sub regional targets for Lancashire.

Consequently there was a need to disaggregate the Lancashire sub regional targets to establish an indicative proportion that West Lancashire can contribute to. In order to do this, percentage factors were developed based on the known strategic issues for the borough. The table below shows percentage factors that were applied to West Lancashire for stage 1.

TECHNOLOGY	FACTOR TYPE	DESCRIPTION	FACTOR %
ONSHORE WIND ONSHORE WIND (WIND FARMS, SINGLE LARGE AND SMALL STAND ALONE TURBINES)	Land area	The capacity for onshore wind is constrained by land area and subsequently the area of unconstrained land. Therefore a land area factor was used to identify the proportion of land within West Lancashire in relation to the total area of the Lancashire sub region.	11%
BUILDING INTEGRATED WIND BLDG.-MOUNTED MICRO-WIND TURBINES	Population density	The capacity of building integrated wind is constrained by the amount of buildings in areas of suitable wind speeds and that are not over-shadowed by other buildings and landscape. Therefore a population density factor was used to identify the proportion of buildings within West Lancashire in relation to the total area of the Lancashire sub region.	7%
BIOMASS CHP	Population density	The capacity for biomass CHP is related to heat loads thus is related to the amount of buildings in the area. A population density factor was used to identify the proportion of buildings within West Lancashire in relation to the total area of the Lancashire sub region.	7%
ANAEROBIC DIGESTION (AD)	Land area	The capacity for AD is constrained by the amount of animal waste produced and by extension, the area of agricultural/ farmland need for livestock farming. Therefore a land area factor was used to identify the proportion of land within West Lancashire in relation to the total area of the Lancashire sub region.	11%
PHOTOVOLTAICS (PV)	Population density	The capacity for PV is related to the amount of buildings in the area, as the technology is roof mounted Therefore a population density factor was used to identify the proportion of buildings within West Lancashire in relation to the total area of the Lancashire sub region.	7%

TABLE 2: PERCENTAGE FACTORS APPLIED FOR WEST LANCASHIRE

This approach was considered[1] for all the other component local authorities in the study to provide an initial indication of the likely proportions (by type of technology) each local authority would need to contribute to meet the wider sub regional targets.

Whilst this approach provides a useful, high level means of providing an indicative disaggregation of targets, it is not capable of taking into account specific technical and planning factors. Work will need to be undertaken to look at specific areas, sites and buildings and the nature of the constraints that exist to provide more detailed local information that can be used to inform strategic and local policies in Local Development Frameworks.

3.3 REFINEMENT OF TARGETS

Following the revision to the sub regional targets to ensure they fit the geographical coverage of the study area; further refinements to the targets were undertaken. This followed a three stage approach to identify the residual amount of energy output that still needs to be met over the periods of 2010, 2015 and 2020 in order to meet the targets.

This involved subjecting each of the targets to an update to identify the extent they have been met to date through installed schemes that are now in operation.

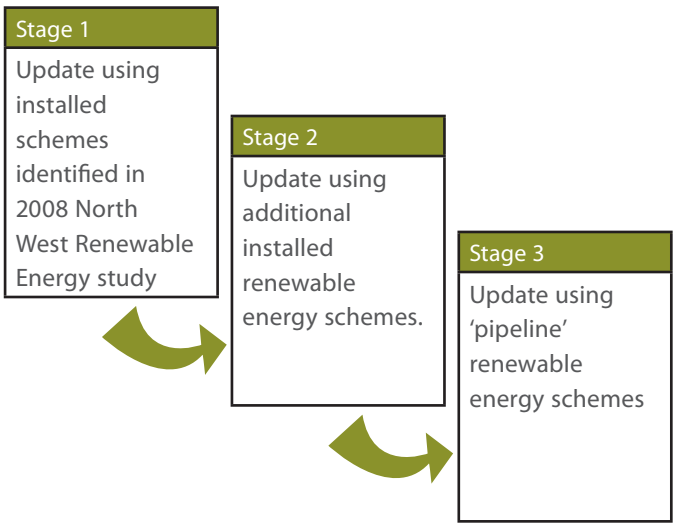


FIGURE 4: BASIC STAGES FOR IDENTIFYING RESIDUAL TARGETS

1 THE USE OF PERCENTAGE FACTORS WAS INITIALLY APPLIED TO SOME OTHER AUTHORITIES IN THE STUDY AREA; HOWEVER AT THIS STAGE OF THE STUDY THE RESULTS WOULD BE MISLEADING AND PROVIDE A UNNECESSARY LAYER OF COMPLEXITY TO THE METHODOLOGY. ARUP CONSIDER THAT FOR THE PURPOSES FOR STAGE 1, THE BEST APPROACH IS TO DEVELOP AN INDICATION OF THE CONTRIBUTION EACH LOCAL AUTHORITY CAN MAKE BASED ON ASSESSMENTS OF TECHNICAL AND PLANNING INFORMATION RATHER THAN JUST LAND AREA AND POPULATION STATISTICS.

Indicative targets that have been refined for the study include:

- On-shore wind
- Building integrated wind
- Biomass Combined Heat and Power (CHP)
- Anaerobic Digestion (AD)
- Hydro power
- Solar PV
- Landfill gas

3.3.1 Stage 1: Assessment against Installed Schemes Identified in the North West Renewable Energy study

To identify the extent to which each target has been met, we have first used the information in the NWDA Broad Locations for renewable energy study, completed in July 2008 by Arup. The study was prepared to identify broad areas for regional renewable energy developments across the region. This work comprised:

- Assessment of existing renewable energy capacity.
- Identification of broad potential and constraints for renewable energy resources.
- Assessment of future energy demand.
- Progress against draft and recommended renewable energy targets.
- Production of a clear set of criteria for the development of renewable energy.
- The identification of broad areas for the development of renewable energy resources.

The information contained in this study led to a number of targets being adjusted to provide the initial indication of the residual targets.

3.3.2 Stage 2: Assessing Against Additional Installed Schemes

Following the first refinement of targets based on the NWDA 2008 study, another update was undertaken to refresh the targets further. This was achieved by reviewing data provided by each of the local authorities on installed and planned schemes since July 2008.

The installed and planned renewable energy scheme capacities have been sourced from the following sources:

- Merseyside Environmental Advisory Service (MEAS): Merseyside EAS provides a range of specialist services to subscribing authorities, including on climate change, renewable and low carbon energy and waste management policy.
- Ofgem: Ofgem holds renewable energy statistics in each country i.e. currently installed, which can be analysed for schemes found in the NW and its sub-regions
- Renewable Energy Association (REA) website: The REA holds information of all currently installed renewable energy schemes by region
- North West RSS Annual Report: Holds all information on schemes in planning and currently installed across the region, which is aligned to BERR's quarterly energy trend reports.

Existing renewable energy schemes throughout the study area have been researched. The following tables display the location and capacities of these schemes. Technologies have not been included where there are energy targets that are either zero, where there is a net reduction in capacity or where RSS targets are set only at a regional level.

An example of regional targets is biomass co-firing such as the Fiddlers Ferry in Warrington. This is a coal-fired power station, however the facility generates up to 10% of its electrical output (approximately 200 MW) from biomass. Nationally the use of biomass at the Fiddlers Ferry power station contributes to the UK Government's carbon reduction target. The supply of electricity purchased from the energy generated from biomass will help achieve the national renewable obligation. Consumers of this 'green' electricity bought from Fiddlers Ferry will enjoy the carbon neutrality of green electricity. However in terms of benefits to the study area (unless consumers of the sub-region purchase this 'green' electricity from the supplier) the carbon reduction achieved by Fiddlers Ferry cannot be claimed by the sub-region.

TECHNOLOGY	PROJECT	RATED CAPACITY (MW)	TOTAL INSTALLED (MW)
Onshore wind	Royal Seaforth Docks	3.6	10
	Extension of Seaforth Docks	6.4	
Building Integrated Wind	Southport Eco Centre	0.02	
Biomass CHP	Mossborough Hall Farm	0.3	0.3
AD	-	-	0
PV	Southport Eco Centre	0.002	0.002

TABLE 3: MERSEYSIDE REGION INSTALLED RENEWABLE ENERGY SYSTEMS

At this stage of the study existing and prospective industrial scale CHP plant within the Halton and Warrington region has not been extensively identified. However, it is noted that industrial areas such as Weston Point, Astmoor, Manor Park and West Bank industrial estates offer particular prospects for CHP (where they do not already exist). For example the PDM Group Granox Ltd CHP plant utilises animal processing by-products as the fuel feed stock to generate process heat and electricity.

TECHNOLOGY	PROJECT	RATED CAPACITY (MW)	TOTAL INSTALLED (MW)
Onshore wind	NWDA	0.02	0.02
Biomass CHP	PDM Group Widnes	9.5	9.5
	PDM Granox Stage 2	14	14
AD	-	-	0
PV	-	-	0

TABLE 4: HALTON & WARRINGTON REGION INSTALLED RENEWABLE ENERGY SCHEMES

TECHNOLOGY	PROJECT	RATED CAPACITY (MW)	POTENTIAL TOTAL INSTALLED (MW)
Building Integrated Wind	Ashworth	0.006	0.012
	Plantation Cottage	0.006	
Biomass CHP	-	-	0
AD	-	-	0
PV	Sparky	0.003	0.006
	College	0.002	
	Hamnet	0.001	
Hydro Power	-	-	0

TABLE 5: WEST LANCASHIRE REGION INSTALLED RENEWABLE ENERGY SCHEMES

3.3.3 Stage 3: Assessment of 'Pipeline' Schemes

Following the completion of stages 1 and 2, information on planned renewable energy schemes received from each of the local authorities in the study area were also considered. This provides an indication of the potential schemes that can be anticipated to come forward in the foreseeable future and the potential energy output that could be achieved. This will inform the future disaggregation of targets for each local authority, and provide a steer on the energy outputs needed from each local authority to meet the minimum energy outputs needed.

The following tables display the location and capacities of these proposed schemes. Again, technologies for which energy targets are either zero or for which a net reduction in capacity is targeted have not been included in these tables.

TECHNOLOGY	PROJECT	RATED CAPACITY (MW)	POTENTIAL TOTAL INSTALLED (MW)
Onshore wind	Sainsburys Distribution Centre	1.2	1.2
Bulding Integrated Wind	St James Primary	0.0032	0.03
	Greenbank High School	0.006	
	Windle Farm	0.0032	
	Eden Close	0.006	
	Marian Avenue	0.002	
	Tesco	0.0036	
	Lyme Primary School	0.006	
Biomass CHP			0
AD	-	-	0
PV	-	-	0

TABLE 6: MERSEYSIDE REGION PLANNED RENEWABLE ENERGY SCHEMES

TECHNOLOGY	PROJECT	RATED CAPACITY (MW)	TOTAL INSTALLED (MW)
Bulding Integrated Wind	Tesco Winwick Rd	0.006	0.012
	Fiddlers Ferry	0.006	
Biomass CHP	PDM Granox Stage 2	14	14
AD	-	-	0
PV	-	-	0

TABLE 7: HALTON & WARRINGTON REGION PLANNED RENEWABLE ENERGY SCHEMES

TECHNOLOGY	PROJECT	RATED CAPACITY (MW)	TOTAL INSTALLED (MW)
Bulding Integrated Wind	The Beeches	0.0032	0.037
	Spurwood Cottages	0.0032	
	Moss Lane	0.0032	
	Rimington	0.006	
	Ivy House	0.0032	
	Gorse Hill	0.015	
	West View	0.0032	
Biomass CHP	-	-	0
AD	-	-	0
PV	-	-	0
Hydro Power	-	-	0

TABLE 8: WEST LANCASHIRE REGION PLANNED RENEWABLE ENERGY SCHEMES

3.4 UPDATING THE SUB REGIONAL TARGETS

Following the completion of the three stage update of the original target capacities for each sub-region, the residual targets have been calculated. These are presented in table 9, which sets the new targets that will need to be met (subject to all installed schemes continuing to maintain their energy output and all pipeline schemes identified being delivered and becoming fully operational).

As with the original stated targets, the capacities displayed here are cumulative. The extents to which each local authority can contribute toward these refined sub-regional renewable energy targets is analysed within sections 9 and 10.

TECHNOLOGY	MERSEYSIDE			HALTON AND WARRINGTON			WEST LANCASHIRE		
TARGET	2010 (MW)	2015 (MW)	2020 (MW)	2010 (MW)	2015 (MW)	2020 (MW)	2010 (MW)	2015 (MW)	2020 (MW)
ONSHORE WIND (WIND FARMS, SINGLE LARGE AND SMALL STAND ALONE TURBINES)	13.04	19.16	19.16	10.54	12.07	12.07	22.64	27.44	27.44
BUILDING INTEGRATED WIND	0.14	1.85	3.75	0.06	0.65	1.3	- 0.03	0.09	0.24
BIOMASS CHP	3.7	8.7	8.7	- 21.4	-21.4	18.6	0.63	0.98	1.33
AD	2	2	4	0	0	0	0.22	0.66	1.10
PV	0.38	9.5	19	0.13	3.25	6.5	0.02	0.71	1.43
HYDRO POWER	0	0	0	0	0	0	0	0	0

TABLE 9: RENEWABLE ENERGY TARGETS FOR NEW MERSEYSIDE, HALTON & WARRINGTON AND WEST LANCASHIRE SUB REGIONAL SCHEMES TAKING KNOWN SCHEMES INTO ACCOUNT

4. STRATEGIC PLANNING ASSESSMENT

4.1 INTRODUCTION

This section presents an overview of existing and emerging policy frameworks and technical information relating to renewable energy and how this relates to the study area. The review covers international, national, regional and sub regional documents and provides a starting point for understanding the study area's renewable energy potential capacity.

This begins to demonstrate how, through effective policy making, each local authority can develop its emerging Local Development Framework (LDF) (and other strategies) to ensure that stakeholders have a greater level of understanding and certainty when planning and delivering renewable energy schemes through new development. More information on the policies and the review are available in Appendix B and the main findings and recommendations are presented in Section 10 and summarised in Section 2.

4.2 ESSENTIAL POLICY CONSIDERATIONS

In 2007, the UK and other European Union member states committed to ensuring that 20% of the EU's energy will come from renewable sources by 2020. The European Commission Directive on Renewable Energy[1] reaffirms this commitment, stating that the UK should aim to produce 15% of its energy from renewable sources by 2020, from a baseline of 1.3% in 2005. A discussion in relation to renewable energy targets is provided in Appendix C.

1 EUROPEAN UNION, 2009, 'DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON THE PROMOTION OF THE USE OF ENERGY FROM RENEWABLE SOURCES AMENDING AND SUBSEQUENTLY REPEALING DIRECTIVES 2001/77/EC AND 2003/30/EC'.

What do we mean by Renewable Energy?

The term Renewable Energy, as used in the EC Directive, incorporates renewable electricity, renewable heat and renewable transport fuels. In the UK renewable electricity is far more advanced than renewable heat and renewable transport fuels. Therefore, the Renewable Energy Strategy[2] recognises that this means that to meet the EC Directive 15% renewable energy target, the UK would need to generate around 30-35% of its electricity from renewable sources.

At the national and regional level there are a large number of policy drivers for renewable energy technologies and developments. This includes the:

- The Planning and Energy Act 2008[3]: which emphasises a national need for diversity in energy production with renewable energy being a key component to the country's overall energy requirements.
- Renewable Energy Strategy 2009: this sets out the UK's renewable energy targets and suggests a wide range of potential measures to deliver them. This includes, but is not limited to:
  - › extending the Renewables Obligation to encourage up to 30- 35% of our electricity to come from renewable sources by 2020;
  - › delivering financial incentives to encourage a very large increase in renewable heat and small-scale heat and electricity technologies in homes and buildings;

2 BERR, 2009, 'UK RENEWABLE ENERGY STRATEGY'.

3 HM GOVERNMENT, 2008, 'ENERGY ACT 2008'.

- exploiting the full potential of energy from waste, by discouraging the disposal of biomass to landfill as far as is practical;
- requiring all biofuels to meet strict sustainability criteria; and
- maximising the benefits for UK business and jobs, by providing a clear long-term policy framework to tackle key blockages, considering support for specific technologies and addressing skills shortages.

- The Renewables Obligation (RO) was introduced in 2002 and is designed to incentivise the generation of electricity from renewable sources in the United Kingdom. The RO places an obligation on electricity suppliers to ensure an increasing proportion of its electricity is from renewable sources. Suppliers meet their obligations by presenting Renewables Obligation Certificates (ROCs). Where suppliers do not have sufficient ROCs to cover their obligation, a payment is made into the buy-out fund at a fixed price per MWh shortfall which is adjusted each year. The proceeds of the buy-out fund are paid back to suppliers in proportion to how many ROCs they have. For example, if they were to submit 10% of the total number of ROCs submitted by suppliers they would receive 10% of the total funds that defaulting supply companies pay into the buy-out fund.
- The National Microgeneration Strategy[4] aims to create conditions in which microgeneration is a realistic alternative or supplementary energy generation source, for individual householders, the wider community and small businesses.
- The Supplement to Planning Policy Statement 1 'Planning and Climate Change' (PPS1 Supplement)[5]: requires that Local Planning Authorities (LPA) consider the potential for renewable energy generation in policy development and planning application decisions. The statement also requires that when setting renewable energy targets, LPAs should:
  - Ensure proposals are evidence-based and viable, with regard to the costs of bringing sites to the market;
  - Ensure targets on housing development do not inhibit the provision of housing development as set out in PPS3;
  - Set out how LPAs intend to advise potential developers on the implementation of the local requirements, and how these will be monitored and enforced; and
  - Develop site-specific renewable energy targets, where appropriate.
- Planning Policy Statement 22 'Renewable Energy' (PPS22)[6]: which promotes renewable energy developments and recognises that renewable energy can contribute to all four elements of the Government's Sustainable Development Strategy[7].
- The North West Climate Change Action Plan (NWCCAP)[8]: sets out a Plan for how the North West can meet its renewable energy targets.
- The North West Regional Spatial Strategy (NWRSS): provides the basis for determining new development for renewable energy. It interprets national policy in terms of what this means to the region and builds on the NWCCAP by setting out targets for Merseyside, Halton & Warrington and Lancashire. These targets provide the starting point for each Local authority developing its options for its LDF.

4.3 FEED IN TARIFFS

As part of the Department of Energy & Climate Changes (DECC)'s recent consultation document concerning renewable electricity financial incentives, Feed-in Tariffs (FiTs) were introduced as a support mechanism for distributed and small-scale electricity. Due to come into effect from April 2010, FiTs will apply for installations of up to 5 MW generation capacity.

The following structure has been proposed for FiTs.

- Generation Tariff – referring to a fixed payment from the local electricity supplier for every kWh generated.
- Export Tariff – another payment in addition to the generation tariff for every kWh exported to the wider electricity market.

4 BERR, 2006, OUR ENERGY CHALLENGE: MICROGENERATION STRATEGY: POWER FROM THE PEOPLE, HTTP://WWW.BERR.GOV.UK/ENERGY/SOURCES/SUSTAINABLE/MICROGENERATION/STRATEGY/PAGE27594.HTML.

5 COMMUNITIES AND LOCAL GOVERNMENT, 2007, 'PLANNING POLICY STATEMENT: PLANNING AND CLIMATE CHANGE – SUPPLEMENT TO PLANNING POLICY STATEMENT 1'.

6 COMMUNITIES AND LOCAL GOVERNMENT, 2004, 'PLANNING POLICY STATEMENT 22: RENEWABLE ENERGY'.

7 HM GOVERNMENT, 2005, 'SECURING THE FUTURE: DELIVERING UK SUSTAINABLE DEVELOPMENT STRATEGY'.

8 NWDA, GONW, NWRA AND EA, 2006, 'RISING TO THE CHALLENGE: A CLIMATE CHANGE ACTION PLAN FOR ENGLAND'S NORTHWEST'

Key Points about FiTs

- FiTs will be payable from April 2010 to installed generation capacities of up to 5 MW for a selected set of Renewable Technologies
- Despite the term "Feed-in", FiTs do not solely cover the small-scale generation of electricity for export to the grid
- Support currently available under the RO scheme for installations of 50 kW and below will be substituted by FiTs support if the technology involved is eligible FiTs
- All other instances of existing RO support will be unaffected by the introduction of FiTs
- Current proposed generation tariffs will be finalised only once a fixed export price has been established
- Further information on FiTs can be obtained via the following page of the DECC homepage: http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

4.3.1 Applicable Technologies

FiTs are intended primarily to support the widespread deployment of proven small-scale low-carbon generation technologies up to 2020, rather than to support the development of unproven technologies. As such, tariffs will only be offered to the following technologies, deemed realistic and effective to be deployed in the short term.

- Wind
- Solar PV
- Hydro
- Anaerobic digestion
- Biomass / Biomass CHP
- Non-renewable CHP

4.3.2 Tariff Lifetimes

Under current proposals, tariffs will be paid for a period of 20 years for new projects, though it has been acknowledged that shorter term tariffs may be appropriate for technologies with typical lifetimes of under 20 years.

4.3.3 Degression

In order to reflect the expected decreases in renewable technology costs over time, degression of FiTs is proposed, referring to an annual percentage reduction in tariff amounts.

Degression rates will vary between both technologies and scales of generation, in line with the predicted variations in related cost reduction.

TECHNOLOGY	SCALE	PROPOSED INITIAL TARIFF (PENCE/KWH)	ANNUAL DEGRESSION (%)
ANAEROBIC DIGESTION	Electricity only	9.0	0
ANAEROBIC DIGESTION	CHP	11.5	0
BIOMASS	<50 kW	9.0	0
BIOMASS	50 kW – 5 MW	4.5	0
BIOMASS	CHP	9.0	0
HYDRO	< 10 kW	17.0	0
HYDRO	10 - 100 kW	12.0	0
HYDRO	100 kW - 1 MW	8.5	0
HYDRO	1 - 5 MW	4.5	0
PV	< 4 kW (new build)	31.0	7
PV	< 4 kW (retrofit)	36.5	7
PV	4 - 10 kW	31.0	7
PV	10 - 100 kW	28.0	7
PV	100 kW - 5 MW	26.0	7
PV	Stand alone system	26.0	7
WIND	< 1.5 kW	30.5	4
WIND	1.5 - 15 kW	23.0	3
WIND	15 - 50 kW	20.5	3
WIND	50 - 250kW	18.0	0
WIND	250 - 500 kW	16.0	0
WIND	500 kW - 5 MW	4.5	0
EXISTING MICRO-GENERATION TRANSFERRED FROM RO		9.0	N/A

TABLE 10: ANTICIPATED FEED IN TARIFFS TO BE INTRODUCED IN 2010

4.3.4 Uplift for CHP

It is proposed that once the Renewable Heat Incentive (RHI) is implemented, heat output from CHP installations will be accordingly rewarded under the RHI. However, as an interim measure, initial FiTs for CHP generators will include an uplift comparable to that which currently applies under the RO.

4.3.5 Generation Tariffs for 1st year of FiTs (2010-11)

These generation tariff values have been developed based on an assumed guaranteed export price of 5 pence/kWh.

4.3.6 Export Tariff Value

Consultation is ongoing with respect to the appropriate fixed export price for small scale generated electricity. Currently, this is intended to represent a value between the minimum price paid for unplanned exports (the "spill price") and the retail price.

As stated above, an assumption of export price has been made in order to compile generation tariff values. These values will be subsequently adjusted once a fixed export price is established.

Many of the policy frameworks mentioned above are set out in more detail in Appendix B.

4.4 MOVING RENEWABLE ENERGY POLICY FORWARD

In addition to the strategic policy review of national and regional policy, best practice examples of existing planning policies prepared by local authorities are included. These examples demonstrate the extent policies have been developed within existing national and regional policy frameworks discussed in Appendix B. They provide a useful point of reference and guidance for how each local authority should move forward in renewable energy policy terms.

To help supplement the planning policy review, this study also includes a broad, strategic assessment of planning constraints across the sub region. This provides initial indications of what the critical constraints are. It also demonstrates the need for planners to have a holistic understanding when determining planning applications that involve different scales of technologies. Details of the best practice review are available in Appendix B, with detailed recommendations set out in Section 10 and summarised in Section 2.

4.5 SPATIAL AND LAND REQUIREMENTS

4.5.1 Identifying the wider spatial considerations

The North West RSS has identified land requirements for housing and employment development during 2003 – 2021. This amounts to over 92,000 homes being required across the study area and approximately 494 hectares of land for employment purposes in Merseyside alone.

LOCAL AUTHORITY	RSS HOUSING NUMBERS	GROWTH POINT INCREASE ON NUMBERS 2008 - 2016/17
KNOWSLEY	8,100	
LIVERPOOL	35,100	4,110
WIRRAL	9,000	
HALTON	9,000	5,706
ST HELENS	10,260	
WARRINGTON	6,840	
SEFTON	9,000	
WEST LANCASHIRE	5,400	
TOTALS	92,700	9,816

TABLE 11: RSS HOUSING NUMBERS AND SECOND ROUND GROWTH POINTS

SOURCE: NORTHWEST RSS HOUSING TARGETS AND CLG SECOND ROUND GROWTH POINTS

One of the most significant issues for the study area when planning for renewable energy infrastructure is the Growth Point status for a number of the boroughs (i.e. Halton, St Helens and Warrington, Wirral and Liverpool). The targets set for these Second Round Growth Points equate to a total of 45,216 dwellings being delivered between 2008 and 2016/17. This represents a total of 9,816 additional dwellings to the targets set in the North West RSS which should be delivered at an increased rate to the annual averages set out in the RSS.

Consequently, the implications of this anticipated growth present significant challenges for the sub region and each of its component local authorities. These challenges relate to availability of land, potential development pressures caused by competing demands and the need to provide critical infrastructure to both facilitate the delivery of development and the subsequent demand for energy this will create. The anticipated rate of new development growth will put significant stresses on all forms of infrastructure, including that relating to energy provision. It will therefore be essential that each borough works to ensure that overall energy needs and consumption are reduced through the application of appropriate planning and climate change policies.

4.5.2 Considering Land Requirements and the Development of Renewable Energy Options

It is inevitable that renewable energy will have some implications for land use planning. This will need to be considered within emerging Local Development Frameworks (LDF), within which each local authority will need to identify competing demands for land, where there are opportunities to integrate renewable energy infrastructure with neighboring local authorities and whether land requirements could potentially threaten and/or can constrain the development or protection of land.

In determining the viable options for the study area it will be particularly important to consider the energy requirements for the area, the type of sites required for the scale of technology involved and their location. Whilst it is likely that some options will require new land to be identified and allocated there will also be opportunities within each local authority to look at options that could potentially reduce or negate the need for new land allocations. The need to identify the potential land requirements for all the options is a critical issue for each local authority and the study area as a whole and will need to be fully understood when developing renewable energy options within LDFs. These implications are likely to be in terms

of the immediate land requirements for new housing and employment development and the renewable and low carbon energy technologies required to sustain them. In basic terms, a key consideration that in the past has been used to determine if certain renewable energy options are land 'hungry' or can be implemented without the need for new land to be identified for this use. Historically there have been increasing pressures on land as the planning system has sought to concentrate development in existing urban areas and on land that has been previously developed. This has often led to increasing land values and higher densities of development. However the recent economic downturn has had a significant impact on this trend and there is uncertainty about how sustainable development and economic growth will be achieved in the future.

A clear understanding of the different types of renewable technologies is critical to determining if certain options would complement or constrain the delivery of other land uses and whether there are opportunities for integration with other forms of development. Section 9 provides an initial indication of the suitability of land and the built environment for delivering distributed and integrated energy schemes. This initial assessment will need to be addressed in more detail in Stage 2 of the commission, so that site specific opportunities and potential land allocations are achievable and/ or if policies supporting its development and integration with other uses are required.

5. RENEWABLE ENERGY AND THE ECONOMY

5.1 INTRODUCTION

This section provides a strategic overview of the economic and employment opportunities for the study area. At the core of this section is a review of the Economic Impact of EU and UK Climate Change Legislation on Liverpool and Liverpool City Region, also known as the Mini-Stern. This provides the most recent evidence for economic and employment opportunities in the city region and is discussed in the context of developing a renewable energy sector in the study area. In considering this, however, it is important to note that the geographic coverage of the Mini -Stern does not cover the areas of West Lancashire and Warrington.

5.2 CONTEXT

There is a rapidly growing evidence base that indicates renewable energy will play an increasingly important role in the future economy in the UK and across this study area/ sub region. Unit cost of energy is likely to increase to cover the costs of what is recognised as the need to de-carbonise grid supplied electricity through Carbon Capture and Storage (CCS), off-shore wind turbine developments and nuclear power station replacement. Higher energy prices, in particular that of electricity, is therefore likely to make investment in local low and zero carbon infrastructure and energy efficiency more competitive.

Energy is critical to the smooth functioning of the economy, and is closely correlated with economic output. The reliance on fossil fuels together with supply side conditions in energy markets lead to fluctuations in the energy prices which are potentially damaging to economic performance. Economic literature demonstrates the close link between high energy prices and recessions: high energy prices tend to lead economic downturns. Energy price volatility and issues in supply are forecast to worsen in future years. Renewable energy implementation could potentially mitigate the negative effects of climate change and at the same time lead to considerable economic benefits.

There is a risk that the current economic downturn could stall the momentum that has and could be achieved. It is well recognised that investment in renewable energy could provide a stimulus to the economy, both in the short and long term[1]. The concern is that, without direction, the market will fail to deliver the required levels of investment. Therefore the Government has introduced wide ranging interventions and targets. It has set up a complex framework of regulations and incentives ranging from marketing campaigns and grants to the introduction of Energy Performance Certificates for many public and commercial buildings. These are issues that will need to be considered comprehensively when implementing future policy for across the study area.

5.3 RECOGNISING THE DRIVERS FOR A LOW CARBON ECONOMY

It should be recognised that when considering the role of renewable energy in future economic growth it is more than simply planning for the recovery from

1 SEE, FOR EXAMPLE: "AN OUTLINE OF THE CASE FOR A GREEN STIMULUS", CENTRE FOR CLIMATE CHANGE ECONOMICS AND POLICY, "CREATING GREEN JOBS: DEVELOPING LOCAL LOW-CARBON ECONOMIES", LOCAL GOVERNMENT ASSOCIATION AND "A GLOBAL GREEN NEW DEAL", UNITED NATIONS ENVIRONMENT BRANCH (UNEP)

recession. The economic downturn has highlighted the need for a significant change in the structure of the global economy and reinforced the realisation of key drivers that we must address when planning for the future. The Government's publication Building Britain's Future: New Industry, New Jobs, published in April 2009 builds on the Green New Deal (see Appendix F) and sets out critical drivers that will shape the future economy, which the Liverpool City Region and Warrington will need to consider. These include:

- Rising incomes: emerging economies will provide increasing opportunities for UK businesses[2]
- Low carbon and greater resource efficiency: moving to low carbon economies and ensuring that the economy is resource efficient and resilient to the effects of climate change will require a structural transformation in how energy is generated.
- New technologies: will be a driver for consumer and business demand.
- Demographics: new demographic patterns will change markets in both the developed and the developing world. An ageing population is one of the sub region's biggest sustainability issues with the ratio of older people to working age population increasing having implications on our social, environmental and economic infrastructure.

The latest national strategy[3] identifies that in order to address these drivers effectively a clear programme for adapting Britain's energy grid is needed to ensure homes and businesses are linked to the new forms of power generation. In addition there will be a driver towards integrated infrastructure

Local Authorities and regional bodies now have a role to play to deliver at a local level. Therefore it is essential that there is a clear understanding of the implications for renewable energy and how it will fit into the wider economic structure. This should be both in terms of the constraints but more importantly the opportunities for the study area. A detailed overview of key economic drivers and opportunities for each local authority, the important economic policy considerations (in addition to those already referred to in this section) such as the Stern Review and Green New Deal are set out in Appendix F. These provide the context for developing a renewable energy sector with more detail set out in the main body of the report via a review of the Mini Stern for the Liverpool City Region[4].

2 BERR (2009) ECONOMICS PAPER NO. 5: CHINA AND INDIA – OPPORTUNITIES AND CHALLENGES FOR UK BUSINESS, HTTP://WWW.BERR.GOV.UK/FILES/FILE50349.PDF

3 BUILDING BRITAIN'S FUTURE: NEW INDUSTRY, NEW JOBS

4 THE ECONOMIC IMPACT OF EU AND UK CLIMATE CHANGE LEGISLATION ON LIVERPOOL AND THE LIVERPOOL CITY REGION

In order to achieve a low carbon economy, it is likely that incentives will be needed to encourage the necessary investment needed to make the local offer competitive and attractive to the private sector. As recently as August 2009[5], the fledgling renewable energy industry in the UK has demonstrated that the country needs to develop better business environments for the sector to develop sustainably. Currently conditions in the UK are not favourable and there is a risk that companies will prefer to establish production elsewhere.

5.4 BUILDING A CASE FOR DEVELOPING RENEWABLE ENERGY SKILLS

The national approach is to continue focus on ensuring that the UK economy is driven by high levels of skills and creativity and barriers to this should be regarded as significant issues that must be addressed urgently. There must also be a very strong focus on technological changes and the impacts this has on shaping new markets, implications on existing ones and the impacts on skills requirements. This issue will be particularly relevant to renewable energy as new technologies are developed and tested it will be important that the renewable energy businesses in the sub region align themselves to technologies that become commercially viable.

The national strategy will be to ensure high skilled workforces are available for innovative business whilst systematically addressing Britain's comparative weakness in low and intermediate skills, and in specific skills such as handling information technology. The approach is to follow a demand-led skills system that responds on the recommendations of the Leitch Report[6] and meets business needs in a timely way.

To help ensure this, Government intends to provide certainty to business in the emerging markets so that

5 IN AUGUST 2009, THE DANISH WIND FARM COMPANY VESTAS LOCATED ON THE ISLE OF WIGHT MADE MORE THAN 400 UK EMPLOYEES REDUNDANT. THE COMPANY'S CEO, DITVEL ENGES CITED THE UK'S PLANNING LAW AS THE MAIN ISSUE FOR MAKING OPERATION IN THE UK COMMERCIALLY UNVIABLE. HE STATED "IN THE UK, THERE IS A CLEAR DIVISION BETWEEN WHAT THE GOVERNMENT WOULD LIKE TO SEE HAPPENING AND WHAT CERTAIN LOCAL POLITICIANS WANT TO SEE HAPPENING, OR RATHER NOT WANT TO SEE HAPPENING ... THERE IS NOT NECESSARILY THE SAME AMBITION LEVELS," HE SAID, ADDING THE GOVERNMENT NEEDED TO INVEST IN THE ELECTRICITY TRANSMISSION GRID TO MAKE IT MORE FRIENDLY TO WIND ENERGY. SOURCE: HTTP://WWW.GUARDIAN.CO.UK/ENVIRONMENT/2009/AUG/12/VESTAS-FACTORY-CLOSES-DESPITE-CAMPAIGN

6 DIUS (2007) WORLD CLASS SKILLS: IMPLEMENTING THE LEITCH REVIEW OF SKILLS IN ENGLAND, HTTP://WWW.DCSF.GOV.UK/FURTHEREDUCATION/UPLOADS/DOCUMENTS/FINALLEITCHWORLDCLASSSKILLS.PDF

economic restructuring is as effective as possible. It highlights renewable energy as an example of a market that will help achieve economic stability. To achieve this the Government aims to incentivise and facilitate technologies through regulation, taxation or other action that will fundamentally shape the nature of consumer and business demand in the economy, and thus business planning and investment.

The skills requirements for renewable energy sectors are a fundamental part of the wider supply chain for the delivering renewable energy. Nationally the industry has been characterised by Small/ Medium Enterprises (SME) that have a workforce made up of highly skilled professionals, with strong academic and vocational levels of qualifications. A recent report produced by BERR[7] sets out the main issues to address at a national level. One of the fundamental issues identified was the availability of skills in meeting the country's energy challenge[8]. Increasing demand for energy, an ageing workforce, problems with worklessness and a lack of new entrants to the energy industry in general are combining to potentially constrain how effectively renewable energy could be delivered across the country. The BERR report identifies that although there is likely to be an adequate supply of labour educated to degree level and willing to enter the renewables sector, there is a general opinion within the industry that there is a lack of experienced staff. However, this is not an issue specific to the renewable energy industry. The number of students accepting places on electrical engineering degrees having fallen by almost 30% over the last decade, reflecting the low appeal of the engineering profession[9]. Consequently, because of these shortages there is a high level of cross-sector competition for experienced staff and employment retention is a problem.

The impact of the economic downturn has had a surprising affect on the industry. Job losses from large companies are providing a supply of skills to the renewable energy industry with significant recruitment in terms of financial skills and confidence within the recruitment sector that the renewable energy market is a growing and stable market. Despite this strength the industry still struggles to recruit experienced people in the renewable energy sector and high vacancy levels are often evident[10].

7 REPORT ON SUPPLY CHAIN CONSTRAINTS ON THE DEPLOYMENT OF RENEWABLE ELECTRICITY TECHNOLOGIES

8 ENERGY WHITE PAPER: 'MEETING THE ENERGY CHALLENGE'

9 WWW.CAREERSINRENEWABLES.CO.UK/SKILLS.HTM

10 SPECIAL REPORT: CLOSING THE SKILLS GAP IN RENEWABLE ENERGY WWW.NEWENERGYFOCUS.COM 8 NOVEMBER 2008.

Building Britain's Future: New Industry, New Jobs identifies advanced manufacturing as another critical sector where the UK needs to retain and adapt existing skills to meet emerging sector requirements. There are a range of new industrial technologies in manufacturing in which strong UK capabilities exist and are particularly well suited to the study area (and the boroughs it is closely affiliated to). This should become a priority for Government support. Key industrial areas include aerospace, where there will be a shift from metal to composite materials, and the industrial biotechnology sector which represents a move from the chemical industry, which is based on oil, to one based on renewable and biological substances and developing plastic electronics.

5.5 THE MINI-STERN FOR LIVERPOOL AND THE LIVERPOOL CITY REGION

The Liverpool City Region economy faces major challenges from current and future climate change legislation and regulation that is needed to push the UK to become a low carbon economy. Although the area is not a particularly large producer of carbon dioxide gases (CO_2) compared to other parts of the UK, by 2020 the costs to businesses and public sector bodies of not adjusting and adapting could amount to 1% of the area's GVA. There are 90,000 jobs (15% of all current employment) in sectors that are likely to be significantly affected.

The Mini-Stern identified significant assets that should be used to develop a renewable energy sector. These include the use of suitable natural assets to respond to opportunities, for example tidal energy and on - shore and off - shore wind energy generation. There is also an emerging presence of Energy from Waste (EfW) facilities across the sub region as well as biomass production.

The Mini-Stern identifies significant opportunities for action with work already happening in the Liverpool City Region, with the Carbon Trust and Enworks working with firms to help tackle resource efficiency and a number of local authority-led initiatives. This has highlighted the need to decouple the link between economic growth and carbon emissions and the need to explore a range of low carbon opportunities (for full details of the proposed low carbon opportunities please see Appendix F). When considering the existing work and potential areas of exploration, the employment opportunities and skills requirements become even wider reaching than just a focus on high level skills. Based on national forecasts, the Mini Stern reports that the city region could see 6,000

to 7,000 new jobs in the energy and environmental technology and service sector emerge in the next 5 to 7 years.

5.5.1 Growth in the City Region

The study area already has a strong Environmental Technologies and Services sector (ETS) that has growth potential and specific opportunities through Waste Management and Recycling (currently around 4,000 jobs[11]). There are also opportunities for diversification through Energy from Waste (EfW) and examples of very innovative businesses including social enterprises in the study area. Renewable Energy (currently 800 jobs) has significant potential particularly in servicing off-shore wind and any future tidal energy schemes. The Mini-Stern also identifies Energy Management (currently 800 jobs) as a sector is likely to benefit from increased demand for energy efficiency across a range of sectors.

However these projections could be expanded even further, the wider job and skills indirectly affected are accounted for. When these are considered it becomes clear that the renewable energy sector could provide a much wider range of jobs and diversity of skills requirements that go beyond what is typically linked to the industry. An indicative (and not exhaustive) list includes:

- Training and education providers
- Construction workers – equipment operators, labourers and project managers etc;
- Engineers of all types including environmental, civil, chemical etc;
- Welders and fabricators , Electricians and electrical equipment assemblers and technicians;
- Plumbers, heating and cooling engineers/ installers and insulation installers
- Scaffolders, Roofers, Concrete Producers;

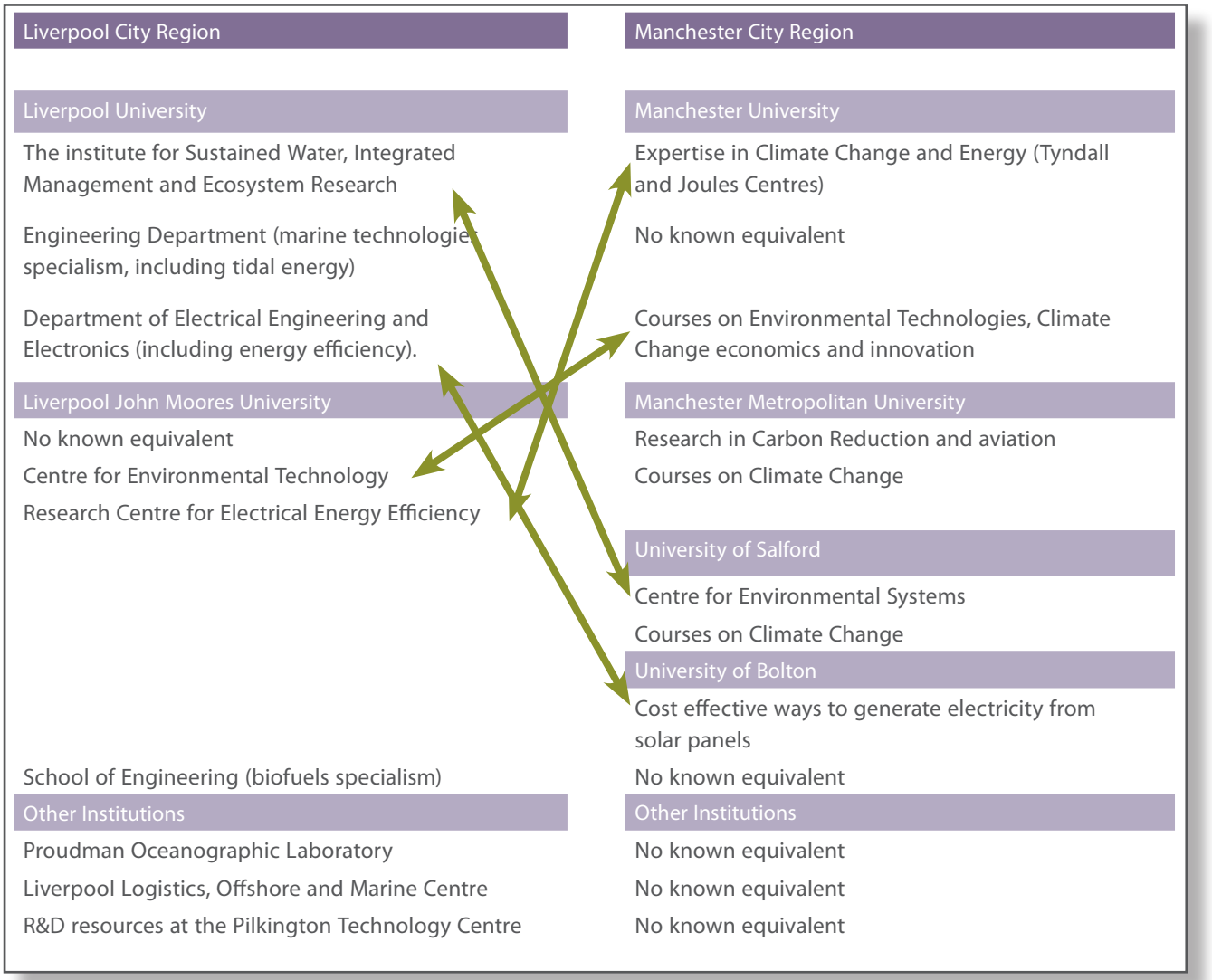


FIGURE 5: DIAGRAM INDICATING KNOWLEDGE ASSETS FOR LIVERPOOL AND MANCHESTER CITY REGIONS. GREEN ARROWS INDICATE WHERE COMMON ASSETS EXIST

11 JOB ESTIMATES BASED ON INFORMATION PROVIDED BY ENVIROLINK

- Drivers of all modes of transport;
- Marine Engineers; Deep sea divers; and
- Agricultural and forestry workers.

5.5.2 Recognising Competition in the Region

Globalisation will continue to be at the heart of future economic restructuring and growth. In terms of developing the Renewable Energy sector in the UK there is already a need for 'catch up' when comparing the strength of the sector in countries such as Denmark and Germany. However the Liverpool City Region and Warrington are in a strong position to achieve growth and contribute, with over 40 renewable energy companies' identified in the study area employing around 820 people.

In addition the city region hosts highly regarded research and development (R&D) expertise which gives the Liverpool City Region an advantage in capitalising on opportunities, and addressing the need for mitigation, presented by climate change legislation.

This provides the sub region with a long term position for sector growth provided the sub region retains the skills developed. Assets include the Proudman Oceanographic Laboratory, Liverpool University which provides climate change research, the Institute for Sustained Water, Integrated Management and Ecosystem Research, an Engineering Department (marine technologies specialism, including tidal energy) and Department of Electrical Engineering and Electronics (including energy efficiency). Liverpool John Moores University also has the Centre for Environmental Technology, Research Centre for Electrical Energy Efficiency, School of Engineering (biofuels specialism) and the Liverpool Logistics, Offshore and Marine Centre.

In addition there is also R&D resources at the Pilkington Technology Centre which is located in the study area. The centre is developing glass technology for large scale solar farm applications with potential manufacturing capacity for Photovoltaics at its factories in St Helens.

Historically the main economic competition to the Liverpool City Region and its close neighbours within the North West is from Greater Manchester. Greater Manchester is comprised of 10 Local authority areas with the city of Manchester providing the economic 'engine' of the sub region.

The Mini- Stern for Manchester was published in August 2008 and refers to the likely assets within the Manchester City Region that will help assist the growth of a low carbon economy. This provides an indication of where there is likely to be strategic opportunities for Liverpool City Region to capitalise and areas where it is likely to compete with the assets in Greater Manchester and will need to plan accordingly to ensure its offer will be effective in contributing to a renewable energy sector for the sub region.

Assessment of these assets highlights the potential for the city region to consider the potential of knowledge clusters. Of particular note are the three assets where the Manchester City Region does not have a similar offer and identifies opportunities where links between knowledge with manufacturing, distribution cluster and development of installation sectors could provide the city region with a complete renewable energy sector.

5.6 FINDINGS FROM CONSULTATION WITH STAKEHOLDERS

The review of the Mini – Stern report for Liverpool City Region and consultation with key stakeholders identified that there are opportunities in the study area to provide employment in the renewable energy sector. It was identified that there are existing businesses in the sub region that are already producing renewable energy, technologies/ component parts and fuels. Equally there is an established infrastructure and labour force with transferable skills to deliver renewable energy technologies in the study area, particularly the Liverpool City Region.

It was also identified that there are immediate employment opportunities due to examples of labour shortages in relation to the installation technologies to produce renewable energy and reduce energy needs. For example a consulted stakeholder referred to known labour shortages for the installation of photovoltaics and insulation that is resulting in labour being supplied from outside the region and in the case of large scale projects labour from mainland Europe. In addition there is a widespread acknowledgement that the waste industry needs to up skill its workforce in order for employees to manage modern facilities such as Energy from Waste infrastructure.

5.7 CONSULTATION WITH LOCAL BUSINESSES

This section presents the findings of a survey involving local business in the study area. The survey was developed to gauge an understanding of attitudes and progress made towards reducing energy consumption and on site renewable energy generation. More details of the survey are set out in Appendix G.

GENERAL COMMENTS: 'WE ARE AN ARCHITECTURAL PRACTICE THAT IS ISO 14001 ACCREDITED AND WE ARE HEAVILY INVOLVED IN THE SOCIAL HOUSING SECTOR WHERE WE ARE LOOKING AT LOW CARBON DESIGN SOLUTIONS TO MEET CURRENT STANDARDS, INCLUDING INSTALLATION OF RENEWABLES, WHEREVER PRACTICAL AND REASONABLE'

'WE ARE INVOLVED IN THE DELIVERY OF AFFORDABLE HOUSING AND AS SUCH INCLUDE A NUMBER OF LOW CARBON AND RENEWABLE TECHNOLOGIES IN RESIDENTIAL PROJECTS'

In total 352 responses were received across the study area. Of the 8 local authorities, Knowsley had the greatest number of responses (92 responses). This was followed by Halton Borough Council (59). The lowest number of responses came from Sefton (7 responses).

The greatest response to the survey came from companies who operated within construction (32 responses). The smallest number of responses received was from the hotel and restaurant and the coke, oil and nuclear business sector. In terms of the size of businesses represented for this study, 45% of respondents were small businesses employing 10 people or less. Over 26% employed between 10 and 50 people and 11% employed more than 250 people. The smallest response (6%) was from businesses with 100-250 employees.

5.7.1 Establishing if businesses are involved in the planning, manufacturing or installation of technology related to renewable energy

Of those who responded to this question (271), approximately 70% were not currently involved in the planning, manufacturing or installation of technologies related to renewable energy. Over 18% (50 respondents) said that they were involved in the renewable sector in some way and a further 12% of respondents would like to be involved in this sector.

5.7.2 ESTABLISHING THE EXTENT THAT BUSINESSES HAVE ALREADY TAKEN STEPS TO SAVE ENERGY

Of the 185 responses to this question, 68% of businesses have already taken steps to save energy. In addition to this, a further 15% of businesses who have not currently taken steps to reduce energy would like to.

The greatest number of responses (120) came from businesses who have trained staff about energy efficiency and why and how to save energy at work. This is followed by businesses (108 responses) who have implemented specific energy saving measures such as roof insulation, energy efficient boilers and smart meters. The lowest number of responses came from businesses that had accessed grants for energy efficiency measures (e.g. the Low Carbon Building Programme).

General comments identified that there are businesses in the study area that are involved in a range of initiatives to promote and enable energy reduction as well as those who have undertaken internal measures to reduce energy consumption and carbon emissions.

'WE HAVE JUST BEEN AWARDED ISO14001 AND ARE CURRENTLY LOOKING INTO RAIN HARVESTING SYSTEMS. OUR ACCOMMODATION IS CURRENTLY BEING REFURBISHED AND INVOLVES A RANGE OF ENVIRONMENTAL INITIATIVES'

5.7.3 Identifying whether businesses have switched to a greener energy supplier in the last 12 months

The survey identified that 67% of respondents have not switched to a green energy supplier. A further 25% of businesses did not know if their energy supplier was from a renewable or low carbon source.

5.7.4 Identifying if businesses have any on-site renewable energy generation and the type of energy generation is being used.

The survey results showed that 85% of businesses do not have any on site renewable energy generation. There were no respondents in St Helen's, West Lancashire or Halton.

A total of 29 businesses responded to confirm having technologies installed. The most popular technology was use of Ground Source Heat Pumps (10 responses) followed by solar hot water (7) and photovoltaics (6). There were 49 responses that stated other technologies, including passive solar, gas fired CHP, thermal energy storage, heat recovery and waste to energy generation.

5.7.5 Establishing if businesses consider that their energy use is likely to increase in the future i.e. due to expansion.

This part of the survey received 230 responses, 42% (96) of businesses identified that they thought their energy needs were likely to increase in the future.

5.7.6 Identifying business plans to introduce energy saving measures?

The survey identified that currently, 21% of businesses already calculate their own annual energy use. In addition to this, 20% of businesses said that they have trained staff about energy efficiency and why and how to save energy. The survey identified that 10% of respondents had applied for grants for energy efficiency measures.

General comments included:

'WE DEVELOP ENERGY EFFICIENT EQUIPMENT FOR THE CHEMICAL AND PHARMACEUTICAL INDUSTRY. IF WE CAN GET THEM TO SWITCH TO OUR TECHNOLOGY IT IS LIKE SWITCHING OFF 2000 LIGHT BULBS FOR EVERY REACTOR. THERE ARE TENS OF THOUSANDS OF REACTORS. SWITCHING TO RENEWABLES IS IMPORTANT, BUT WE BELIEVE REDUCING CONSUMPTION IS THE KEY TO A LOW CARBON WORLD.'

5.7.7 Identifying business plans to install small scale renewable energy on site

The survey identified that of a total of 222 responses, less than 1% of businesses had installed renewable technology on site or were about to do so. 27% (60) of responses identified that they were currently investigating options for installing renewable energy, whilst 96 businesses (43%) had no plans yet, but would be interested to find out more. Almost 22% of respondents said that they had no interest in considering small scale renewable energy.

5.7.8 Business aspirations to use renewable energy technologies in the future

45 % of businesses that responded stated that they did not have any plans to date to use renewable energy. Of those who do have aspirations to use on site renewable energy, most (30%) of the businesses were looking at the period 2010-2012 to do so, whilst a significantly lower proportion aspired to use on site renewable after 2012. Three of the seven local authority areas had a response of zero in this category.

Comments identified a number of companies were considering on site energy generation. However those in freehold contracts such as serviced office accommodation had no plans as it was out of their control. One respondent identified that they were actively seeking to locate on a site with renewable energy potential. Several businesses were also looking to relocate to premises with higher energy efficiency.

5.7.9 Issues stopping businesses taking action to save energy

A third of businesses from across the study area stated a lack of finance as the reason for not taking action to save energy.

5.7.10 Issues stopping businesses taking action to install renewable energy technologies

The greatest barrier stopping businesses taking action to install renewable energy technologies is lack of finance with (124 responses). The second barrier was a lack of information (76 responses) followed by lack knowledge and staff time to investigate options.

'OUR PRIORITY AT THIS TIME IS TO ENSURE THE BUSINESS COMES THROUGH THE CURRENT RECESSION. ONCE THAT HAS HAPPENED WE WILL CONTINUE ALLOCATING CAPITAL TOWARDS RENEWABLE ENERGY AND PROJECTS THAT REDUCE OUR IMPACT ON THE ENVIRONMENT '

'OUR OFFICE IS A LISTED BUILDING IN A CONSERVATION AREA SO WE NEED TO IDENTIFY AN ACCEPTABLE AND SENSITIVE SOLUTION TO ADDING RENEWABLE TECHNOLOGIES IN A WAY THAT DO NOT ADVERSELY AFFECT THE APPEARANCE OF THE BUILDING WHILST ALSO PROVIDING US WITH A REALISTIC RETURN'

'…NOT SURE IF WE WOULD QUALIFY FOR ANY GRANTS OR NOT, AND WOULD NOT KNOW WHERE TO START. IF GRANTS WERE AVAILABLE THIS MAY SPEED UP OUR PROGRESS SOMEWHAT, ESPECIALLY WITH REGARD TO THE CURRENT ECONOMIC CLIMATE.'

'THE CHEMICAL INDUSTRY IS HIGHLY ENERGY INTENSIVE AND IT IS UNCERTAIN WHAT TECHNOLOGIES CAN HELP HERE'

'WHAT IS REQUIRED IS A CO-ORDINATED CITY CENTRE APPROACH SPONSORED AND PLANNED BY THE CITY COUNCIL IN PARTNERSHIP WITH KEY STAKEHOLDERS INCLUDING THE KNOWLEDGE QUARTER PARTNERS SUCH AS THE UNIVERSITIES, THE ROYAL LIVERPOOL UNIVERSITY HOSPITAL AND OTHER LARGE ENERGY USERS'

'THE COSTS OF INSTALLING SOLAR PANELS OR WIND TURBINES WOULD TAKE IN EXCESS OF 30 YEARS TO RE-COUP THE INITIAL OUTLAY, ASSUMING IT DOES NOT NEED SERVICING OR REPAIRING IN THAT PERIOD'

5.8 SUMMARY OF FINDINGS AND CONCLUSIONS

There is potential for growth of the renewable energy sector in the study area. However, as discussed in section 5, the reality is that established renewable energy companies do not see the UK as a commercially viable country to operate in. It will therefore be essential that the barriers to the growth of a low carbon economy are addressed to ensure there are favourable market conditions. The study area has a number of existing assets that lend themselves to growth of a renewable energy sector, particularly with respect to higher education. It will be essential that this potential is matched by real employment and market opportunities.

Despite initiatives to reduce energy consumption, over 40% of businesses said that they viewed their energy needs increasing due to growth. Consequently, the current minimum targets set out in the North West RSS need to be assessed to establish the extent this will meet energy needs from existing users as well as new development.

A lack of finance and information is seen as a barrier to considering on-site renewable energy and reducing energy needs. The survey identified that there was a limited knowledge of grants for reducing energy or installed on site energy generation. Despite the volume of initiatives promoted at regional and national levels only 20% of businesses stated that they had trained staff on reducing energy consumption and how and why it should be done and only half of those respondents had sought grant assistance in doing so.

The survey identified that businesses in the study area are actively seeking sites and premises with on site energy generation and buildings that would help reduce energy consumption. Consequently there are opportunities for suitable accommodation that meets modern business requirements through the delivery of new development and retrofitting of existing stock to meet demand.

6. A REVIEW OF RENEWABLE TECHNOLOGIES

6.1 INTRODUCTION

Following the identification of renewable energy targets, as described within section 3, this section identifies the relevant technologies these targets relate to, and provides an overview of them in the context of their suitability as a means of achieving these targets.

In addressing the residual, sub regional targets, primary consideration has been given to the investigation of the potential for distributed energy systems within each local authority. Generally distributed energy offers the most commercially viable options for the local authorities to deliver their future targets. With the inherently higher energy demands met via distributed arrangements, the identification of suitable areas offers the greatest potential for renewable energy provision.

When undertaking assessments of different technologies, consideration of the potential for district heating and associated biomass CHP technologies has been linked to the identification of related appropriate exiting heat loads. The analysis of the potential for technologies such as large-scale wind and tidal power, (whose application is not dependant on the presence of suitable connecting load centres), has been based around the availability of associated fuel sources (i.e. wind and tidal energy).

Distributed Energy:
Medium-large scale devices installed in a central location in conjunction with site-wide distribution network(s) as appropriate. Generated energy supplied to buildings via site-wide distribution networks. Typically it is most suited to large-scale, mixed use areas/ developments. Under the heading of distributed energy also comes the option of utilising alternative fuel supplies.

In the case of medium-large scale independent electrical generation, it is recognised that with specific targets also set in relation to micro-generation technologies, analysis of deployment opportunities for building-integrated systems has also been carried out.

Building Integrated Energy:
Small scale devices or systems installed within or mounted upon individual building(s). Generated energy supplied to individual building. Most suited to small developments with multiple building ownerships and where energy distribution networks are not available or appropriate.

Whilst complimentary electricity generating technologies are generally compatible, certain combinations of hot water generating technologies will require additional consideration to ensure that neither plant performance nor financial viability of each are affected by parallel operation.

An example of such an arrangement would be the local generation of hot water via solar thermal heating potentially displacing part of the connected thermal 'base-load' which a complimentary distributed technology has been designed to meet, resulting in operational inefficiencies.

Further discussion of advantages and disadvantages of both approaches are summarised within Appendix A of this report.

In addition to the Building Integrated and Distributed Energy options, a third option concerning utilisation of Energy from Waste has also been considered, but for the purposes of this study has been addressed as a form of Distributed Energy . Energy from Waste is the process of creating energy in the form of electricity or heat via the use of waste fuel sources.

In consideration of these two distinct scales of integration, and in the specific context of the imposed sub-regional targets, the following technologies have been assessed with respect to their specific suitability within and to serve the study area.

- Wind Energy – at a range of scales
- Biomass-fuelled Combined Heat and Power (CHP)
- District Heating as a method by which to facilitate Distributed Energy generation
- Anaerobic Digestion of Farm Biogas
- Hydro Power (as and where applicable)
- Photovoltaics (PV)
- Landfill Gas

Detailed information on all the technologies considered here can be found within Appendix A.

The following section provides only a brief introduction to each, followed by results from a broad strategic assessment of suitability to the study area.

6.2 DISTRIBUTED ENERGY

The following technologies and systems have been broadly assessed with regard to appropriate integration within the study area. The deployment of these technologies in the UK presently provides around 10% of our energy needs and is set to increase.

When compared to Germany where 50% of energy needs are provided by distributed energy infrastructure, the UK is along way behind. However this should be viewed as a significant opportunity as the UK offers huge potential for certain technologies if planned, delivered and operated in the right locations. Their improved economics over typical small scale building integrated solutions are improved further by: capital off-set, land/ area savings, long term commercial options and grant funding.

6.2.1 Wind Turbines

Wind powered electricity generation is an established industry and medium to large scale wind turbines are manufactured with capacities ranging from a 0.3MW to 2.3MW.

6.2.2 District Heating

Energy demands for buildings are traditionally met by a mix of electricity supplied by the national grid with gas boilers and potentially chillers serving individual buildings.

An alternative approach is to use modern district heating piped infrastructure for the delivery of heat to multiple buildings, sites and campus areas from a central heat source, often synonymous with combined heat and power. Heat generated in an energy centre is pumped through a network of pre-insulated pipes to consumers.

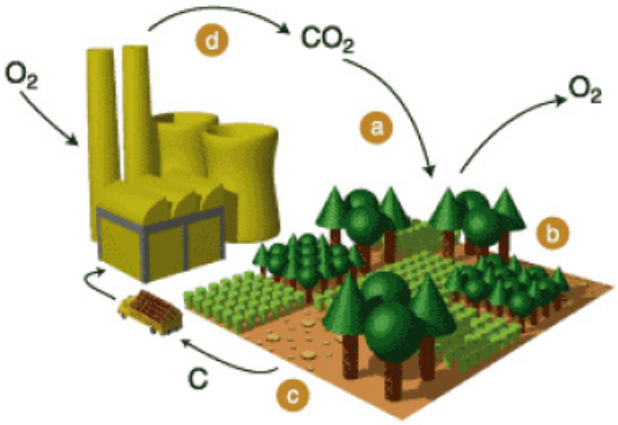
Infrastructure of this scale takes vision and commitment in so far as such systems enable future wide spread decarbonisation of both electricity and thermal energy supplies but is not without barriers which cannot always be overcome, as described further within Appendix A.

6.2.3 Biomass CHP

CHP systems generate electricity and capture waste heat thus achieving higher overall efficiencies than conventional generation.

Biomass CHP can be best integrated as part of a district heating system.

Renewable obligations certificates (ROCs) -a fiscal incentive for renewable energy project operation -can be gained if a CHP system utilises one of the following variety of biomass based fuels: wood pellets; wood chip; bio-oils and recycled solid fuels. The most commonly used is wood pellet or chips.



Biomass fuel is derived from plant matter and is termed a renewable fuel, due to the energy and carbon emissions related to its cultivation, production and utilisation being partially offset by the amount of carbon that is absorbed by the plant in its period of growth.

Biomass is thus a low carbon fuel, as carbon is emitted during planting, harvesting, processing, in transportation and in the result of energy use, as described in the figures below:

A. As trees in the energy plantation grow, they absorb carbon dioxide from the atmosphere.

B. During photosynthesis the trees store carbon in their woody tissue and oxygen is released back to the atmosphere.

C. At harvest, woodfuel is transported from the plantation to the heat or power generating plant.

D. As the wood is burned at the heat or power generating plant the carbon stored in the woody tissue combines with oxygen to produce carbon dioxide, this is emitted back to the atmosphere in the exhaust gases.

6.2.4 Anaerobic Digestion

The anaerobic digestion (AD) conversion process yields a biogas, suitable for use within a boiler or CHP configuration, a solid residue which can be utilized as compost and a liquid liquor that can be utilized as a fertilizer. Suitable feedstocks for AD conversion to biogas include:

- agricultural manures
- food wastes
- sewage sludge effluent

Whilst it forms part of the broader spectrum of energy from waste technologies, the individual assessment of potential for AD is felt to be most appropriate in specific reference to agricultural waste streams. Within this study, this assessment takes the form of the identification of farmland areas within the Liverpool City Region with only agricultural manures assessed in this study, via the identification of farmlands for application of AD. In addition, the use of biogas derived from anaerobic digestion within CHP arrangements is financially incentivised via the Renewables Obligation scheme.

6.2.5 Energy from Waste (EfW)

Energy from Waste (EfW) uses similar technologies as biomass to generate energy but includes additional processes to convert waste to a solid or gaseous fuel. The three primary forms of EfW are:

- Thermal Treatment (including incineration, gasification and pyrolysis) to convert combustible waste to heat and/or a combustible gas (syngas) that are used to generate energy.
- Anaerobic Digestion (AD) of biodegradable waste to produce biogas, which is subsequently converted to energy in boilers or CHP units; and
- Landfill Gas which is methane processed and treated depending upon the ultimate use for the gas i.e. to be used to fuel a generator.

Each of the three processes can be preceded by a form of initial treatment, from the removal of metallic items to be recycled through to more complex forms of pre-treatment such as Mechanical Biological Treatment (MBT).

A more detailed description of the technologies used to generate energy from waste is contained in Appendix A.

6.3 POTENTIAL BUILDING INTEGRATED TECHNOLOGIES

An alternative approach to an area-wide centralised Renewable Energy strategy is to integrate low and zero carbon technologies into the buildings to which they supply energy.

A building integrated strategy involves using technologies on a much smaller scale but means that technologies which are not often applicable on a larger scale can at times be attractive options in the delivery of meaningful carbon savings.

As presented more fully in Appendix A, building integrated technologies have a number advantages and disadvantages over a centralised approach. The following technologies, as specified within the sub-regional targets, have been broadly assessed with regard to appropriate integration within the study area at the building integrated scale. However, in order to fully understand the potential for these technologies at an individual local authority scale, more detailed assessments will be performed as part of Stage 2 of the commission.

Whilst capital costs for these technologies remain high, pending an increased take-up within the UK, a number of options and consideration exist to improve the long-term financial viability of renewable micro-generation such as;

- Carbon Reduction Commitments (CRC)
- Capital off-set
- Grant funding streams
- Feed in tariffs

6.3.1 Building Integrated Wind

Due to new technologies, ease of maintenance and improved public perception modern turbine designs are becoming increasingly flexible, with small or micro turbines now being located in low density urban areas despite relatively lower wind speeds than open areas. Building integrated turbines are available between 3.2kW and 15kW.

6.3.2 Photovoltaics (PV)

Photovoltaic systems convert energy from the sun into electricity through semi conductor cells. The PV cell consists of one or two layers of a semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. Photovoltaic systems can be discreet through being designed as an integral part of the roof or high visibility if implemented as a stand alone feature.

7 STRATEGIC REVIEW OF ENERGY RESOURCE AND ENERGY DEMAND POTENTIAL

7.1 INTRODUCTION

This section provides a strategic assessment of the energy resource supply that occurs across the study area. The resources assessed and exercises completed include:

- Wind Resource: A mapping exercise has been completed identifying areas where average wind speeds in the study area would be commercially attractive for on shore wind energy generation.
- Biomass Fuel Resources: This identifies existing and potential biofuel producers across the study area and potential areas to explore additional resources for Biomass CHP.
- Waste and Animal Waste Resources: This sets out the volume of resource needed and the potential for Biomass CHP and Anaerobic Digestion.

In addition a further review of heat and energy demand has also been completed. This begins to explain where there will be opportunities for District Heating and indications of where energy supply will be required. With the aid of RSS and Growth Point information, constraint mapping and resource mapping at the sub-regional level, this initial review provides the basis for an assessment of target contributions explored later in Sections 9 and 10 of the study.

7.2 SUB REGIONAL ENERGY RESOURCE POTENTIAL

Energy resources ultimately determine the costs, type, scale, location and volume/ capacity of renewable and low carbon energy. It is essential that the resource potential that enable renewable technologies is understood in order to plan and deliver the most suitable technologies for each borough.

In considering resources and technology options we have undertaken high level assessments against technical and planning constraints. This provides an initial indication of the potential for renewable and low carbon options, how efficiently they could operate to meet energy demand and what the constraints may be when looking to deliver schemes. The issues discussed here are explored in more detail in Section 10 and Appendices A and D.

7.2.1 Wind Resource

Identification and quantification of wind resource is critical in determining the attractiveness of any wind turbine development investment. The BWEA estimates that, on average, a wind resource of 6.5m/s can be considered commercially attractive.

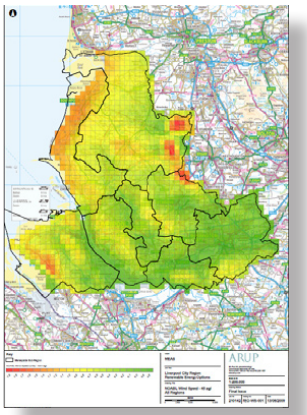


FIGURE 6: THUMBNAIL MAP OF WIND SPEEDS ACROSS THE STUDY AREA

Wind resource of the sub-regions has been 'mapped' via GIS.
This technique has been used in parallel with the area constraints map in order to determine areas potentially suitable for wind turbine development.

Based on the BWEA required wind resource at the proposed site, a typical pay back for singular large

STOCKIST	FUEL TYPE	LOCATION	SOURCE	MOISTURE CONTENT	DELIVERED COST (£ /T)	MINIMUM DELIVERY AMOUNT
Oldham Brothers, Merseyside	Wood Chip	Knowsley Industrial Park	Reprocessed wood	15–20%	£25-£30 /t	8 tonnes
WRS Composting Ltd, Merseyside	Wood Chip	Sefton	Reprocessed wood	50%	£20-£50 /t	27 tonnes
Billington Biofuels	Wood pellet	Liverpool	Sawmill residue	7-10%	£200 /t	-
Liverpool Wood Pellets	Wood pellet	Liverpool	Sawmill residue	6-10%	£200 /t	-

TABLE 12: IDENTIFIED BIOMASS FUEL SUPPLIERS

scale turbine developments is approximately 10 years. The larger the turbine, and also the larger the number of large turbines, the more attractive the investment payback becomes.

Specific constraint considerations within the study area include:

- Liverpool John Lennon Airport
- Environmental designations
- Bird migratory routes

7.2.2 Biomass Fuel Resources

As part of this study, a number of biomass fuel suppliers located within the Liverpool City Region have been identified, offering a range of wood chip and wood pellets. Details of these suppliers are provided within Table 12.

Wood pellets have a higher energy content than that of wood chip, due to their lower moisture content, but are more expensive to purchase, due to the more energy intensive nature of their production. Table 12 demonstrates that there is already a good provision of wood chip and pellet manufacturers that provide good quality products for local biomass energy generation. Further details of biomass fuels can be found within Appendix A.

Engagement with both the identified local suppliers and forestry partnerships within the study is recommended in order to establish a sustainable fuel supply of consistent quality.

7.2.3 Animal Waste Resource

Similar to the considerations around biomass CHP equipment, the successful deployment of anaerobic digestion (AD) is highly dependant on the potential source of suitable local feedstock.

As discussed previously, the process of AD can utilise a range of feedstock types. As the most commonly utilised feedstock for this technology is agricultural manures and that the NW regional targets for AD are from agricultural manures only, then identification of AD targets in this study will be designed to utilise agricultural manures only.

There are approx. 24,000 main agricultural holdings in the North West, most of which comprise of beef cattle and dairy farms. It is not possible to attain a robust figure for agricultural waste arisings for the study area. However the Merseyside Environmental Advisory Service estimates that 18, 892 tonnes of agricultural wastes are produced in Merseyside and Halton each year. A significant proportion of this waste is slurry and suggests that approximately 93 per cent of all agricultural waste in Merseyside and Halton remains on site at source. Animal manure can be a major source of greenhouse gas emissions and if slurry is not managed correctly it can pollute local watercourses. The combination of intensive animal rearing and stricter environmental control on water pollution and odour may drive farmers to consider anaerobic digestion as a form of waste management treatment. Anaerobic digestion is a method that can use liquid and semi-liquid slurries such as animal waste to produce a biogas. It is ideal for small operations, such as farms, where enough energy (electricity and heat) can be produced to run

LIVESTOCK	ANNUAL COLLECTION OF SOLID EXCRETE DURING HOUSING PERIOD (TONNES /YR)	AVERAGE BIOGAS (M^3/TONNE MANURE)	ENERGY CONTENT (MJ/TONNE MANURE)
Dairy Cow 550kg	9.6	20	23
Beef Cow 400kg	6.2	34	
Poultry	0.02875	87.5	13.5

TABLE 13: BIOGAS PRODUCTION FROM VARIOUS ANIMAL LIVESTOCKS FOUND IN NW

the operation (including the potential to fuel some vehicles) using wastes that are produced on the farm.

Information has been sourced from: the Department of Environment, Food and Rural Affairs (DEFRA); The AD Centre, the University of Glamorgan; and the Renewable Energy Statistics Database (RESTATS) on the characteristics of agricultural manures. Information from these sources has been summarised in Table 13 above and has been used to derive the quantity of livestock required to achieve the AD targets.

Farmlands within each region are required to be sourced and their associated livestock identified in line with the amount of livestock required to reach the AD target for each region.

7.2.4 Waste Resource

There is large amount of planned capacity for EfW in the study area that could contribute significantly to achieving renewable energy targets. Additional EfW facilities could be developed to manage any further waste generated in the study area. Waste streams suitable for EfW include Municipal Solid Waste (MSW), Commercial and Industrial Waste (C&I) and agricultural waste. These waste streams are subject to different management regimes so are discussed individually in more detail.

7.2.4.1 Municipal Solid Waste

The EfW capacity targets identified in Table 1 will be predominantly available for the treatment of residual MSW and is sufficient to manage all residual waste produced in the study area. A more detailed description of MSW management in the study area is provided in Appendix A. It is unlikely that additional capacity will be required for the management of MSW by Thermal Treatment. However, if waste was to be imported from areas outside of the study area, additional capacity may be required. This raises a range of sustainability issues and there is a risk that transportation of waste from other areas could lead to unsustainable patterns developing in relation to increased carbon emission due to transportation of resources.

There may be potential to develop facilities for treatment of biodegradable MSW by AD. This would require additional investment in the separate collection of this material. However, at present, none of the Waste Disposal Authorities in the study area have included this in their waste management strategies.

7.2.4.2 Commercial and Industrial Waste

A report prepared for Envirolink North West[1] has identified the potential to develop EfW facilities for the management of C&I waste in the North West. The

Waste Group	BLACKBURN WITH DARWIN	BLACKPOOL	HALTON	WARRINGTON	CHESHIRE	CUMBRIA	GREATER MANCHESTER	LANCASHIRE	MERSEYSIDE	TOTALS
Chemical Wastes	9,648	3,126	20,624	12,096	0	33,134	179,277	34,985	71,638	364,530
Health care	328	211	182	330	1,161	714	4,577	2,033	2,674	12,210
Metallic wastes	0	0	0	0	0	0	0	0	0	0
Non-metallic wastes	0	0	0	0	0	0	0	0	0	0
Discarded equipment	0	0	0	0	0	0	0	0	0	0
Animal & vegetable wastes	1,362	908	891	1,212	12,200	0	39,229	7,857	14,508	78,168
Mixed (ordinary) wastes	3,632	1,965	1,869	4,109	12,992	8,298	49,354	20,363	20,225	122,807
Common sludges	2,773	743	177,620	2,368	7,297	5,439	23,962	3,649	9,052	232,802
Mineral wastes	4,669	433	14,192	3,234	11,900	0	33,288	0	14,458	82,175
Total	22,413	7,387	215,377	23,349	45,550	47,587	329,587	68,887	132,555	892,691

TABLE 14 ENERGY RECOVERABLE POTENTIAL OF C&I WASTE (TONNES) BY WASTE GROUP

SOURCE: ENVIROLINK NORTH WEST ENERGY FROM WASTE (EFW) NORTHWEST OPPORTUNITIES STUDY FINAL MARKET INTELLIGENCE REPORT. MARCH 2009, P4

1 ENVIROLINK NORTH WEST ENERGY FROM WASTE (EFW) NORTHWEST OPPORTUNITIES STUDY FINAL MARKET INTELLIGENCE REPORT. MARCH 2009

report summarised the findings of the North West C&I Survey[2] to identify Energy Recoverable Waste by Sub Region in 2006. This is provided in Table 14.

Table 14 estimates that energy was potentially recoverable from nearly 900,000 tonnes of C&I waste arisings in the North West in 2006. Approximately 50 per cent (440, 000 tonnes) of this waste was produced in the study area (Lancashire, Merseyside, Warrington and Halton). The study area generates significant quantities of chemicals, minerals, common sludges and mixed ordinary waste.

When the report was produced energy was only recovered from 50,000 tonnes of C&I waste in the North West. This suggests that EfW offers the potential to recover energy from an additional 415,000 tonnes of C&I waste in the study area. Some of this waste could be treated by facilities that are already in planning, however many of these plants have been developed to meet the tonnages of a contract from Waste Disposal Authorities and the planned facilities will be developed specifically to treat MSW waste.

7.3 SUB-REGIONAL HEAT AND ENERGY DEMAND MAPPING

This section presents the findings of a high level heat mapping exercise and energy demand analysis. The heat mapping provides an initial indication of the best locations for district heating, whilst the energy demand exercise provides the starting point for the assessments and recommendations provided in sections 10 and 11 respectively.

7.3.1 Heat Demand Mapping

A high level heat mapping exercise has been undertaken to establish the level of heat demand within the study area. The main purpose of the exercise is to identify potential areas of suitability for a renewable energy network or conversely a more distributed/building integrated approach.

In order to sustain an economically viable district heating network, it is vital to target large point heat loads as well as areas of high building density. These areas are typically urban city centre locations where there maybe several large buildings such as hotels, shopping centres, office blocks etc all in close proximity to each other.

Areas of high building density, and hence heat density will typically require less district heating infrastructure than an area of low building density and hence prove to be more economical.

2 URBAN MINES, STUDY TO FILL EVIDENCE GAPS FOR COMMERCIAL & INDUSTRIAL WASTE STREAMS IN THE NORTH WEST REGION OF ENGLAND. MAY 2007

The energy mapping procedure applied utilises CO_2 emissions data published as part of the National Atmospheric Emissions Inventory (NAEI) scheme. The NAEI maps the emission quantities of several different types of pollutant at a 1km^2 resolution for the entire UK.

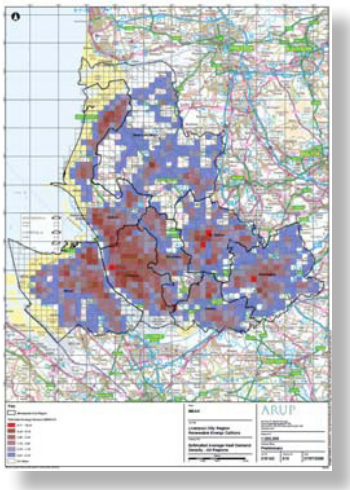


FIGURE 7: THUMBNAIL OF HEAT MAPPING OF THE STUDY AREA

Using the NAEI CO_2 figures, in combination with an understanding of heat and electricity consumption across different sector types, it is possible to calculate a heat demand density at a 1km^2 resolution.

Via this mapping exercise, areas of highest heat density (i.e. highest heat usage relative to land area) have been identified and subsequently analysed for suitability. This identified that with incorporation of biomass CHP into district heating arrangements are suitable in order to maximise connecting heat loads.

7.3.2 Local Authority Energy Demand Mapping

By examining the share of total energy demand that each local authority has, an initial estimate has been made when considered against housing targets discussed in section 4 and knowledge of specific points of interests such as industry, and large public sector estates.

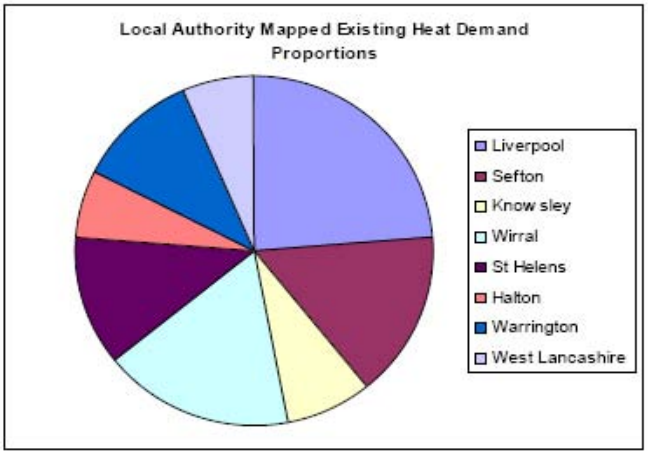
The consumer base energy mapping exercise utilises CO_2 emissions data, published as part of the National Atmospheric Emissions Inventory (NAEI) scheme. The NAEI maps the emission quantities of several different types of pollutant at a 1km^2 resolution for the entire UK. Using the NAEI CO_2 figures, and applying an understanding of heat and electricity consumption across different sector types, it is possible to calculate heat demand density at a 1km^2 resolution and thus identify areas of notable heat density.

In the case of certain local authorities, it should be noted that simplified total energy demands figures will often not demonstrate the presence of notable areas of heat density when the authority also features corresponding areas of low heat density.

The following table and graphics show the mapped data and energy demand share respectively for each of the local authorities in the study area.

SUB-REGION	LOCAL AUTHORITY	HEAT DEMAND (MW)	POWER DEMAND (MW)
MERSEYSIDE	Liverpool	340.28	268.67
	Sefton	218.39	128.86
	Knowsley	109.19	109.98
	Wirral	242.53	166.21
	St Helens	171.22	107.52
HALTON & WARRINGTON	Halton	90.22	97.59
	Warrington	157.41	129.47
LANCASHIRE	West Lancashire	92.46	69.51
TOTALS		1,421.70	1,077.80

TABLE 15: LOCAL AUTHORITY EXISTING ENERGY DEMAND



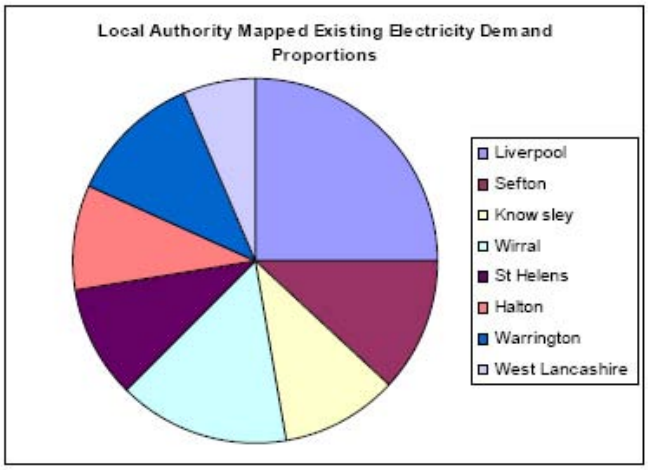


FIGURE 8: LOCAL AUTHORITY ENERGY DEMAND BY PROPORTIONS

8 DISTRIBUTED ENERGY POTENTIAL

8.1 INTRODUCTION

This section builds on the review of energy resource potential and heat and energy demand across the study area. It begins to outline the appropriateness of the study area for the distributed and integrated renewable technologies in accordance with the sub regional targets.

In addition, this section also provides an overview of further technologies that should be considered in the study area, with the potential to provide diversity to the range of viable energy generation options.

It should be noted that the potential identified in this section, while cognisant of resource and broad location mapping, does not encompass more subjective views on likely implementation that have been included in later sections and conclusions of the study.

8.2 POTENTIAL FOR WIND TURBINES

The sub regional targets require 'additional' small stand-alone wind turbines, single large wind turbines and on-shore wind farm /clusters in order to achieve the renewable energy targets for each sub-region, provided in Table 16 below.

SUB REGION	2010 TARGET (MW)	2015 TARGET (MW)	2020 TARGET (MW)
Merseyside	13.04	19.16	19.16
Halton and Warrington	10.54	12.07	12.07
West Lancashire	22.64	27.44	27.44

TABLE 16: COMBINED SUB REGIONAL ONSHORE WIND TARGETS

8.2.1 Merseyside Wind Turbines

Wind resource maps have been produced both for Merseyside as a whole and for its individual local authority areas.

In this way, it has been possible to identify a number of areas within the Merseyside sub region of the study area, where commercially attractive wind resource is present, with respective wind speeds between 6.7 – 7.4 m/s.

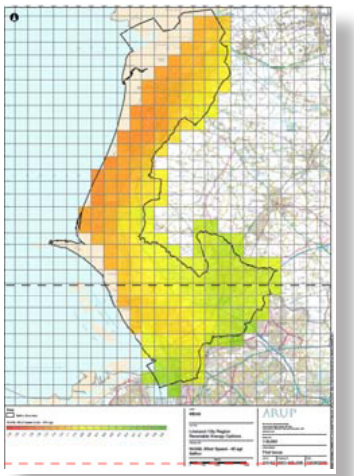


FIGURE 9: THUMBNAIL OF SEFTON WIND SPEEDS

The target for onshore wind within Merseyside is 13.04MW by 2010, equating to approx. 6 large scale i.e. Nordex N90 turbines rated at 2.3MW (largest commercially available).

The most suitable areas identified in the Merseyside area include Wirral and Sefton. However, further detailed assessment would be required to determine a particular location's suitability for wind turbine development. This assessment would need to feature annual monitoring of actual wind speed as well as consideration for local terrain.

8.2.2 Halton and Warrington Wind Turbines

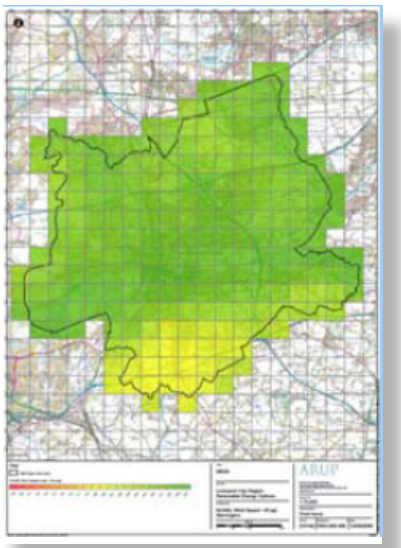


FIGURE 10: THUMBNAIL OF WARRINGTON WIND SPEEDS

Through a similar mapping process for Halton and Warrington it has been established that, within the areas of unconstrained land, there appears to be limited potential for commercially attractive wind turbine developments, due to an average wind resource of less than 6.5 m/s. Further assessment would be required in order to confirm the suitability or otherwise of specific locations.

Whilst exceptions do exist in areas of southern Warrington and central Halton, constraints are present in both cases in the forms of the M56 and the built-up areas of Runcorn respectively.

The initial target for onshore wind within Warrington and Halton is 10.54 MW by 2010. This equates to approximately 5 large scale (e.g. Nordex N90) turbines rated at 2.3MW, similar to that calculated to meet the Merseyside requirements.

8.2.3 West Lancashire Wind Turbines

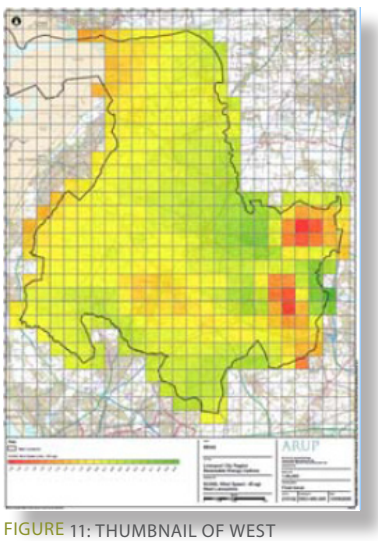


FIGURE 11: THUMBNAIL OF WEST LANCASHIRE WIND SPEEDS

Of all areas mapped for wind resource, the West Lancashire region features the areas of highest wind speed. Average speeds of between 6.6 – 7.1 m/s have been identified within a significant portion of the region.

The target for onshore wind within West Lancashire, once disaggregated from that for Lancashire as a whole, is 22.64MW by 2010. This can be equated to approximately 10 large scale turbines rated at 2.3MW.

The initial assessment suggests that West Lancashire has the greatest potential for wind generation in the study area. Whilst the abundant wind resource within this sub-region suggests West Lancashire as a suitable location for turbines, further assessment would be advised to confirm both this resource and identify actual unconstrained land available for consideration.

In addition, the cumulative constraints inherent with the potential co-location of a number of turbines should also be addressed within any further work.

8.3 POTENTIAL FOR DISTRIBUTED BIOMASS CHP WITH DISTRICT HEATING

Targets for additional biomass-fuelled CHP arrangement, as required to achieve renewable energy targets for each sub-region, are presented in the following table.

SUB REGION	2010 TARGET (MW)	2015 TARGET (MW)	2020 TARGET (MW)
Merseyside	3.7	8.7	8.7
Halton and Warrington	-21.4	-21.4	18.6
West Lancashire	0.63	0.98	1.33

TABLE 17: SUB REGIONAL BIOMASS CHP TARGETS

Assessment of the potential to introduce Biomass CHP plant capacities within the study area requires consideration of two elements in particular;

- Availability of suitable biomass fuel quality and quantities.
- Sufficient available heat load density for CHP to serve areas and buildings.

Without these two components, the viability of distributed Biomass CHP and District Heating is limited.

8.3.1 Merseyside Biomass CHP with District Heating

8.3.1.1 Fuel Requirements

In accordance with the sub regional target installed capacities, and the required annual generation of energy, biomass CHP systems sized to meet the Merseyside targets would require amounts of woody biomass as shown in the following table, per target year:

BIOMASS TYPE	2010 TARGET (T)	2015 TARGET (T)	2020 TARGET (T)
Wood Chip	615	4,400	4,850
Wood Pellet	450	3,210	3,550

TABLE 18: APPROXIMATE BIOMASS FUEL REQUIREMENTS (TONNES) FOR MERSEYSIDE BIOMASS CHP TARGETS

8.3.1.2 Capacity Potential

Following further analysis of areas of high heat density within the Merseyside region, a combined potential for biomass CHP has been identified for several schemes attributing to a potential installed capacity of up to 30MW of heat, typically around 15MW of electricity, equivalent to consuming around 53,000 tonnes of biomass wood chip per annum. This is based upon the incorporation of plant into potential district heating arrangements in areas within Liverpool and St Helens, which are deemed to offer the most suitable heat loads.

Whilst further investigation would be required in order to verify the suitability and scale of potential CHP and district heating incorporation, the work carried out within this study suggests that within Merseyside there is sufficient existing heat densities to allow all targets set for biomass CHP to be met.

8.3.2 Halton and Warrington Biomass CHP and District Heating

8.3.2.1 Fuel Requirements

In accordance with the target installed capacities, and the required annual generation of energy, biomass CHP systems sized to meet the Halton and Warrington targets would require amounts of woody biomass as shown in the following table, per target year:

BIOMASS TYPE	2010 TARGET (T)	2015 TARGET (T)	2020 TARGET (T)
Wood Chip	1,200	1,200	2,350
Wood Pellet	860	860	1,710

TABLE 19: APPROXIMATE BIOMASS FUEL REQUIREMENTS FOR HALTON & WARRINGTON BIOMASS CHP TARGETS

8.3.2.2 Capacity Potential

The area already has significant CHP genration installed via the PDM Granox facilities which ensures that the 2010 and 2015 targets are already exceeded. Following further analysis of areas of high heat density within the Halton & Warrington regions, a combined potential for biomass CHP incorporation has been identified of up to 0.75MW of heat demand, typically around 375kW of electricity, equivalent to around 460 tonnes of biomass wood chip per annum. This is based upon the incorporation of plant into potential district heating arrangements to serve a number of discreet areas toward the centre of Warrington, which is deemed to offer the most suitable heat loads.

Whilst further investigation would be required in order to verify the suitability and scale of potential CHP and district heating incorporation within Halton and Warrington, heat load densities in excess of those currently identified would be required in order to sustain the target level of biomass CHP.

These loads not withstanding industrial plant potential may be presented by areas of new-build or expansion which could serve to supplement existing heat loads and combine to provide adequate heat requirements for linking a CHP plant.

8.3.3 West Lancashire Biomass CHP and District Heating

8.3.3.1 Fuel Requirements

In accordance with the target installed capacities, and the required annual generation of energy, biomass CHP systems sized to meet the disaggregated West Lancashire targets would require amounts of woody biomass as shown in the following table, per target year:

BIOMASS TYPE	2010 TARGET (T)	2015 TARGET (T)	2020 TARGET (T)
Wood Chip	350	550	750
Wood Pellet	260	400	550

TABLE 20: APPROXIMATE BIOMASS FUEL REQUIREMENTS FOR WEST LANCASHIRE BIOMASS CHP TARGETS

8.3.3.2 Capacity Potential

Following further analysis of areas of high heat density within West Lancashire, a combined potential for biomass CHP incorporation has been identified of up to 15MW of heat demand, typically around 7.5MW of electricity, equivalent to around 2710 tonnes of biomass wood chip per annum. This is based upon the incorporation of plant into potential district hearing arrangements in primarily industrial areas within Ormskirk, which is deemed to offer the most suitable heat loads.

Whilst further investigation would be required in order to verify the suitability and scale of potential CHP and district heating incorporation, the work carried out within this study suggests that sufficient existing heat densities exist within West Lancashire, and more specifically the town of Ormskirk, to allow all targets set for biomass CHP to be met.

8.4 DISTRIBUTED ANAEROBIC DIGESTION POTENTIAL

Research to date has revealed that the Liverpool City Region currently features no Anaerobic Digestion plant of note. Similarly, it is understood that, at the time of writing, there are no such schemes planned or in the process of being implemented.

As such, the entirety of the previously derived targets exist as targets for the introduction of new AD capacity and are set out in the following table.

SUB REGION	2010 TARGET (MW)	2015 TARGET (MW)	2020 TARGET (MW)
Merseyside	2.0	2.0	4.0
Halton and Warrington	0	0	0
West Lancashire	0.22	0.66	1.10

TABLE 21: SUB REGIONAL ANAEROBIC DIGESTION TARGETS

8.4.1 Derived Biogas from agricultural manures

The biogas yield from animal manure will vary with, reactor systems, loading regimes, total solid content %, mixing efficiencies, operating temperatures; and retention times.

Based on the data provided above, the quantities of livestock required to achieve the installed capacity targets for AD have been provided below:

DAIRY COW (550KG)	2010 TARGET	2015 TARGET	2020 TARGET
Merseyside	1,630	1,630	3,261
Halton and Warrington	0	0	0
West Lancashire	206	546	905

TABLE 22: QUANTITIES OF DAIRY COW REQUIRED TO ACHIEVE AD TARGETS

BEEF COW (400KG)	2010 TARGET	2015 TARGET	2020 TARGET
Merseyside	1,485	1,485	2,970
Halton and Warrington	0	0	0
West Lancashire	163	497	824

TABLE 23: QUANTITIES OF BEEF COW REQUIRED TO ACHIEVE AD TARGETS

BEEF COW (400KG)	2010 TARGET	2015 TARGET	2020 TARGET
Merseyside	7,373,611	7,373,611	14,747,222
Halton and Warrington	0	0	0
West Lancashire	811,097	2,470,160	4,092,354

TABLE 24: QUANTITIES OF POULTRY REQUIRED TO ACHIEVE AD TARGETS

An AD system is flexible in accepting a combination of different feedstock, and is not limited to one specific type of feedstock.

As mentioned, in order to establish locations of the quantities of livestock derived in the tables above, a study of farmland areas and details of the livestock within the associated farmland areas will need to be performed in order to assess the availability of suitable feedstock, and thus determine how realistically achievable the AD targets are.

SUB REGION	RESOURCE REQUIREMENTS FOR ANAEROBIC DIGESTION
Merseyside	In order to achieve the initial 2MW target for the Merseyside region, approximately 1630 dairy cows will be required per annum
Halton and Warrington	Halton and Warrington have no targets for AD within the regions, thus will be excluded from analysis
West Lancashire	In order to achieve an initial target of 0.22MW derived for the West Lancashire region, around 206 dairy cows will be required per annum.

TABLE 25: QUANTITIES OF CATTLE REQUIRED FOR ANAEROBIC DIGESTION TARGETS

8.5 POTENTIAL FOR DISTRIBUTED ADDITIONAL ENERGY FROM WASTE (EFW)

The Envirolink study referred to earlier in this section identified that about 400-500 companies and organizations in the North West generate Commercial and Industrial (C&I) waste in quantities suitable for energy recovery using micro/small scale EfW plants. It anticipated that the strongest demand at a sub-regional level would be from Greater Manchester, Merseyside, Lancashire and Halton.

The Envirolink study identified the requirement for additional facilities to treat chemicals, minerals and common sludges. Envirolink also identified technologies that could treat these waste streams, which are presented in Table 26 on the next page.

C&I waste presents significant opportunities for on-site EfW facilities, since a number or organisations will produce waste in quantities that could justify decentralised treatment.

Many of the technologies required to treat the waste generated are available at a small scale that can be integrated into sites and/ or buildings. The study identified that plasma and mini fluidised bed technologies appear to provide the most suitable options, although some manufacturers will supply bespoke small scale EfW plant.

Waste Groups	Included Wastes	Technology Fit							
		ANAEROBIC DIGESTION	MECHANICAL AND BIOLOGICAL TREATMENT	AUTOCLAVING	GASIFICATION	PYROLYSIS	FLUIDISED BED COMBUSTION	ROTARY/ OSCILLATING KILN	PLASMA
Chemical Wastes	Solvents, acids/alkalis, paints, used oil, catalysts, wastes from chemical preparation, industrial and oil residues and sludges								
Healthcare	Healthcare wastes								
Metallic Wastes	Metals								
Non metallic Wastes	Glass, paper & card, plastic, rubber, wood, textiles								
Discarded Equipment	End of Life Vehicles, batteries, waste electronics (WEEE), other discarded equipment								
Animal & Vegetable Wastes	Food, manure, other animal & vegetable wastes								
Mixed (ordinary) Wastes	Household, undifferentiated wastes and sorting sludges								
Common Sludges	Sludges (common) and dredgings								
Mineral Wastes	Combustion residues, contaminated soils, solidified mineral wastes, other mineral wastes								

	Fit for Purpose
	Reasonable Fit
	Not Suited

TABLE 26: EFW TECHNOLOGY APPLICATION TO C&I WASTE STREAMS[1]

In addition to the above on-site opportunities, the study identified that there were over 3000 smaller enterprises in the above sectors that generate relatively low volumes of C&I waste, where a merchant collection or shared facilities could be the best option.

It is not within the scope of this report to undertake a more detailed investigation; however, it would be beneficial to investigate this further in order to identify the scale of opportunity in the study area.

1 ENVIROLINK NORTH WEST ENERGY FROM WASTE (EFW) NORTHWEST OPPORTUNITIES STUDY FINAL MARKET INTELLIGENCE REPORT. MARCH 2009, P24

9 BUILDING INTEGRATED ENERGY POTENTIAL

9.1 BUILDING INTEGRATED WIND PRIMARY ENERGY POTENTIAL

Building integrated wind turbines are best suited to commercial developments and in areas with a minimum wind speed of 5m/s.

9.1.1 Sub region

The residual targets for additional building integrated wind required in order to achieve renewable energy targets.

SUB REGION	2010 TARGET (MW)	2015 TARGET (MW)	2020 TARGET (MW)
Merseyside	0.14	1.85	3.75
Halton and Warrington	0.06	0.65	1.3
West Lancashire	- 0.03	0.09	0.24

TABLE 27: SUB REGIONAL BUILDING INTEGRATED WIND TARGETS

9.1.2 Merseyside

To achieve the target for building integrated wind turbine instalments within Merseyside of 0.14MW by 2010, approximately 10 installations would be required, based on the largest commercially available building integrated wind turbine (Proven15, rated at 15kW).

9.1.3 Halton and Warrington

To achieve the target for building integrated wind turbine instalments within Halton and Warrington of 0.06 MW by 2010, four 15kW instalment suitable for commercial properties would be required.

9.1.4 West Lancashire

The target for building integrated wind turbine instalments within West Lancashire for 2010 has already been met. In order to meet the target in 2015, six installations, based on a 15kW instalment suitable for commercial properties would meet the target.

9.2 PV PRIMARY ENERGY POTENTIAL

Photovoltaic (PV) cells convert sunlight directly into electricity through a semi conductor cell. Semi conductor cells are comprised of silicon-based materials and are grouped within two categories; crystalline silicon cells (mono and poly); and thin film cells, each having differing varieties and subsequent efficiencies. The following table displays the sub-regional targets derived for new PV installations.

SUB REGION	2010 TARGET (MW)	2015 TARGET (MW)	2020 TARGET (MW)
Merseyside	0.38	9.5	19.0
Halton and Warrington	0.13	3.25	6.5
West Lancashire	0.02	0.71	1.43

TABLE 28: SUB REGIONAL PV TARGETS

The following data has been used during the subsequent PV analyses for each sub-region, with referenced cost data obtained from discussions with Solar Century, a major UK-based designer & supplier of solar energy systems.

Photovoltaic cells on housing roof

PV MODULE	EFFICIENCY (%)	AREA REQUIRED PER kW OUTPUT (m^2)	COST (£/kW)
Mono Crystalline	15%	8	£7,000
Poly-crystalline	8-12%	10	£6,000
Amorphous	4-6%	20	£7,000

TABLE 29: PV DATA APPLIED WITHIN ANALYSIS

9.2.1 Merseyside

The amount of PV required to meet the targets as set in Section 3 are as follows:

PV MODEL	ROOF AREA (m^2) REQUIRED FOR 2010 TARGET	ROOF AREA (m^2) REQUIRED FOR 2015 TARGET	ROOF AREA (m^2) REQUIRED FOR 2020 TARGET
Mono Crystalline	3,024	75,984	79,984
Poly-crystalline	3,780	94,980	99,980
Amorphous	7,560	189,960	199,960

TABLE 30: PV AREA REQUIREMENTS FOR MERSEYSIDE

Based on the stated assumption, the projected capital costs to provide PV areas in line with the Merseyside target are shown in table 31.

PV MODEL	CAPITAL COST OF ACHIEVING 2010 TARGET (£)	CAPITAL COST OF ACHIEVING 2015 TARGET (£)	CAPITAL COST OF ACHIEVING 2020 TARGET (£)
Mono Crystalline	£2,646,000	£66,486,000	£69,986,000
Poly-crystalline	£2,268,000	£56,988,000	£59,988,000
Amorphous	£2,646,000	£66,486,000	£69,986,000

TABLE 31: CAPITAL COST OF ACHIEVING RENEWABLE TARGETS FOR PV IN MERSEYSIDE

9.2.2 Halton and Warrington

The amount of PV required to install to meet the targets as set in Section 3 are as follows:

PV MODEL	ROOF AREA (m^2) REQUIRED FOR 2010 TARGET	ROOF AREA (m^2) REQUIRED FOR 2015 TARGET	ROOF AREA (m^2) REQUIRED FOR 2020 TARGET
Mono Crystalline	3,280	82,000	164,000
Poly-crystalline	4,100	102,500	205,000
Amorphous	8,200	205,000	410,000

TABLE 32: PV AREA REQUIRED TO MEET TARGETS FOR HALTON AND WARRINGTON

Based on the stated assumption, the projected capital costs to provide PV areas in line with the Halton and Warrington target are shown in the table below.

PV MODEL	CAPITAL COST OF ACHIEVING 2010 TARGET (£)	CAPITAL COST OF ACHIEVING 2015 TARGET (£)	CAPITAL COST OF ACHIEVING 2020 TARGET (£)
Mono Crystalline	£2,870,000	£71,750,000	£143,500,000
Poly-crystalline	£2,460,000	£61,500,000	£123,000,000
Amorphous	£2,870,000	£71,750,000	£143,500,000

TABLE 33: CAPITAL COST OF ACHIEVING RENEWABLE TARGETS FOR PV IN HALTON AND WARRINGTON

9.2.3 West Lancashire

The amount of PV required to meet the targets as set in Section 3 are as follows:

PV MODEL	ROOF AREA (m^2) REQUIRED FOR 2010 TARGET	ROOF AREA (m^2) REQUIRED FOR 2015 TARGET	ROOF AREA (m^2) REQUIRED FOR 2020 TARGET
Mono Crystalline	992	25,952	51,952
Poly-crystalline	1,240	32,440	64,940
Amorphous	2,480	129,880	129,880

TABLE 34: PV AREA REQUIRED TO MEET TARGETS FOR WEST LANCASHIRE

Based on the stated assumption, the projected capital costs to provide PV areas in line with the West Lancashire target are shown in the table below.

PV MODEL	CAPITAL COST OF ACHIEVING 2010 TARGET (£)	CAPITAL COST OF ACHIEVING 2015 TARGET (£)	CAPITAL COST OF ACHIEVING 2020 TARGET (£)
Mono Crystalline	£868,000	£22,708,000	£45,458,000
Poly-crystalline	£744,000	£19,464,000	£38,964,000
Amorphous	£868,000	£22,708,000	£45,458,000

TABLE 35: CAPITAL COST OF ACHIEVING RENEWABLE TARGETS FOR PV IN WEST LANCASHIRE

10 ADDITIONAL TARGETED TECHNOLOGY OPPORTUNITIES

10.1 ADDITIONAL TARGETED TECHNOLOGY OPPORTUNITIES

In addition to the Distributed and Building Integrated techologies discussed in the previous sections, the study touches on some additional technologies. These technologies are not identfied in the RSS targets but could make a significant contribution to the low carbon energy supply in the study area.

10.2 TIDAL ENERGY GENERATION AND HYDRO POWER

The use of water flows and tides to generate energy is a long established technology with a long history.

The UK is potentially one of the most suitable areas in the world for tidal schemes, with the Mersey estuary providing one of the country's largest resources for tidal generation.

A large scheme could deliver enough renewable electricity to meet a significant proportion of the energy needs of the Liverpool City Region. Any scheme put forward will need to take into account the ecological diversity of the Estuary, which supports internationally important bird habitats.

Peel Holdings, in partnership with the NWDA and the Mersey Basin Campaign, recently completed a pre-feasibility study, "Power from the Mersey", to consider viability, technology and options. The initial study identifies four study zones from the open sea and along the estuary to inland areas. Boundaries include the estuary from the tidal limit to the Mersey Narrows (e.g. Wirral). This is because RSS identifies tidal energy as a strategic regional resource, whereby such infrastructure provides an energy output that meets

ZONE	OPTION
1	Tidal Lagoon
2	Central Reservation Tidal Fence Constrained Channel Tidal Barrage
3	Waterwheels Constrained Channel Tidal Barrage Tidal Gate

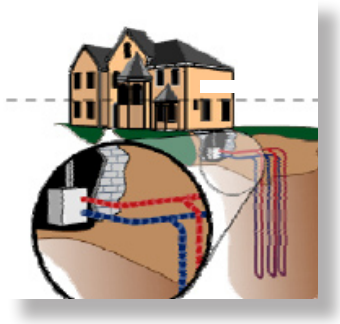
an overall regional targets rathers than a sub region. Zones 1, 2 and 3 are the main areas of search for energy generation.

Zone 4 is included in the study as the research will look to identify the impacts on the estuaries sandbanks, and ecology if energy generation was installed in the other zones. Each zone presents opportunities for a range of options. However, there is also the possibility that other schemes may come forward.

Each option presents significant opportunities for energy generation; however at present this would not contribute to the sub regional targets for the local authority areas where LPA boundaries include the estuary (e.g. Wirral, Liverpool and Halton). The project is now progressing with the aim of identifying a preferred scheme and taking it to a planning application

by 2012 with a scheduled date for the completion of construction and operational commencement of 2020.

The capacity for hydro power was only defined for the Lancashire sub region within the renewable energy targets for North West. The capacity for hydropower in West Lancashire has been ruled out, as the main river flows outside of the West Lancashire region.



10.3 GROUND SOURCE HEAT PUMPS AND DEEP GEOTHERMAL

Geothermal energy can provide us with air and ground source heating and cooling via utilisation of the heat stored in underground rock. Where very high temperatures and pressures exist the steam can drive a steam turbine to produce electricity.

The cost of drilling bore holes is the most capital intensive aspect on a geothermal scheme. This cost can be eliminated or significantly reduced if there are existing facilities such as disused coal mines/ shafts for example. There are coal shafts within the study area, particularly St Helens that have potential to be converted into geothermal boilers through the use of Ground Source Heat Pumps (GSHP). However the application is likely to be limited to specific areas e.g. where mine shafts remain uncapped and where ground stability is secure. This technology could also be applicable for use in water courses and rivers where GSHPs could also be used to heat or cool buildings which could widen their application along the Mersey Estuary. Consequently there will be merit in investigating the potential for GSHP and Deep Geothermal potential across the study area, with specific focus on local authority areas such as St Helens, Wirral, Halton, West Lancashire and Liverpool.

There are not many countries that can commercially exploit the geothermal energy resource, cost effectively. However, there are examples in the UK such as a district heating scheme in Southampton that was based on geothermal energy. Hot water was pumped up from about 1,800 metres below ground at 700°C and was used to heat a number of nearby offices and civic buildings. Despite the success of such schemes, the heat source is often finite and in the case of Southampton the energy source has now been exhausted.

10.4 ENERGY FROM WASTE

No new EfW facilities have been delivered in the study area since the RSS target was set in 2003. However a number of significant facilities have received financial backing and planning permission. A summary of these facilities are detailed in Table 36 and shows that there are four facilities that are located within the study area and two significant facilities (Ince Marshes and Thornton) that are in close proximity to the study area.

This demonstrates that there is significant potential for EfW to provide a low carbon and renewable energy source for the study area, however there should be caution when considering the sustainability of this form of energy generation. The North West currently has a significant amount of new infrastructure in the pipeline and there is a risk that this could lead to the unsustainable use of waste.

When considering EfW in the study area, it will be essential to consider the availability and proximity and volumes of feedstocks/ waste streams for such facilities. At present there is significant potential from waste streams such as Commercial and Industrial waste in the North West and with Landfill Tax becoming an increasingly unviable option for disposing of waste the availability is likely to be good. However, the region is driving towards sustainable production and consumption which places a much greater emphasis on waste management practices that focus on recycling of materials with EfW being one of the last options for waste. Consequently it is reasonable to assume that sustainable waste streams for EfW will reduce as they are recycled and reused for other purposes.

Consequently the study area should look to identify as many sustainable resources as possible when considering additional EfW facilities and ensure that facilities are adaptable. For more information on EfW please refer to Appendix A.

10.4.1 Landfill Gas

In the lifetime of a landfill site, a significant quantity of methane is generated, from the breakdown of organic biological matter in the controlled environment of a landfill. Modern landfills capture 80% of the methane generated. However, the landfilling of municipal solid waste (MSW) has been in decline since the turn of the century, responding to the UK landfill directive introduced in 1999 and UK landfill taxes introduced in 1996.

Additionally, in 2007 the Government's waste strategy provided a framework for the necessary investment

in infrastructure to divert more waste from landfill in order to help the UK meet its landfill directive targets and comply with EU waste law. EU targets set reductions for the organic biodegradable content of the MSW being sent to landfill, thus reducing the methane content derived from a landfill site.

The diversion of MSW from existing landfill sites by EU waste laws and the inherent diversion of all wastes from landfill to meet UK landfill directive targets will therefore have implications for the generation of renewable energy from landfill sites. There is limited information on energy generation for landfill gas facilities in the study area; although it is known that they exist and are in operation. The sub regional targets for landfill gas in Table 1, identify that landfill gas energy generation will decrease as landfill capacities are decreasing and are therefore not of strategic significance to the study area.

OPERATOR NAME	SITE LOCATION	TECHNOLOGY TYPE	CAPACITY	COMMENTS
ENERGOS	Knowsley	Gasification	80,000-96,000 tpa	The main feedstocks will be commercial, industrial and household residual waste. The plant will be capable of generating 8MW of energy output. A planning application has been approved and construction work is due to begin in 2010 with work finishing in 2012.
BIOSSENCE	Hooton Park, Wirral	Gasification and Pyrolysis	400,000 tpa	Planning permission was granted in Spring 2009. Will accept MSW and C&I waste and plans to start construction in 2010. Will generate up to 40MW of electricity per annum.
PDM GRANOX	Widnes, Halton		150,000 tpa	Planning permission was granted in September 2008. The development adds capacity to an existing facility.
INEOS RUNCORN TPS	Weston Point, Runcorn	Thermal Treatment with Combined Heat and Power	400,000 – 850,000 tpa	Plant has a designed capacity of up to 100MW based on a waste capacity ceiling of 850kte of RDF. The plant will accept Solid Recovered Fuel (SRF) from Greater Manchester WDA and may sufficient capacity to accept SRF from Cheshire and may have sufficient capacity to accept additional SRF from other sources. The plant will recover 270,000 megawatt hours of electricity and 500,000 tonnes of steam a year, which would be used by the "internal network" of the Ineos Chlor site. Planning permission was awarded in September 2008.
PEEL ENVIRONMENTAL	Ince Marshes, Frodsham	Incineration with Combined Heat and Power, MBT	Up to 600,000 tonnes	The majority of refuse derived fuel (RDF) for the plant will be produced from municipal household waste pre-treated with the MBT. Some commercial and industrial waste may also be sourced. Planning permission was approved by the Secretary of State in August 2009. An estimated 95MW should be available to export to the national grid.
GLOBAL RENEWABLES	Thornton	UR-3R (urban resource – reduce, recover, recycle) Process® (MBT with AD	276,000 tpa	The facility will treat residual MSW from Lancashire County Council and Blackpool Council. Bio-gas produced during anaerobic digestion is used to create renewable energy to power the facility, with excess production sold back into the local power grid.

TABLE 36: SUMMARY OF PLANNED EFW FACILITIES IN THE STUDY AREA

11 SUB-REGION AND LOCAL AUTHORITY OPTIONS APPRAISAL

11.1 INTRODUCTION

This section sets out the results of an appraisal of the key technologies needed to meet the sub regional targets. This builds on sections 8 & 9 and considers each technology and its suitability for each local authority in the study area on technical, commercial and environmental considerations. It provides the initial indication of the likelihood of meeting and contributing to the sub regional targets.

The key relevant technologies include:

- Building Integrated Photo-voltaic
- Building Integrated Wind
- Distributed Anaerobic Digestion
- Distributed Biomass CHP with District Heating
- Distributed Wind Energy

The appraisal is based on the use of the simplified Integrated Risk Management (IRM) process, which has been informed by the strategic planning appraisal and forms the basis for this initial, strategic stage of investigations into renewable energy potential. Full details of the constraints mapping is presented in Appendix D and provides a useful reference of the strategic constraints for the study area. It should be noted that at this stage the assessment of constraints is relatively broad and a more detailed investigation will be required to understand area and site specific constraints.

11.2 IRM AND PLANNING APPRAISAL

The over arching appraisal is presented using a traffic light system which compares and assesses the suitability of a range of options for each local authority. Each technology option is given a disaggregation ranking applicable to an appropriate range of cost / benefit judgement criteria.

For this stage of the study the criteria used includes resource availability, technology suitability and potential target achievement. Disaggregation of technology opportunities at the sub-regional level has been informed by the resource, demand and constraint mapping undertaken, along with consideration of growth point identification and local intelligence. At this stage of the overall study the analysis is relatively subjective and raises the need to undertake more detailed area, site specific and individual building investigations. Stage 2 of the study would seek to establish the true extent technologies can be delivered in terms of commercial viability, locations (site specific and broader areas and zones) and the likely timescales involved.

Employing this methodology provides a rational approach to establish preferred scenarios of renewable energy project development to be prioritised for detailing at the next stages of renewable energy investigation.

It is recommended that prioritising renewable energy project opportunities at this stage should focus on 'A'verage to 'V'ery 'G'ood target achievement opportunities as indicated in the following key.

KEY	
	'V'ery 'G'ood
	'G'ood
	'A'verage
	'B'ad
	'V'ery 'B'ad

ON-SHORE WIND VIABILITY	LOCAL AUTHORITY	APPROPRIATE LAND	WIND RESOURCE	ROI	CARBON SAVINGS	TARGET ACHIEVEMENT
Merseyside	Liverpool	B	A	B	B	B
	Sefton	A	VG	VG	G	VG
	Knowsley	B	A	B	B	B
	Wirral	B	G	A	B	G
	St Helens	B	A	B	B	A
Halton & Warrington	Halton	A	B	VB	VB	B
	Warrington	A	B	VB	VB	B
Lancashire	West Lancashire	VG	VG	VG	VG	VG

TABLE 37: SUMMARY TABLE OF INDIVIDUAL LOCAL AUTHORITY PERFORMANCE FOR DISTRIBUTED WIND ENERGY

11.3 DISTRIBUTED WIND ENERGY

Following the initial analysis, Knowsley and St Helens have been identified to have fewer (technically) unconstrained land areas available for commercially viable wind turbine project opportunities. The Return on Investment (ROI) is based on small or medium scale turbine installation and correspondingly low carbon savings.

Sefton has suitable land for at least one and possibly more larger scale wind turbines in an area of high wind resource, achieving good emission savings, an attractive ROI and achievable capacity target.

Wirral is also identified as having very good resource, however at this stage it is anticipated local planning in both Wirral and Sefton are likely to limit this potential.

Halton and Warrington local authorities have low wind resource; hence the ROI reflects that these are not commercially suitable sites for wind turbine development.

For the area of West Lancashire there is also (technically) unconstrained land in areas of high wind resource. The emissions savings and ROI for a large scale turbine developments i.e. small wind farms would be commercially attractive and the capacity target achievable.

11.4 DISTRIBUTED BIOMASS CHP WITH DISTRICT HEATING

In urbanised and industrialised local authorities such as Liverpool, Sefton, Knowsley and St Helens there are high heat load densities and good to average proximity to biomass resource. Consequently the ROI is very attractive and will provide reasonable carbon savings and good capacity to meet the sub regional target.

With regard to public sector and commercial / residential opportunities Wirral and Sefton have associated low heat loads that suggests carbon savings and prospective commercial attractiveness will be poor. However, due to good national incentive mechanisms, reasonably good proximity of biomass resource and both public and private sector consumer points of interest it is anticipated that the target could still be achieved.

However, the opportunities in Sefton for industrial scale biomass CHP for process needs should be investigated at a more site specific level as part of future assessments. For example, in Halton examples exist of large scale biomass CHP at the PDM Group Granox Ltd site where bio-fuel derived from animal processing provides process heat and power. It is reasonable to assume that industrial opportunities in Sefton will also provide opportunities of heat distribution to public residential areas in close proximity.

BIOMASS CHP & DH	LOCAL AUTHORITY	PROXIMITY OF BIOMASS RESOURCE	EXISTING HEAT LOAD DENSITY	ROI	CARBON SAVINGS	TARGET ACHIEVEMENT
Merseyside	Liverpool	G	VG	VG	G	VG
	Sefton	G	B	A	B	VG
	Knowsley	G	A	G	A	VG
	Wirral	A	B	VB	VB	A
	St Helens	A	VG	G	A	G
Halton & Warrington	Halton	A	G	G	G	G
	Warrington	B	G	G	A	G
Lancashire	West Lancashire	A	G	A	A	A

TABLE 38: SUMMARY TABLE OF INDIVIDUAL LOCAL AUTHORITY PERFORMANCE FOR DISTRIBUTED BIOMASS CHP WITH DISTRICT HEATING

ANAEROBIC DIGESTION	LOCAL AUTHORITY	FARMLAND AVAILABILITY	ROI	CARBON SAVINGS	TARGET ACHIEVEMENT
Merseyside	Liverpool	B	B	A	A
	Sefton	B	VB	B	B
	Knowsley	B	VB	B	B
	Wirral	A	B	A	A
	St Helens	B	VB	B	B
Halton & Warrington	Halton	B	VB	B	B
	Warrington	B	VB	B	B
Lancashire	West Lancashire	G	A	G	G

TABLE 39: SUMMARY TABLE OF INDIVIDUAL LOCAL AUTHORITY PERFORMANCE FOR DISTRIBUTED ANAEROBIC DIGESTION

When considering the public residential and industrial opportunities the assessment shows that Warrington has reasonable public residential heat loads, however the proximity to biomass resources is not ideal. This results in average performance in terms of carbon emissions due to the transportation of biomass.

Halton is also likely to have industrial opportunities with the potential to link with residential areas. The assessment suggests that the ROI is likely to be good due to known and potential points of interest, resulting in the likelihood of achieving targets being good.

The same can be said of West Lancashire, however the assessment suggests that there is less capacity to meet the targets.

11.5 DISTRIBUTED ANAEROBIC DIGESTION

As an emerging technology, anaerobic digestion is capital intensive, thus all but areas with above average farmland availability and livestock will have poor ROI, carbon reduction potential and target achievement.

Due to its geographical location, West Lancashire is the only area; apart from Wirral where there is potential for AD to be an attractive technology. Resources need to be identified in close proximity to these other local authorities to make this option more attractive and achievable and provide the study area with a sustainable option for EfW infrastructure

11.6 BUILDING INTEGRATED WIND

In urbanised areas with very good wind resource, the ROI and carbon savings are relatively low which reflects the lower economic viability of micro-generation scale turbines of 12kW more suited in urban settings.

BUILDING INTEGRATED WIND	LOCAL AUTHORITY	SUITABLE BUILDING AVAILABILITY	WIND RESOURCES	ROI	CARBON SAVINGS	TARGET ACHIEVEMENT
Merseyside	Liverpool	G	A	B	B	A
	Sefton	VG	VG	A	A	G
	Knowsley	G	A	B	B	A
	Wirral	G	G	B	B	G
	St Helens	G	A	B	B	A
Halton & Warrington	Halton	G	B	VB	VB	B
	Warrington	G	B	VB	VB	B
Lancashire	West Lancashire	VG	VG	A	A	G

TABLE 40: SUMMARY TABLE OF INDIVIDUAL LOCAL AUTHORITY PERFORMANCE FOR BUILDING INTEGRATED WIND

11.7 BUILDING INTEGRATED PHOTO-VOLTAIC

Carbon emission savings on PV schemes are very low due to their high capital cost and low efficiencies, despite good roof-top location availability and average solar irradiance resource. All local authorities are viewed to have an average potential for meeting their respective sub regional targets due to the nature of the sub region's climate (and therefore opportunity for the technology to operate at maximum efficiency), the expense of the technology and the low carbon savings.

However, with the right incentive mechanism in place this could be a more viable option in the medium to long term.

PV	LOCAL AUTHORITY	SUITABLE BUILDING AVAILABILITY	PV RESOURCE	ROI	CARBON SAVINGS	TARGET ACHIEVEMENT
Target Achievement	Liverpool	G	A	VB	VB	A
	Sefton	VG	A	B	B	A
	Knowsley	G	A	VB	VB	A
	Wirral	G	A	VB	VB	A
	St Helens	G	A	VB	VB	A
Halton & Warrington	Halton	G	A	VB	VB	A
	Warrington	G	A	VB	VB	A
Lancashire	West Lancashire	VG	A	B	B	A

TABLE 41: SUMMARY TABLE OF INDIVIDUAL LOCAL AUTHORITY PERFORMANCE FOR BUILDING INTEGRATED PV

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 INTRODUCTION

As described in sections 1, 2 and 11, disaggregation of sub-regional targets to the local authority level in terms of accurate proportions is not viable at this stage of the study. However, the study does provide indications of the technology opportunities for each local authority. This has been based on a review of the function and potential of the resource and constraint mapping along with Growth Point identification and local intelligence.

Employing this methodology has provided a rational approach to establishing prioritised renewable energy opportunities that should inform the next stages of the investigation.

The following section provides conclusions from the work undertaken at Stage 1. Where relevant, recommendations have been made that need to be considered in the short, medium and long term by each local authority, individually and collectively. These recommendations should also be used to inform Stage 2 of the commission.

12.2 DISTRIBUTED WIND TURBINES

Modest areas of technically unconstrained land fall within Sefton, Wirral and St Helens local authority areas of Merseyside. Sefton and Wirral in particular have a higher associated wind speed compared to St Helens within the unconstrained areas.

It is likely that the target of 19MW for Merseyside will come from small clusters of large scale wind turbine developments or singular large scale wind turbine. Sefton and Wirral offer the best locations for these technologies and will therefore be the boroughs that are most likely to contribute to the sub regional targets for this technology.

Halton and Warrington local authorities are highly constrained and have comparatively lower wind speeds of approx. 6.0m/s, in comparison to the rest of the region. It is likely that the target of 12MW will be challenging for these authorities and therefore the priority should be to focus on the more viable locations in the study area.

West Lancashire has the highest amount of technically unconstrained land that is suitable for wind turbine development. The land assessed is associated with average wind speeds of 6.6m/s – 7.2m/s. It is likely that the target of 27.4MW wind turbine development in this region will come from clusters of large scale wind turbines and possibly a wind farm development.

Recommendation 1: We strongly recommend that for distributed wind generation Stage 2 of the study focuses and prioritises on the areas that are most suitable for wind turbine development. Following our initial assessments, the priority areas are West Lancashire, Sefton and Wirral.

12.3 DISTRIBUTED BIOMASS CHP AND DISTRICT HEATING

Biomass CHP targets for all of the regions are achievable and have the potential to exceed the given targets. There are suitable wood fuel suppliers in the regions with a consistent grade of product and which is sourced sustainably. The application of such biomass CHP systems are likely to depend upon further analysis of balancing the energy demands

of identified suitable buildings and industry and the appropriate selection of capacities which take full advantage of grants and renewable energy revenue incentives.

Recommendation 2: We recommend that Stage 2 of the study involves the identification of priority areas/ zones for Biomass CHP and District Heating opportunities. This should, specifically look at opportunities in existing residential and employment areas across the study area for opportunities. Equally the work should also explore opportunities where infill and extension sites for new development could ensure there is integration of new development with existing areas. The work should involve the preparation of development scenarios and how this can make technology options viable by increasing heat loads and urban densities as well as the availability of local resource supplies.

More detailed work has already been completed in the study area for Knowsley Council which identified that there are opportunities for the borough becoming a biomass hub. Our initial investigations for this sub regional study reaffirm this option and also suggest that a biomass hub option could also be expanded to include other local authority areas such as Sefton, Liverpool and Halton. In addition, discussion with stakeholders such as The Mersey Forest has identified that a number of local authority areas will be applying for Sustainable Forestry Commission (SFC) accreditation which will provide opportunities for local sourced resources for biomass.

Recommendation 3: To enter consultation with the Mersey Forest, Forestry Commission and potential biomass sources to establish the potential capacity and location for biomass resources. In particular any further analysis in Stage 2 should be undertaken to inform and be informed by the emerging Green Infrastructure Strategies being developed by Mersey Forest.

12.4 DISTRIBUTED ANAEROBIC DIGESTION

AD produced gas can be fed into a CHP system, the central hub of a heat distribution network. Further examination would be undertaken for biomass CHP locations and how they would feed into a heat distribution network. Following this, further analysis would be completed on the location of farmland near these central hub sites is recommended, the number of livestock on that farmland and identification of the amount of slurry resource that could be produced for use in AD.

Recommendation 4: To enter consultation with DEFRA to establish potential for resource production of agricultural waste within the study area and opportunities to increase the use of AD. This includes those local authorities that have not been identified in the initial assessment of having significant potential.

12.5 OTHER TARGETED TECHNOLOGIES

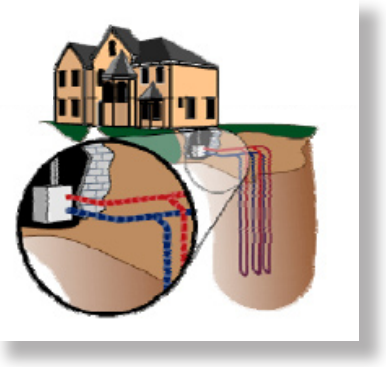
12.5.1 Tidal Energy Generation and Hydro Power

There is significant potential for tidal generation; however, at present any generation would not contribute to sub regional targets as the RSS sets this as an overall regional target.

Recommendation 5: Local authorities work in partnership with the private sector, NWDA and Mersey Estuary Partnership to explore the feasibility of options and explore the potential for energy generation in zones 2 and 3 of the tidal feasibility study (discussed in section 10.2) to contribute to sub regional targets.

12.5.2 Geothermal

There is potential for Geothermal energy generation across the study area and offers potential to make effective use of land and a range of under performing assets. This includes retrofitting the curtilages of existing settlement areas to provide heat to buildings and utilising the floor plates of premises.



Recommendation 6: Detailed investigation should be considered of using GSHP particularly with regards to where the technology could be delivered with minimal capital cost. The priority area of search should focus on St Helens and its network of uncapped mine shafts. In addition there is potential for GSHP in areas along the Mersey Estuary and areas with deep geothermal potential. In addition more detailed work should be considered for existing and new development sites and where use of GSHPs could provide 'landless' generation options through integration of GSHP with building floorplates for example. Other opportunities could also exist through the use of air pumps in suitable land use areas such as employment sites.

12.5.3 Energy from Waste

There is potential for EfW to provide a significant contribution to the study area's overall renewable energy targets and essentially fill any gaps where

technologies and targets are unlikely to be met. The potential capacity from 'pipeline' developments across the study area could provide a significant amount of energy generation that would ensure that the study region far exceeds its minimum targets. The study area provides significant potential for the development of small-scale, decentralised EfW facilities. This is particularly true for facilities that would utilise waste from large C&I waste producers for energy production, which has been identified as a waste stream that is currently under used for recycling and energy production. However, as discussed previously in section 10.4, caution should be applied to the merits of EfW and the availability of sustainable resources in the medium to long term as sustainable consumption and production begins to reduce the availability of waste streams in the study area.

AD provides potential for even greater efficiencies through on-site energy generation. The waste hierarchy advocates that recycling and composting should be considered before EfW. This should be considered when assessing the potential feedstock available for thermal treatment facilities. However, waste treated by AD can count towards recycling and composting so can support the waste hierarchy and generate energy, however for AD to be viable for all the component local authorities that make up the study region additional local resources (i.e. agricultural waste) need to be identified.

Recommendation 7: Further research is undertaken to establish the sustainability of EfW facilities in the study area.

12.6 BUILDING INTEGRATED WIND AND PHOTOVOLTAICS

The study identified that overall the study area is well suited for this micro level technology, with Sefton, Wirral and West Lancashire providing the best wind resources for the technologies to work (i.e. very good wind resource in urbanised areas). However, even in these areas, the ROI and carbon savings are low and therefore commercially unattractive.

Consequently, we consider that delivery of the sub regional targets is unlikely unless each council and/ or the sub region as a whole develop an encouragement mechanism. This could be achieved by developing an active role through the development of an Energy Service Company (ESCo). This would manage delivery of integrated solutions for SMEs and homes alike and be used to arrange for study grants and installation grants/assistance along with the administration of things like the FiT and ROCs.

As with the findings for Building Integrated Wind, the study identified that PV technology is not viable at present at an even greater degree than wind generation. The roof area required to meet the targets will need to be south facing and in areas that are not shaded by surrounding developments. Solar PV can be easily integrated into existing properties but are one of the most expensive of the renewable energy technologies to implement on a capital cost basis.

Therefore meeting sub regional targets for PV is likely to be extremely challenging without effective targeted intervention to encourage take-up, using an ESCo or other support or incentive mechanism. In addition there is a potential role for planning policies in LDFs and associated mechanisms such as Climate Change Strategies, developer and sustainable building guidance and Part L building regulations and control to assist the delivery of integrated energy. This is explored in more detail in Recommendation 13.

Recommendation 8: Further investigation is undertaken as to the best mechanisms for making building integrated technologies viable in the sub region. This should look specifically at the merits of ESCos and whether they should be developed at individual local authority levels or on wider scales.

12.7 STRATEGIC PLANNING: CHALLENGES AND OPPORTUNITIES FOR RENEWABLE AND LOW CARBON ENERGY

From our broad, strategic assessment there are a range of potential constraints that will shape the types, scales and combinations of renewable and low carbon energy schemes across the study area.

The initial IRM assessment showed that there appear to be several opportunities for wind farm and stand-alone wind turbines in locations that are relatively unconstrained.

The initial planning assessment has identified that there are a number of local variations across the study area in terms of how each LPA can determine planning applications.

For example: not all LPAs have Conservation Character Appraisals or landscape characteristic assessments. Other local circumstances will relate to a range of environmental considerations, and wherever possible standardised criteria should be developed across the study area.

Recommendation 9: That work is undertaken in the short to medium term to align and synergise constraints mapping across the study area to reduce the risk of inconsistencies when determining planning applications and monitoring of schemes.

12.8 INTEGRATING RENEWABLE AND LOW CARBON ENERGY WITH EXISTING SETTLEMENTS AND INFRASTRUCTURE

Regional planning policy (the North West RSS) also requires that a significant amount of development should be focused on previously developed/ brownfield land. This provides opportunities and challenges for the study area in terms of renewable and low carbon energy infrastructure.

Recommendation 10: Local authorities will need to work in partnership with utilities providers; both individually and collectively, to ensure delivery is effective. To do this, the following needs to be undertaken:

- Identify the capacity of the existing energy infrastructure and whether this will meet future energy demands.
  For example is the existing grid fit for purpose to 'plug in' renewable/ low carbon energy generation or will decentralised solutions be needed in the short to medium term whilst major infrastructure improvement is undertaken?
- Establish how integrated infrastructure can be delivered to help deliver future development. This includes aligning the phasing of appropriate future development sites with utility asset/ infrastructure plans and identifying the opportunities.
  For example, consideration should be given to the potential for initially phasing housing development on infill sites within established settlement areas which would enhance the potential for district heating schemes.
- Multi Utility Companies (MUCos) should also be investigated as a mechanism for delivering integrated infrastructure (e.g. energy, utilities, transport and Green Infrastructure).

12.9 DEVELOPING POLICIES, GUIDANCE AND TARGETS

Recommendation 11: Consider the potential outside the planning system for policies and initiatives to:

- Develop policies across Council's on renewable energy;
- Retrofit renewable energy technologies on existing buildings and areas (e.g. large scale initiatives to fit solar panels on residential buildings);
- Encourage renewable energy generation in and on local authority buildings; and
- Promoting renewable energy schemes and consulting businesses to explore how initiatives and developments can be supported.

Recommendation 12: Consider developing supplementary guidance for Council Officers (i.e. Development Management) on the main issues associated with each renewable energy technology. This should be used to develop understanding rather than for officers to predetermine whether they feel a technology is more suited to one area compared to another. The guidance should also be used to clarify how policies should be interpreted and provide an overview of likely issues that planners and other Council officers will experience when determining applications for distributed and integrated energy schemes.

Recommendation 13: That the criteria for determining planning applications is clear and consistent. Policies should include guidance on how each criterion should be met, the type and amount of information needed to meet the criteria and how this will be measured and monitored.

Recommendation 14: In developing policies, full consideration is given to the extent to which a sub regional policy approach can be achieved. To ensure effective delivery across the study area it will be essential that there are standard criteria identified across each local authority area. Guidance should also be prepared setting out how planning applications for renewable and low carbon energy schemes will be determined. In doing so it will be essential that the balance between local and sub regional needs is understood and that policy approaches are rigorously tested to establish the extent a sub regional approach is workable.

Recommendation 15: Each local authority should consider the development of standardised thresholds for renewable and low carbon energy (e.g. 10 dwellings and non-residential developments over 500m 2 gross floor space). This would also assist the suggested standardised, sub regional monitoring approach identified in Recommendation 16 and ensure that analysis can be undertaken on a cross boundary level.

12.10 SETTING TARGETS FOR RENEWABLE AND LOW CARBON ENERGY

Recommendation 16: When developing targets each local authority should also consider developing a local authority renewable energy target and/or CO_2 reduction target in Corporate Strategies or, potentially, Core Strategies. Whether possible each local authority in the study area should look to develop cross-departmental targets and commitments with regard to renewable and low carbon energy and produce borough wide and site specific targets.

Recommendation 17: Ensure that policies are closely linked to targets. Targets should be set for provision of renewable energy in new developments that:

- Require at least 10% of predicted energy requirements;
- Cover residential, commercial and industrial development and consider whether it is possible to include refurbished buildings;
- Clearly state the assumptions about the renewable energy provision (i.e. should it be on-site? Can it also include 'low carbon' energy sources such as Gas Combined Heat and Power? Is it 10% of energy requirements or 10% of CO_2 generated?)
- Include clear thresholds for the size of development covered and consider consistent thresholds across the study area;
- Consider limiting 'exceptions' to provision of renewable energy development, and instead providing criteria to consider when designing renewable energy developments or guidance on major considerations for each technology; and
- Provide a clause stating that where on-site renewable energy is not possible, an alternative solution should be sought (e.g. contributions to off-site provision).

12.11 MONITORING AND MEASURING

Recommendation 18: All Local Authorities need to fully consider the benefits of local authority wide targets in LDFs in line with national guidance. Stage 2 of the commission will provide refined proportions for energy outputs for different technologies, and this should then be used to inform strategic and site specific policies and targets.

When considering this matter, it should be noted that planning has a relatively limited scope when dealing with carbon emissions i.e. it can only address the impact on future developments and not existing development which make up the majority of the built environment and associated operational and energy needs that result in carbon emissions. Therefore there may be difficulties for planning alone to meet a target aiming to reduce local authority emissions by a certain amount. Consequently, each local authority should also consider how targets fit into existing frameworks such as National Indicator 186 and/ or should be developed in parallel with targets in other corporate documents.

Recommendation 19: Each local authority should consider the benefits of a standardised approach to monitoring renewable and low carbon energy schemes across the sub region. The information gathering process for this study identified that there were varying levels of detail and ability of local authorities to report on schemes that had been delivered and those that were in the pipeline/ planning system.

It is therefore recommended that, at a minimum, each local authority:

- Develops a data recording function in each of their planning application databases that allows officers to record if planning application is for a renewable energy or low carbon energy scheme and/or includes such technologies as part of a development.
- Develops a data field that includes a drop down menu of relevant technologies so that reporting can be undertaken in accordance with sub regional technologies.
- A data field that records the potential energy output of the scheme.

In addition each Council should also consider the benefits of monitoring planning applications for renewable and low carbon energy. This could be guided by prompts such as:

- The proportion of approved/ rejected and the decisions related to the renewable energy technology
- Of those approved/ rejected was the decision related to the type of renewable energy technology proposed?
- Where schemes are approved without renewable energy provision, how did the developer manage to gain permission without conforming to policy requirements?; and
- Of those developments permitted with renewable energy technologies, which of these are finally built, and what are the reasons e.g. market conditions, wider infrastructure issues constraining implementation?

Further, monitoring of permitted schemes could also include analysis against Feed in Tariffs and ROCs to identify the spatial implications of such incentives.

Recommendation 20: In addition monitoring frameworks could also be extended to cover the 'life time' operation of the development/ technology once implemented. This should be used to establish the effectiveness of a technology/ scheme providing information on the actual energy output achieved (compared to the projected outputs) and to determine the views of the developers, agents and occupiers to understand the full spectrum of issues.

12.12 PROMOTING RENEWABLE AND LOW CARBON ENERGY, SKILLS AND RESOURCES

The local business survey identified a range of issues and opportunities affecting the amount of renewable and low carbon energy installed in the study area. Many of the issues relate to availability of appropriate funding and the ability of businesses to adapt and innovate where renewable technology and its installation is concerned. Opportunities for increasing the amount of renewable and low carbon energy technology are immediate and are largely being constrained by a lack of funding and/ or knowledge of

how businesses can embrace this and move forward. There is significant market potential in the study area for renewable and low carbon energy installation and adaptation of businesses to contribute to the sector. At present the capacity of the study area to develop its own energy sector and the opportunities and need for new skills is still relatively unknown.

Recommendation 21: Each local authority to consider the resource and skills implications of increase in developments involving renewable and low carbon energy technologies. This will require a skills audit to be undertaken to ensure that work for distributed and building integrated schemes are promoted to the business sector businesses and this is supplemented with appropriate resources, such as training and financial support.

Recommendation 22: Local Planning Authorities to clearly set out the extent to which they will promote the use of renewable and low carbon technologies. This should be supplemented by guidance on the most viable technologies for the borough. However this should not place a limitation on technologies that in the short and medium term are considered unviable. Each local authority (and subsequently their policies) should recognise that there is not one, single solution to meeting renewable energy requirements and that a combination and mix of technologies could be needed to meet energy demand effectively.

Recommendation 23: Local Authorities promote successful renewable energy schemes to businesses and residents to demonstrate, through appropriate use of policies and guidance that installing micro-renewables can be achieved successfully.

Recommendation 24: Local Authorities to develop focus groups and community and business forums to discuss how to promote and deliver large scale renewable energy schemes and establish local energy needs.

Recommendation 25: Local Authorities to working closely with organisations such as the Mersey Partnership, Chamber of Commerce, NWDA, Carbon Trust, Utilities and Skills Council, Sector Skills and Productivity Alliances (SSPA), Regional Skills Partnership, Job Centre Plus and Envirolink to make the most of existing knowledge, resources ,business links and funding opportunities.

APPENDIX A

Renewable Energy Technologies Overview

A1 RENEWABLE ENERGY TECHNOLOGY DETAILS

A1.1 INTRODUCTION

As discussed in the main report there are two main forms of energy integration. This Appendix provides an overview of the technologies for each form beginning with an overview of the main advantages and disadvantages.

A1.2 ADVANTAGES AND DISADVANTAGES

The general advantages and disadvantages of the building integrated approach are:

ADVANTAGES	DISADVANTAGES
✓ Systems can be installed independently on a building-by-building basis with little dependence on external works.	× Large spatial requirements for installation and maintenance access = significant impact on building design
✓ Off-the-shelf technologies can readily provide access to renewable energy generation for any development.	× Difficult or impossible to retro-fit within existing buildings – a long-term strategy consideration for developments comprising existing and proposed buildings.
	× Potentially low operational efficiencies and low energy generation yield.
✓ 'Bolt-on' short-term approach requires little consideration of long-term strategy and future requirements.	× For thermal energy generating devices, potential conflict between installed rated capacities required to meet renewable generation / CO_2 emission reduction requirement and the maximum instantaneous demand of the building. Result: surplus energy generated energy can be wasted.
✓ Energy distribution network not required.	× Fixed solution: Limited or no opportunity to adapt technology or expand capacity in the future.
✓ Potentially simple operation and maintenance procedures.	× Generally small installed capacity and limited operational effectiveness requires additional supplementary equipment to meet total demand.
✓ Can provide a discrete visible statement clearly associated with a building.	× High cost and small generation yields = poor whole-life cost-effectiveness and adverse impact on allocating funds to low carbon building design.

The general advantages and disadvantages of the Distributed Energy approach are:

ADVANTAGES	DISADVANTAGES
✓ Renewable energy can be distributed to and utilised by existing and new buildings.	× Capital cost of distribution network(s).
✓ Large number of connected buildings results in greater utilisation of generated energy.	× Requires long-term strategic planning.
✓ 'Future proofing' - single/ small no. of central generation source(s) can be practically and economically replaced by emerging viable renewable energy technology energy distributed utilising existing networks.	× Design and installation co-ordination requirements for distribution network(s). × Requires supply contracts for private tenants
✓ Provide access to those highly effective technologies which are only practical and/or economically viable at larger capacities.	× Requires operation and maintenance capability for larger-scale plant
✓ Small spatial requirements relative to installed capacity + no constraint on building design.	× Requires specialist operational planning to ensure plant configuration is robust to operational failure
✓ Provides resilient energy supply which can satisfy annual building energy demands.	× Potential increased complexity of planning approvals.
✓ Cost-effective benefits associated with single point of operation and maintenance.	× Potential public misconception of technology, scale and community impact.

A2 DISTRIBUTED ENERGY

This Appendix provides further background information and details regarding the distributed energy technologies analysed for suitability in relation to the study area.

A2.1 WIND TURBINES

Wind turbines use the kinetic energy of the wind to turn blades which are connected to a generator to produce electricity. In order to generate worthwhile quantities of electricity, average wind speeds of more than 5–6 m/s are typically required.

The electricity produced can be exported to the grid, a private wire community network or stored on batteries. Once installed turbines can produce electricity with little noise and without carbon dioxide emissions. The most common design is for three blades mounted on a horizontal axis which are free to rotate into the wind on a vertical mast.

Alternative designs include vertically mounted turbines where the blades rotate about a vertical tower.

The power output of wind turbines depends on the swept area of the rotor and the wind speed. Doubling the diameter would quadruple the swept area and therefore quadruple the output. Power output also increases with wind speed, where the relationship is cubic i.e. if the wind speed doubles the power output will increase by a factor of around eight.

The best locations for wind turbines are away from obstructions which affect air flow, including any features of buildings which may have an affect on airflow. Wind speed increases with height, and so turbines often require masts or towers to take advantage of higher wind speeds and to avoid turbulence caused by the building structure

Key advantages of infrastructure scale turbines include the higher hub heights, which allow access to higher wind speeds, and the economies of scale achievable, resulting in lower capital and operation & maintenance costs per unit of electricity output.

In contrast, the planning approval processes for larger turbines can be complex and lengthy.

A2.1.1 Wind Speed

Understanding a sites wind speed is critically important when calculating energy yield and hence a projects financial feasibility. Wind speed is one of the most important factors is wind turbine viability.

Onsite wind trials and wind data, sourced from local metrological stations, are normally used when performing detailed wind resource to predict accurate energy yields, though a recognised method of calculating indicative energy yields is to use an average wind speed figure given by the UK wind speed database (NOABL) wind database, as has been performed for the study area.

Whilst the NOABL methodology takes into account large changes in topography, additional local knowledge of local obstacles such as buildings and trees is required since these are not addressed within the data.

A2.1.2 Turbine Positioning

Turbine positioning is vitally important to project success both from an energy yield and planning perspective.

In order to maximise wind speed and hence energy yield turbines should be located as far away from obstacles such as trees and buildings as possible, especially ones upwind. Even obstacles several hundred meters away can have a detrimental effect of wind speed.

Key technical and planning constraints to be considered when assessing potential turbine locations are:

- Noise produced
- Shadow flicker
- Wake losses
- Proximity to railways and other public rights of way
- Location of nearby power lines
- Microwave links
- Low level flight-paths
- Environmental Designations

A2.2 DISTRICT HEATING

All modern buildings have energy requirements in order to provide heating, electricity and often cooling for occupant comfort and functionality. These energy demands are traditionally met by a mix of electricity supplied by the national grid with gas boilers and potentially chillers serving individual buildings.

An alternative approach is to use district heating which is an infrastructure for delivering heat to multiple buildings from a central heat source. Heat is generated in an energy centre and pumped through a network of pre-insulated pipes to the end heat consumer. At this point heat is either fed directly into the consumer's central heating system or transferred by a heat exchanger contained within a hydraulic interface unit (HIU), which also contains a heat meter

for monitoring heat consumption for billing purposes.

Any building can be connected onto the network, including dwellings, retail, commercial buildings and industrial facilities. Both the space heating system and the domestic hot water systems within each building are the same as for buildings with individual gas boilers, with the added benefit of hot water available immediately on demand.

Providing sufficient temperatures can be achieved district heating is fuel flexible and a number of technologies could be utilised including CHP, biomass, and Energy from Waste. Examples exist in Denmark where a number of different technologies and fuel types feed into the same network.

District heating has the potential to deliver a number of benefits both to the building owner/heat consumer and the wider community.

Building owner:

- Cheap heat

The type and scale of technology typically used to feed heat into DH schemes means that heat can be delivered to the end consumer at a competitive price, usually cheaper than the base case alternative of using heat from localised gas fired boilers.

- Reduced maintenance

The maintenance requirements of heat exchangers are far fewer than that of a boiler. Boiler maintenance will be the responsibility of the DH owner/operator and the maintenance cost of the HIU will usually be included in the heat tariff.

- Reduced spatial requirements

The HIU for a domestic property is smaller than that of a boiler of the same capacity. Space savings for commercial and industrial buildings will be even greater.

- No flue

Centralised plant means that no flues will be required in individual buildings. This can have positive architectural and spatial benefits.

- Safety

Centralising heat generation removes the necessity to have gas in all buildings. This removes any potential risk of carbon monoxide poisoning or gas explosion.

Community:

- Reduced CO_2 emissions

District heating facilitates the implementation of a number of low carbon technologies including gas CHP, biomass boilers and several energy from waste (EfW) technologies.

- Fuel flexibility

District heating is completely technology and fuel independent providing sufficient flow temperatures can be achieved. District heating enables whole areas to be switched to new and emerging technologies with ease. For example gas fired CHP could be replaced with a hydrogen fuel cell as and when they become economically viable with no disruption to consumers.

- Fuel security

District heating allows fuels and/or technologies to be utilised which would be uneconomic at a smaller scale. For example whereas biomass CHP is unproven at a building scale it is a well established technology at a larger scale.

A2.3 DEVELOPING A DISTRICT HEATING NETWORK

It is theoretically possible to develop a district heat network in any area where they are multiple heat consumers. However, the economic viability of district heating is usually optimised when considering network implementation within highly urban or industrialised areas.

Installing a district heating network is a major capital investment. The cost depends on the number of buildings, their proximity and how much heat they require. For example the network cost per dwelling for a block of flats would be substantially less than that for individual houses.

Heat demand density is a key parameter when considering district heating feasibility. Network cost should be minimised whilst maximising the flow of energy and hence revenue through the pipes.

Ideal loads for district heating would offer one point of connection, require a continuous supply of heat, be located close to the heat source and carry little risk i.e. likely to be present for the entire life of the district heating scheme. Loads would also ideally require Low Temperature Hot Water, thus ensuring minimum distribution heat losses.

In addition to individual large loads, areas of high building density should be targeted. These areas are typically city or town centre locations where several large buildings such as hotels, shopping centres and office blocks exist in close proximity to each other. Areas of high building, and hence heat, density will typically require less district heating infrastructure than an area of low building density and hence prove to be more economical.

The cost of connection of individual dwellings is typically very high compared to the amount of heat required, with residential heat loads being highly seasonally dependant. Additional complexities arise through heat metering and billing issues.

Building ownership/occupation is also considered important. Buildings owned by Council, social landlords and Governmental organisations are often more likely to connect to a scheme and have a longer term presence than commercial customers.

In order to minimise risk a general strategy for developing a scheme would be to secure the connection of a single or small number of large anchor loads within close proximity to the heat plant, in order to form a solid economically stable base. The practicalities, time and cost of managing several smaller loads is likely to mean a small number of large loads are preferable.

Once an anchor load has been established other large singular point loads should be targeted together with areas of high building density.

Although district heating schemes can have primary distribution mains totalling many kilometres, the distance between loads is rarely more than a few hundred meters. It is therefore important to identify pipe routes which run close to potential heat loads.

A2.4 COMBINED HEAT & POWER (CHP)

Typical CHP systems use either a gas turbine, a steam turbine, a gas fired or oil fired engine to drive an electricity generator, and makes use of the 'waste' heat which is produced. An alternative option is a Combined Cycle Gas Turbine (CCGT) which uses the exhaust gases from combustion in a gas turbine to produce steam to drive a steam turbine to generate further electricity.

This is the most efficient type of fossil fuel electricity in production and can achieve an electrical efficiency of up to 60% in the largest plant and around 40 to 50% in the medium scale such as that that may be suitable for industrial applications.

The heat produced can be used for building heating, domestic hot water and for cooling through the use of absorption chillers. The overall efficiency of a CCGT

CHP systems can be up to 90%, far greater than

traditional power stations, which are typically 30-45% efficient.

In general the increased efficiency of CHP plant of any variety can lead to considerable reductions in emissions of carbon dioxide, nitrogen oxide and sulphur dioxide. The heat to power ratio of CHP varies according to the engine/turbine used but is typically between 1.5 -3:1.

CHP should ideally be connected to a building, group of buildings, or process with a constant supply of heat in order to maximise plant utilisation and increase scheme viability. CHP units can be sized to meet either electric of thermal base demands depending on the application but are usually selected according to the thermal base load of the network.

This is because it is less efficient to store any excess heat which maybe produced than it is to store excess electricity which can easily be exported back onto the national grid. Any peak thermal demands above the base load are met by supplementary boilers and any electricity peaks are met by importing electricity from the national grid.

In general, CHP is considered to be an economic solution if it runs for more than 5,000 hours per year at or near full capacity. Plant usually has a high availability of up to 92% assuming it is well maintained. Typical costs for a CHP system assuming that all ancillary plant and infrastructure is in place is £550 to £750 per kWe depending on the exact technology system used.

As gas turbine reciprocating engine CHP units have a lower electrical efficiency than the UK power station average, it is essential that waste heat is utilised in order to achieve both economic and environmental viability. Experience has shown that correctly sized CHP applied to a mixed use development can achieve between 15 to 20% carbon saving, depending on the exact site demand characteristics.

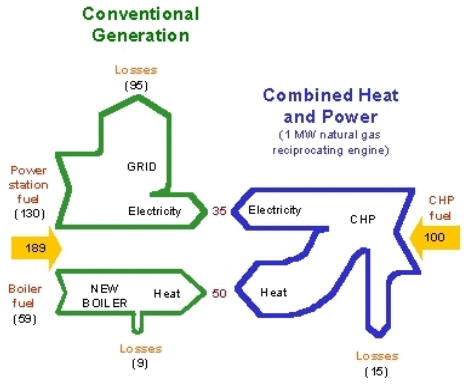


FIGURE 1: A COMPARISON OF CONVENTIONAL AND CHP GENERATION TECHNOLOGIES

Below is a diagram highlighting the basic principals of onsite CHP and an illustration showing the capital cost of different CHP prime movers and capacity options.

A2.5 BIOMASS CHP

Biomass CHP follows the same principles as gas fired CHP but instead uses biomass as a fuel source. A variety of biomass fuel types can be utilised, including wood pellet or chips, bio-oils and recycled solid fuel (RSF).

Biomass CHP is increasing in popularity as it can be one of the most effective ways of making significant CO_2 savings from an 'onsite' renewable technology. However, whereas gas fired CHP is a well established technology the biomass CHP market, at least at a small scale, is still yet to be fully proven.

A number of technology options are available, these include; steam turbine, air turbine, gasification and organic rankine cycle. Units are available from 100kWe to 30MW + although the technology choice maybe limited and only available in discreet sizes.

The advantages and disadvantages of using biomass CHP over gas fired CHP are tabled below:

ADVANTAGES	DISADVANTAGES
✓ Potentially significant CO_2 savings	× Unproven at small scale
✓ Reliable renewable heat and electricity	× Expensive
✓ Low maintenance	× Limited commercial availability
✓ Easily integration into building or other infrastructure – minimal footprint	× Fuel availability and storage
✓ Aesthetically appealing	× Limited plant operational flexibility
✓ Silent	
✓ Educational resource	

A2.6 BIOMASS

A2.6.1 Wood Chip

Wood chips are simply wood which have been chipped to a consistent size, typically 1 to 5cm in length. Chips are inexpensive as the only process required in production is chipping with a mechanical chipper.

The chipping can be done on any scale and at most locations as the chipper is easily transportable and compact in size. Wood chips generally are of variable quality and have a lower energy density than wood pellets due to higher moisture content.

A2.6.2 Wood Pellets

A wood pellet is saw dust compressed under pressure into a cylindrical shape typically 6mm in diameter and 30mm in length. The production of wood pellets is energy intensive process and it is usually only viable to use waste wood products such as sawdust or fine off cuts rather than grinding up large chunks of wood or trees.

Pellet production also usually only occurs on a large industrial scale when the plant is combined with a large waste wood producer and heat user. A relatively large amount of capital equipment is required in pellet production therefore pelletising is uneconomic and impractical for small scale production.

In pellet production the wood material is first milled into sawdust and then compressed at over 100kPa and extruded through a die at around 90°C. During this process the lignin contained within the wood melts and acts as glue binding the wood particles together.

Once the pellets have been extruded they are left to

cool and the lignin sets and forms a glaze around the pellet. No additives are used in the pelletising process. Currently there is very little pellet production in the UK, the majority of pellets used are imported from Scandinavia.

The table below highlights the typical energy content per kg of a number of different fuels. Wood pellets and chips have far lower energy content than traditional fuels meaning that large fuel stores are required to store an equivalent amount of fuel.

FUEL TYPE	WOOD PELLET	WOOD CHIP	MAINS GAS	HEATING OIL	COAL
Energy Density (GJ/ tonne)	17	14	55	46	34

Therefore although wood fuels contain less energy per kg than oil and gas and require more storage space, if wood chip is used in place of oil or gas, fuel costs are reduced.

The biomass fuel industry is still in its infancy and only a small number of suppliers operate throughout the UK. Certain business operate a national networks supplying fuel throughout the country, in addition a handful of suppliers local to the Northwest region have been identified.

A2.7 SOLID RECOVERED FUEL (SRF)

SRF is a fuel produced by shredding and dehydrating municipal solid waste (MSW) in a Mechanical Biological Treatment (MBT) or Mechanical Heat Treatment (MHT) plant (please refer to section 4.2.8). As an output it takes the form of a flock or a pellet. (Note: Refuse Derived Fuel (RDF) is the material out put, from the same process using a slightly different plant configuration which provides an output with less biodegradable value).

The use of SRF requires plants to meet strict environmental controls under the Waste Incineration Directive (WID). Additional markets are accessible at other industrial sites where the use of specific technologies that benefit under the Government's renewable energy incentives can be economic at relatively low gate fees. Local Authorities can contribute to the success of SRF markets through the development of community heating networks (as recognised within Planning Policy Statement 1- Delivering Sustainable Development) which could utilise waste heat from SRF electricity generation.

The existing markets for SRF are fragmented and not well understood by industry. If the development of these markets is to be successful, and delivered in a time frame consistent with Local Authority waste PFI processes, then urgent action is required to engage the market and bring forward robust supply solutions.

The EU has set itself a target to achieve 20% of its energy from renewable sources by 2020 and the UK has committed to deliver its share of 15%. Initial analysis for the consultation on a UK Renewable Energy Strategy ("RES") indicates that biomass, including biomass

derived from waste sources, will play a key role in helping the UK achieve this target[1].

A2.8 SOURCES OF BIOMASS FUEL

A2.8.1 Growing Biomass Short Rotation Coppice

Short Rotation Coppice (SRC) consists of densely planted, high-yielding varieties of either willow or poplar. The willow grows rapidly, sometimes reaching 4m in height during the first year and up to 7-8 metres prior to harvest. Willow is typically harvested on a 2 –5 year cycle although every 3 years is the most common.

Most operations other than planting or harvesting can be completed using conventional farm machinery. In the UK, yields from willow SRC are usually in the range of 7 – 12 oven dry tonnes per hectare per year (odt/ha/yr) depending on site.

SRC plantations can become established on a diverse range of land types ranging from heavy clay to sand providing the pH is in the 5.5 – 7 range. Time taken for the crop to become established can vary according to soil type but ultimately all yields should be reasonable. However, SRC planted in shallow or dry soils may give poor yields.

A typical annual rainfall of between 600mm-1,000mm is ideal but as long as there is sufficient moisture within 1m of the soil surface good growth should occur. Land prone to flooding can be used but permanently waterlogged soil is not suitable.

In terms of economies of scale the larger the plantation size the better and the most appropriate field sizes are those of regular shape which minimise the need for short rows and require no regular changes in direction during harvesting operation.

Ideally a field should be as flat as possible with a slope less than 7%, it is strongly recommended that the slope should not exceed 15%. An area for processing and storing the crop should be as close to the plantation as possible. Other practical considerations are the size of gates required for large machinery and the location of any critical drains under the land which maybe affected by willows long fibrous roots.

The impact of SRC on local landscape, ecology, archaeology and public access should be considered due to the long term nature of the crop and its large height.

The energy content of wood is inversely proportional to its moisture content, the lower the moisture content the higher the energy content. When burning wet wood, energy generated by combustion is used to evaporate the moisture present, thus lowering the net heat available.

Freshly harvested wood has a moisture content of approximately 50% and a calorific value of 9 MJ/kg once dried woodchip may have a moisture content of 25% and a calorific value of 14 MJ/kg. Correctly managed wood can typically be dried to a moisture content of 30% in 3 -4 months.

A2.9 MANAGED WOOD AND PARKLAND

Another source of biomass fuel is the chipping of untreated wood waste products which often result from activities such as park and woodland maintenance. Wood collected in this way can be brought to a central depot, either for immediate chipping or to be allowed to dry as appropriate.

Wood chipped in this way can be either subsequently stored, though should be turned regularly to aid drying and prevent composting, or else transported directly for storage and use by fuel customers.

A2.10 ALTERNATIVE BIO-FUELS

Other bio-fuel options exist in addition to wood-based biomass, in both liquid and gaseous form. Each has their advantages and disadvantages and ultimate suitability for use within centralised plant arrangements will depend on:

- Availability
- Calorific Value

1 HTTP://RENEWABLECONSULTATION.BERR.GOV.UK/CONSULTATION/CONSULTATION_SUMMARY

- Storage Requirements
- Fuel Handling
- Waste/Ash Production
- Processing/Refining Requirements
- Embodied Energy/Carbon
- Alternative Demands for the Fuel

A2.11 LIQUID BIO-FUELS

Liquid bio-fuels are any liquids produced from organic sources which can be used to produce useful energy. Examples of liquid bio-fuels are pure plant oils (PPO) such as rape seed. Bio-diesel is a liquid bio-fuel which can theoretically be used as an equivalent to hydrocarbon diesel fuel.

Though derived from biological sources bio-diesel is different from rape seed as it is a processed fuel that can be used in unmodified diesel engine. Bio-diesel refers to alkyl esters made from the transesterification of both vegetable oils and/or animal fats.

Although when pure bio-diesel is combusted it produces no emissions it often has to be mixed with hydrocarbon diesel for use in most engines. This is because using bio-diesel in unmodified engines can lead to problems, particularly blocked injectors, which in turn can lead to serious engine damage.

The majority of engine and turbine manufacturers say using 100% bio-diesel can damage their engines will and only maintain their engine warranties for use with maximum 5% bio-diesel - blended in with 95% conventional diesel.

Bio-diesel can be distributed using today's infrastructure, and its use and production are increasing rapidly. The cost of bio-diesel is very similar to the price of conventional hydrocarbon diesel.

A2.12 GASEOUS BIO-FUELS

The two main techniques employed for generating bio-gas are Pyrolysis or Gasification and Anaerobic Digestion. These processes are most commonly applied alongside commercial or municipal waste.

A2.13 MUNICPAL SOLID WASTE MANAGEMENT

Pyrolisis

Pyrolisis is the thermal degradation of residual waste material in the absence of any oxidizing agent (other than that which forms part of the substance itself) to produce char and one or both of gas and liquid and where the gross calorific value of the gas so formed is at least 4.0 MJ/M3 and/or that of the liquid is at least 10MJ/kg when sampled at the generator inlet and measured at 0.1 MPa and 25 deg Centigrade.

Gasification

Gasification is the substoichiometric oxidation or steam reformation of residual waste material to produce a gaseous mixture containing two or all of the following: oxides of carbon, methane and hydrogen and which has a gross calorific value of at least 4.0 MJ/M3 when sampled at the inlet to the generator and measured at 0.1 MPa and 25 deg Centigrade.

Anaerobic digestion

Anaerobic digestion (AD) is a biological process where biodegradable wastes i.e. Food, garden wastes or the mechanically separated organic fraction of municipal waste (MSW) are converted into a biogas and also a digestate liquid. Bacteria decomposes the waste in the absence of air, this is the key difference between AD and composting systems.

The AD process takes place in an enclosed vessel under specific temperature controls to enable the bacteria to survive and suitably degrade the organic waste material. The release of a methane rich biogas is collected and then burnt as a fuel to produce electricity. Digestate containing bio solids and liquid can be used as a biofertiliser subject to quality and market requirements. The bio solids can also be dewatered and treated aerobically which results in a compost material which can be used as a soil conditioner. The final use of the outputs from AD , depend upon the quality of the input material and the management of the process. Clearly, the cleaner the inputs the better quality of the outputs.

The liquid digestate resulting from the dewatering process is rich in organic compounds and can be either recirculated through the system as a fertilizer or treated and disposed to sewer.

Biogas can be sold as a fuel and combusted to generate electricity in gas engines. The sale of the gas is eligible under the Renewable Obligation Credits (ROCs) which provides financial incentives for the production of electricity from renewable sources.

Landfill Gas

Each year the UK alone landfills 100 million tonnes of waste and one tonne of biodegradable waste produces between 200m3 and 400m3 of landfill gas which contains typically 50% Methane CH4 with most of the remainder being Carbon Dioxide (CO_2). Landfill Gas is one of the largest sources of methane

emissions to the atmosphere. If methane is released into the atmosphere it is a potent greenhouse gas. In fact, its global-warming potential is 21 times greater than that of carbon dioxide. It is also a danger underground - potentially migrating off site to nearby buildings and creating an explosive atmosphere.

Landfill gas has to be dealt with to prevent both its emission to atmosphere and its danger to surrounding property. Landfill gas can be flared (the simplest option), converting the methane to CO_2 but using it as an energy resource both displaces fossil fuel use and encourages more efficient collection, minimising emissions to atmosphere. For this reason, energy recovery from landfill methane has considerable benefit to the environment: reducing global warming on two fronts.

Landfill gas is extracted from landfills using a series of wells and a flare system. This system diverts the gas to a central point where it can be processed and treated depending upon the ultimate use for the gas i.e. either to be flared off or used to fuel a generator.

Incineration

This is the most common and well-proven thermal process using a wide variety of fuels. The combustion process follows a process known as the Rankine Cycle which is also employed in all the large coal-fired power stations in the UK[2]. Heat from combusting the fuel is applied to the process via a boiler and is dissipated from the process via a condenser cooling medium. Similarly work is applied to the process to drive a boiler feedwater pump and work is exported from the process via the turbine drive shaft. The Cycle produces both electric power and heat. By employing a combined heat and power (CHP) plant the heat can be used as community heating, as in Sheffield[3]. With the long term forecast for energy costs to increase, fuel poverty is likely to rise making these district heating schemes look very attractive to many Local Authorities.

Modern incineration plants have to meet stringent environmental standards to monitor emissions such as dioxins, however, perceptions that they are 'dirty' continue. For example 75 per cent of proposed UK incineration schemes in the 1990s failed to achieve planning permission which was usually attributable to public opposition[4].

A2.14 WASTE MANAGEMENT IN THE STUDY AREA

Merseyside Waste Disposal Authority

MWDA is a local government body consisting of nine elected members, representing the four constituent district councils in the Merseyside area (Knowsley, St. Helens, Sefton, Liverpool and Wirral). It is responsible for organising and managing the disposal of waste collected by the five District Councils of Merseyside and for managing the 14 HWRCs across Merseyside[5].

The Merseyside Waste Disposal Authority (MWDA) was awarded £90 million PFI credits from the Government in 2007. Under this PFI there are three different contract packages indentified in the procurement strategy:

- Recycling contract – Awarded to Veolia 1st June 09
- Resource Recovery Contract - Currently being procured for.
- Landfill contract

The MWDA signed a £640 million waste and recycling contract with Veolia Environmental Services. The 20-year contract, awarded by the MWDA on behalf of the Merseyside and Halton Waste Partnership makes Veolia Environmental Services responsible for operating the area's network of 16 household waste recycling centres plus a Materials Recycling Facility (MRF) at Bidston.

The Resource Recovery Contract will provide two primary treatment facilities, Mechanical Biological Treatment (MBT) plants and also two secondary treatment facilities, Energy from Waste plants.

The waste PFI Outline Business Case for the Resource Recovery Contract states that the two MBT capacities will be 305,000 tonnes per annum. The EfW capacities will be 160,000 tonnes per annum. The estimated energy output from a plant of this size could range between 10 -16MW per year and could potentially provide power for between 10-15,000 homes. The process would involve firstly the waste being treated through the MBT plant then the residual waste element being used in SRF form and fed into the EfW plant. MWDA is seeking to acquire two 8 hectare sites for the location of these waste plants.

2 INSTITUTION OF MECHANICAL ENGINEERS - ENERGY FROM WASTE: A WASTED OPPORTUNITY - 2009 AVAILABLE FROM: HTTP://WWW.IMECHE.ORG/NR/RDONLYRES/7607F26C-A62C-4492-B20B-F8506F15BDCC/0/ENERGYFROMWASTEREPORTIMECHE.PDF

3 VEOLIA, DISTRICT ENERGY. AVAILABLE FROM : HTTP://WWW.VEOLIAENVIRONMENTALSERVICES.CO.UK/SHEFFIELD/PAGES/DISTRICT.ASP , 2009

4 BOYLE, E, RENEWABLE ENERGY, OPEN UNIVERSITY PRESS, 2006

5 MERSEYSIDE WASTE DISPOSAL AUTHORITY, WWW.MERSEYSIDEWDA.GOV.UK, 2009

Halton Borough Council

Halton Borough Council is a Unitary Authority, and as such has responsibility for both the collection and disposal of municipal waste arisings within the borough. It also has responsibilities and powers for other waste management activities including recycling, composting, street cleansing, enforcement and promotion of waste minimisation activities.

Halton has a published Municipal Waste Management Strategy. The aim of the Strategy is to provide a framework for Halton to plan and manage its waste services in order to achieve the following objectives:

- Reduce reliance on landfill in line with European and UK legislation
- Maximise recycling and recovery of waste
- Increase public awareness on waste issues
- Strive for best value in all aspects of waste management, and
- Manage waste in a way that takes account of Haltons' six strategic priorities

This strategy document covers each of these activities and also includes pledges, projections and targets for future management of wastes.

The Merseyside Waste Partnership (MWP) is jointly procuring alternative treatment for residual wastes, and Halton is part of this Partnership.

Halton is working with the Merseyside Waste Partnership to jointly procure enough capacity to take waste from Halton.

The business sector generates significant quantities of waste, either from commercial or industrial wastes. A small proportion of this is collected and handled on behalf of the council as trade waste amounting to approximately 4% of MSW. The vast majority however is dealt with through private arrangements for which the Council has no direct duty or responsibility. It is considered in Halton however that the Council should still have a role in providing support and encouragement to business to improve the management of their wastes, and this aspect will be also explored in the Halton Waste Prevention Strategy and action plan.

Warrington Borough Council

Warrington Borough Council is currently developing a route map for MSW. A Draft Waste Strategy[6] has been produced to provide a clear way forward for managing the overall municipal waste stream. The Council has sufficient landfill capacity until 2013, however, the main challenge will be to meet the requirements set by the Landfill Directive on reducing the amount of biodegradable waste that is landfilled. The Strategy identifies how it will meet the aims of Waste Strategy for England 2007 by reducing waste, increasing recycling, recovering energy from the residual waste and only landfilling waste where there is no alternative option.

A strategic environmental assessment (SEA) undertaken as part of the formation of the waste strategy, selected nine options for future management of MSW arisings.

Each option was evaluated in terms of its environmental, economic and social impacts. Additionally each option was assessed in terms of deliverability and the proportion of waste that would be diverted from landfill.

The SEA highlighted that the use of an autoclave facility to produce treat residual waste received the highest score. However, there is a higher deliverability risk with this option than with alternatives that are based around more established technologies such as incineration.

The results from this initial evaluation indicate that there is a strong level of support for the use of incineration to treat Warrington's residual waste. A consultation exercise is now being undertaken to provide stakeholders with the opportunity to feedback on potential treatment solutions. These responses will be used to update the Draft Waste strategy and produce a final document which will drive the procurement process for new waste management facilities. Alternatively the Council may opt to approach existing facilities with spare capacity.

West Lancashire Borough Council

West Lancashire Borough Council is part of the consortium formed under Lancashire County Council (LCC) to produce a Waste Management Strategy for the area. In 2005, following a 15 month procurement process, LCC in partnership with Blackpool Council entered into a Waste PFI Agreement with Global Renewables. Global Renewables shared LCC and partners views that waste management should follow the waste hierarchy and recover resources rather than landfill them. The PFI contract included the following facilities:

Leyland Waste Technology

- Urban Resource - Reduction, Recovery and Recycling (UR-3R) residual waste processing plant treating up to 170,000 tonne per annum
- Kitchen and garden waste enclosed composting plant treating up to 55,000 tonne per annum

6 WARRINGTON BOROUGH COUNCIL -DRAFT MUNICIPAL WASTE MANAGEMENT STRATEGY - 2008

- Material Recycling Facility (MRF) treating up to 50,000 tonne per annum
- Environmental Education centre.

Thornton Waste Technology Park

- Urban Resource - Reduction, Recovery and Recycling (UR-3R) residual waste processing plant treating up to 170,000 tonne per annum
- Kitchen and garden waste enclosed composting plant treating up to 55,000 tonne per annum
- Recyclate transfer and handling facility.

Waste from West Lancashire will be sent to the Leyland facility. These major processing facilities and associated services procured through the PFI contract will enable West Lancashire Borough Council to:

- Divert residual waste from landfill;
- Divert kitchen and garden waste from landfill;
- Divert separately collected co-mingled plastics, glass and metals from landfill;
- Divert of separately collected paper, glass, plastics, metals, cardboard and textiles from landfill;
- Deliver an environmental education service to local schools;
- Develop a market development programme for recovered materials; and
- Introduce a waste minimisation and community engagement programme to promote the new services.

Reduction in waste arisings

It is important that the potential for the development of new EfW facilities is considered within the context of the waste hierarchy. The European Waste Framework Directive[7] (supported by the Waste Strategy for England) required that where waste is generated it should be managed in accordance with the Waste Hierarchy, which advocates, in the following order of preference: waste reduction at source, re-use, recycling and composting, energy recovery and landfill as a last resort. Therefore, where there is an opportunity to move waste up the hierarchy, this should be explored through waste minimisation and resource efficiency before EfW.

Additionally Sustainable Consumption and Production (SCP) is now one of Defra's Departmental Strategic Objectives. Achieving SCP is about doing more with less and using resources such as raw materials more efficiently. If the introduction of SCP is successful this will lead to further resource efficiency and waste reduction.

The recent economic downturn has also resulted in a reduction in MSW with Councils reporting waste arisings falling between 2 – 10 per cent[8].

These issues could affect the stability of supply of feedstock for EfW facilities and should be investigated further during more detailed investigations.

Life cycle impacts

Life Cycle Assessment (LCA) is an environmental management tool being increasingly used to understand, compare and predict the overall environmental burden (e.g. emissions or energy consumed) of a product, service or function. LCA should be applied to waste management options through tools such as WRATE[9] to understand the life cycle impacts of new facilities. LCA can be used to investigate complex issues such as the carbon implications of EfW. Producing energy from residual waste will usually result in carbon benefits. However, further research should be undertaken to quantify the life cycle benefits of EfW facilities. For example it is important to understand the complexities of incinerating waste streams such as plastics which are likely to produce more environmental benefits being managed higher up the waste hierarchy through recycling.

Planning

With the provision of landfill now decreasing and the need for the UK to increase the security of energy supply, EfW facilities are likely to increase. However, the enthusiasm of local authorities for treating wastes is likely to have more influence than energy policy. Much of the UK public are unlikely to accept incineration. Therefore smaller scale technologies such as the anaerobic digestion can play an important role in the study area through the provision of integrated sustainable waste management.

Collection

It is not possible to develop the EfW facilities, especially AD, without considering collection systems. The separate collection of organic wastes can be expensive and complex. The Waste and Resources Action Programme (WRAP) have provided support to 21 local authorities to carry out trials of separate food waste collections[10]. This highlights key practical lessons for

7 REVISED WASTE FRAMEWORK DIRECTIVE 2008/98/EC

8 ECONOMIC DOWNTURN LEADS TO FALL IN WASTE ARISINGS, LETS RECYCLE - HTTP://WWW.LETSRECYCLE.COM/DO/ECCO.PY/VIEW_ITEM?LISTID=37&LISTCATID=2787&LISTITEMID=31294&SECTION=WASTE_MANAGEMENT

9 WASTE AND RESOURCES ASSESSMENT TOOL FOR THE ENVIRONMENT, WRATE, HTTP://WWW.ENVIRONMENT-AGENCY.GOV.UK/RESEARCH/COMMERCIAL/102922.ASPX

10 WRAP, EVALUATION OF THE WRAP SEPARATE FOOD

A3 BUILDING INTEGRATED

A3.1 PHOTOVOLTAIC PANELS

Photovoltaic systems convert energy from the sun into electricity through semi conductor cells. The PV cell consists of one or two layers of a semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. The greater the light intensity, the greater the flow of electricity.

Systems consist of the semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn the created DC output into AC electricity. There are three basic kinds of solar cells: monocrystalline with a typical efficiency of 15%, polycrystalline with a typical efficiency of at least 13% and thin film which can be applied to other materials such as glass or metals and has a typical efficiency of 7%. The cost of cells typically rises with efficiency.

A3.1.1 Applications

Photovoltaics can be used to supply electricity to the building or load to which they are attached or transport the electricity via a private wire community network. Excess electricity can be sold to the National Grid when the generated power exceeds the local need.

PV systems do not require direct sunlight so energy can still be produced in overcast or cloudy conditions. Photovoltaic panels come in modular panels which can be fitted to the top of roofs, integrated into building or attached to individual items such as street lights, parking meters, motorway noise barriers or the sides of bridges.

Photovoltaic systems can be discreet through being designed as an integral part of the roof or high visibility if implemented as a stand alone feature. Ideally photovoltaics should face between south-east and south-west, at an elevation of about 30-40°. However, in the UK even flat roofs receive 90% of the energy of an optimum system. They are particularly suited to buildings that use electricity during the day such offices, retail and schools.

Panels require very little maintenance in comparison with conventional energy generation systems. With solar power the occupier can take ownership of their power generation. As an outwardly visible form of energy generation, solar power presents an opportunity to raise awareness of the link between energy generation and consumption

A3.1.2 Operational Considerations

ADVANTAGES	DISADVANTAGES
✓ Work all year round	× Non-constant output
✓ The only product of generation from photovoltaic is energy with no CO2 or any other pollutants being emitted	× Seasonal variation
✓ Low maintenance	
✓ Easily integration into building or other infrastructure – minimal footprint	
✓ Aesthetically appealing	
✓ Silent	
✓ Educational resource	

A3.1.3 Economics

Whilst the price of photovoltaic cells is dropping year on year, it is still one of the least economically

competitive renewable technologies. Applications where cells are used to power remote or stand alone systems, such as street lights or parking meters, can be more economical than new connections to the national grid.

A3.2 BUILDING INTEGRATED WIND

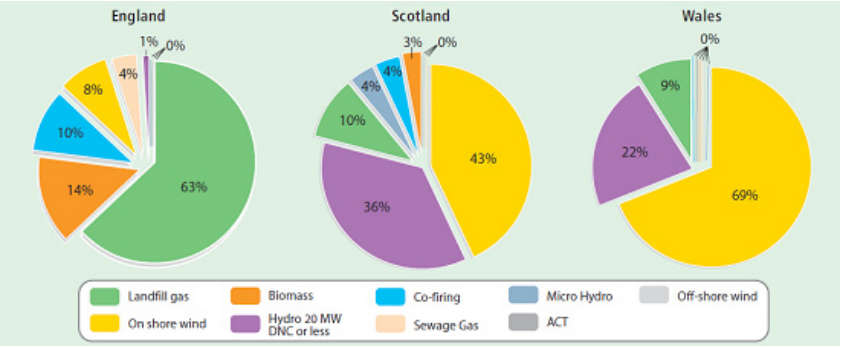
Although there are certain features which distinguish building-mounted wind turbines from the larger, more established stand-alone wind turbines, such as their short towers and proximity of obstructions, they are subject to the same physical laws.

For stand-alone turbines, tower height is generally maximised to gain additional wind resource. Building-mounted wind turbines may take advantage of the given height of the building in accessing greater wind resource.

In an urban environment in the UK, the wind speed is generally significantly lower than that found in remote hill top locations where there are less obstructions and friction losses.

A4 RENEWABLE OBLIGATION CREDITS

Figure showing the ROCs provided by technology type for England, Scotland and Wales



Adapted from Ofgem Renewable Obligation taken from the RO data base – Facts and Figures

A4.1 RENEWABLE OBLIGATION CREDITS (ROCS)

The Government has introduced an incentivised market for renewable energy through the renewable obligation (RO). Under the obligation Renewable Energy Certificates (ROCs) are issued to generators for each MWh of renewable electricity generated. The number of ROCs received per MWh of generated electricity depends on the type of technology how it is operated. For many investments using waste as a renewable energy source ROCs provide an essential pay back mechanism to add value to the installation.

For EfW projects the technology choice has a big implication on the number of ROCs received. The Renewables Obligation was revised in April 2009 and under the new banding technologies achieve the following number of ROCs:

TECHNOLOGY	ROCS PER MWH
Incineration	1 – for schemes with CHP 0 – for schemes without CHP
Gasification/Pyrolysis	2 – for schemes with or without CHP
Anaerobic Digestion	2 – for schemes with or without CHP

Allocations for dedicated biomass CHP are due to the requirement for these projects to pay for their fuel and also reflect costs associated with installing heat recovery and supply equipment as well as the higher risks associated with heat supply contracts. In all cases ROCs are awarded on the energy derived from the biomass content of the relevant fuel and only where the CHP achieves the Good Quality CHP criteria.

There has been much debate about the declared content of biomass waste. Much of this stemmed from the issues surrounding measuring and sampling the content of biomass in Municipal Solid Waste (MSW) due to its variable composition. The fossil fuel energy content of MSW is deemed to be 50% from 2009 to 2013, 60% from 2013 to 2018 and 65% from 2018. This reflects current waste policy in directing biodegrable waste away from landfill and also takes into account the increase in local authority collection streams for food and green waste.

The renewable content of the SRF from an MBT or MHT is not eligible for ROCs unless the combined energy content of the biomass fuel stream and the SRF is at least 90% derived. The difference in ROCs between MSW and SRF are because SRF is derived from MSW and is a specifically prepared fuel. Where SRF or MSW are combined in a biomass boiler with CHP the ROC allocation will be; 1 ROC/MWh <90% biomass (treated as waste receives same as EfW with CHP) 2 ROCs/ MWh>90% biomass.

It can be seen from the diagram above that Landfill gas is the highest contributor in England and that there is a small proportion of biomass ROC credits.

APPENDIX B

Local Authority Policy Review

B1 REVIEW OF LOCAL AUTHORITY RENEWABLE ENERGY POLICIES

B1.1 INTRODUCTION

This appendix sets out a review of existing and emerging planning policies associated with renewable energy for each of the Local Authorities involved in the study.

National guidance for Local Authorities on renewable energy policies is provided in Planning Policy Statement: Planning and Climate Change – Supplement to Planning Policy Statement 1 (PPS1 Supp) and Planning Policy Statement 22: Renewable Energy (PPS22). Local Authority renewable energy policies are evaluated against the recommendations of national policies, and areas are identified where Local Authorities can build on existing and emerging renewable energy policies. The following criteria/ prompts are used:

Policy promoting renewable energy (PPS22)
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)
Clear criteria for developments affected by the above
Target for renewable energy generation for LA area
Criteria to be met by renewable energy development are stringent (5) or minimal (1)
Identify broad areas of suitability for certain technologies (PPS1 Supp)
Allocate specific sites (PPS22) [where viable, there is developer interest and the site]
Does not require applicants to demonstrate need for development, why sited in a particular location
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).

Recommendations are then provided, based on a comparison between LA policies and national policies, incorporating an understanding of the regional and local policy contexts and aspirations.

This section looks at local authorities at the local authorities collectively and individually. It looks at where there are opportunities for policy convergence, or where divergence is justified given the status of existing policies or differences between Local Authority areas.

B1.2 INTERNATIONAL, REGIONAL AND LOCAL POLICIES

B1.2.1 Documents Reviewed

This appendix summarises the review of national and regional policies affecting the study area. As referred to in the main study report there are a number of essential policies that have implications for local and sub regional Renewable Energy Options. These include, but are not limited to:

- European Commission Directive on Renewable Energy[i]
- The Energy Act 2008
- The Draft Renewable Energy Strategy
- The National Microgeneration Strategy[ii]
- The Supplement to Planning Policy Statement 1 'Planning and Climate Change' (PPS1 Supplement)[iii]
- Planning Policy Statement 22 'Renewable Energy' (PPS22)[iv]
- The North West Climate Change Action Plan (NWCCAP)[v]
- The North West Regional Spatial Strategy (NWRSS)

B1.2.2 The International and National Imperative for Renewable Energy

In 2007, the UK and other EU member states agreed to a binding target that 20% of the EU's energy must come from renewable sources by 2020. The European Commission Directive on Renewable Energy reaffirms this commitment, stating that the UK should aim to produce 15% of its energy from renewable sources by 2020, from a baseline of 1.3% in 2005. This total incorporates renewable electricity, heat and renewable transport fuels. Given that in the UK renewable electricity is far more advanced than the other two options, the draft UK Renewable Energy Strategy recognises that this would require the UK to generate around 30-35% of electricity from renewable sources.

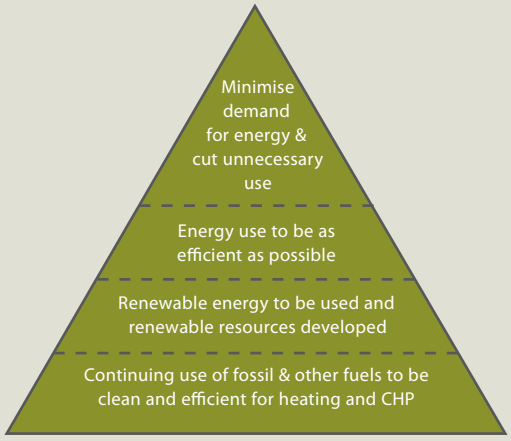
Reasons for increasing the proportion of renewable energy generation in the UK include:

- to mitigate climate change;
- increase energy security; and
- reduce reliance on finite resources.

Renewable energy is also only once component of an approach to sustainable energy, and this is explored in more detail in the figure below.

Renewable Energy as a Component of Sustainable Energy

At all policy levels, it is emphasised that renewable energy is part of a number of interventions that work towards sustainable energy, rather than being the whole picture. At the regional level, the North West Regional Spatial Strategy (NWRSS)[vi] (Policy EM15) aims to promote sustainable energy production and consumption in accordance with the Energy Hierarchy, presented below.



Energy Hierarchy, North West Sustainable Energy Strategy

The diagram above shows that renewable energy is one component of the 'energy hierarchy', with minimising demand for energy and energy efficiency being viewed as elements to be addressed first. This is because the simplest way to reduce carbon emissions is to use less energy. Further, as renewable energy targets are set as a percentage of energy consumption, the lower the energy consumption, the lower the amount of energy that needs to be produced by renewable sources. Reducing energy losses occurring during production and distribution of energy, carbon capture and storage and offsetting are all components of sustainable energy that are not specifically considered here.

B1.2.3 Regional Policies on Renewable Energy

To meet international and national policy requirements for renewable energy, the NWRSS (Policy EM17) aims to meet progressive targets for renewable electricity generation in the North West. These targets are that renewable energy accounts for 10% of electricity generation in the region by 2010, 15% by 2015 and 20% by 2020.

These targets are in line with the North West Sustainable Energy Strategy[vii]. It should be noted that the policy focuses specifically on renewable electricity, rather than 'energy' which also includes renewable heat and renewable transport. Therefore, providing 20% of the region's renewable electricity by 2020 will not provide 20% of the region's 'energy' needs overall. This means that these targets are lower than the suggested 30-35% in the draft Renewable Energy Strategy. However, they still present a significant challenge for the region and could make a significant contribution to the UK's renewable energy targets.

Table 1 shows the North West's current progress towards the targets in terms of Mega Watts of installed generating capacity, excluding allowances for offshore wind energy. PPS22 advises that the potential to generate substantial amounts of renewable energy from offshore projects should not be used as a justification to set lower targets for onshore projects. Therefore, it was decided that the figures below would be presented as onshore targets only. Information is derived from BERR Energy Statistics[viii] and the NWRSS.

The table shows that although the North West region is making progress towards the 2010 target, the region needs to double its capacity between 2008 and 2010 to meet the NWRSS target.

In terms of renewable heat, NWRSS (Policy EM15) states that the:

'North West aims to double its installed Combined Heat and Power capacity by 2010 from 866 MWe to 1.5 GW, if economic conditions are feasible'.

The NWRSS states that work to agree renewable heat targets will be considered in a future review of the RSS. However this should not be seen as a constraint for the study area and if CHP is identified to be feasible Council should encourage it as a means to providing renewable energy.

Renewable Energy Target (MW		Total installed generating capacity	Progress towards 2010 target	Progress towards 2020 target	Required additional to 2020
2010	2020	MW	%	%	MW
937	1,234	478	50	36	2363

Table 1: North West Progress towards Renewable Energy Targets in 2008 (Onshore only)

B1.3 IMPLICATIONS OF INTERNATIONAL, NATIONAL AND REGIONAL POLICIES FOR LOCAL AUTHORITIES

The national and regional focus on renewable energy and decentralised energy networks encourages the localisation of energy generation. The localisation of energy generation means that Local Authorities have an increasing responsibility to understand and support renewable energy generation.

Many Local Authorities have signed the Nottingham Declaration[ix], pledging that they will systematically address the causes of climate change and prepare the community for its impacts. Promoting renewable energy can work towards addressing the causes of climate change by promoting energy generation that produces less carbon emissions. The focus on the role of the planning system in delivering renewable energy targets also places a responsibility on local planning authorities to consider renewable energy generation in their actions and policies. The responsibility for delivering renewable energy is placed on the planning system by, for example:

- PPS22: states that Local Development Documents should contain policies designed to promote and encourage, rather than restrict, the development of renewable energy resources.
- PPS1 Supplement: sets out how planning can contribute to reducing carbon emissions and stabilising climate change.

The Planning and Energy Act provides Local Authorities with significant powers to meet these requirements. The Planning and Energy Act states that a Local Authority (LA) may, in their Development Plan Documents, include policies imposing reasonable requirements for:

(a) a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;

(b) a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development.

The NWRSS also states that LAs should work with stakeholders to prepare sub regional studies of renewable energy resources. Its policies also call for local authorities to promote renewable energy generation and minimise energy consumption in their own buildings and actions. Therefore it is clear that Councils have a leading role in helping deliver renewable energy, whilst considering how the imperative for renewable energy development can be met in a way that complements other objectives for the area. The following section explores the main conclusions emerging from existing policies for the study area.

B1.3.1 Local Planning Authorities Should Set Targets for Renewable Energy Generation

PPS22 states that the Government expects all authorities to put in place policies to encourage at least 10% of energy to be provided by on-site renewable sources. Similarly, PPS1 Supplement states that local planning authorities (LPAs) should set targets for renewable energy generation for the LPA area. These targets should be realistic, reflect opportunities at regional, sub regional and local scales and, where appropriate, present targets that increase over time.

PPS1 Supplement also advocates setting set out a target percentage of the energy to be used in new development to come from decentralised and renewable or low-carbon energy sources where it is viable. PPS1 Supplement emphasises that any policies relating to local requirements for decentralised energy should be set out in a Development Plan Document (DPD), not a Supplementary Planning Document (SPD). Similarly, the draft Renewable Energy Strategy states that LPAs can require renewable energy generation as a condition of new development.

Similarly, the NWRSS (Policy EM18) states that local authorities should, in their DPDs, set out targets for the energy to be used in new development to come from decentralised and renewable or low-carbon energy sources, based on appropriate evidence and viability assessments. The NWRSS states

that LPA policies should state the type and size of development to which the target will be applied. The NWRSS (Policy EM18) policy also necessitates that in advance of local targets being set, large new developments[xi] should secure at least 10% of their predicted energy requirements from decentralised and renewable or low-carbon sources, unless it can be demonstrated that this is not feasible or viable. However, the NWRSS (Policy EM17) recognises that, in accordance with PPS22, meeting targets for renewable energy is not a reason to refuse otherwise acceptable development proposals.

PPS1 Supplement requires that when setting renewable energy targets, LPAs should:

- Ensure proposals are evidence-based and viable, with regard to the costs of bringing sites to the market;
- Ensure targets on housing development do not inhibit the provision of housing development as set out in PPS3; and
- Set out how LPAs intend to advise potential developers on the implementation of the local requirements, and how these will be monitored and enforced.

PPS1 Supplement also advocates setting development area or site-specific renewable energy targets, where appropriate.

B1.3.2 Local Planning Authorities Should Consider Identifying Broad Areas/Sites for Renewable Energy Generation

PPS22 states that broad areas of suitability for certain renewable energy technologies should be identified at the regional level. Similarly, the Renewable Energy Strategy states that there is need for greater clarity on the land resource available for renewables in a way that does not stifle innovation. PPS22 states that when identifying sites or areas for renewable energy generation, LPAs should not make assumptions about the technical and commercial feasibility of renewable energy projects. For example, identifying generalised locations for development based on mean wind speeds. This is because technological change can mean that sites currently excluded as locations for particular types of renewable energy development are suitable in the future.

Similarly, PPS1 Supplement states that local planning authorities should consider identifying suitable areas for renewable and low-carbon energy sources where this would help secure the development of such sources. However, whilst identifying suitable areas, PPS1 Supplement and the Renewable Energy Strategy also state that LPAs should avoid rejecting proposals solely because they are outside areas identified for energy generation.

However regional evidence[xii] argues that the identification of broad areas may not always be appropriate. It states that where broad areas are used, they must offer developers some reassurance that schemes in these areas would be more likely to succeed. The study notes that although broad area maps were developed for onshore wind, biomass and offshore technologies, it was agreed that these were not helpful. The following constraints were noted for the identification of 'broad areas' for the following technologies:

- Wind: As the North West region was highly constrained for onshore wind, the distribution of 'relatively unconstrained' land was so dispersed that it was not possible to identify 'broad areas' of sufficient size to accommodate more than one significant development proposal.
- Biomass: Supply was limited more by commercial factors and the absence of supply chains than their spatial distribution.
- Renewable Energy from Waste: Renewable energy from waste can only be exploited on site where the resource occurs and these areas are identified in the Regional Waste Strategy.
- Run-of-river Hydro Schemes: Require presence of a water course with a suitable 'head' and a local user, which could occur at many locations around the region, but not necessarily focused in 'broad areas'.

Further the regional evidence states that:

'experiences in the North East region suggest that the 'broad areas' approach proposed by PPS22 can be ineffective in practice, and is perceived by some observers to present more of a barrier than a stimulus to renewable energy development'.

Therefore, although identification of 'broad areas' for renewable energy may be supported by national policies, in reality, the difficulty of identifying these areas and the uncertainty over the effectiveness of the identification of areas in promoting renewable energy mean that it may not necessarily be possible or desirable. The 4NW report advises that a criteria based approach is taken to renewable energy technologies rather than recommending a broad area approach.

PPS22 also states that LPAs should only allocate specific sites for renewable energy where a developer has confirmed an interest in the site, that the site is viable and that it will be brought forward during the plan period. It is suggested that if the LPA is aware that a developer has demonstrated that a site is viable and is coming forward in the

near future, the developer would need to have completed significant background work and indicated an intention to submit a planning application. If the LPA is aware of these details, it is likely that there have already been pre-application meetings or other communications were LPAs have got this information. Therefore, the allocation would not be encouraging developer interest or affecting the intention to submit an allocation.

The main benefit of an allocation would therefore be to provide the developer with some certainty that the LPA will support the application in principle, or protect land that is imminently to be the subject of a renewable energy application. It is suggested that the work required to demonstrate that the principle of renewable energy development would need to be technology specific as the material considerations for different technologies are often different. Consequently, Local Authorities may not yet have the capacity to carry out this assessment work and integrate it into policy before a planning application is submitted: given that the viability work is fairly advanced and therefore, an application likely to be imminent.

It is tentatively suggested that even if a Local Authority were to pursue an allocation of a site, it may actually delay an application as the applicant may wish to wait until the site is allocated before submitting an application. Therefore, it is likely that identifying sites for renewable energy development within the Local Development Frameworks is likely to only occur in very particular circumstances when the policy can be demonstrated to be robust and likely to increase the potential of the site coming forward.

Finally, the Renewable Energy Strategy suggests that one way in which incentives could be used to encourage renewable energy developments is an idea similar to that of renewables growth points. This could involve inviting proposals from localities which felt particularly able and willing to be pacesetters in providing renewable energy generation. Subject to the availability of funding, these localities could be supported in their efforts through a package of community benefits. This idea would be similar to the identification of broad areas for renewables, but closely linked to funding to bring forward developments, rather than identifying locations for allocation in Local Development Frameworks, led by concerns over viability and avoidance of constraints.

B1.4 LOCAL AUTHORITIES SHOULD VIEW RENEWABLE ENERGY APPLICATIONS POSITIVELY

PPS22 states that at the local level, planning authorities should set out the criteria that will be applied when assessing planning applications for renewable energy projects. PPS22 states that the wider environmental and economic benefits of all proposals for renewable energy projects, whatever their scale, are material considerations that should be given significant weight in determining whether proposals should be granted planning permission. PPS22 also states that where renewable energy schemes are likely to impact upon European designated sites, an Appropriate Assessment must be carried out.

When dealing with renewable energy applications, PPS1 Supplement states that LPAs should not:

- Require renewable energy applicants to demonstrate the need for renewable energy and its distribution; or
- Require applicants to demonstrate why a proposal must be sited in a particular location.

PPS1 Supplement also states that LPAs should ensure any local approaches to protecting landscape and townscape are consistent with PPS22 and does not preclude the supply of any type of renewable energy other than in the most exceptional circumstances. The NWRSS (Policy EM17) also states that LPAs should give significant weight to the wider environmental, community and economic benefits of proposals for renewable energy.

B1.5 LOCAL AUTHORITIES OWN DEVELOPMENTS

The Renewable Energy Strategy suggests that LAs should consider the use of renewable energy in their own developments. Similarly, the strategy advocates that LAs, as major energy consumers, can enter into long-term supply contracts that prioritise renewable energy. At the regional level, the NWRSS (policy EM15) also states that public authorities should aim to reduce energy consumption and maximise sustainable energy generation in their own proposals and schemes.

B1.6 GRANTS AND FUNDING

The Renewable Energy Strategy states that Local Authorities can facilitate access to finance for renewable energy companies through grants and investment in local economic regeneration. The Community Infrastructure Levy (CIL) will also provide an opportunity to gain funding for new renewable energy developments. The CIL is a new charge which local authorities will be empowered (but not required) to charge on most types of new development in their area. CIL charges will be based on simple formulae which relate the size of the charge to the size and character of the development. The proceeds of the CIL would

be spent on local and sub-regional infrastructure to support the development of the area.

A particular focus of the CIL is the potential role it can play in delivering sub regional infrastructure in order to serve the needs of several local authority areas. Examples noted in the CIL include hospitals, larger transport projects, or waste facilities. However it is reasonable that renewable energy could also be considered as sub regional infrastructure. Sub-regional infrastructure is considered to often be the most critical type of infrastructure in terms of unlocking significant housing or economic development, and therefore the CIL could be powerful tool in assisting Councils to meet its renewable energy requirements.

B1.7 COMMUNITY CONSULTATION

The Renewable Energy Strategy states that local authorities can also build acceptance for renewable projects by engaging local residents, ensuring that projects are transparent and accountable and ensuring there is a clear benefit to the local economy. Similarly, PPS1 Supplement states that LPAs, regional stakeholders and Local Strategic Partnerships should foster community involvement in renewable energy projects and seek to promote knowledge of and greater acceptance by the public of prospective renewable energy developments that are appropriately located. The NWRSS (Policy EM17) supporting text notes that developers must consult and engage with local communities at an early stage of the development process prior to submission of any proposals and schemes for approval under the appropriate legislation.

B2 LOCAL AUTHORITY POLICY REVIEWS

B2.1 ST. HELENS METROPOLITAN BOROUGH COUNCIL RENEWABLE ENERGY POLICIES

B2.1.1 Existing and Emerging Policies on Renewable Energy

St Helens Metropolitan Borough Council's (MBC) Unitary Development Plan (UDP) was adopted in July 1998. The majority of policies were extended beyond their expiration date in 2007, but as Policy S12 on Renewable Energy expired in 2007, it is not considered here.

St Helens published the publication version of their Core Strategy in May 2009 (draft Core Strategy), with consultation completed in July 2009. Consultation responses are now being considered for submission to Government, with a hearing scheduled for December 2009. Draft Core Strategy Policy CP1 discusses renewable energy.

Policy CP1, Ensuring Quality Development in St Helens (St Helen's Draft Core Strategy)

'All proposals for development within the Borough will be expected, where appropriate, to meet the following standards as a minimum…

4ii. Minimise consumption of energy and incorporate renewable and low carbon energy generation. An initial target of 10% renewable will be sought which will be superseded by a target in the Climate Change DPD'.

The supporting text states St Helen's intention to prepare a renewable energy study to inform the Climate Change DPD, and acknowledges that the Annual Monitoring Report does not currently measure success on delivering 10% of renewable energy on sites. Policy CAS3.2 also states that proposals for a Strategic Rail Freight Interchange at the Former Parkside Colliery should consider energy generation by renewable means.

B2.1.2 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	DRAFT CORE STRATEGY	CLIMATE CHANGE DPD
Policy promoting renewable energy (PPS22)	Not Applicable	✓	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	Not Applicable	✓	Not Applicable
Clear criteria for developments affected by the above	Not Applicable	× (Makes reference to NWRSS)	Not Applicable
Target for renewable energy generation for LA area	Not Applicable	×	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	Not Applicable	×	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	Not Applicable	×	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	Not Applicable	×	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	Not Applicable	✓	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	Not Applicable	Not Applicable	Not Applicable

B2.1.3 Potential for this Study to Inform Future Planning Policies

The development of a Climate Change Development Plan Document (DPD) for St. Helens provides an opportunity to set out policies and supporting text that enable and encourage development of renewable energy technologies. Consultation with the planning department will ensure that this study is developed in a way that provides a robust evidence base for this DPD.

B2.2 HALTON BOROUGH COUNCIL RENEWABLE ENERGY POLICIES

B2.2.1 Review of Existing Policies

Halton Borough Council's (BC) Unitary Development Plan (UDP) was adopted in April 2005. The vast majority of policies were saved beyond the April 2008 expiration date by a Direction from the Secretary of State in March 2008. Halton's UDP Policy MW18 focuses on renewable energy.

Halton's Local Development Scheme (March 2009) states that publication of the Core Strategy is scheduled for September 2010, with adoption in October 2011. The Core Strategy Issues and Options paper was published for consultation in 2006, with consultation on Preferred Options finishing on the 5 November 2009.

MW18 Energy from Non-Fossil Sources (Halton's UDP)

'Proposals for renewable energy schemes will be permitted if all of the following criteria can be satisfactorily demonstrated:

a The scheme, including any associated power lines, would not result in an unacceptable, adverse effect on the landscape character of the area.

b That, both during and after construction, measures will be taken to minimise the impact of the development on nearby land uses and residential amenity.

c That the proposal will bring local and wider benefits.'

The supporting text recognises that the setting and characteristics of Halton mean that the following energy sources might be exploited:

- Wind power –initial feasibility studies are being conducted at Hutchinson's Hill, overlooking the Mersey Estuary.
- Energy generation within industrial processes - there are already a number of power plants fired by non-fossil fuels, including waste products from within the site. Further schemes of this nature are likely in the future, and planning control will need to be exercised in close cooperation with the pollution control authorities'.

B2.2.2 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	DRAFT CORE STRATEGY	OTHER
Policy promoting renewable energy (PPS22)	✓	Not Applicable	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	×	Not Applicable	Not Applicable
Clear criteria for developments affected by the above	Not Applicable	Not Applicable	Not Applicable
Target for renewable energy generation for LA area	×	Not Applicable	Not Applicable
Criteria to be met by renewable energy development are stringent (5), medium (3) or minimal (1)	4	Not Applicable	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	Partially	Not Applicable	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	×	Not Applicable	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	✓	Not Applicable	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	Policy would cover this in combination with other policies	Not Applicable	Not Applicable

B2.2.3 Potential for this Study to Inform Future Planning Policies

Given that the Core Strategy Preferred Options paper has not yet been published for consultation, there would be the potential for the study to influence emerging policies, either through consultation with Halton BC's planning department during the study, or through submitting a Merseyside Renewable Energy study response to the Core Strategy consultation.

B2.3 LIVERPOOL CITY COUNCIL RENEWABLE ENERGY POLICIES

B2.3.1 Existing and Emerging Policies on Renewable Energy

Liverpool City Council's (CC) UDP was adopted in 2002, with the majority of policies saved by a Direction from the Secretary of State in 2007. Policy EP16 discusses renewable energy.

EP16 Renewable Energy (Liverpool's UDP)

'The City Council will support the development of renewable energy projects provided that the proposal:

i. would not have a detrimental impact on neighbouring uses;

ii. would not have a detrimental impact on environmentally sensitive areas; and

iii. is in accordance with other policies in the Plan.'

The supporting text states that in an area as built-up as Liverpool it is not possible to identify specific sites suitable for renewable energy installations beyond stating that the most appropriate location for such uses are likely to be in existing or proposed industrial areas.

Liverpool City Council published their Core Strategy Preferred Options report in March 2008. However, following developments at a national and regional level the Council has decided to undertake a further round of consultation in November/December 2009. The Core Strategy is scheduled for adoption late 2011. The March 2008 Preferred Options report Option 13 discusses renewable energy.

Preferred Option 13 (Liverpool's Core Strategy Preferred Options Report)

'New development within Liverpool should ensure, including where necessary through appropriate developer contributions, the efficient and effective use of environmental resources by:

- … Providing at least 10% of total predicted energy requirements from renewable sources in development comprising 10 or more dwellings or in non-residential development over 1000m2 gross floorspace;

…In order to make efficient use of the City's natural resources and to contribute further to the tackling of climate change, proposals for standalone schemes for the generation of renewable energy will be supported provided that they would have no unacceptable adverse impacts (including contributing to cumulative impacts) on the built or natural environment of the City.'

B2.3.2 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	DRAFT CORE STRATEGY	OTHER
Policy promoting renewable energy (PPS22)	✓	✓	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	×	✓	Not Applicable
Clear criteria for developments affected by the above	Not Applicable	✓	Not Applicable
Target for renewable energy generation for LA area	×	×	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	3	3	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	×	×	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	×	×	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	✓	✓	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	Policy would cover this in combination with other policies	Policy would cover this in combination with other policies	Not Applicable

B2.3.3 Potential for this Study to Inform Future Planning Policies

The Liverpool City Council Core Strategy is at a relatively advanced stage so it is unlikely that major changes to policies would be carried out. However, Liverpool CC will carry out a second consultation on the Preferred Options report at the end of 2009 and this study could help provide a robust evidence base for emerging renewable energy policies and help refine the policies themselves. The consistency between this study and the emerging Core Strategy can be maximised through consultation with the planners at the CC and potentially, informing a response to the Council's Core Strategy consultation at the end of this year.

B2.4 SEFTON METROPOLITAN BOROUGH COUNCIL RENEWABLE ENERGY POLICIES

B2.4.1 Existing and Emerging Policies on Renewable Energy

Sefton Metropolitan Borough Council (MBC) adopted its UDP in June 2006. The majority of policies were saved by a Direction from the Secretary of State in April 2009. Policies DQ2 and EMW2 discuss renewable energy.

Policy DQ2 Renewable Energy in Development (Sefton's UDP)

All proposals for major non-residential development will be expected to incorporate renewable energy production equipment to provide at least 10% of their predicted energy requirements from renewable sources.

The supporting text states that the policy seeks to secure use of renewable energy from on-site sources in major non-residential development schemes and to also encourage energy efficient schemes. This will reduce the total energy used and thus the total amount of energy required from renewable sources. The supporting text defines major non-residential development as having a gross floorspace of 1,000sqm^2 or more, and including both new buildings and conversions. The supporting text states that grants are likely to be available that will cover a proportion of the cost of any renewable energy scheme.

Policy EMW2 Renewable Energy Infrastructure (Sefton's UDP)

1. Proposals for renewable energy infrastructure will be judged against the national and Sefton-wide benefits that the proposal may bring and the availability of other sites that will allow the particular renewable energy source to be harnessed.

Procedures

2. Proposals should be accompanied by:

(a) a project overview which identifies the cumulative impacts of the proposed development;

(b) a statement which indicates what measures will be taken during and after construction to minimise the impact on local land-uses.

The Sefton Core Strategy is in the earliest development stages, with workshops on developing the vision and options planning for summer/autumn 2009, submission in May 2010 and approval in summer 2011.

B2.4.2 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	DRAFT CORE STRATEGY	OTHER
Policy promoting renewable energy (PPS22)	✓	Not Applicable	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	✓(only non-residential)	Not Applicable	Not Applicable
Clear criteria for developments affected by the above	✓	Not Applicable	Not Applicable
Target for renewable energy generation for LA area	×	Not Applicable	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	4	Not Applicable	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	×	Not Applicable	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	×	Not Applicable	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	Policy would cover this in combination with other policies (Policy does require other site assessments)	Not Applicable	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	Policy would cover this in combination with other policies	Not Applicable	Not Applicable

B2.4.3 Potential for this Study to Inform Future Planning Policies

As the Sefton Core Strategy is in the earliest stages of development, there is a large scope for this study to inform the document from the outset.

B2.5 WEST LANCASHIRE BOROUGH COUNCIL

West Lancashire Borough Council (BC) adopted the West Lancashire Replacement Local Plan in 2006. The policies within the Replacement Plan were due to expire on 5th July 2009, but the majority were saved beyond this date. Policy SC12 discusses renewable energy.

Policy SC 12: Renewable Energy (West Lancashire's Replacement Local Plan)

'Proposals for renewable energy generation will be approved provided that they do not have an adverse impact on the character and value of the landscape and on areas of natural and built heritage, including their settings, and meet the other policies set out in this Plan'.

The supporting text recognises national and sub-regional targets for renewable energy generation in Lancashire, although the targets in the Lancashire Structure Plan have subsequently expired.

West Lancashire BC began working on the evidence base to support the Core Strategy in 2006. The BC is currently in the process of working on an options paper with a view to consulting formally on it in during summer and early autumn 2009.

B2.5.1 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	DRAFT CORE STRATEGY	OTHER
Policy promoting renewable energy (PPS22)	✓	Not Applicable	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	✓ (Although mentions Structure Plan targets)	Not Applicable	Not Applicable
Clear criteria for developments affected by the above	Not Applicable	Not Applicable	Not Applicable
Target for renewable energy generation for LA area	×	Not Applicable	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	3	Not Applicable	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	×	Not Applicable	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	×	Not Applicable	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	✓ (particularly wind turbines)	Not Applicable	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	Policy would cover this in combination with other policies	Not Applicable	Not Applicable

B2.5.2 Potential for this Study to Inform Future Planning Policies

West Lancashire BC's Core Strategy is at the options stage and consequently the present study has significant opportunities to inform the development of the BC's core planning policies.

B2.6 KNOWSLEY METROPOLITAN BOROUGH COUNCIL'S RENEWABLE ENERGY POLICIES

B2.6.1 Existing and Emerging Policies on Renewable Energy

Knowsley Metropolitan Borough Council (MBC) adopted their Unitary Development Plan (UDP) in 2006. Policy MW7 discusses renewable energy.

Policy MW7 (Knowsley's UDP)

'1. Proposals for new development required in connection with the generation of energy from renewable sources will be encouraged and permitted.

2. Proposals for new infrastructure required to generate renewable energy should seek to avoid causing a detrimental impact on:

- Sites of national, international and local importance for nature conservation;
- The appearance or character of the surrounding area;
- The amenity of any nearby residents by reason of noise, odour, disturbance, pollution, visual intrusion or traffic generation.

3. Proposals for renewable energy development in sensitive areas such as the Green Belt, nature conservation designations, and Conservation Areas will only be permitted if the developer has established that it would be impractical to site the development outside such areas, and that any adverse impacts of the proposal would be minimised through careful site selection, location, scale, design and screening.

4. Any large scale new residential, commercial and industrial developments will be required to generate at least 10% of the predicted energy requirements from renewable sources, where this is practicable and viable given the type of development proposed, its location and design.'

Knowsley MBC began consultation on their Core Strategy in July 2008 and has been completing the evidence base documents to support future policies, such as their Employment Land Review. As yet there are no draft policies available for review.

B2.6.2 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	CS	OTHER
Policy promoting renewable energy (PPS22)	✓	Not Applicable	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	×	Not Applicable	Not Applicable
Clear criteria for developments affected by the above	×	Not Applicable	Not Applicable
Target for renewable energy generation for LA area	×	Not Applicable	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	4	Not Applicable	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	✓	Not Applicable	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	No but does set out stringent targets for development within 'sensitive' areas	Not Applicable	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	×	Not Applicable	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	×	Not Applicable	Not Applicable

B2.6.3 Potential for this Study to Inform Future Planning Policy

As Knowsley MBC's Core Strategy is at a relatively early stage, there are opportunities for this study to inform the development of the document. However, Knowsley MBC have recently completed their own, detailed renewable and low energy study and detailed Assessments of Knowsley's renewable energy potential have already been carried out and are being taken forward. Therefore, the main area of influence for Knowsley is the split of Merseyside renewable energy targets at the Local Authority level. Knowsley MBC's renewable energy study has been taken into account at every stage of this study to ensure consistency and integration of the two pieces of evidence.

The local study sets out a series of recommendations and actions that the Council are now considering. This includes the need to undertake site and premises specifc feasibility research for individual schemes and undertake further site specifc analysis of future development sites to identify priority areas were renewable and low carbon energy schemes. It would be beneficial for the Council to consider these actions together with its neighbouring authorities in order to have a wider understanding of site specifc opportunities. Continued engagement with Knowsley MBC will ensure that this study builds on the content and experience developed through the Knowsley Renewable Energy Study.

B2.7 WARRINGTON BOROUGH COUNCIL RENEWABLE ENERGY POLICIES

Warrington Borough Council's (BC) UDP was adopted in January 2006. Outlined within it, are three policies relating to renewable energy and wind turbines. Policies REP16, REP17 and REP18 of the UDP discuss renewable energy.

REP16 Renewable Energy (Warrington's UDP)

'Permission will be granted for proposals for the generation of power from renewable energy sources provided that the following criteria are met:

- the development would cause no significant harm to the appearance and character of the surrounding area;
- highway safety standards would not be adversely affected;
- the development would have no unacceptable impact on the amenities of neighbouring residential occupiers by reason of noise, disturbance, pollution, visual intrusion, or traffic generation;
- the proposal includes effective measures to safeguard features or areas of particular landscape or nature conservation interest;
- The development would not cause significant harm to the landscape, nature conservation sites or historic features;
- the characteristics of an individual site are such that they can accommodate the infrastructure requirements for renewable energy generation; and

- in determining proposals, the Council will take into account any benefits for the wider community, which the provision of the development would bring, either directly or indirectly'.

REP17 Wind Turbines (Warrington's UDP)
'In addition to the provisions of policy REP16, proposals for the development of wind turbines will need to satisfy the following criteria:

the development will not unacceptably affect the amenities of neighbouring occupiers by reason of shadow flicker or reflected light;

no electromagnetic disturbance will be caused by the development to any existing transmitting or receiving systems or, if such disturbance may be caused, that mitigation measures are proposed to remedy any such disturbance

there will be no adverse environmental effect associated with the provision of transmission lines between the development and the point of connection to the grid; and

provision is made for a realistic means of securing the removal of the wind turbines when redundant, and the restoration of the site so as to allow grazing or agricultural use.

In assessing these criteria, full account will be taken of proposed mitigating measures.

REP18 Wind Turbines (Warrington's UDP)
'The Council will seek to safeguard permitted or operational wind turbines generating power to the grid from development which would prejudice their commercially viable operation.'

Consultation on the Issues and Options Core Strategy was undertaken in early 2009. The Issues and Options paper recognises the aim of the Sustainable Community Strategy to meet and exceed targets for energy generated by renewable resources and CO_2 emission reductions. The Core Strategy Issues and Options paper states the Council's objective to:

Core Strategy Issues and Options Objectives (Warrington's CS Issues and Options Paper)
'promote and exploit low carbon and renewable energy technologies and increase the amount of electricity from renewable sources'.

This shows Warrington BC's objective to increase renewable energy, although draft policies are at an early stage.

B2.7.1 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	CS	OTHER
Policy promoting renewable energy (PPS22)	✓	✓	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	×	×	Not Applicable
Clear criteria for developments affected by the above	✓	Partially	Not Applicable
Target for renewable energy generation for LA area	×	×	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	4	4	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	Partially	Partially	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	×	×	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	×	×	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	×	×	Not Applicable

B2.7.2 Potential for this Study to Inform Future Planning Policy

Like many other Local Authorities, Warrington BC is in the process of developing their Core Strategy. The Core Strategy has not yet the Preferred Options report stage. therefore there is a significant opportunity for the study to inform emerging planning policies.

B2.8 WIRRAL METROPOLITAN BOROUGH COUNCIL RENEWABLE ENERGY POLICIES

Wirral Metropolitan Borough Council (MBC) adopted their UDP in 2000. Policy REN1 outlines the council's policy on renewable energy.

REN1 Principles For Renewable Energy (Wirral's UDP)

'Renewable energy proposals will be assessed with regard to their siting and design, environmental impact, and impact on the amenity of neighbouring uses, subject to the other policies of the plan'.

The supporting text states that although current renewable energy technologies may not be appropriate in Wirral, advances in technology may bring forward proposals for renewable energy schemes in the future. These may lead to unobtrusive adaptations to existing buildings or simply the best alignment of new buildings to take advantage of solar gain.

The Issues and Options report for the Core Strategy was originally scheduled for September 2007, but has been delayed.

B2.8.1 Evaluation of Policies with Reference to PPS22 and PPS1 Supp Guidance

CRITERIA	UDP	CS	OTHER
Policy promoting renewable energy (PPS22)	✓	Not Applicable	Not Applicable
DPD target to encourage 10% of energy generation on-site (PPS22 and PPS1 Supp)	×	Not Applicable	Not Applicable
Clear criteria for developments affected by the above	×	Not Applicable	Not Applicable
Target for renewable energy generation for LA area	×	Not Applicable	Not Applicable
Criteria to be met by renewable energy development 1= minimal, 2 = some requirements, 3 = medium level of requirements 4 = high level of requirements 5= stringent	3	Not Applicable	Not Applicable
Identify broad areas of suitability for certain technologies (PPS1 Supp)	✓	Not Applicable	Not Applicable
Allocate specific sites (PPS22) Where viable, there is developer interest and the site	×	Not Applicable	Not Applicable
Does not require applicants to demonstrate need for development, why sited in a particular location	×	Not Applicable	Not Applicable
Approaches to protecting landscape and townscape should not preclude renewable energy developments other than in exceptional circumstances (PPS1 Supp).	Policy would cover this in combination with other policies	Not Applicable	Not Applicable

B2.8.2 Potential for this study to inform future planning policy

Wirral MBC is at a relatively early stage of their Core Strategy development and consequently, there is a significant opportunity to inform the emerging Core Strategy documents. It is understood that the Council recognise that there is potentially a need to develop policies in its LDF that go beyond the 10 – 15 year plan period and align longer term energy strategies being developed in the private sector that have implications for the borough. As with all other Authorities, consultation will be vital to ensure this study produces evidence in the most useful format inform Core Strategy development.

B2.9 LOCAL AUTHORITY POLICY ANALYSIS

All Local Authority policies above are in accordance with national and regional policies in that they state the Councils' intentions to contribute to the achievement of national and regional renewable energy targets. All Council's in the study area have an existing or emerging policy on renewable energy and most Local Authorities have both. However, the strength of policies varies considerably between Local Authorities, as does the requirements set to support the Council's aspirations.

B2.9.1 Targets for Renewable Energy Generation within Local Authority Areas

None of the eight Local Authorities in the study area set targets for renewable energy generation for their area as suggested by PPS1 Supplement.

Without policies that incorporate overall targets it will be very difficult to assess the amount of renewable energy schemes and their energy outputs in a robust and credible way. Reporting on renewable energy schemes is a statutory requirement for each Council's Annual Monitoring Report.

B2.9.2 Targets for Renewable Energy Generation within New Developments

Some councils studied had existing or emerging targets requiring that a percentage of energy used in new developments should come from renewable and/or low carbon sources, as advocated by PPS1 Supplement and PPS22. Knowsley MBC provides the most comprehensive policy direction on this matter, with its UDP policy stating that any large scale new residential, commercial and industrial developments will be required to generate 10% of their own energy requirements from renewable sources.

Sefton MBC also has an adopted policy in their UDP encouraging renewable energy development to meet 10% of energy requirements from non-residential developments. St Helens MBC and Liverpool CC both set targets in their draft Core Strategy documents, showing the intention to take forward the policies in future planning policies. Halton BC, Warrington MBC, Wirral MBC and West Lancashire BC do not yet have any existing or emerging targets for new developments and developing such as policy might be a priority for these authorities in their forthcoming Core Strategies.

Where Local Authorities have emerging or existing policies for renewable energy in new developments, the thresholds and targets vary. St Helens MBC sets a target of 10% but does not set out clear criteria as to which developments would need to supply 10% of energy requirements. In contrast, Liverpool CC's Draft Core Strategy policy sets clear thresholds for the developments that would need to provide 10% of their own energy, making the policy clearer and easier to enforce, whereas Sefton MBC set clear criteria, but only require renewable energy from non-residential developments. In order to adopt a fairly consistent approach across the sub-region, and promote renewable energy in the area, it is recommended that all local authorities should consider necessitating that new developments aim to supply some of their energy on-site.

Given that the national targets are currently 10%, this should be considered the minimum requirements and, based on the evidence in this review, some authorities may wish to require more generation from certain sites and developments. Across the UK, many policies use the thresholds for renewable energy generation as residential developments over 10 dwellings and non-residential developments over 500m^2 gross floorspace. Some Local Authorities, such as Sheffield, use targets of half this size (e.g. 5 dwellings), and this could be considered if Local Authorities want to include more developments in the policy.

Finally, where policies exist, Local Authorities do not yet measure the success of policies in delivering renewable energy schemes in planning applications. A next step could therefore be monitoring how many large scale planning applications are approved with 10% renewable energy generation included in proposals. This would help highlight areas where loopholes in policies are being exploited by developers, for example, where developers are finding it easy to prove that options are not 'appropriate'.

Optional Extras: Every development and/or larger requirements for certain developments

A bolder approach would be to look at ways to generate renewable energy contributions from all developments involving new or refurbished buildings. Acknowledging that it will not always be feasible to develop renewable energy on-site (particularly for small developments), an alternative may be to look at gaining contributions towards near-site (e.g. district heating schemes) or off-site renewable energy generation for those developments for which on-site or near-site generation is not feasible. This could be done by first devising a policy in emerging Core Strategies (or other DPDs) and then securing payments through Section 106 payments or the Community Infrastructure Levy.

Alternatively, a standard policy could specify a target for all large developments, with higher targets set for particular sites and areas. For example, during the course of the baseline research for an Area Action Plan or Supplementary Planning Document for a certain area, one of the main parts of the research could be to identify areas where 20% of energy needs could be met on-site. The intention to do this could be set out in Local Authorities' Core Strategies where timescales permit. Similarly, when Local Authorities are developing other policies, renewable energy potential should be considered.

B2.9.3 Assessing Criteria for Renewable Energy Developments

One of the most significant variations in renewable energy policies across the study area is associated with the criteria schemes are considered against when determining renewable energy planning applications. The table below provides an indicative comparison of how comprehensive the existing policy frameworks are for determining renewable energy developments across the study area.

	LCC	SH MBC	HBC	WIRRAL MBC	SEFTON MBC	WLBC	KMBC	WARRINGTON BC
Criteria for developments 1= minimal, 2 = some requirements 3 = medium level of requirements 4 = high level of requirements 5= stringent	3	1	4	2	4	2	3	4

This assessment suggests that the policy approaches in the study area vary, however no approach should be considered 'better' or 'worse' than another. The main issue for each local planning authority when developing future policies for renewable energy will be to provide clarity on how each policy will be interpreted and implemented. Developers will require certainty when renewable technologies and/or developer contributions are required. It shoud also be recognised that the development of policies need to be assessed in terms of is impact on incentivising developers.

The following discussion sets out the findings of a broad assessment of the study area in terms of how each LPA intends to assess future schemes for contributions to renewable energy schemes. The assessment highlights the differences in approach and recommends areas where Local Authorities may wish to consider whether current policies will have the intended impact.

B2.10 DISCUSSION OF ASSESSMENT

The assessment identified that St Helens MBC's draft Core Strategy does not specify nay criteria that will be used to assess renewable energy applications which. This has resulted in a low score being provided, however whilst it does not indicate how applications will be assessed however it could be argued that this ensure that applications are not restricted from the outset.

Wirral MBC and West Lancashire BC's current UDP policies set out criteria that will be considered. Wirral MBC states that applications will be assessed with regard to the criteria, whereas West Lancashire BC states that applications will be approved provided that they meet the criteria. Both approaches generally promote, rather than restrict renewable energy schemes. Policy requirements include statements such as with regard to their siting and design (Wirral MBC) and impacts on the character and value of the landscape (West Lancashire

BC). This wording is relatively broad in nature and could be interpreted in a number of ways, leading to uncertainty.

Liverpool CC set criteria related to the impact on neighbouring uses, environmentally sensitive areas and other policies in the plan. Knowsley sets similar criteria which looks at nature conservation sites, the appearance and character of the surrounding area and residential amenity. These criteria are similar to those used by Wirral MBC, but the Liverpool policy states that the City Council will support renewable energy if schemes 'would not have a detrimental impact on neighbouring uses/environmentally sensitive areas', whilst Knowsley's policy states that proposals 'should seek to avoid causing a detrimental impact on'. These policies provide a robust set of criterion that clearly indicate what would be considered as a significant barrier/ 'show-stopper' for development schemes.

Halton BC, Sefton MBC and Warrington BC set out comprehensive criteria for renewable energy developments. All three Local Authorities have policies with similar levels of assessment criteria; however, the wording of policies varies significantly. Warrington's UDP policy sets out a comprehensive list of criteria, with each criterion is worded to minimise the risk of the policy not being implemented. For example, 'the development would have no unacceptable impact…' this wording provides clarity of criteria considered, without overly restricting renewable energy developments.

In contrast, Sefton MBC and Halton BC's UDP policies do not contain a long list of criteria for developments. Instead there is a more limited, but a wider ranging set of criteria that are relatively broad in their requirements. For example Halton BC's UDP policy states that the proposal will be permitted if it 'will bring local and wider benefits'. However the policies do not set out what local and wider benefits are likely to be or how they could be demonstrated by an applicant. When determining the local and wider benefits of renewable energy schemes (i.e. related to national, regional and local targets and mitigation), this could be interpreted as a request for schemes to demonstrate the 'need' for development. This is not recommended by national policies and consequently careful consideration will be needed to ensure that any future policies have considered this matter in full. For example renewable energy schemes can also bring benefits such economic development and employment; however, it may not be easy for a proposal to robustly demonstrate this, particularly with respect to providing 'additionality' to employment.

Further, Sefton MBC's UDP policy states that proposals will be judged against 'the availability of other sites that will allow the particular renewable energy source to be harnessed'. This policy could be seen as promoting renewable energy if it is interpreted to mean that where a renewable energy development can only be located in one place, applications should be appraised more favourably. However, it would also be reasonable to assume that the policy requires developers to undertake a sequential test to demonstrate that a particular location is preferred and is more suitable than other available locations. If this interpretation was to be upheld, then the current policy is not in general conformity with national policy (PPS1 Supplement), which states that Local Planning Authorities should not require applicants to demonstrate why a proposal must be sited in a particular location.

B2.10.1 Conclusions

Overall, there is significant variation across the study area in how planning policy is interpreted, how renewable energy applications will be appraised, the documents and evidence that developers would need to develop and the implications this has for the determination of schemes involving different scales and types of renewable and low carbon energy applications.

Whilst it is recognised that national policies emphasise that renewable energy developments located in nationally recognised designations (such as the European designation, Natura 2000) should consider the impact on those designations, some policies reviewed go further by including local criteria such as the Green Belt.

Policies suggesting that renewable energy developments have account of local designations can help developers to identify and prioritise the types of areas that would be best suited for renewable energy development. However, the policy may also provide developers with 'get-out clauses', where a justification could be developed to demonstrate that other considerations make renewable/ low carbon energy is unviable.

B2.10.1.2 Locations for Renewable Energy Development

Of the eight local authorities in the study area, none identify broad areas of suitability for renewable energy development as recommended by PPS22 (however this study now begins to address this issue). The Local Authority that comes closest to meeting this requirement is Liverpool, which recognises the potential for renewable energy generation on existing and proposed industrial areas. If planning applications submitted for renewable energy generation in the areas

specified increases the chances of the schemes gaining planning permission, the development of these policies may encourage renewable energy development in these areas, particularly where it is emphasised that this is not at the exclusion of other locations.

It should be noted that regional studies have shown that the identification of broad areas is not always appropriate[xiv]. Therefore, it is not recommended that Local Authorities should attempt to identify such areas for the sake of meeting national policy and need to be identified where there is suitable resource supply and infrastructure capacity to ensure it is commercially viable. This study begins to address this, however more detailed work is required if the potential and viability of areas is to be properly understood.

Two Local Authorities already discuss the potential of particular sites for renewable energy. For example, St Helen's mention the potential for renewable energy technologies at the proposed Strategic Rail Freight Interchange and Halton identifies (subject to the outcomes of feasibility studies being undertaken) and Hutchinson's Hill. National guidance generally advises against identification of particular sites for renewable energy in core policy documents, except when Local Authorities are reasonably sure that the site will come forward.

Optional Extras: Informing developers about options for specific sites/areas and investigating requirements in future Local Development Framework documents.

Where possible, Local Authorities should not want policies requiring on-site renewable energy technologies to prevent other forms of development. To avoid this, the information gained as part of this study and any future updates could be developed into information documents, either formally in Local Development Framework policies or supporting documents that can be updated periodically to reflect changes in the efficiency and commercial viability of technologies. This could help developers identify renewable energy solutions to meet requirements that they may not have previously considered and 'demystify' issues surrounding certain renewable energy technologies.

Another approach would be to incorporate assessments of the potential for renewable energy into site assessments completed for established forms of evidence such as Employment Land Reviews, Strategic Housing Land Availability Assessments, and/or when areas subject to Masterplans, Area Action Plans and area based Supplementary Planning Documents. This could help identify areas that might be suitable for higher renewable energy targets or areas where other incentives could be made available to realise and enhance potential for renewable energy.

B2.10.1.3 Monitoring

Through the data collection process for this study it has been identified that there is no formalised process or system developed for monitoring renewable and low carbon energy in each Local Planning Authority. This makes monitoring the effectiveness of policies and identifying the extent to which local authorities are contributing individually and/ or collectively to sub regional targets are relatively limited. It will be important that Local Authorities consider how they can monitor renewable energy developments in the future individually and as a sub region.

Where an existing or emerging policy requires a defined percentage of renewable energy to be provided in developments, a measure could be introduced in Annual Monitoring Reports to examine the success of this policy.

[i] European Union, 2009, 'Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'.

[ii] BERR, 2006, Our Energy Challenge: Microgeneration Strategy: Power from the People, http://www.berr.gov.uk/energy/sources/sustainable/microgeneration/strategy/page27594.html.

[iii] Communities and Local Government, 2007, 'Planning Policy Statement: Planning and Climate Change – Supplement to Planning Policy Statement 1'.

[iv] Communities and Local Government, 2004, 'Planning Policy Statement 22: Renewable Energy'.

[v] NWDA, GONW, NWRA and EA, 2006, 'Rising to the Challenge: A Climate Change Action Plan for England's Northwest'.

[vi] Government Office of the North West, 2008, 'North West of England Plan: Regional Spatial Strategy to 2021.'

[vii] NWRA, NWDA, GONW and EA, 2006, 'North West Sustainable Energy Strategy'.

[viii] Department for Business, Enterprise and Regulatory Reform, 2008, 'Energy Trends'.

[ix] The Nottingham Declaration on Climate Change is a declaration that recognises the central role of local authorities in leading society's response to the challenge of climate change. By signing the Declaration, councils pledge to mitigate and adapt to climate change. Signing the Declaration is a public commitment to take action and a catalyst for a more systematic response. Over 300 Local Authorities have signed the Declaration. Further information is available here: http://www.energysavingtrust.org.uk/nottingham.

[x] HM Government, 2008, 'Planning and Energy Act 2008'.

[xi] This includes new non residential developments above a threshold of 1,000m^2 and all residential developments comprising 10 or more units.

[xii] 4NW, 2008, 'Towards Broad Areas for Renewable Energy Development'.

[xiii] Communities and Local Government, 2008, 'The Community Infrastructure Levy'.

[xiv] 4NW, 2008, 'Towards Broad Areas for Renewable Energy Development'.

APPENDIX C

Policy Implications for Locations and Targets for Renewable Energy in the Study Area

C1 POLICY IMPLICATIONS FOR LOCATIONS AND TARGETS FOR RENEWABLE ENERGY IN THE STUDY AREA

C1.1 INTRODUCTION

At the regional level, the North West Regional Spatial Strategy (NWRSS) and the 4NW study 'Towards Broad Areas for Renewable Energy Development' (4NW study) set out:

- indicative targets for potential renewable energy generation by technology; and
- criteria to consider when establishing broad locations for renewable energy generation in the North West.

The implications of the policies and research presented in these two documents, in addition to other relevant documents, have been evaluated to provide an overview of the implications for the study area.

C1.2 LOCATIONS FOR RENEWABLE ENERGY: CRITERIA TO CONSIDER

NWRSS (Policy DP1) states that proposals, schemes and investment decisions should aim to meet a number of criteria, namely:

- promote sustainable communities;
- promote sustainable economic development;
- make the best use of existing resources and infrastructure;
- manage travel demand, reduce the need to travel, and increase accessibility;
- marry opportunity and need;
- promote environmental quality;
- mainstreaming rural issues; and
- reduce emissions and adapt to climate change.

These principles will also apply to decisions regarding locations for renewable energy development. The principle of renewable energy developments will directly contribute to reducing emissions and promoting sustainable communities, however the type and location of proposals will affect whether a renewable energy option supports the other priorities.

NWRSS (Policy EM17) also sets out criteria that should be taken into account when developing renewable energy technologies, although it is emphasised that these should not be used to rule out development. The criteria are include

- local amenity impacts;
- acceptability of the location/scale of proposal and visual impact in relation to sites designated at the national and international level and their settings;
- impact on nature conservation, biodiversity and geodiversity;
- the Green Belt;
- benefits of development to the local economy and local community;
- accessibility (where necessary) by the local transport network;
- agriculture and other land based industries;
- ability to connect to the electricity distribution network and/or proximity to the renewable fuel source; and
- integration of combined heat and power into developments

These factors were taken into consideration when assessing the constraints and benefits of renewable energy in the study area and directly informed the criteria for assessment presented in the main report for stage 1. Stage 2 of the commission will look at these issues in greater detail.

C1.3 RENEWABLE ENERGY TECHNOLOGIES IN THE NORTH WEST

C1.3.1 Existing Generation of Renewable Energy in the North West by Technology

The graph in Figure 1 shows the estimated outputs of existing renewable energy generation plants in the North West for 2007/08, extracted from the 4NW study. This shows that currently the majority of the North West's renewable electricity is generated by offshore wind, biomass with fossil fuels, landfill gas and onshore wind. Onshore and offshore wind together generate almost half the North West's electricity from large and small scale renewable sources

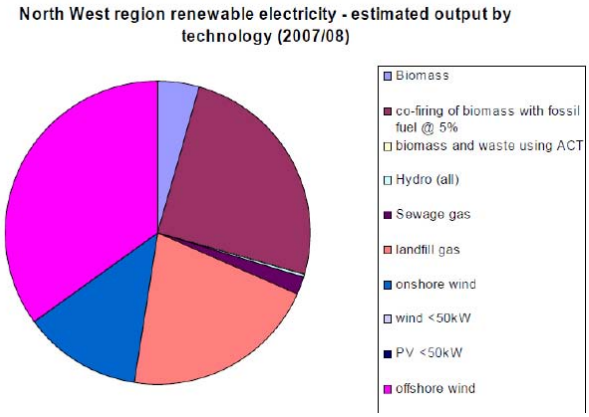


FIGURE 1: ESTIMATED OUTPUT OF LARGE AND SMALL SCALE RENEWABLE ELECTRICITY GENERATION PLANTS IN THE NORTH WEST (GWh)

C1.3.2 Future Generation of Renewable Energy in the North West by Technology

The NWRSS (Policy EM18) sets targets for sub-regional energy production by technology to meet the 2010, 2015 and 2020 renewable energy targets. The targets provide an indication of how Sub-Regional targets might be met, but are flexible and are likely to change in the future. The totals exclude micro wind and photovoltaic installations and are presented

These targets provide the study with some guidance on the technologies that could be used to meet the sub-regional and regional renewable energy targets and form the basis of stage 1 of the study. The 4NW study estimates the installed capacity and actual generation of electricity from large and small scale generation stations accredited under the Renewable Obligation Scheme in the North West. The installed capacity is the maximum that could be produced by a generating station, whilst the estimated output reflects the likely output that would be generated in practice.

The following section provides an overview of the 4NW study findings on the potential for each renewable energy technology in the North West. This information was built upon to develop recommendations about the most appropriate renewable energy technologies for the study area, presented in the main report.

C1.3.3 North West Potential for Wind Energy

In comparison to many other regions of England, the North West has high average wind speeds and large areas of low population density, which in principle suggests that the region has a large potential wind resource. Potential wind yield is influenced by designated planning, technical and environmental constraints, landscape sensitivity and cumulative landscape and visual issues The 4NW study examines areas that might have potential for additional wind schemes, areas the study refers to as 'less constrained' land. The criteria identified in this assessment were used to inform the assessment of how different constraints affect the potential for renewable energy technologies in the study, presented in the main report. The Royal Society for the Protection of Birds has also produced guidance on constraints to wind energy developments in the North West[i] which informed the options appraisal in this study.

The 4NW study summarises that Merseyside has no land that is 'less constrained' or 'variably constrained' for wind energy developments. The study concludes that Merseyside has a theoretical maximum of 18 MW of installed capacity on less constrained land if wind farms are separated by 5km, with an estimated output of 43 GWh. These figures are 8 MW and 19 GWh respectively if wind farms are separated by 10km.

The 4NW study emphasises that sites within 'constrained' areas may be suitable for relatively small scale wind schemes, although they may not be suitable for medium to large scale schemes. The study states that, for example, industrial sites can often be suitable locations for 'merchant wind' schemes. The report also recognises that as wind turbines have become increasingly efficient, the replacement of existing turbines could also increase the overall electrical output of existing wind energy generation sites.

C1.3.4 North West Potential for Biomass

The 4NW study states that a main factor influencing the optimum location of biomass plants is that plants should be located in close proximity to areas of high demand for the heat and electricity they generate. This is because it is more efficient to transport fuels

than heat or electricity. Therefore, there are two locational aspects to biomass, the first being the location of the biomass crops growth and the second being the location of the plant itself.

Some biomass fuels are grown for the purpose of generating renewable heat/electricity (e.g. willow and miscanthus) and these require suitable agricultural land and a strong supply chain to provide farmers with certainty of demand. Large scale biomass crop growth can impact local hydrology, ecology (including birds) and landscape characteristics. The RSPB has identified sensitive bird areas where biomass crop growth could have a significant impact on birds of conservation concern[ii].

Potential sources of biomass in the North West include co-firing, sawmill co-products and other waste wood, managed woodland and biomass crops. The North West Biomass Woodfuel Strategy[iii] identifies the following volumes could be used to generate renewable power in the region:

- Waste wood (220,000 tonnes per annum)
- Sawmill co-products (20,000 tonnes p.a.)
- Recycled wood (50,000 tonnes p.a.)

There may be potential in the region for woodlands in private ownership to supply wood products for use in renewable energy schemes, with the 4NW study estimating that around 90,000 oven dry tonnes could be available each year from woodlands. The 4NW study also estimates that other aboricultural arisings and wood products could generate 147 GWh of CHP, or 163 GWh of heat if used for heat alone. This would also require development of supply chains to turn wood into chips, transport chips to users and install suitable biomass boilers.

C1.3.5 North West Potential for Energy from Waste

The 4NW study found that the greatest potential for Energy from Waste (EfW) plants is located near energy users. There are two potential EfW options discussed in the 4NW study, namely landfill gas and municipal waste. The 4NW study notes that at the current rates of landfilling there is significant potential to generate energy from landfill gas in the North West. However, the majority of landfill sites in the North West are likely to reach capacity by 2015, and although they will continue to generate landfill gas, this decreases over time. Therefore, the peak for landfill gas as a resource is likely to be reached in the mid 2010s.

Therefore, use of landfill gas may not be a good long-term solution to the North West's sustainable energy aspirations. In terms of municipal waste, the biological elements can be used in anaerobic digestion schemes to create gas which can then be used to generate electricity. The 4NW study suggests that there is potential to generate a significant amount of energy using this method.

C1.3.6 North West Potential for Hydro Power

The 4NW study suggests that there is a theoretical potential for a significant increase in the North West's energy generation using hydro power. Lancaster University are currently developing a Hydro Resource Model[iv] looking at suitable locations for run-of-river hydro schemes and facilitate their development.

C1.3.7 North West Potential for Microgeneration

There is significant potential for microgeneration in the North West, and within the study. The main existing barrier to installation is the upfront installation costs. Therefore, initiatives that aim to minimise the negative impact of these costs may help promote microgeneration. Table 1 shows the results of a recent study[v] estimating the potential for microgeneration in the North West.

TECHNOLOGY	2015	2020	2030
Ground Source heat pump	100	100	100
Air source heat pump	200	3,100	10,300
Stirling Engine CHP	16,300	47,200	85,300
Fuel cell CHP	900	52,700	248,600
Biomass	100	1,200	1,600
Micro-wind	200	600	1,300
Solar PV	300	700	2,500
Solar hot water	15,900	28,700	53,500
Total number of schemes	34,000	134,300	403,200
Total renewable heat (GWh)	n/a	116	244
Total renewable electricity (GWh)	n/a	2	5

TABLE 1: POTENTIAL MICROGENERATION IN THE NORTH WEST

C1.3.8 North West Potential for Combined Heat and Power

Defra prepared an estimate of the potential for Combined Heat and Power (CHP) schemes across the UK to 2020[vi], including renewable CHP and CHP using other fuels such as natural gas. The study recognised that:

- The most significant barriers to the installation of CHP in the UK are market conditions, particularly unfavourable electricity and gas prices and uncertainty over future market conditions and the continuity of fiscal benefits.
- Uncertainty arises on what will happen to the EU Emissions Trading Scheme post 2012 and the longevity of industrial heat demands at particular sites,

- The proportion of electricity generated from CHP is not projected to grow significantly to 2010 (although the proportion of heat used may).
- The projected installed capacity of good quality CHP for 2010 is now estimated to be 7,500MWe.

These findings were taken into consideration when developing recommendations for stages 1 and 2 of the commission.

i RSPB, 2008, 'Wind Turbines, Sensitive Bird Populations and Peat Soils'.

ii RSPB, 2008, 'Biomass Planting and Sensitive Bird Populations'.

iii Biomass Contacts Group, 2006, 'North West England Biomass Woodfuel Strategy'.

iv Lancaster University Renewable Energy Group, 'North West Hydro Resource Model'. Available here: http://www.engineering.lancs.ac.uk/lureg/research/hydro/nw%5Fresource%5Fmodel/index.asp.

v Element Energy, 2008, 'The growth potential for microgeneration in England, Wales and Scotland'.

vi Defra, 2007, 'Analysis of the UK potential for Combined Heat and Power, available online at http://www.defra.gov.uk/environment/climatechange/uk/energy/chp/pdf/potential-report.pdf.

APPENDIX D

Liverpool City Region Constraints Mapping

D1 ENVIRONMENTAL DESIGNATIONS AND BIODIVERSITY

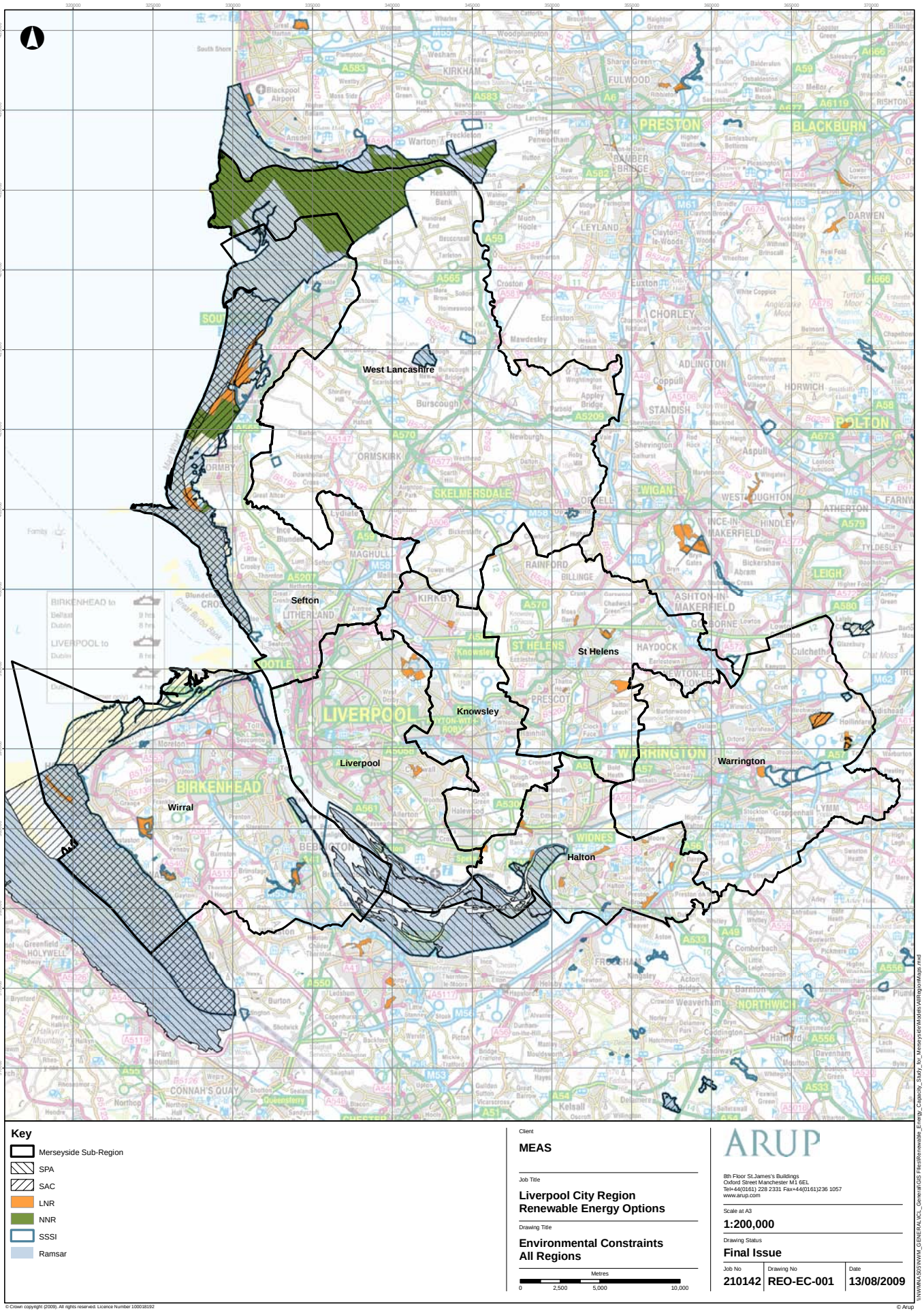


FIGURE 1: ENVIRONMENTAL CONSTRAINTS ALL REGIONS

SOURCE: NATURAL ENGLAND

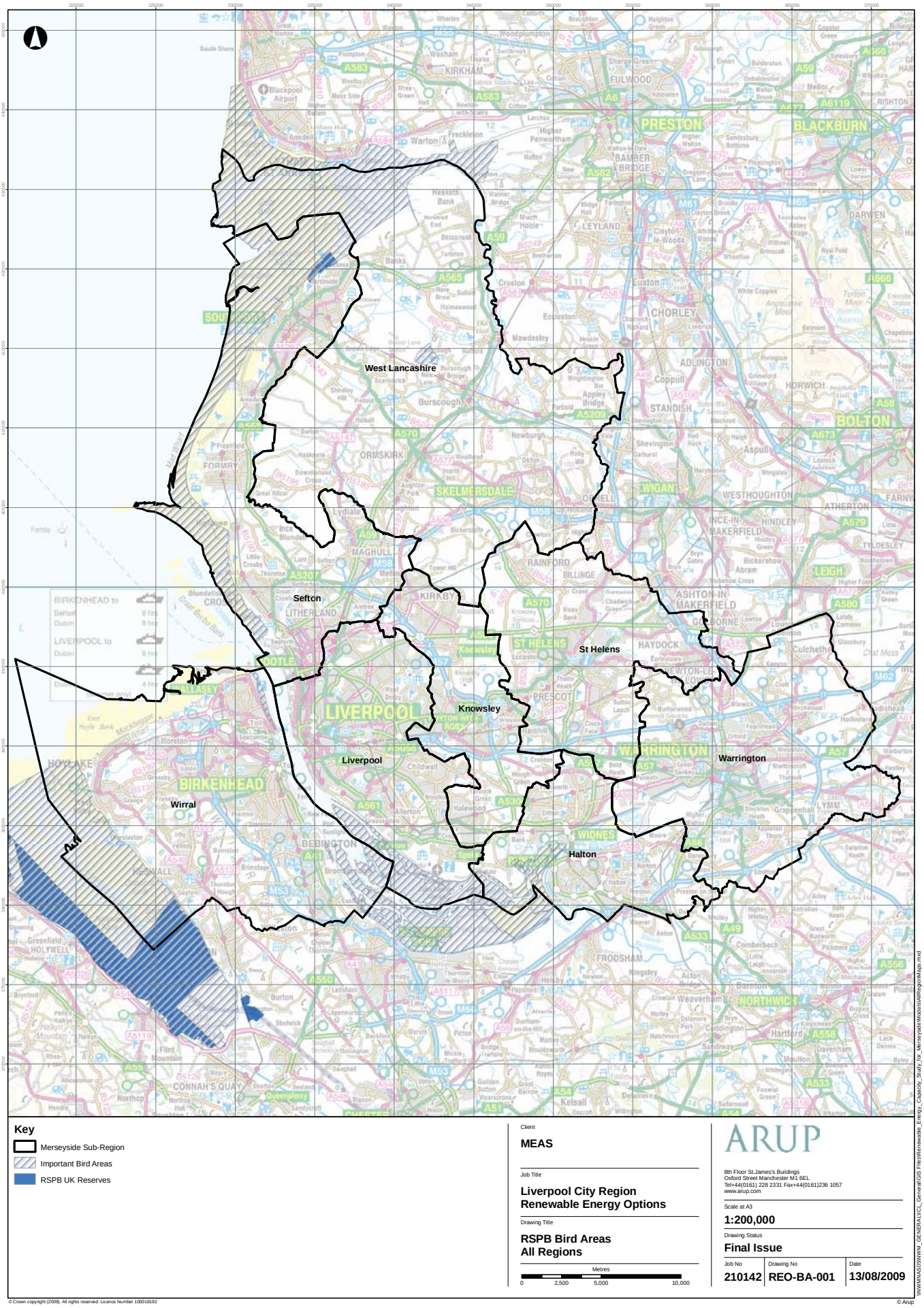


FIGURE 2: RSPB BIRD AREAS ALL REGIONS

SOURCE: (RSPB)

The study area has a number of environmental designations that would present implications for renewable and low carbon energy being delivered in the sub region.

D1.1 RAMSAR SITES, SPECIAL PROTECTED AREAS, SPECIAL AREAS OF CONSERVATION AND BIRD RESERVES

Ramsar sites are designated under the International Convention on Wetlands of International Importance especially as Waterfowl Habitats. There are several sites across the sub region including the Mersey Estuary site, which covers the Wirral, Liverpool and Halton, as well as extending outside the study area. This site is also designated a Special Protected Area (SPA), which is a protected site classified for rare and vulnerable birds in accordance with the EC Birds Directive. Currently the Mersey Narrows and North Wirral Foreshore is a proposed Ramsar site and SPA, which has the same protection as a designated site, and will therefore have the same implications for renewable energy technologies. The Dee Estuary site, which extends into the Wirral is another Ramsar site and is also partially designation as a SPA as well as a Special Area of Conservation (SAC). SACs are strictly protected sites designated under the EC Habitats Directive. The Dee Estuary Site is also part designated an RSPB UK Reserve. The third major Ramsar site in the study area is partially in Sefton, along the west coast stretching from Crosby to Blackpool and is also partially a SPA, SCA and a National Nature Reserve (NNR). NNRs are a selection of the very best of England's Sites of Speical Scientific Interest (SSSI) and it is this underlying designation which gives NNRs their strong legal protection. A small portion of this site, just north of Southport is also an RSPB UK Reserve. Finally there is a small Ramsar site in West Lancashire, Martin Mere.

The study area has a significant amount of data available on core biodiversity areas and habitat areas that have the potential for expansion. These data sources will be used when determining the suitability of renewable technologies. When using them it will be essential that the balance of protecting local environment is measured against the wider benefits renewable energy will bring in reducing carbon emissions and therefore protecting local areas from the affects of climate change.

D1.2 SITES OF SPECIAL SCIENTIFIC INTEREST, LOCAL NATURE RESERVES AND DESIGNATED LOCAL SITES

There are also smaller areas with environmental designations scattered across the study area. As well as those discussed, these include SSSIs and Local Natural Reserves (LNR). SSSIs represent England's best wildlife and geological sites and are nationally designated. LNRs are places with wildlife or geological features that are of special interest locally. Any renewable energy development within any of these designated areas would need careful consideration to evaluate the affects on the area, with Appropriate Assessment potentially required. On a local level, all the local authorities have sites across their borough as designated conservation sites and priority habitats. A priority habitat is one listed for conservation action under the UK Biodiversity Action Plan. There are approximately 65 priority habitats which span terrestrial, freshwater and marine environments. Several of the local authorities in the study area (Halton, Knowsley, Liverpool, Sefton, St Helens and Wirral) also have plans to expand their local designations, which will be an important consideration in forward planning for renewable technologies.

D1.3 IMPLICATIONS FOR RENEWABLE ENERGY TECHNOLOGIES

The suitability of renewable energy technologies in designated areas depends on the technology under consideration, with all building integrated technologies having the potential to be located in designated areas, with appropriate mitigation. Within environmentally constrained areas, the most appropriate renewable energy options are likely to be small scale technologies, particularly photovoltaics and solar thermal panels. Ground source heat pumps could also be suitable, although there are significant ground-works that might affect designations in terms of habitat and biodiversity. Finally, small-scale wind turbines might also be suitable, although the impact of the technology on birds, bats, noise pollution and the visual and landscape quality of the area would need to be considered. Outside designated areas, considerations would be the same, although the impacts are likely to be limited.

Larger infrastructure scale technologies are more difficult to accommodate in designated areas. For example, large wind turbines have some impact, with the main issues being the impacts on bird and bat populations. The level of impact is dependent on the types of species present and biodiversity considerations are not necessarily prohibitive. The RSPB highlights evidence that wind farms can harm birds in three possible ways – disturbance, habitat loss or damage (both direct and indirect) and collision. However if wind farms are located away from major migration routes and important feeding, breeding and roosting areas of those bird species known or suspected to be at risk, the RSPB believe that there is a strong possibility that they will have minimal impact on wildlife. Therefore careful

consideration should be given to the siting of wind farms in respect to birds.

Producing biomass crops for biomass CHP plants or biomass boilers may not be appropriate in designated areas because of the impacts on biodiversity, and biomass plants will be constrained due to traffic generation noise and air pollution and visual impacts. Gas CHP plants may not have a significant impact on biodiversity outside the building footprint, but the visual impact could be unacceptable in designated areas.

D2 REQUIREMENTS FOR TRANSPORT ACCESS

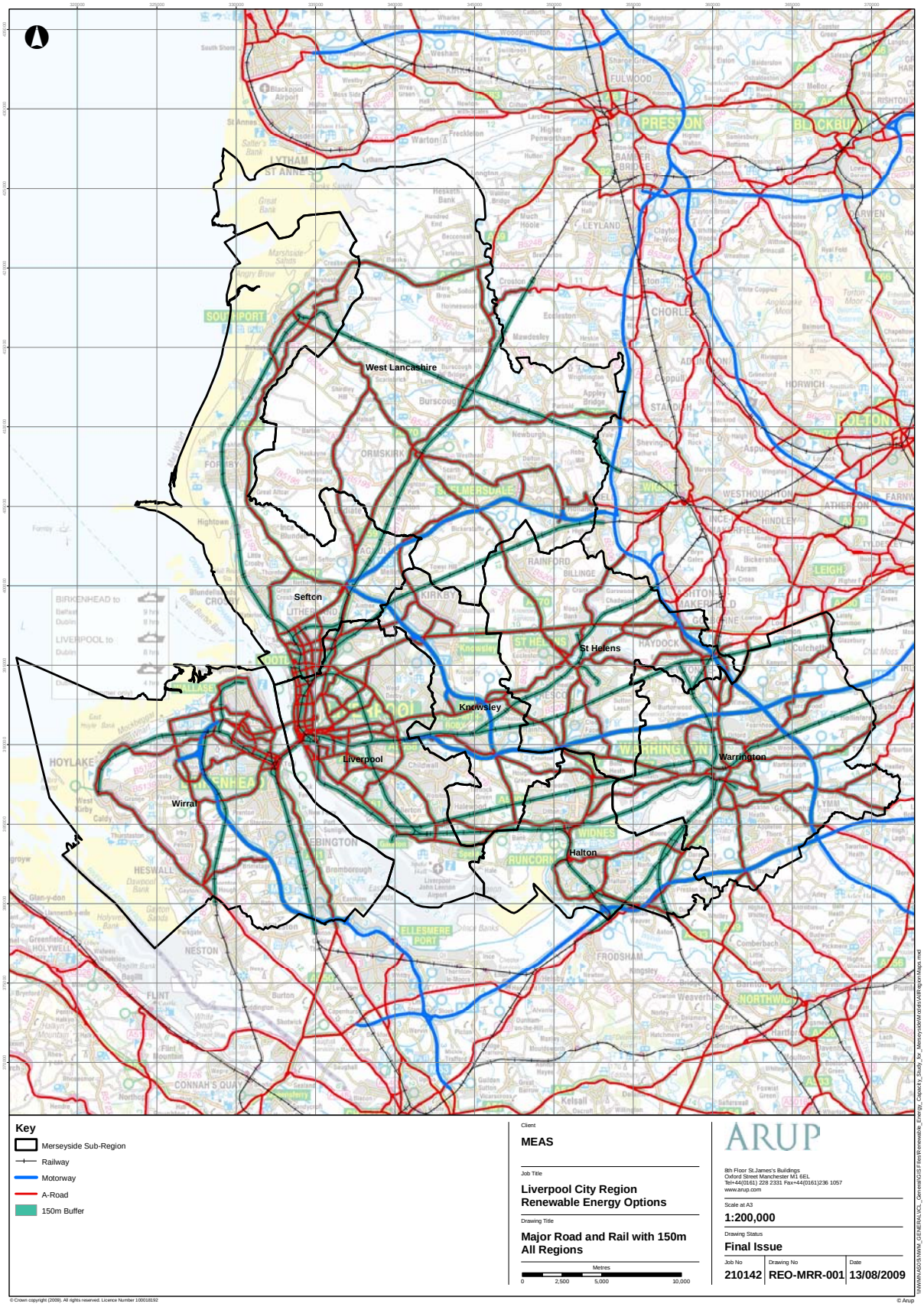


FIGURE 3: MAJOR ROAD AND RAIL ALL REGIONS

SOURCE: INTERNAL ARUP SOURCE

D2.1 OVERVIEW OF STRATEGIC TRANSPORT INFRASTRUCTURE

The study area is well connected with the main transport linkages diverging on Liverpool. The study area has six motorways passing through it with an additional three around the periphery. The M6 is an important connection north to south with the rest of the country and the M56 connects Liverpool to the other main city in the northwest, Manchester. The study region is also well served by A roads, including three crossings across the Mersey, and railway linkages.

The most significant railway station in the study area is Liverpool Lime Street, which serves local, regional and national destinations, including the Midlands, London, Leeds and the North East. The study area is well served by the Merseyrail network, which connects all the local authorities within the study area, converging on Liverpool, and is one of the most intensively used networks in the UK. Other significant transport infrastructure includes Liverpool John Lennon Airport and Formby Woodvale Airport; the Port of Liverpool; and the ferry services provided across to Ireland from Birkenhead and Liverpool. The Port of Liverpool is ranked among Britain's and northern Europe's major container ports and handles nearly 700,000 container units a year. Liverpool is planning a second container terminal to be built in the River Mersey and will double Liverpool's capacity to nearly 1,500,000 containers per year.

D2.2 IMPLICATIONS FOR RENEWABLE TECHNOLOGIES

Transport requirements are a consideration when appraising potential locations for renewable energy technologies or which technologies are suitable for particular sites. Biomass boilers and biomass CHP plants both require access for fuel deliveries, as well as initial access for installation and intermittent maintenance access. Consequently, plants would need to be located in areas with good freight and hgv access, so the development would not lead to an unacceptable amount of congestion on the transport networks. Large scale wind turbines would require some access for installation and maintenance, but this would be intermittent rather than ongoing. Therefore, although access will be required, it is not a very significant consideration. The proximity of large scale windturbines to highways will also need to be considered to ensure that the risk of itoppling of structure does not cause risk to pedestrians and traffic.

Building scale installations will require access for installation, including borehole equipment for ground source heat pumps. However, access considerations are minor and transport is unlikely to be a constraint on the development of such technologies, especially given that some access would be required for operation of the building on/ in which the technology is situated.

D3 HERITAGE CONSTRAINTS

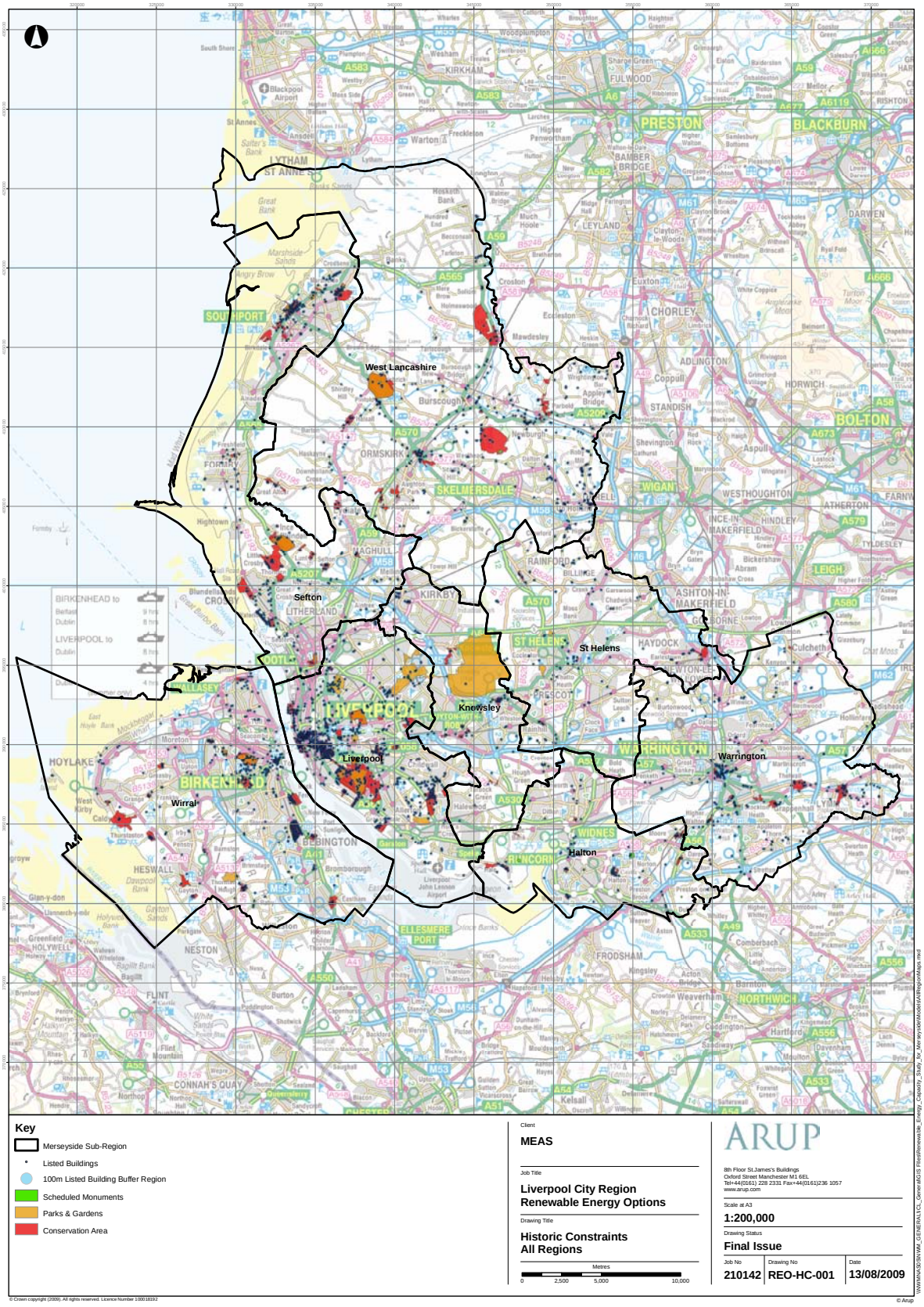


FIGURE 4: HISTORIC CONSTRAINTS ALL REGIONS

SOURCE: ENGLISH HERITAGE

D3.1 OVERVIEW OF HISTORIC CONSTRAINTS

There are heritage designations dispersed across the study area of varying weight and importance.

The most significant in terms of size is Knowsley Park in Knowsley which is designated as a park of Special Historic Interest. There are also various other parks and gardens on the English Heritage register across the study area, including in the Wirral, Sefton, Liverpool, West Lancashire, and St. Helens.

Conservation Areas are present in all the local authority areas, with Liverpool having the highest concentration, though West Lancashire has two of the largest. A particular issue identified in this stage of the study is that not all LPAs have a Conservation Area Appraisal for each of their designated areas. As a consequence there are likely to be inconsistencies in how planning applications (for renewable and energy schemes that have implications for such areas) are determined across the study area.

There are also listed building designations across the study area, with the highest concentrations being in the dense urban areas, most notably Liverpool city centre.

D3.2 IMPLICATIONS FOR RENEWABLE TECHNOLOGIES

Large scale technologies are unlikely to be suitable in Conservation Areas and parks and gardens on the English Heritage register due to their visual impact. Gas CHP, biomass CHP and biomass boilers generally have a visual impact similar to that of other industrial processes. Unless a Conservation Area for example, was inherently industrial in nature, these types of renewables would most likely be unsuitable as it would be judged that they compromised the appearance or setting of the area.

English Heritage specifically recommends against proposals for biomass power stations or energy crops within sites on the English Heritage Registers of Parks and Gardens of Special Historic Interest. Another consideration for these types of historic designations is the ground disturbance that could be caused by installation, again compromising the integrity of the historic site.

Wind turbines on a large infrastructure scale would also likely be viewed to compromise the character of the Conservation Area or a designated park or garden. Key considerations in assessing the acceptability of wind energy developments in historic environments include visual dominance, scale, intervisibility, vistas and sight-lines and unaltered settings. In order to understand where these important historic elements are, such as vistas, local authorities should take note of their Conservation Area Appraisals. Several local authorities in the study area have completed appraisals and highlighted views of importance, including Warrington Borough Council and Sefton Council.

Warrington Town Hall Conservation Area Appraisal, Warrington Borough Council

The view towards the Golden Gates and Town Hall from Winmarleigh Street must be one of the most significant vistas in the town.

Promenade, Southport Conservation Area Appraisal, Sefton Council

There are views along the side streets linking Lord Street and the Promenade to the landscaped areas and leisure uses along the former shoreline. The view along Nevill Street to the Marine Way Bridge and the entrance to the pier is particularly important as it forms a major route from the Railway Station. There are also views along a number of side streets, between the Promenade and Lord Street. The issue of reversibility for the long-term protection of the landscape is also important and would likely require legal agreements between the local authority and developer.

Renewables on a building integrated scale are much more likely to be accepted in Conservation Areas and designated parks and gardens, however issues are raised when they affect a listed building, of any grade. The impact upon the listed building itself as well as the curtilage must be considered. The study area has a high number of listed buildings, mainly clustered around the key urban areas. Liverpool city centre has the highest concentration, followed by Southport. West Lancashire

has a notable number of listed buildings in the rural area.

The Town and Country Planning General Permitted Development Order 2008 stipulates that the installation of domestic microgeneration equipment is permitted development, however there are certain caveats for conservation areas and listed buildings. The installation of solar is permitted development on a dwelling house or a building situated within the curtilage of a dwelling house in a conservation area and World Heritage Site if the solar PV or thermal panel equipment:

- does not protrude more than 200millimetres beyond the plane of the wall or slope of the roof;
- is not higher than the highest part of the roof (excluding the chimney); and
- is not installed on a wall or roof slope forming the principal or side elevation of the dwelling house or building within the curtilage of the dwelling house, and would be visible from the highway.

The installation of a stand alone solar within the curtilage of a dwelling house in a conservation area or World Heritage Site is allowed if:

- only one is present;
- it does not exceed four metres in height above ground level; and
- it is not visible from the highway.

Solar equipment is therefore a highly viable option for conservation areas as long as consideration is taken in their setting and they are sensitively sited on the rear of buildings (provided this is south facing). Installing solar equipment on a listed building would require Listed Building Consent, however this does not preclude this being a viable option.

The installation of a ground source or water source heat pump is permitted development in the curtilage of a dwelling house in a conservation area and is also permitted for listed buildings as well, provided the found disturbance caused by installation is minimal and does not compromised the historic significance of the site.

The installation of a flue, forming part of a biomass or combined heat and power system on a dwelling house is permitted in a conservation area or World Heritage site, as long as the flue is not installed on a wall or roof slope that does not form the principal or side elevation and is not visible from a highway.

Generally proposals for renewables at a building integrated scale will generally be accepted if there is no loss or damage to significant historic fabric or special interest, and the work is reversible.

D4 DEEP PEAT AREAS AND SOIL QUALITY

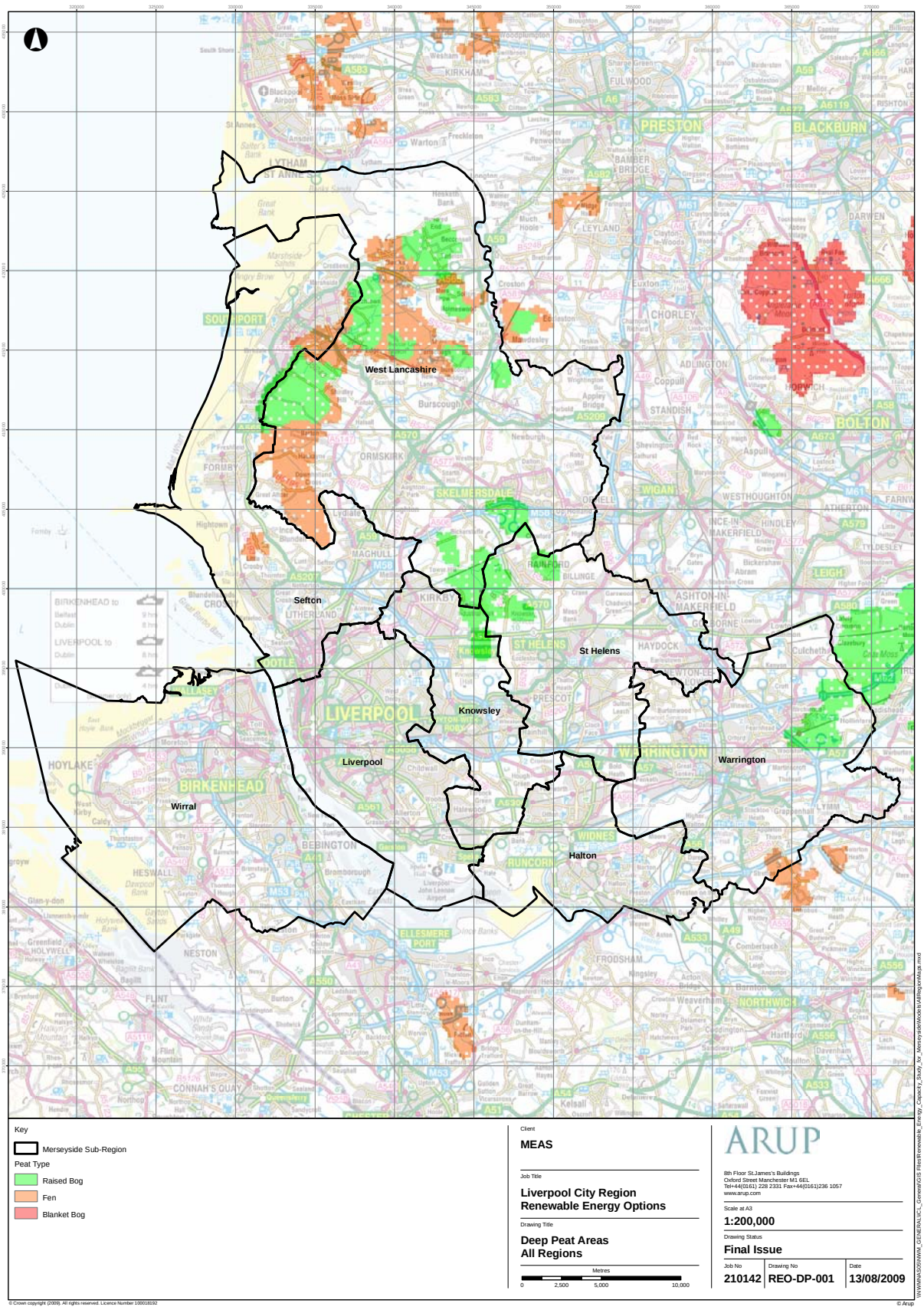


FIGURE 5: DEEP PEAT AREAS ALL REGIONS

SOURCE: NATIONAL SOIL RESOURCES INSTITUTE

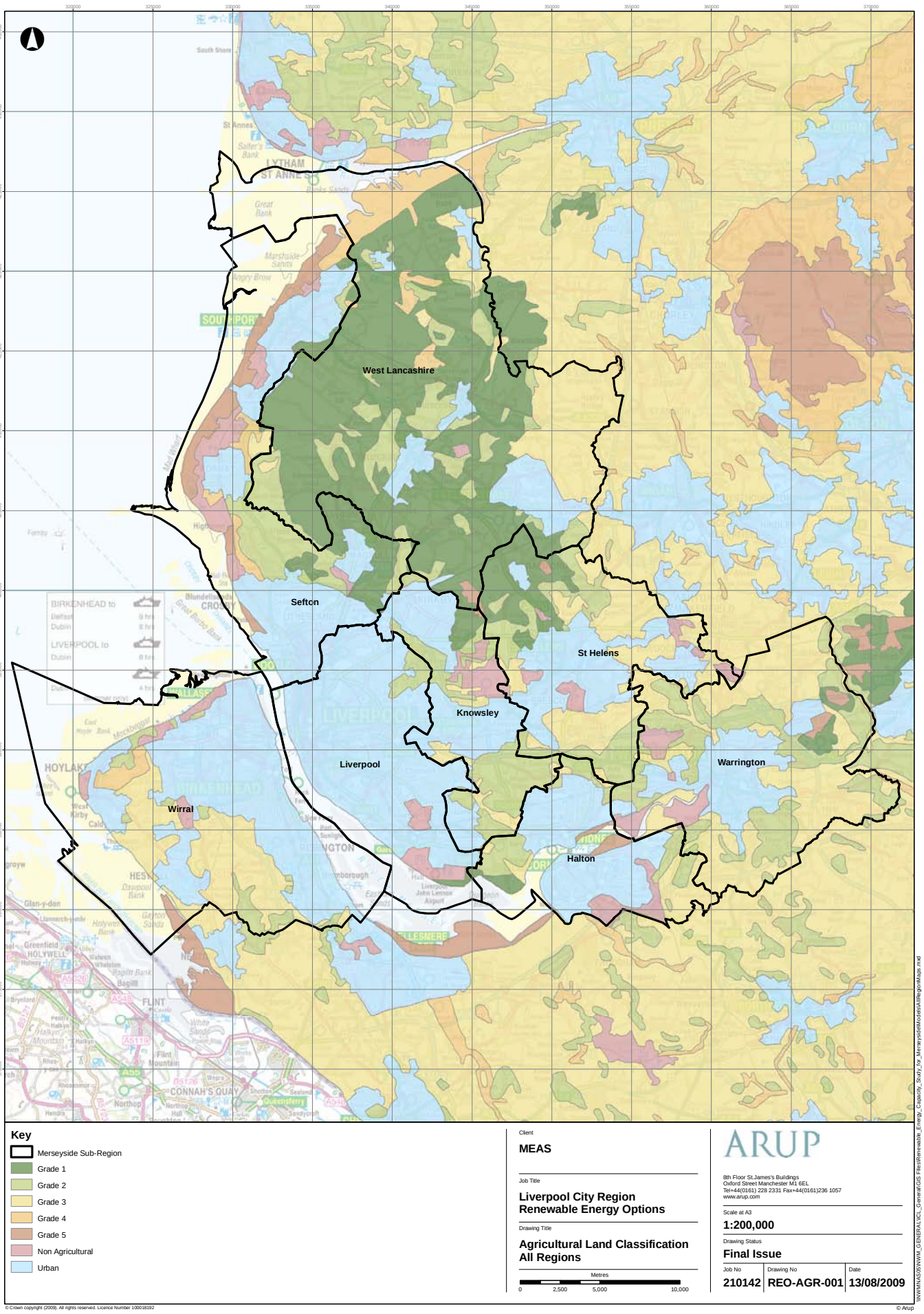


FIGURE 6: AGRICULTURAL LAND CLASSIFICATION ALL REGIONS

SOURCE: NATURAL ENGLAND

D4.1 OVERVIEW OF CONSTRAINTS

Deep peat areas are carbon sinks, which, when damaged, can release carbon dioxide. Therefore, renewable energy developments that harm deep peat areas or prevent their restoration can potentially increase, rather than decrease the carbon in the atmosphere. Sefton, West Lancashire, Knowsley and Warrington all have deep peat areas, with West Lancashire having a large portion of the western rural part of the borough and northern-central area affected. Any renewable energy development in areas of deep peat would need to consider whether it would have any negative impacts.

Some technologies can potentially impact soil quality and this should be taken into consideration when considering the most appropriate technology for a given site. Soil quality may be particularly relevant in areas with high quality agricultural land and environmental designations. There is a significant amount of grade agricultural land in the study area, emphasising the relevance of this consideration. Again West Lancashire is the area most constrained, with the majority of the borough being Grade 1 agricultural land. There are also significant sections of Grade 2 and 3 agricultural land in the southern area of the study area, covering notable areas of the Wirral, Knowsley, St Helens, Warrington and Sefton. Even the most urban boroughs of Halton and Liverpool have graded agricultural land, highlighting this constraint as a consideration for all local authorities.

Ground source heat pumps require the sinking of bore holes or trenches which may well harm deep peat areas. Consequently, this technology may not be suitable for these areas without mitigation. Large wind turbines, gas CHP plants and biomass plants would also need to ensure that they did not cause harm if sited in sensitive areas. Gas CHP, biomass boilers and biomass CHP plants could have additional impacts on soil quality, although mitigation should minimise this. All other technologies are considered to have very little impact on soil quality or deep peat areas.

D5 AVIATION CONSTRAINTS

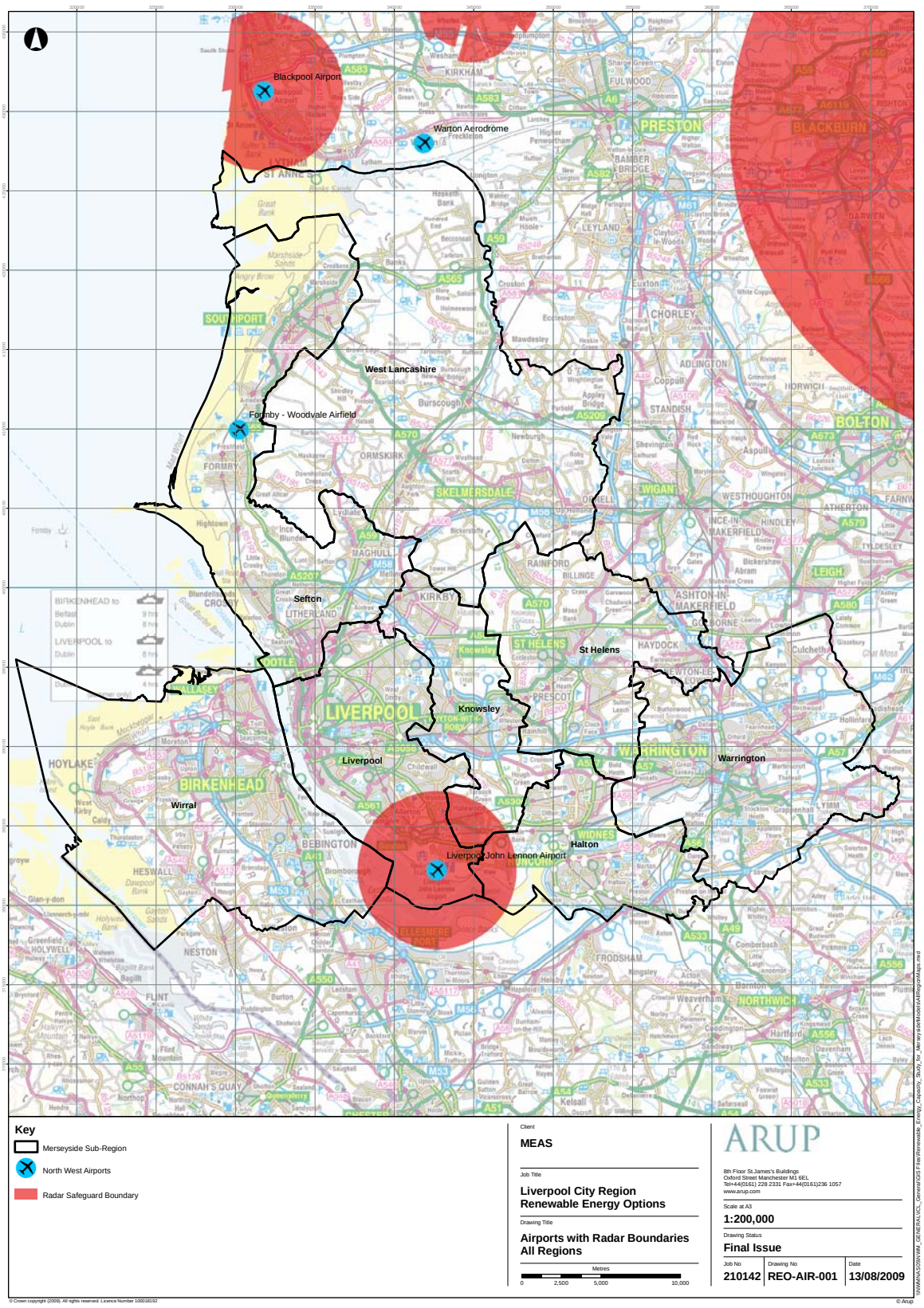


FIGURE 7: AIRPORTS WITH RADAR BOUNDARIES

SOURCE: BRITISH WIND ENERGY ASSOCIATION

D5.1 OVERVIEW OF CONSTRAINTS

There are two airports located in the study area; Formby Woodvale and Liverpool John Lennon. There are several located just outside the study area, however only one impacts on the area, with Blackpool Airport's radar safeguard boundary just crossing over the local authority boundary of West Lancashire. Of the two airports within the study area, only Liverpool John Lennon has a radar safeguard boundary, impacting on areas of the Wirral, Liverpool, Knowsley and Halton. Low level flight corridors may also affect these areas as well as areas around Formby Woodvale. It is also important to note that in the context of wider strategic renewable energy planning, is the wide radar safeguard boundary of a radar station based to the east of Blackburn and to the northeast of the study area.

The main technology to be affected by aviation constraints would be large scale wind turbines, which may not be suitable in low level flight corridors or within the radar boundary. The Civil Aviation Authority is required to chart all structures over 300 feet high, which would include large wind turbines. Combined heat and power plants, and biomass boilers could also potentially have chimneys tall enough to impact on low level flight corridors. Building integrated technologies would be unlikely to have any impact on aviation.

D6 LAND DESIGNATIONS

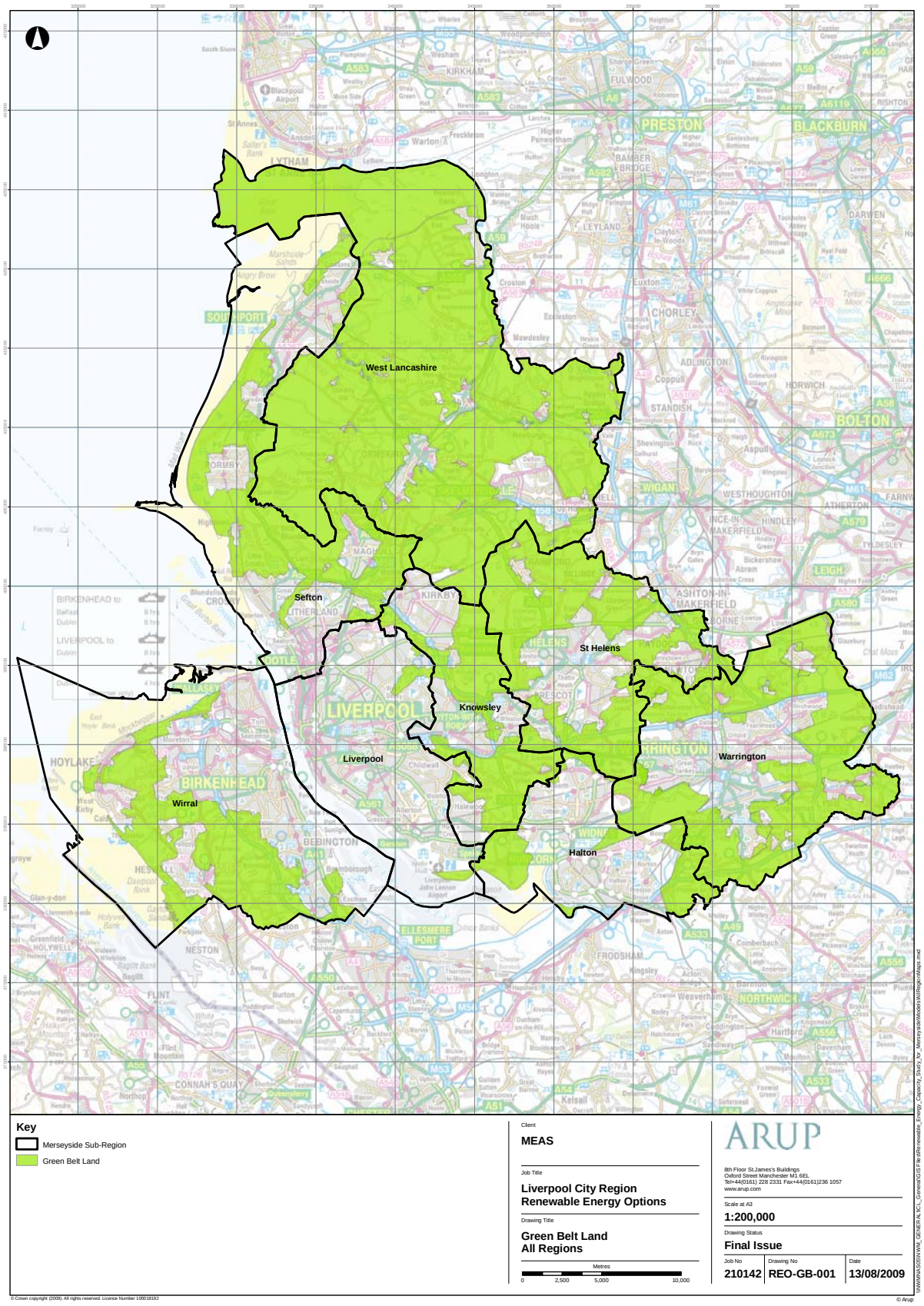


FIGURE 8: GREEN BELT LAND ALL REGIONS

SOURCE: LOCAL AUTHORITY INFORMATION

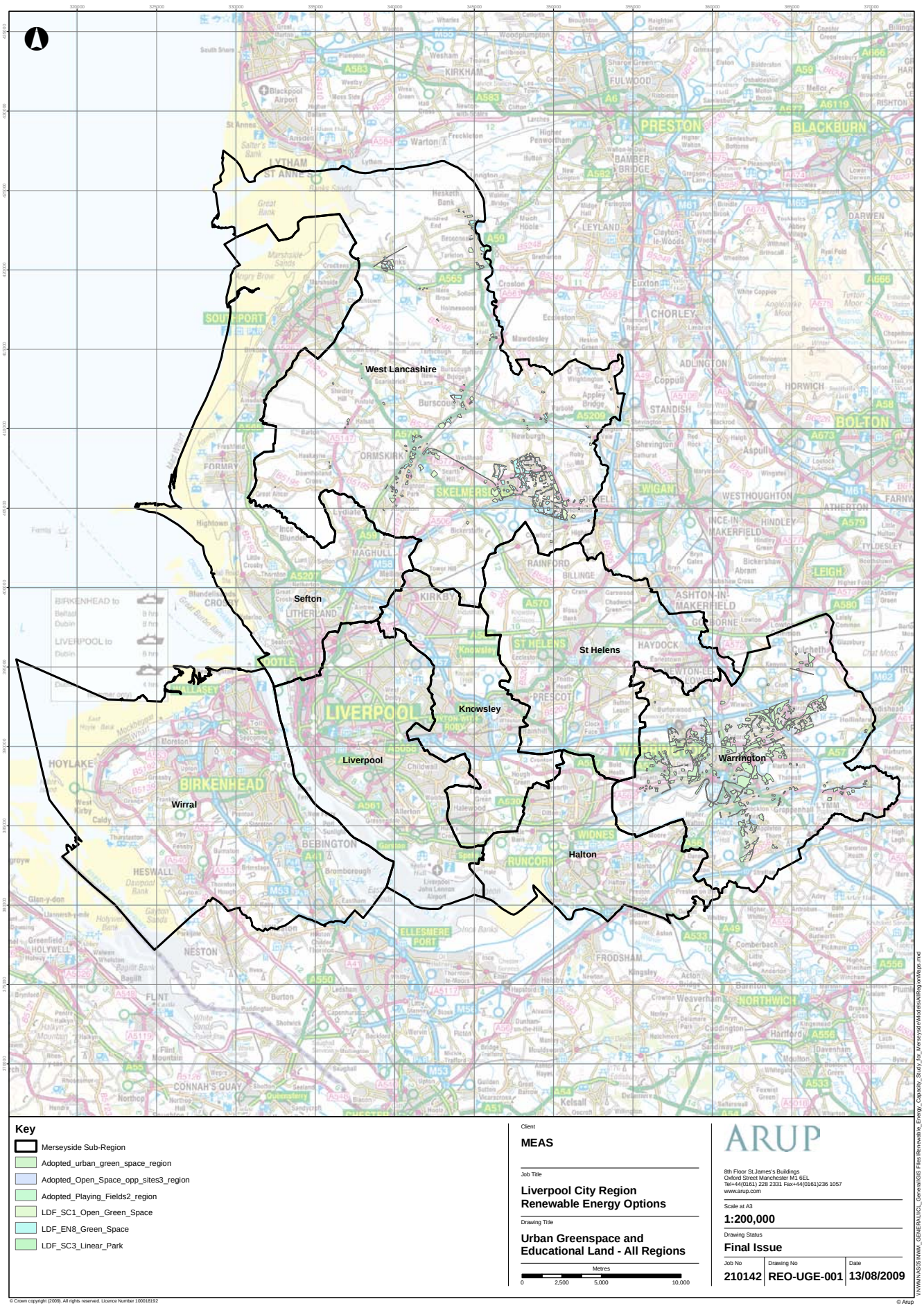


FIGURE 9: URBAN GREENSPACE AND EDUCATIONAL LAND ALL REGIONS

SOURCE: LOCAL AUTHORITY INFORMATION

D6.1 OVERVIEW OF CONSTRAINTS

The majority of the study area is classed as green belt land; most notably, the majority of West Lancashire. Green belt land surrounds all the main settlements and indicates where the open countryside is located within the study area. The fundamental aim of green belt policy and designated land is to prevent urban sprawl by keeping land permanently open and there are therefore stringent guidelines on what is appropriate development within the green belt.

Policy on development in the green belt is set out in PPG2. When located in the green belt, elements of many renewable energy projects will comprise inappropriate development, which may impact on the openness of the green belt. Careful consideration will therefore need to be given to the visual impact of projects, and developers will need to demonstrate special circumstances that clearly outweigh harm by reason of inappropriateness and any other harm if projects are to proceed. Special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources.

The presence of so much green belt within the study area is therefore an important consideration in the choice of renewable energy. Visually intrusive renewable energy developments and those with large land requirements should be sensitively developed in the landscape. The options with the largest land requirements are biomass plants (CHP and boilers) and large wind energy developments. Biomass plants require land for both growing biomass plants and for infrastructure-scale plants. Land for growing biomass plants would require particular soil conditions and would generally be situated on agricultural land. The plants themselves require land for buildings, pumps, controls and fuel storage. Large scale wind developments also require significant amounts of land, particularly when developments include a large number of turbines. However, in contrast to requirements to grow biomass plants, development of wind turbines does not necessarily preclude the land from being used for other purposes. Whilst there are relatively limited opportunities to use this land due to constraints such as noise and safety, this opportunity should not be ruled out.

Other renewable energy developments, especially those at a building integrated scale, with a much smaller footprint in the green belt will be easier to implement as the impact on the openness of the green belt will be much less.

Another land constraint is designated green and open space, and playing fields. Figure 9 demonstartes the dispersal of green open space for West lancashire and Warrington based on the data recieved. This type of land is protected from large scale development and therefore large scale renewable energy on this land will be extremely difficult to implement. In the study area, Warrington and West Lancashire have notable areas of such protected land and in these, mainly urban areas, building integrated scale renewable energy technologies are likely to be more appropriate.

There is more detailed mapping available of existing and potential Green Infrastructure across the study area as part of the Green Infrastructure Ecological Framework. Green Infrastructure will play an increasingly signifcvant role across the study area and provide a range of economic, environmental and social benefits. As the amount and quality of Green Infrastructure increases across the study area it will become an increasingly important consideration when determining planning applications.

D7 RESIDENTIAL IMPACTS

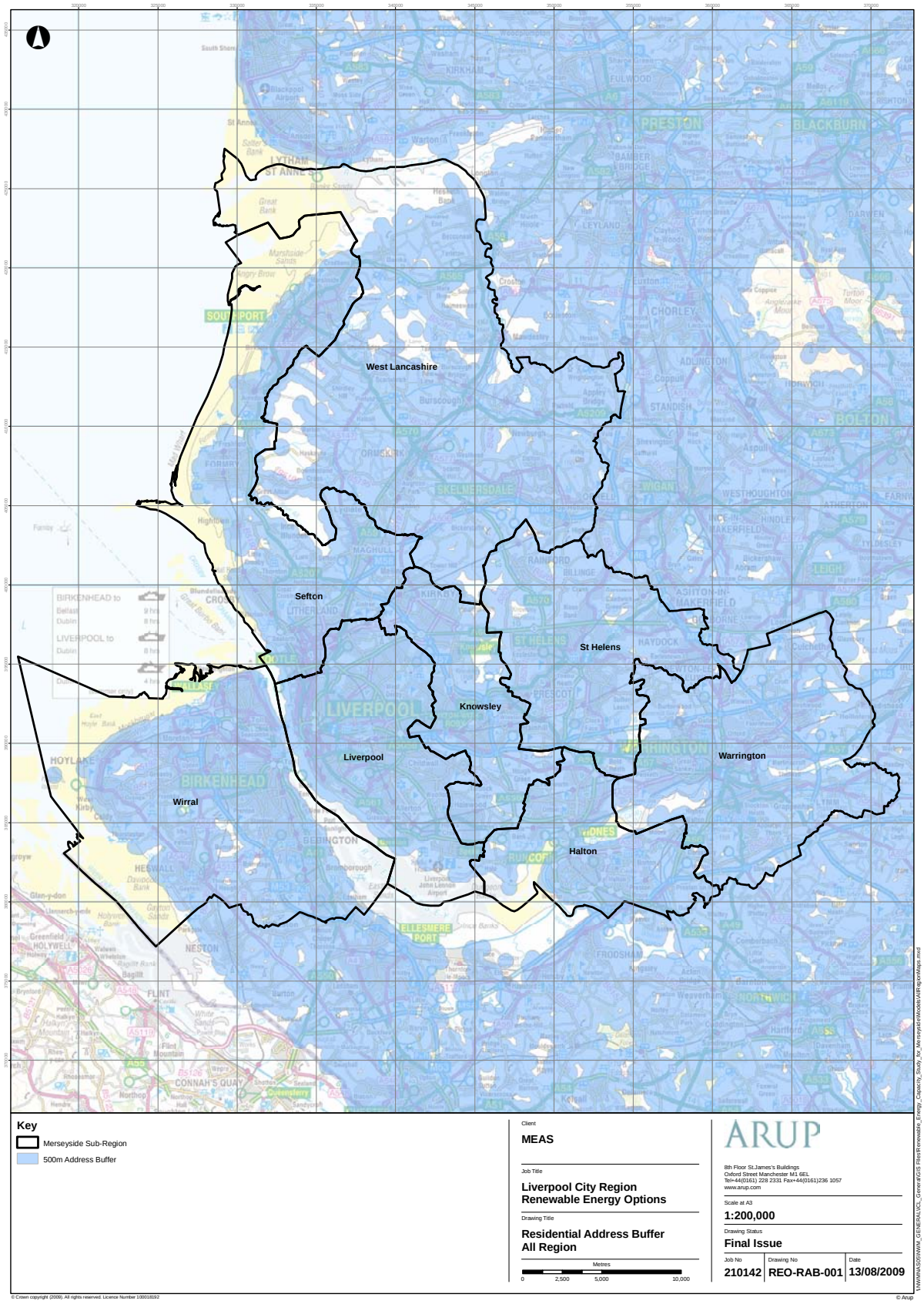


FIGURE 10: RESIDENTIAL ADDRESS BUFFER ALL REGIONS

SOURCE: LOCAL AUTHORITY INFORMATION

D7.1 OVERVIEW OF CONSTRAINTS

Renewable energy technologies can impact on residential areas in a variety of ways such as noise generation and visual impact. The study area has has a 500 meter buffer applied to resditneial proprties in the study area. This demonstrates how there is very few opporutnties if this constriant is applied and that it is unrealistic do consider this contraint in isolation and literally. The largest residential areas are in the conurbation of Liverpool, including Birkenhead and further afield in the towns of Warrington and Southport.

However there are notable rural areas in west and central West Lancashire and areas dotted in Knowsley and the Wirral. The rural character of these areas (and relatively low background noise) means that noise generating developments could have a larger impact in these areas. Therefore, it is difficult to generalise about the most suitable locations for noise generating renewable energy developments. The ideal locations would be areas with higher levels of background noise and less sensitive receptors. This might include locations such as industrial estates.

Noise generation is one of the most significant considerations for wind turbines, especially very large turbines. However, turbines differ significantly in terms of size and design, and each turbine generates a different level of noise. Building integrated wind turbines can be designed to have little impact on noise levels. Combined heat and power plants generate noise, but are provided with their own acoustic enclosures to minimise the impacts and ground source heat pumps and biomass boilers produce some operating noise but this is minimal. The delivery of biomass fuel would generate noise and consequently biomass boilers and CHP plants may not be suitable in sensitive areas. Solar thermal and photovoltaic cells do not generate noise. Overall, within areas with little ambient noise or areas close to sensitive receptors, large scale wind turbines are unlikely to be suitable, but other technologies are likely to be appropriate.

In addition, Air Quality is also a key consideration, particular where CHP is concerned. The designation of Air Quality Management Areas (AQMAs) will be an important consideration when determining CHP options. There are a number of AQMAs in the study areas with Liverpool (6), St Helens (2), Sefton (3), Warrington (2), Halton (1 with several areas in need of further investigation) and West Lancashire (1 AQMA, currently subject to consultation). Consequently consideration and monitoring of the impacts CHP emissions would be needed and should consider the cumulative impact on existing AQMAs and areas that are identified to be close to the threshold of becoming an AQMA.

The presence of residential areas could also raise visual issues, with residents concerned about vistas and character areas, however visual impact is a very subjective measure and a technology perceived as unattractive by one individual, may not be perceived as unattractive by another.

Gas CHP, biomass CHP and biomass boilers vary in appearance, but would generally have a visual impact similar to that of other industrial processes. Generally they would not be considered attractive, but do not need to be visually obtrusive if located on appropriate sites. If located in a residential area, careful siting decisions and landscaping could mitigate impacts.

Large wind turbines will have a visual impact as they are necessarily sited in exposed locations. However, the attractiveness of wind turbines is very subjective, with the perceptions of their attractiveness varying wildly between individuals. Careful planning on the design and siting of wind turbines can also offset the impacts. Building integrated wind turbines, solar panels and photovoltaic cells have some visual impacts, but impacts are considered fairly minimal. The perceived attractiveness of building integrated technologies can vary between individuals and the surrounding context. Ground source heat pumps are hidden within and under buildings and consequently would not have any visual impact.

APPENDIX E

Renewable Energy Industry in the North West

E1 RENEWABLE ENERGY INDUSTRY IN THE NORTH WEST

E1.1 MARKET SURVEY OF COMPANIES OPERATING WITHIN THE RENEWABLE ENERGY SECTOR IN ENGLAND'S NORTHWEST PRODUCED BY ENVIROLINK

The survey was undertaken by Envirolink Northwest in 2005 and involved the North West's Renewable Energy sub sector and builds on a previous study undertaken in 2002. This includes companies that supply products and services to the wind, solar, wave, tidal, hydro, landfill gas and biomass sectors. In summary the survey identifies that:

- The region has experienced significant growth in renewable energy. The study notes that since 2002 the industry has almost doubled in size with employees in the sector increasing from 500 to 929 and annual turnover increasing from £52 million to £104 million.
- The region's renewable energy sector is a highly technical, high value-added sector with greater levels of research and development activity and turnover per employee than Northwest or UK averages.
- At the time prospects for growth and optimism within the sector are high.
- The majority of businesses within the sector are small and medium sized enterprises (SMEs) – reflecting the emerging and innovative nature of the market.
- Over half (54%) of the businesses operating in the Northwest's renewable energy sector have been established since 1990, with two companies established in the first half of 2005.of the majority of
- The majority of Northwest RE companies are based and owned within the region and region provide services across a range of technologies.
- The domestic and microgeneration market has seen the greatest growth since 2002.
- There are also tidal and wave sector developers based in the region and they tend to operate solely within these areas.
- There is a significant focus on research and development - overall 30.6% of respondent companies put staff resources into research and development, however the number of people employed within this area varies greatly between organisations.

E1.2 ENGLAND'S NORTHWEST: FACILITIES FOR OFFSHORE RENEWABLE ENERGY

England's Northwest: facilities for offshore renewable energy provides a guide to the services available at each of the region's major ports and its suitability for delivering offshore renewable energy. It identifies that the environmental sector is one of the fastest growing market areas because of the abundance of renewable energy generating resources and that coastline provides an excellent test-bed for the next generation of wind, wave and tidal energy technologies. Put into context the North West represents 25% of UK and 7% of European estuary resource. In summary the document identifies that:

- The North West's historic role as an industrial base for world ship building means that the Northwest offers excellent facilities, particularly in the Merseyside ports of Birkenhead and Liverpool.
- Each port has flexible engineering works and a skilled labour force which could play a large part in the next round of renewable offshore

projects, able to support companies and industries interested in offshore energy generation.

- The skill and resource base surrounding the Merseyside ports offers a wide range of opportunities that each local authority in the study area, particularly Merseyside due to the critical mass of authorities and good access with freight terminals and Warrington with the Manchester Ship Canal. Further, these opportunities could easily be of regional significance in terms of stimulating the manufacturing, installation, maintenance, importing and exporting of renewable energy technologies.
- Birkenhead and Liverpool's ports and docks provide opportunities for the offshore renewable technologies offered.
- Liverpool Port provides access to deepwater docks and berths with 'oven ready' equipment and infrastructure for offshore renewable energy technology.

It identifies that the port has extensive experience in servicing and supporting offshore industries and there is an excellent local skills base that has grown up around companies such as Northwestern Shiprepairers and Shipbuilders Ltd.

Liverpool dominates Britain's container trade with North America and serves more than 100 other non-EU destinations from China to India, Africa, Australia, the Middle East and South America. The port handles many of the commodities and materials needed to produce renewable energy technologies such as steel, copper and aluminium.

E1.3 DEVELOPING A BIODIESEL INDUSTRY IN ENGLAND'S NORTHWEST (MAY 2006)

This report provides the background information on feedstocks, production sites and markets that are necessary to develop a viable and successful biodiesel industry within England's Northwest.

The document set out that EU funding generally applies to programmes of assistance provided by public sector bodies and not to individual businesses directly. Public bodies can provide funding for activities such as training workers in new skills. At the time of publishing this study, current funding was available until the end of 2006.

Five areas within the Northwest have been evaluated through an empirical assessment of their characteristics, and then ranked using a numerical assessment against key criteria: One of the areas was Liverpool/Birkenhead, which along with Ellesmere Port / Runcorn were regarded as the most suitable sites as they are located closest to feedstocks and the largest markets.

The study identifies that as at 2006 there were capital and revenue grants available up to 35% for Merseyside as a Tier 1 area under Selective Financial Investment (SFI) which is used to fund new investment projects that lead to long-term improvements in productivity, skills and employment and help to launch, modernise, expand re-organise or upgrade a business. The Northwest Regional Development Agency (NWDA) manages SFI in the Northwest on behalf of the DTI.

The documents identifies that additional support for training and skills was identified that be provided through Objective 1 funding 6.

E1.4 DOING BUSINESS WITH WIND MANUFACTURERS

The document provides comprehensive guidance for businesses looking to work with the wind turbine manufacturing industry.

The guide is based on the assumption that the audience has no previous knowledge of the industry and provides:

- A summary and profile of the industry
- Forecasts of future market size, composition and value
- An overview of wind turbine technology and development processes
- What to do to begin working with wind turbine manufacturers
- Specific wind turbine manufacturer details including company profiles and contacts.

In summary the document identifies that:

- The UK as having 'a world-class level of relevant offerings throughout the supply chain, from manufacturing through operations and maintenance to decommissioning, including its oil and gas industry experience. In many cases, these skills are directly transferable to the wind industry'
- The UK currently has a very limited share of turbine & component manufacturing.
- Increasing the UK share of supply to turbine manufacturers is a key way to take advantage in the growth of the UK and global markets.
- UK companies have the opportunity to act as 1st and 2nd tier suppliers to turbine manufacturers by supplying component parts ranging from power converters through gear wheels to bolts.

APPENDIX F

Economic and Employment Considerations

F1 DRIVERS AND OPPORTUNITIES TO DEVELOP THE RENEWABLE ENERGY SUB-SECTOR IN THE STUDY AREA

F1.1 OVERVIEW OF DRIVERS AND OPPORTUNITIES

There are a range of drivers that provide opportunities for the study area developing its own Renewable Energy sector. These are set out below.

Energy Alternatives: It was identified through consultation with stakeholders that increased energy prices and the need for energy security are becoming increasingly important issues for local businesses. Adopting innovative policies to overcome barriers to developing Renewable Energy in the borough and secure access to the electrical grid or localised supplies at consistent and secure prices will be critical considerations when planning for Renewable Energy for exisntg and future development.

Legislative Requirements: The Climate Change Bill and Renewable Energy Obligation are legally binding drivers for ensuring climate change and Renewable Energy targets are met. In addition, one of the most significant steps that the public and private sector will need to prepare for is the Carbon Reduction Commitment (CRC) which encourages improvements in energy efficiency which can save organisations money. The scheme has been designed to generate a shift in awareness in large organisations especially at senior level, and to drive changes in behaviour and infrastructure. Further examples include the Climate Change Levy and national Planning Policies such as PPS1 Supplement and PPS 22.

Emerging Renewable Energy Sector in the Region: The North West has a strong and emerging Renewable Energy sector that has the potential to place it at the forefront of the UK's Renewable Energy industry. This is supported by a growing and emerging evidence base that provides a useful basis for understanding the drivers and opportunities for the city region bringing forward Renewable Energy Options in future. For more detail Appendix E provides summaries of the key documents.

Environmental benefits through the reduction of greenhouse gas emissions and mitigation of negative climate change impacts.

Benefits for Health and Well Being: Fuel Poverty is a national concern and affects the sub region's most deprived areas, individuals and communities. Renewable Energy can result in NHS savings from reduced incidence of illness due to greater energy security and potentially cheaper costs of energy for housing. In turn this has potential for improving the quality of life in an area bringing longer term health benefits and potential for increasing social inclusion.

Wide Range of Economic Benefits for Local Economy: There are potential economic and employment gains including:

- Widespread employment gains – creation of employment opportunities across a broad range of occupations that require high and low skill levels. For example renewed construction and manu¬facturing work could be achieved thought investment for retrofitting of micro technologies in the property sector. This could help replace lost jobs in a range of industries affected by the recession.
- Increased energy security – a range of Renewable Energy technologies would result in lower dependence on imported energy and provide more a sound basis for increased productivity.

- Increased resources for investment in other areas over the long term due to resource and efficiency savings. For example other forms of infrastructure, and public sector investment in schools and hospitals
- An increase in demand for known, proven and late stage development technologies which would stimulate increased production and lead to economies of scale. This would lower the payback period of Renewable Energy technologies and increase the financial viability of Renewable Energy technologies.
- The creation of new markets and the potential to increase exports through research and development and manufacturing[i]
- Insuring that suitable sites for employment and sites in town centres are available to accommodate current and future demand for green buildings, retrofitting of micro renewable technology and large scale Renewable Energy technologies

Subsidies: Phasing out subsidies for environmentally harmful industries, and shifting a portion or all of those funds to Renewable Energy, efficiency technologies, clean production methods, and public transit. This is an important driver for the city region's economy and therefore it will be important that any employment sectors that are considered as harmful are assisted by each Council and not unduly penalised.

Targets and Mandates: Ensuring that regulatory tools are used to the fullest extent in the drive to develop greener technologies, products, and services and consequently low carbon economy employment. This includes spatial/ land-use policies in each of the Local Development Frameworks being devloped, building codes and regulations, energy efficiency standards (for appliances, vehicles, etc.), and targets for producing Renewable Energy such as the sub regional targets set out in the North West Regional Spatial Strategy.

Bulk Purchasing: Enabling communities to access/ purchase critical generation, transmission and storage technology without requiring 'economies of scale' at the local level.

Carbon Markets and Tax Reform: Embracing the opportunities and challenges of emerging initiatives such as Carbon Reduction Commitments so that they can become reliable and adequate sources of funding for Renewable Energy projects and employment.

Research and Development Budgets: It is recognised that nuclear power will have to play a key role in proving energy, however the scale of this contribution is dependant on how effective Renewable Energy becomes. Reducing support for nuclear power and fossil fuels and provide more funds for Renewable Energy and efficiency technologies at national, regional (see Appendix A) and local levels would help minimise a reliance on low carbon energy production such as nuclear power.

Training: Economies such as Germany's are already facing a shortage of trained workers for the green economy and from discussion with stakeholders such as the Mersey Partnership there are indications (albeit at a lower scale) of labour shortage in Merseyside. World wide there are examples (such as Ontario, Canada) of colleges expanding their programs in related areas.

F2 KEY DOCUMENTS TO CONSIDER FOR THE SUB REGIONAL ECONOMY

F2.1 CONSIDERING THE STERN REPORT

The Stern report set out to investigate the economics of climate change. It compared the costs and the benefits of actions to reduce the emissions of greenhouse gasses that cause climate change. The conclusion that "the benefits of strong, early action considerably outweigh the costs" has been welcomed by a very wide range of experts.

Stern identified serious and increasing risks of irreversible impacts from climate change associated with business-as-usual (BAU) paths for emissions. The report predicts that a 25% cut in emissions by 2050 will be required in order to stabilise atmospheric concentrations of CO_2 at 500-550ppm – a level thought to be consistent with limiting the implications of climate change in order to secure continued growth and development. Stern estimated that this will require an investment of 1% of world GDP in measures to reduce green house gas emissions. Based on the UK's GDP of approximately £1.4 trillion, this suggests that an annual investment of £14 billion in measures to cut carbon emissions would be economically efficient.

The challenge for the UK will be to find ways to cut emissions that will have minimal negative impacts on the economy and living standards. Currently properties are responsible for 47% of UK CO_2 emissions with the remainder being split between transport (32%), industrial processes (20%) and agriculture (1%) (BRE, GVA Grimley 2007). Newly constructed buildings are significantly more efficient than the existing stock indicating the potential for properties to be more efficient. However, only a small proportion of buildings are replaced each year – in 2050 more than 85% of the existing housing stock and 70% of the current stock of non-domestic buildings will still be in place. This highlights the potential importance of investments for Renewable Energy options to consider existing buildings as well as new development.

F2.2 CONSIDERING THE GREEN NEW DEAL

The Green New Deal as described by the Green New Deal Group[ii] is a policy response to the 'triple crunch' the global economy is facing - credit fuelled financial crisis / economic recession, accelerating climate change, and volatile energy prices. The underlying motivation is the avoidance of economic and environmental meltdown. The Green New Deal is a transformational programme aimed at substantially reducing the use of fossil fuels and in the process tackling unemployment and the decline in demand caused by the credit crunch. It is a natural progression from previous reviews undertaken to establish the key skills issues in the UK[iii] and provides sustained programme to invest in and deploy energy conservation and renewable energies, coupled with effective demand management. It lays the foundations for the emergence of a set of resilient low-carbon economies, rich in jobs and based on independent sources of energy supply. This will create a more stable economic environment in which there is a lot more local production and distribution, and enhanced national security.

One of the key messages from the Green New Deal is that reducing carbon dependency and ecological scarcity is not just important because of environmental concerns. It is critical because this is a way to revitalise the economy on a more sustained basis.

The aim of the Green New Deal is to develop the right mix of policy actions that can stimulate economic recovery at the same time improve the sustainability of the economy by

- Creating jobs
- Tackling social and spatial inequalities
- Channelling investments into dynamic economic sectors

F2.3 SECTOR SKILLS AGREEMENT FOR THE NORTH WEST STAGE 5 REPORT

The report is a response to the wider national initiative for Service Skills Agreements developed by Energy and Utilities Skills. The report identifies that the NWDA has set up the Sector Skills and Productivity Alliances (SSPA's) to work on sector issues and effectively analyse demand by sectors. These are aligned closely with Sector Skills Councils (SSC's) which typically cover the more traditional energy sectors such as power generation, oil and gas, nuclear.

There is one for energy and environmental technology (which covers power generation, oil and gas, nuclear, renewable energies and low carbon technologies). These have been developed to move forward North West sector skills requirements.

The NWDA, and its partners, are very keen on supporting the outcomes of the Sector Skills Agreement (SSA). Greater emphasis has been placed on the development and implementation of the SSA with specific focus on addressing Renewable Energy skills and training through integrating, rationalising and modernising skills and training in the traditional sectors. There are a number of ongoing projects that have been set up by Energy and Utilities Skills that provide a framework for a Renewable Energy sub sector to be developed across the city region.

F2.4 LOW CARBON OPPORTUNITIES FROM THE ECONOMIC IMPACT OF EU AND UK CLIMATE CHANGE LEGISLATION ON LIVERPOOL AND LIVERPOOL CITY REGION

Low carbon opportunities in the Liverpool City Region:

- Tidal Energy Centre of Excellence
- Innovation & Technology Transfer
- Develop Off-Shore Wind Supply Chain
- Sector Development for Environmental Technology Services
- Skills Capacity in Sustainable Construction
- Plan to Achieve Sustainable Construction Standards at Lowest Cost
- Energy Efficiency in Social Rented Housing
- Energy Efficiency in Private Housing
- Expanded Business Support for Energy Efficiency
- Expand On-shore Wind Installations
- Expand Use of Biomass and Energy from Waste
- Low Carbon Transport City
- Low Carbon Port
- Low Carbon Airport
- Communication – wider dissemination of findings of report with business community

i However it is recognised that increased exports could increase CO^2 emissions if the modes of transport used are run on low carbon fuels and the distances are unnecessary.

ii Including NEF

iii Leitch Review of Skills: The government commissioned Lord Sandy Leitch in 2004 to undertake an independent review of the UKs long term skills needs. The interim report 'Skills in the UK: the Long Term Challenge' was published in December 2005. It committed the Review, in its final report, to identify the UKs optimal skills mix for 2020 to maximise economic growth, productivity and social justice, set out the balance of responsibility for achieving the skills profile and consider the policy framework required to support it. The final report of the Leitch Review of Skills was published on the 5 December 2006, 'Prosperity for all in the Global Economy - World Class Skills'. In addition, The Energy and Utilities Skills Council have developed a Sector Skills Agreement (SSA) which is provided a structured framework for collaboration, to create an evidence-based skills need assessment. The framework places employers firmly at the centre of the process and examine key business skills issues and develops solutions. The SSA has been a 5 Stage process which has resulted in the development of a suite of skills' solutions projects, which are now being implemented. The 5 Stage SSA skills' needs assessment was conducted by an assessment of current & future skills needs; mapping quality and availability of Training Provision; gap analysis of training requirements and training provision; development of practical, workable and cost effective solutions to identified needs and action plans to tackle the short, medium and long term priority skills issues. Stage 5 has now been completed and an SSA has been developed for the North West region.

APPENDIX G

Consultation with Local Businesses

G1 CONSULTATION WITH LOCAL BUSINESSES

G1.1 INTRODUCTION

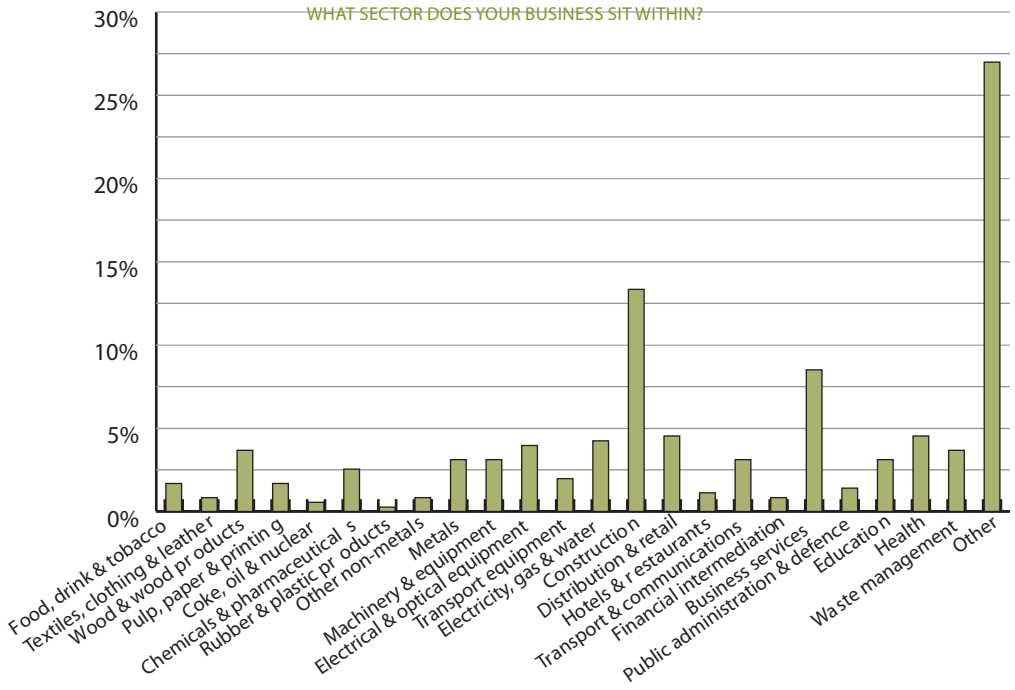
This appendix presents the findings of the local business survey discussed in section 5.7 of the main report. The survey was developed to gauge an understanding of attitudes and progress made towards reducing energy and consumption and on site renewable energy generation.

In total 352 responses were received across the study area. The survey aimed to identify a number of issues through fourteen questions. In summary this included:

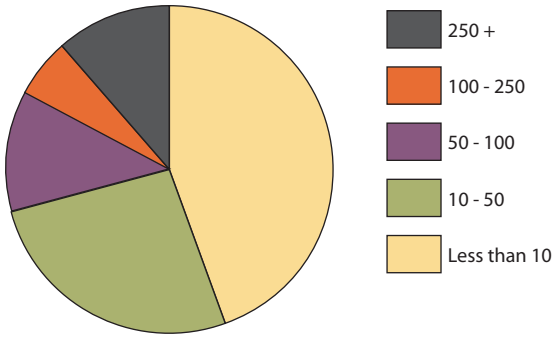
- Establishing if businesses are involved in the planning, manufacturing or installation of technology related to renewable energy
- Establishing the extent that businesses have already taken steps to save energy
- Identifying whether businesses have switched to a greener energy supplier in the last 12 months
- Identifying if businesses have any on-site renewable energy generation and the type of energy generation is being used.
- Establishing if businesses consider that their energy use is likely to increase in the future i.e. due to expansion.
- Identifying business plans to introduce energy saving measures
- Identifying business plans to install small scale renewable energy on site
- Business aspirations to use renewable energy technologies in the future
- Issues stopping businesses taking action to save energy
- Issues stopping businesses taking action to install renewable energy technologies

The detailed results of the survey for each of the fourteen questions are set out in the rest of this appendix.

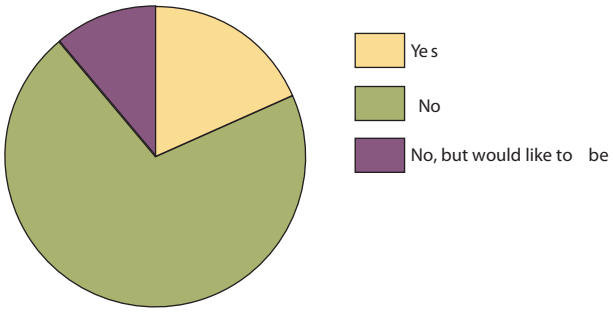
G1.2 WHAT SECTOR DOES YOUR BUSINESS SIT WITHIN?



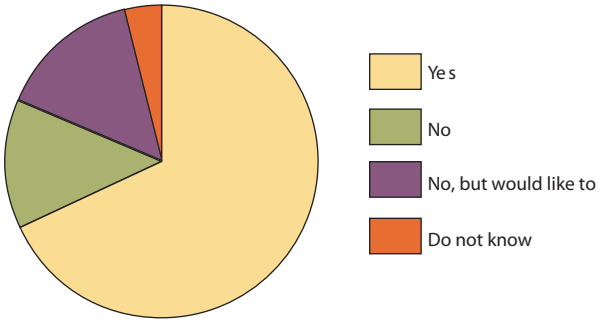
G1.3 PLEASE INDICATE THE SIZE OF YOUR BUSINESS IN TERMS OF NUMBER OF EMPLOYEES.



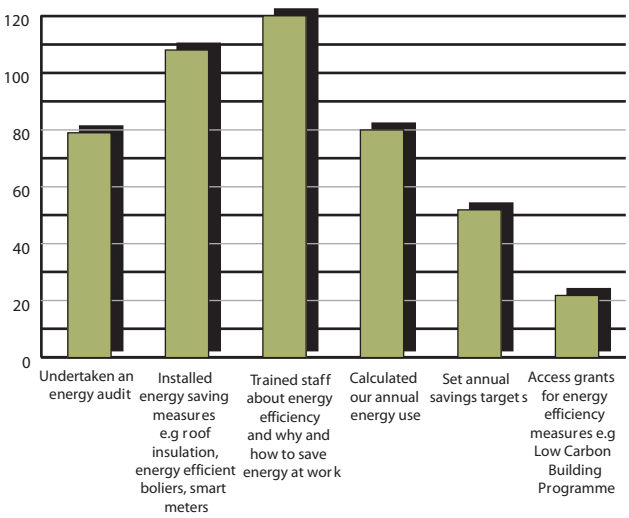
G1.4 IS YOUR BUSINESS INVOLVED IN THE PLANNING, MANUFACTURING OR INSTALLATION OF TECHNOLOGY RELATED TO RENEWABLE ENERGY?



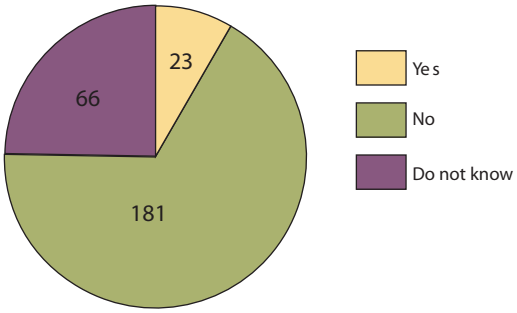
G1.5 HAS YOUR BUSINESS ALREADY TAKEN STEPS TO SAVE ENERGY?



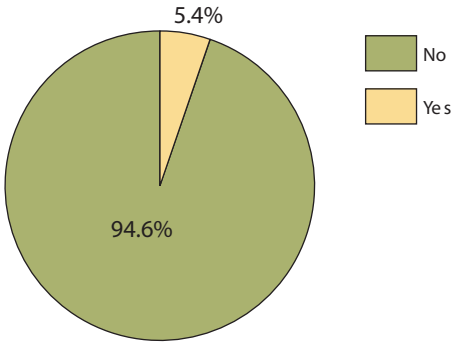
G1.6 PLEASE TICK WHAT YOUR BUSINESS IS ALREADY DOING



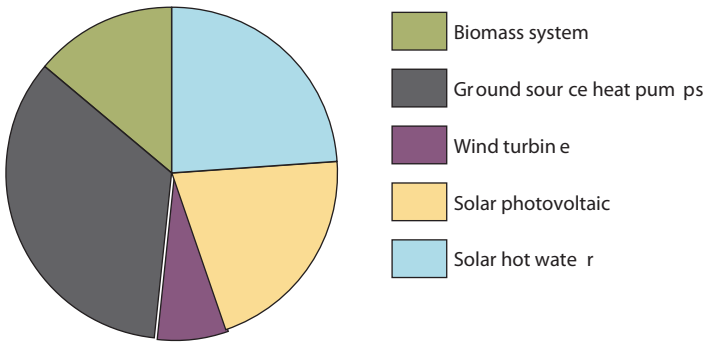
G1.7 IN THE LAST 12 MONTHS HAS YOUR BUSINESS SWITCHED ELECTRICITY SUPPLIERS TO A GREENER ENERGY SUPPLIER?



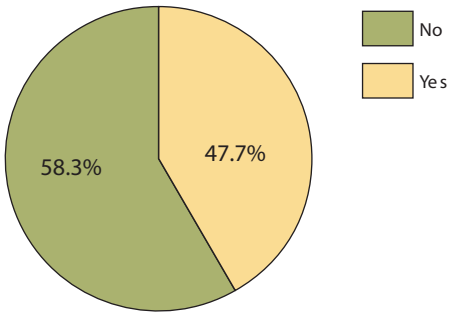
G1.8 DOES YOUR BUSINESS HAVE ANY ON SITE RENEWABLE ENERGY GENERATION? E.G SOLAR PANEL, WIND TURBINES?



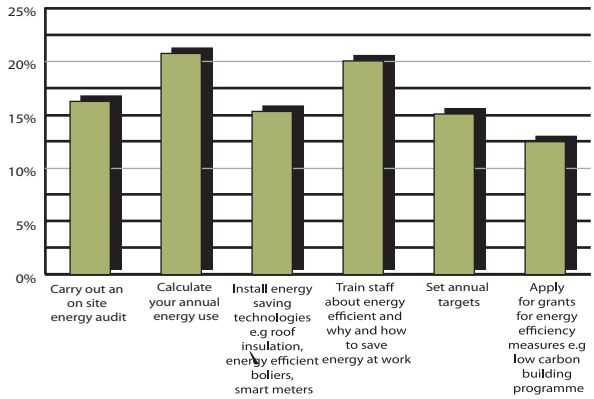
G1.9 WHAT ON SITE ENERGY GENERATION DO YOU USE?



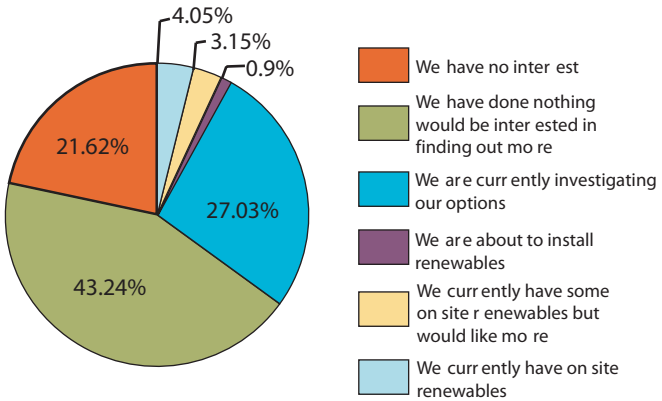
G1.10 DO YOU ANTICIPATE THAT YOUR ENERGY USE IS LIKELY TO INCREASE IN FUTURE I.E DUE TO EXPANSION?



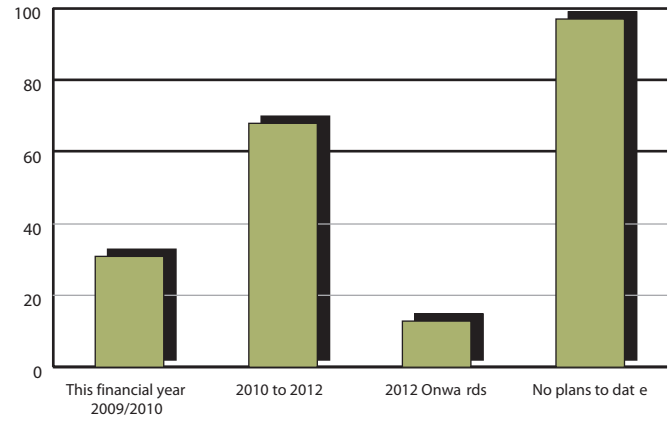
G1.11 WHAT PLANS DOES YOUR BUSINESS HAVE TO INTRODUCE ENERGY SAVING MEASURES?



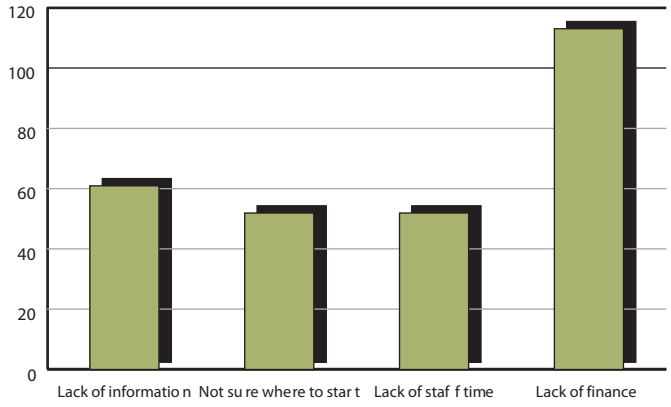
G1.12 WHAT PLANS, IF ANY DOES YOUR BUSINESS HAVE TO INSTALL SMALL SCALE RENEWABLE ENERGY ON SITE?



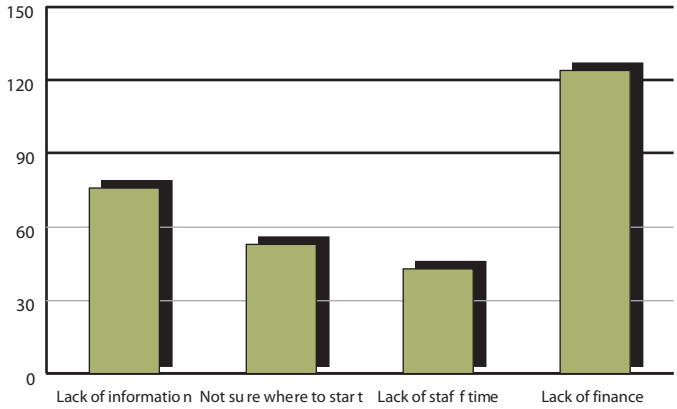
G1.13 IF YOUR BUSINESS DOES HAVE ASPIRATIONS TO USE RENEWABLE ENERGY TECHNOLOGIES IN THE FUTURE PLEASE PROVIDE MORE INFORMATION. WILL THIS BE IN?



G1.14 WHAT IS STOPPING YOUR BUSINESS TAKING ACTION TO SAVE ENERGY? PLEASE TICK ALL THAT APPLY



G1.15 WHAT IS STOPPING YOUR BUSINESS TAKING ACTION TO INSTALL RENEWABLE ENERGY TECHNOLOGIES?



APPENDIX H

Interventions for Renewable Energy Industry across the Liverpool City Region

H1 INTERVENTIONS FOR RENEWABLE ENERGY

The Electricity and Gas Distribution Networks have an ageing workforce. In response Energy and Utilities Skills is working with them to build detailed industry resourcing models which are helping them to attract, recruit, train and retain the next generation of skilled workers. This section presents an overview of the key project Energy and Utilities Skills which Knowsley should - if it is not already involved with or considering – work with, adopt, promote, replicate and implement with its existing and future partners.

H1.1 SECTOR QUALIFICATION STRATEGY

By translating the outputs from our employer consultation, EU Skills is working to create an employer-led vocational education system, responsive to employers needs and offering flexible and fit for purpose qualifications and frameworks to support the sector.

H1.2 LITERACY AND NUMERACY SKILLS WORKSHOPS

Following a pilot scheme, demonstrating the specific business and individual benefits of running workshops to address low levels of literacy and numeracy, further projects are under consideration. Literacy and Numeracy Skills Workshops are essential in upskilling the workforce and enabling employees to complete tasks efficiently.

H1.3 POWER SECTOR SKILLS STRATEGY GROUP (PSSSG)

Established in July 2007, the PSSSG is a senior collaborative group of power sector companies, set up to address the strategic issues across the power sector and to deliver a sustainable skills strategy to meet the needs of the sector in the medium and long-term.

H1.4 HIGHER EDUCATION STRATEGY FOR WORKFORCE DEVELOPMENT

In response to employer demand, the Strategy will promote high-level accredited programmes with the emphasis on Work Based Learning, through effective partnerships between Higher Education Institutions and employers. Learning processes directly link to business performance improvements and pathways will support technician to professional level development.

H1.5 NETWORK CONSTRUCTION OPERATIONS - SUPERVISORY QUALIFICATION

For the first time, supervisors at Level 3, working for Network Construction employers, will have a cost-effective way of demonstrating competency, through a competency framework. The framework has been initiated, developed and delivered to meet the industry's specific needs. Supervisory level employees are pivotal to driving improved performance and productivity, and through improved competency employers will also derive better financial performance.

H1.6 NETWORK CONSTRUCTION OPERATIONS - CROSS UTILITY QUALIFICATION

A cost-effective way for employees working as team leaders, at Level 2 in Network Construction, to demonstrate competency across both water and gas. The competency framework initiated, developed and delivered to meet their needs, will reduce cost and the time taken to develop competent team leaders.

H1.7 CAREERS WEBSITE

Aimed at 14-19 year olds, the careers website is helping to raise the profile of the sector, making it more attractive to young people by providing information on Apprenticeships, jobs, qualifications, salaries, entry requirements and career progression.

H1.8 FORCES RESETTLEMENT SCHEME

In Wales, the forces resettlement scheme is a means of recruiting and upskilling from the armed forces. Some training may be provided whilst candidates are still in service, saving the the employer training costs, whilst tapping into a strong source of manpower and attracting a highly skilled and trained workforce to the sector.

H1.9 SKILLS CAPACITY BUILDING

A National Training Awards (NTA) award-winning project, achieved through collaborative working between stakeholders, employers and dedicated Further Education training providers, addresses a regional shortage of good quality skills provision. Partnering employers and Further Education

training providers has enabled the delivery of fit for purpose, quality, local training provision, at competitive prices to meet employer needs.

H1.10 ENGINEERING TECHNICAL APPRENTICESHIP

In Northern Ireland, a new Gas Apprenticeship, designed to meet both technical skills and business requirements, enables Apprentices to have the vital skills required to meet today's technology, and to become a valued asset to their company. The Apprenticeship will include the main Level 3 gas qualification, with bolt on courses in electricity inspection and testing, plumbing hot and cold water and renewables.

H1.11 YOUNG APPRENTICESHIPS

The EU Skills Young Apprenticeship Programme encourages bright 14-16 year old pupils to complement their school STEM (Science, Technology, Engineering and Maths) studies by spending up to 50 days on work placement/experience in a safe, controlled environment. This feeds sustainable, structured career pathways.

There are already a large number of opportunities available to support Knowsley implementing renewable energy technologies and providing opportunities in the borough. The framework for advice and support is varied with a range of organisations and funding regimes in place to assist businesses.

H2 RENEWABLE ENERGY INVESTMENT INCENTIVES

H2.1 EXISTING AND EMERGING POLICY

H2.1.1 Renewable Obligation Order

The Renewable Obligation Order (ROO) is the main support mechanism for renewable energy projects in the UK. The Order requires that UK suppliers of electricity to source an increasing portion of their electricity supply from renewable energy resources.

Suppliers can either present enough certificates to cover the required percentage of their output (which is expected to increase to 10.4% by 2010), or they can pay a 'buyout' price' for any discrepancies. The buyout price is set by Ofgem on a yearly basis, in April of this year, the buyout price for 2009/2010 is set at; £37.19 /MWh.

The eligibility of electricity generated from renewable technologies by a licensed supplier is accredited by Ofgem. Once accredited, Ofgem issues the supplier with a Renewable Obligation Certificate (ROC) per MWh of accredited renewable energy produced. The average ROC price in July 2009 was: £52.90.

Some renewable energy technologies are more commercially viable than others, hence the number of ROCs per MWh supplied vary, so that specific technologies that require more support for effective market deployment, receive additional incentive.

Renewable Obligation Certificate Banding System	
Renewable Technology	Number of ROCs per MWh
Onshore Wind	1
Biomass Power Generation / CHP	1.5 / 2
Anaerobic Digestion	2
Solar PV	2
Hydro	1
Micro-generation (<50kW)	2

H2.1.2 Feed-in Tariffs

It is anticipated that a UK-wide Feed-in Tariff (FiT) will be implemented in the UK for renewable micro-generation and biomass electricity generation and biomass CHP from 50kW up to a capacity of 5MW of electrical generation and that it will work in conjunction with the existing ROC scheme.

The FiT system is more directly compared to ROCs in that there is a guarantee of either a fixed price or a fixed period of remuneration. Where ROCs are a tradable certificate, FiT provides a guaranteed unit return on all electricity generated.

FiTs will oblige electricity supply companies to buy electricity from renewable energy generators at a price that is above the current market rate. The prices are guaranteed for long period of time i.e. ~20 years, in order to provide commercial confidence for those investing in technologies. The additional income received by the renewable generators is funded by a slight increase in electricity prices across all customers.

In July of this year, the UK Government announced illustrative FiTs for micro-generation wind and solar technologies:

- Wind: 23.0p /kWh for turbines between 1.5kW and 15kW i.e. building integrated
- Solar PV: 36.5p /kWh up to 4kW; 28p /kWh up to 10kW
- Biomass electricity 50kW to 5MW: 4.5p/kWh
- Biomass CHP 50kW to 5MW: 9.0p/kWh

The FiTs will begin on 1st April 2010 but all small wind and solar PV systems commissioned from now on will be eligible for both Low Carbon Building Program (LCBP) grants and the new FiT.

H2.1.3 Heat and Energy Saving Strategy

The Heat and Energy Saving Strategy (HESS) was issued for consultation in Spring 2009. The measures contained within the strategy target existing buildings and aims to demonstrate emissions reductions from existing buildings down to zero carbon by 2050, pledging emission cuts of 44millions tonnes by 2020 i.e. 30% reduction in household emissions compared to 2006.

The new HESS highlights the need for more district heating networks and combined heat and power (CHP) schemes.

CHP is already being supported by a range of mechanisms, while forthcoming schemes like the Renewables Obligation revisions, Feed-In Tariffs (for very small scale systems), Renewable Heat Incentive and the Carbon Reduction Commitment should help.

H2.1.4 Renewable Heat Incentive

Details of the Renewable Heat Incentive (RHI) scheme have not yet been finalised and the Department for Business, Innovation and Skills (BIS, formerly BERR) and Department of Energy and Climate Change (DECC) will be consulting widely on all aspects in 2009, with an initial consultation in summer 2009.

The RHI will provide financial assistance to generators of renewable heat, which will include air and ground source heat pumps, biomass fuelled stoves and boilers, solar-thermal water heaters and combined heat and power (CHP) and may also support producers of renewable biogas and bio-methane.

The incentive payments will be funded by a levy on suppliers of fossil fuels for heat. These are mainly licensed gas suppliers – but could also include suppliers of coal, heating oil, LPG etc.

Initial estimates of the RHI value range from £39/MWh to £89/MWh, the levy on fossil fuel suppliers is estimated to amount to around 36p/therm (≈12.3£/MWh).

Through a consultative process, the BIS and DECC propose to develop the detailed design of the RHI which will be set out in regulations to be approved by Parliament. They expect the RHI to be in place by April 2011.

H2.1.5 Carbon Reduction Commitment

The UK's first mandatory carbon trading scheme; the Carbon Reduction Commitment (CRC) is set to commence April 2010 and will work in tandem with the existing EU Emissions Trading Scheme (EU ETS) and Climate Change Agreements operated for large energy users (≥20MW of thermal capacity). The initial phase of the CRC will be compulsory for organisations that consume over 6,000 MWh (6,000,000 kWh) of half-hourly metered electricity during the period from January 2008 to December 2008.

The aim of the Carbon Reduction Commitment is to reduce the level of carbon emissions currently produced by the larger 'low energy-intensive' organisations by approximately 1.2 million tonnes of CO_2 per year by 2020. As a Climate Change Bill commitment, the scheme is aiming for a 60% reduction in CO_2 emissions by 2050.

H2.2 GRANTS

H2.2.1 Low Carbon Buildings Program grants

Phase 1

The Low Carbon Building Program (LCBP) Phase 1 grant is managed by DECC for the Energy Savings Trust. The LCBP allows householders interested in generating heat or electricity to apply for up to £2,500 per property for micro-generation with wind, solar PV and hydro electric. Currently there are no certified products and installers for biomass CHP.

Phase 2

The Low Carbon Building Program Phase 2 (LCBP2E) grant is managed by BRE. The LCBP2E allows for the public sector (including schools, hospitals, housing associations and local authorities) or charitable bodies apply for up to 50% of the cost of installing approved technologies for micro-generation i.e. wind, solar PV and hydro electric up to a maximum of £200,000.

Eligible products and installer companies are registered on the Micro-generation Certification Scheme (MCS). In terms of the additional products this also includes Solar Keymark for solar thermal collectors, and the Environmental Technology List (ETA part of the Enhanced Capital Allowance Scheme). Renewable electrical products of up to 50kW; and renewable thermal products of up to 300kW heat generation are eligible.

H2.2.2 Salix

Interest free loans are being offered to public organisations in England to cut their energy bills following the Government budget announcement of £51.5 million of new loan funding. Applications are now being invited for the first call by 17th July 2009. Other calls will follow until the end of the year or until all loans have been committed.

DECC is providing this new funding in partnership with Salix Finance and the Carbon Trust. The funding is available through Salix Finance, the provider of loans to public sector organisations for energy saving initiatives. The loan fund will help save around £18 million and 100,000 tonnes of CO_2 per year. It will complement the existing match funding programme offered by Salix Finance which has some £90m of funding operating with 128 public sector clients in the UK.

Loans will be made available for 100% of the projects cost provided that they meet agreed criteria that deliver energy efficiency savings and reduce costs. The interest-free loans will be repaid over a four year period in eight equal instalments, with the first payment being March 2011. The payments should be covered by the energy savings made. This new interest free loan scheme has already attracted a high level of interest from across the whole of the public sector.

With a raft of legislation such as the Climate Change Act, the carbon reduction programme (CRC) and the 2010 Kyoto agreement targets fast approaching, pressure is being placed on the public sector to reduce its carbon footprints. Departments and other public sector organisations have sustainability targets incorporated into performance agreements and this new fund will enable them to practically demonstrate their commitment to improving the energy efficiency of their estates. In leading by example, the public sector can help drive performance across the entire economy.

Further information on the application process, criteria for project funding and further deadlines for applications is available on the Salix Finance website www.salixfinance.co.uk/loans.html

APPENDIX I

Glossary

I1 GLOSSARY OF RENEWABLE ENERGY TERMS

Additionality - In the context of renewable generation, additionality is about whether the customer's action or decision has made a genuine reduction in emissions above and beyond what would have happened anyway.

Air Source Heat Pump (ASHP) - The heat pump absorbs heat from the outside air and transfers the heat to the space to be heated in the heating mode. In the cooling mode the heat pump absorbs heat from the space to be cooled and rejects the heat to the outside air.

Alternating current (AC) - Flow of electricity that constantly changes direction between positive and negative sides. Electricity produced in the UK moves in current that shifts direction at a rate of 50 times per second (50 Hertz, 50Hz).

Anaerobic Digestion - anaerobic digestion is a biological process that produces a gas principally composed of methane (ch4) and carbon dioxide (CO_2) otherwise known as biogas. These gases are produced from organic wastes such as livestock manure, food processing waste, etc.

Biogas - biogas is generated when bacteria degrades biological material in the absence of oxygen, in a process known as anaerobic digestion. Since biogas is a mixture of methane (also known as marsh gas or natural gas) and carbon dioxide it is a renewable fuel produced from waste treatment.

Biomass - biomass, also known as biofuels or bioenergy, is obtained from organic matter either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. The use of biomass is classed as a 'carbon neutral' process because the carbon dioxide released during the generation of energy from biomass is balanced by that absorbed by plants during their growth.

Carbon Credits - carbon credits are created when a project reduces or avoids the emission of greenhouse gases, such as carbon dioxide (CO_2) and methane (CH_4). The carbon credits are measured against a baseline.

Carbon Trading - the uk emissions trading scheme, launched in april 2002. Emissions trading is designed to allow businesses to reduce their emissions of greenhouse gases in the most economically efficient way.

Climate Change Levy - the climate change levy is a tax on energy use in industry, commerce, agriculture and the public sector.

Carbon capture - A technological solution for capturing carbon dioxide as it is released into the atmosphere from fossil fuels either before or after combustion.

Carbon storage - Sometimes called 'carbon sequestration', this is the long-term storage of carbon or CO_2 in the forests, soil, ocean, or underground in depleted oil and gas reservoirs, coal seams, and saline aquifers. Carbon Capture and Storage can be referred to as CCS.

Carbon Credits - A credit or permit arising from a greenhouse gas emissions reduction scheme, such as emissions trading, JI or CDM. Emissions are controlled by setting a cap on total emissions

and allowing the market sector(s) to reach an economically balanced response via

Carbon Footprint - A measure of the amount of carbon dioxide or CO_2 emitted through the combustion of fossil fuels; can be measured on a personal or national level, or according to a specific activity, such as taking a flight to go on holiday.

Carbon Neutral - An activity or process that doesn't add to the net amount of CO_2 in the atmosphere. As the organisation or product will typically have caused some greenhouse gas emissions, it is usually necessary to use carbon offsets to achieve neutrality.

Carbon Offset - A carbon offset negates the overall amount of carbon released into the atmosphere by avoiding the release or removing it elsewhere – e.g. through a renewable energy or energy conservation project. Voluntary carbon offsetting schemes can help people reduce their carbon footprint, but should only be used as a last resort. It is also important that a credible scheme is used.

Carbon Reduction Commitment - This is a mandatory scheme to promote energy efficiency and help reduce carbon emissions. It is a UK wide scheme which covers large business and public sector organisations.

Carbon Tax - A tax levied on fossil fuel usage usually based on the carbon content

Carbon Trading - The trading of personal, corporate or national credits to maintain and gradually reduce carbon emissions. Companies, nations or individuals who beat the targets can sell the balance as credits to those that exceed their limits.

Carbon Value - In order to encourage individuals to reduce carbon dioxide emissions a value has been placed on carbon. The more you produce the more you pay. To give investors the confidence to invest in low carbon solutions and thereby help to reduce emissions it is necessary to have certainty that there will be a long-term value of carbon.

Combined Heat and Power (CHP) generation - When electricity is generated up to 60% of the energy can be wasted as lost heat. Combined Heat and Power schemes are designed to recover most of this waste heat and use it to power a turbine and generate more electricity.

Combined Cycle Gas Turbine (CCGT) - CCGT plant comprises a gas turbine and generator set being used to generates electricity, with the waste heat produced being used to raise steam to generate additional electricity via a steam turbine.

Distributed and Micro-`generation - This is when electricity is generated for local distribution and is not connected directly to the National Grid. Microgeneration is typically smaller scale generating technology. Both of these types of generation have a role to play in Britain's energy mix, although it is important to be realistic about the overall size of the contribution they may not be the best economic or most environmentally friendly solution in every case.

Emissions Trading - A market mechanism that allows emitters (countries, companies or facilities) to buy emissions from or sell emissions to other emitters. Emissions trading is expected to bring down the costs of meeting emission targets by allowing those who can achieve reductions less expensively to sell excess reductions (e.g. reductions in excess of those required under some regulation) to those for whom achieving reductions is more costly.

European Union Emissions Trading Scheme (EUETS) - EUETS is an EU mechanism for the trading of carbon dioxide and other greenhouse gas emissions.

Energy Efficiency - Achieving desired levels of lighting, heating or cooling for minimum energy use. Cutting down on waste energy. A good example is an energy efficient light bulb which produces the same amount of light as a conventional bulb but uses up to 75% less energy to do so.

Energy From Waste - Energy recovery of post recycling waste residue - an alternative to landfill.

Energy Performance Certificate (EPC) - EPC is intended to inform potential buyers or tenants about the energy performance of a building, so they can consider energy efficiency as part of their investment or business decision. The scale is from A-G, A being the most efficient.

Energy Services Company (ESCO) - An ESCo is normally a deregulated organisation set up to provide energy services (electricity, heat and chilled water) to a defined set of users or a local community separate from the regulated utilities serving the area. They may perform any or all of the following services: auditing, developing packages of recommended measures, arranging financing, installing or overseeing installation of measures, resident and staff education, equipment commissioning, maintenance, measuring, verifying, and guaranteeing savings.

Energy Services Directive (ESD) - The Directive's full name is the EC Directive on Energy End Use Efficiency and Energy Services. It aims to promote energy efficiency in the UK by developing a market for energy services and delivering energy efficiency programmes and measures to energy end users.

Fuel Cells - Fuel cells produce electricity from hydrogen and air, with water as the only emission. Potential applications include stationary power generation, transport and portable power (replacing batteries in mobile phones).

Gas-fired Generation -. Combined Cycle Gas Turbine (CCGTs) are currently the more favoured option for new large-scale electricity generation in the UK compared to new coal power stations. Burning natural gas to produce electricity does emit carbon dioxide, but the emissions are significantly lower than from coal.

Green Certificates - customers can buy green certificates whether or not they have access to green power through their local utility or a competitive electricity marketer. And they can purchase green certificates without having to switch electricity suppliers. See also renewable energy certificates.

Ground source heat pump (GSHP) - a type of heat pump that uses the natural heat storage ability of the earth and/or the groundwater to heat and/or cool a building. The earth has the ability to absorb and store heat energy from the sun. To use that stored energy, heat is extracted from the earth through a liquid medium (groundwater or an anti-freeze solution) and is pumped to the heat pump or heat exchanger. There, the heat is used to heat the building. In the summer, the process is reversed and indoor heat is extracted from the building and transferred to the earth through the liquid.

Hydroelectricity - Producing electricity by using the force of falling water to turn the turbine blades, usually accomplished by damming a river to create a source of falling water.

Marine Generation (Tidal And Wave) The principle behind tidal generation is similar to wind turbines, except that instead of wind turning the turbine blades, the process uses underwater current caused by tides. One of the benefits of tidal power over wind power is the predictability of tidal currents, enabling the developers to know exactly when the turbines will be producing power.

National Grid - The National Grid owns the main transmission systems and is responsible for transmitting the electricity from the generator to the local RECs area. All electricity generated in mainland UK is

Photovoltaics (PV) - The direct conversion of solar radiation into electricity by the interaction of light with the electrons in a semiconductor device or cell..

Renewable Energy - 'Renewable energy' is used to describe the energy produced using naturally replenishing resources. This includes solar power, wind, wave and tide and hydroelectricity. Wood, straw and waste are often called solid renewable energy, while landfill gas and sewerage gas can be described as gaseous renewables.

Renewable Energy Certificates (REC's) RECs, also known as 'Green Certificates', green tags, or tradable renewable certificates, represent the environmental attributes of the power produced from renewable energy projects and are sold separate from commodity electricity.

Renewables Obligation Certificate (ROC) - Eligible renewable generators receive Renewable Obligation Certificates (ROCs) for each MWh of electricity generated. These certificates can then be sold to suppliers.

Uk Emissions Trading Scheme - based on the international kyoto summit on climate change agreement, this describes the UKs national emissions trading scheme designed to reduce a range of greenhouse gases, 80% of which is carbon dioxide.

Wind power - The conversion of energy in the wind into electrical power. The wind hits the blades of the wind turbine, which rotates like a giant propeller and powers the generator. Wind farms can be sited on land or at sea, with those offshore able to take advantage of the much stronger and consistent winds found off our coast.

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RENEWABLE ENERGY CAPACITY STUDY

LIVERPOOL CITY REGION
STAGE TWO REPORT

ARUP


L1

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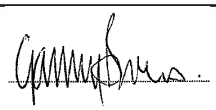
Garry Banks	

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 per partner authority based on potential future growth as set out in the, now abolished, RSS. Also presented are projections for employment land based on targets for Merseyside and Halton.

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	**23,106**	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**
Merseyside and Halton	Employment Land	42,420	44,710	**87,130**	81,376	85,300	**166,676**	88,986	93,201	**182,187**

To put these figures into context:

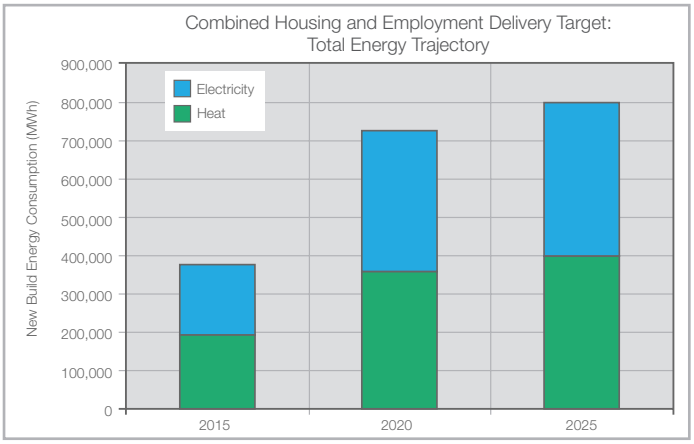
- A typical three bedroom house will consume 9.5 MWh of heat and 4.5MWh of electricity per year;
- A typical four storey office block (accommodating around 160 people) will consume approximately 250MWh of heat and 350MWh of electricity per year;
- Fiddlers Ferry power station produces at peak output 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.

2.4.1 Combined Energy Trajectory

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



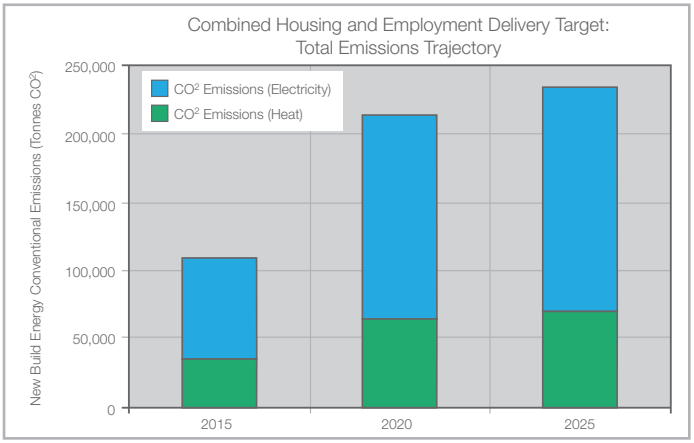
2.4.2 Combined CO_2 Emissions

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.

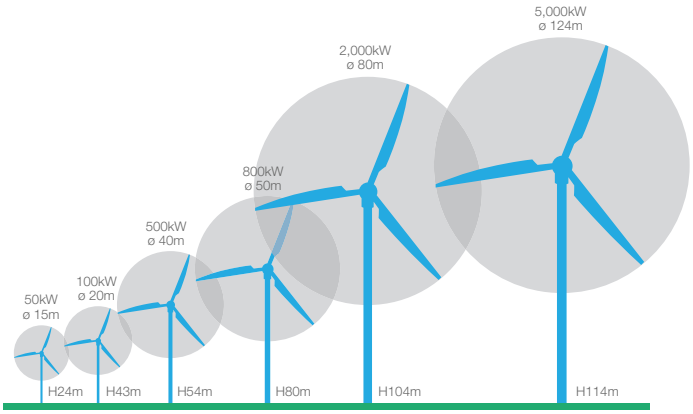
Note that the Priority Zones are identified as areas of search and specific sites are not defined although grid areas are shown on plan for illustrative purposes.

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.

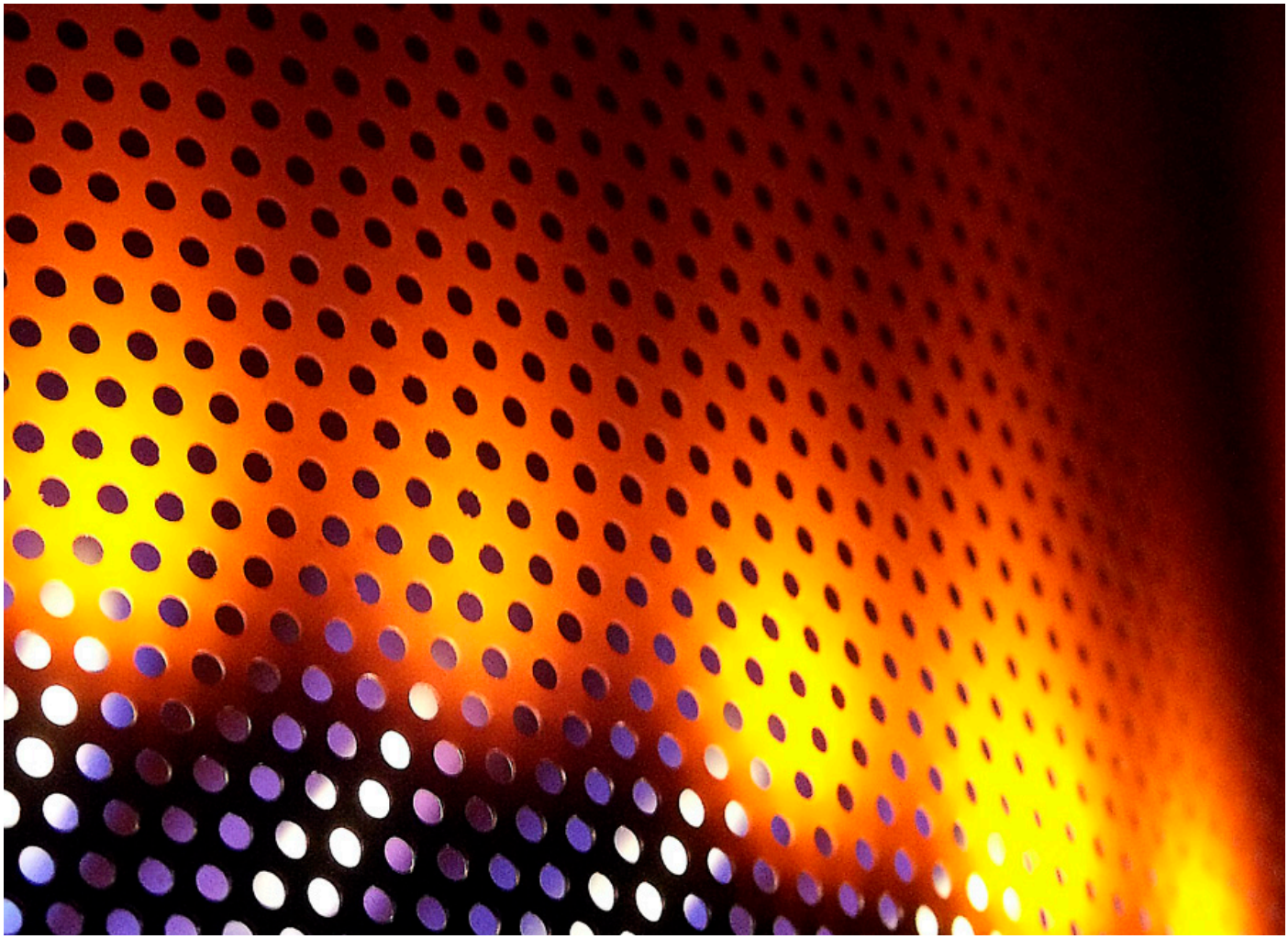
TABLE 6: CHP TARGETS

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.

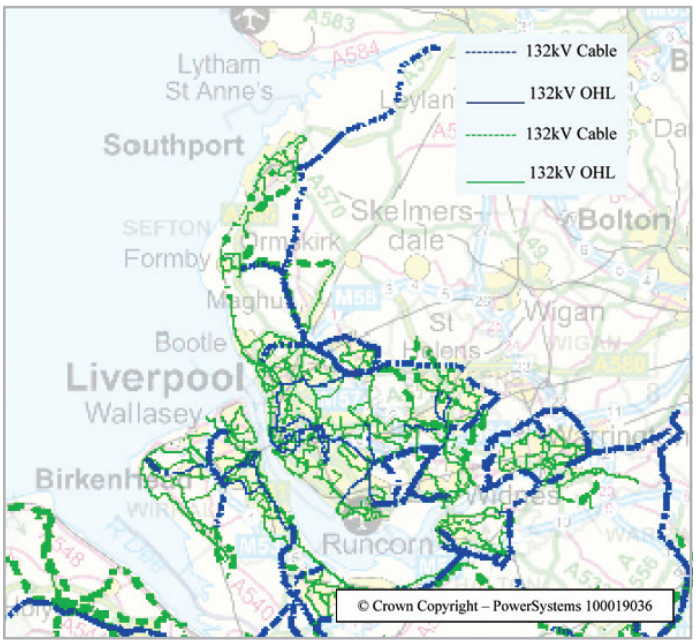
A further voltage drop occurs to establish localised "High Voltage" (HV) 11kV and 6.6 kV networks which distribute electricity around towns and cities, via either overhead or buried cables.

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

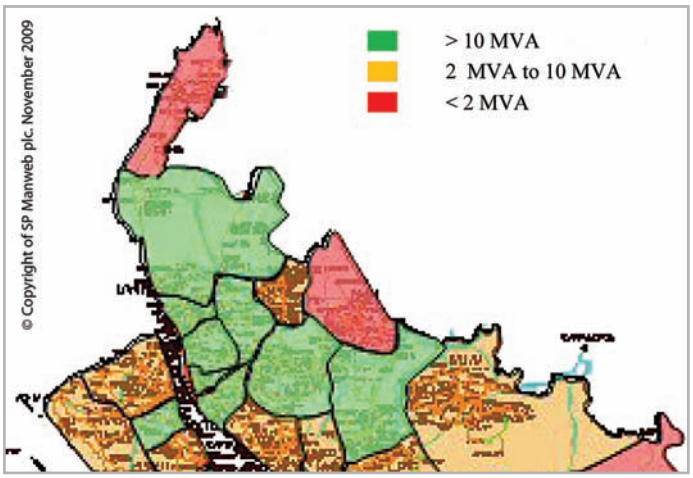


4.3 NETWORK CAPACITY

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.

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: Wirral

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

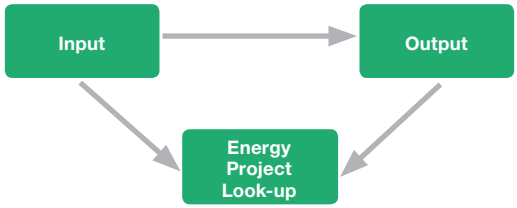
E1.2.1 Tool Structure

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:

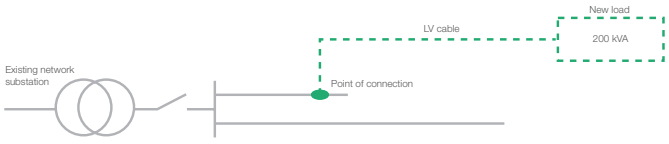
$$\text{Cost Apportionment Factor (CAF)} = \frac{\text{Customer Required Capacity} \times 100\%}{\text{New Network Capacity}}$$

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

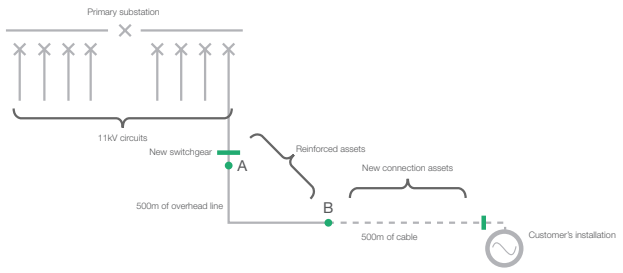
An important aspect of generation connection to existing networks is the resulting affect on power flow. This is directly related to the magnitude and location of the connecting generation.

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) = Customer Required Capacity x 100% / 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.

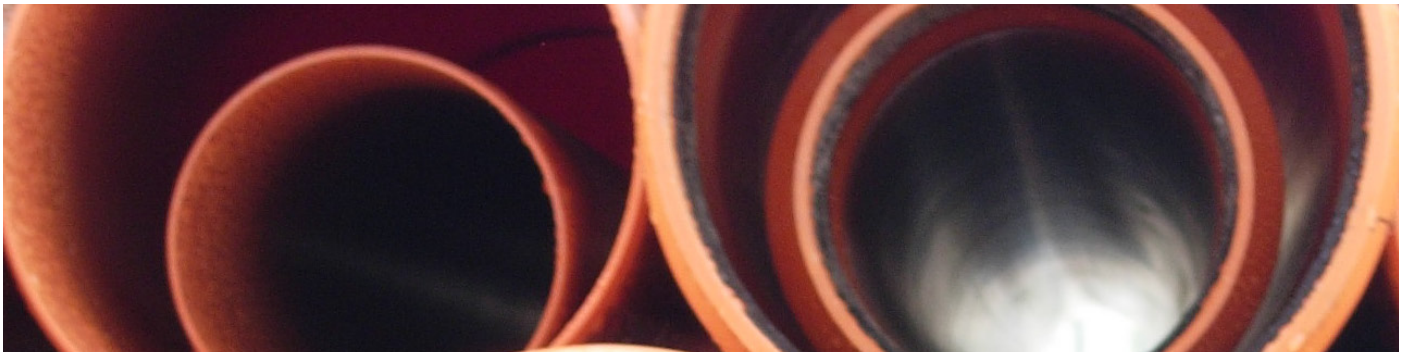
New network capacity = 5 MVA
Connecting generator capacity = 3 MVA

New network capacity = £14,760

Cost Apportionment Factor (CAF) = Customer Required Capacity x 100% / 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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