Wirral Local Plan
Climate Change and Renewable Energy Study

Wirral Borough Council

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Wirral Local Plan: Climate Change and Renewable Energy Study Report

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1 Introduction

1.1 Context

Ambitious international carbon reduction commitments have been agreed under the Paris Agreement in 2016[1] which outline that in order to avoid the worst impacts of climate change, it is vital to secure the increase in the global average temperature to well below 2ºC above pre-industrial levels. In addition, in 2018 the IPCC released their Special Report 15 (SR15)[2] which outlined advice that global temperature increases should be limited to below 1.5 ºC and that action would be needed to reduce global Greenhouse Gas emissions by over half of their 1990 levels in just over a decade (by 2030).

In response to international commitments, the UK government have set out their legal commitments and obligations relating to climate change. The national legislative context is underpinned by the Climate Change Act (2008)[3], which introduced a statutory target for the UK to reduce Greenhouse Gas emissions by 80% by 2050. In June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order[4] amended this target to a 100% reduction (or net zero) by 2050.

International and national carbon reduction commitments have also prompted action at a local level, to ensure climate action is being taken within local government's activities. On the 15th of July 2019, Wirral Borough Council declared a Climate Emergency, which set a commitment to embedding climate action within the Councils services and deliverables[5]. This commitment is supported by Wirral Borough Council's Climate Change Strategy (2014-2019)[6] and updated strategy (Cool 2[7]) which sets out ambitious climate action targets for the local area. This includes an aim to reach net zero pollution as early as possible before 2041.

Wirral Borough Council are currently preparing a new Local Plan, which once adopted will set out the ambitions for future development of Wirral over the next 15 years. The Wirral Local Plan Issues and Options document has undergone consultation, which closed in April 2020. At the time of the study, the Council are currently drafting the final Wirral Local Plan document for publication. Through a series of commissions, including this study, Wirral Council are seeking to embed climate action into the Local Plan, to ensure climate change mitigation and adaptation is at the forefront of the Council's decision making.

[1] United Nations (2016) The Paris Agreement, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement, accessed 05/08/20
[2] IPCC (2018) Special Report 15 (SR15), https://www.ipcc.ch/srccl/, accessed 05/08/20
[3] UK Government (2008) The Climate Act, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 05/08/20
[4] UK Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 05/08/20
[5] Wirral Council (2020) Climate Emergency, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/climate-change-action, accessed 05/08/20
[6] Cool Wirral (2014-2019) Wirral Climate Change Strategy. https://www.wirral.gov.uk/sites/default/files/all/About%20the%20council/climate%20change/Wirral%20Climate%20Change%20Strategy%202014-2019.pdf accessed 05/08/20
[7] Cool Wirral (2020) Cool 2: A strategy for Wirral in the face of the global climate emergency (draft). https://www.wirral.gov.uk/sites/default/files/all/About%20the%20council/climate%20change/Cool2-Strategy-2020.pdf accessed 05/08/20

1.2 Purpose of the Study

The Wirral Local Plan Climate Change and Renewable Energy Study has been commissioned to identify opportunities to embed climate change and renewable energy considerations into the local planning process, to support Wirral Council's wider action on climate change, to assist the Council in contributions to local, national and international carbon reduction targets.

The scope of the study involved the following key steps:

- Undertaking a context review of legislation, policy and guidance to set the context for the study and development of policy.
- Undertaking a review of best practice guidance and of best practice local authority policies to provide support for the development of policy.
- Delivering a stakeholder questionnaire with key stakeholders and workshop with Officers and Elected Members, and the Wirral Youth Parliament to benefit from local knowledge and encourage co-design of policy.
- Undertaking a Clean Energy Opportunities and Implications Study to guide the potential for renewable energy in the Borough.
- Developing Policy Direction Papers to guide policy making for the Local Plan, drawing on the evidence and best practice from the study; including providing potential policy wording and justification.

The study forms part of a number of separate commissions, contributing to the Local Plan. As such, this study focusses primarily on the potential interventions through land use planning for net zero carbon development, sustainable building design and renewable energy. Wider considerations, such as the natural environment, green infrastructure and flood risk / adaptation, are being pursued through separate commissions. Where relevant information has been highlighted for wider policy agendas, such as green infrastructure, transport and flood risk, these have been presented to provide added value and to feed into work being undertaken on parallel commissions to support wider policy development of Wirral Borough Council on these topics. Similarly, this commission does not seek to provide evidence or advice for wider action on climate change outside of land use planning.

1.3 Report Structure

This report provides a summary of work undertaken to embed climate change and renewable energy policies within the Wirral Local Plan, and is supplemented by a series of technical appendices which provide further detail on the study and its findings:

Section 2 provides a summary of the context review of relevant legislation, policy and guidance in relation to climate change and renewable energy (the full context review is included in Appendix 1.

Section 3 provides a summary of the best practice review of guidance and of other Local Planning Authorities Local Plan policies. A full review of best practice guidance is included in Appendix 2. A table to show a full review of best practice planning policies from other Local Authorities is included in Appendix 4.

Section 4 provides a summary of the stakeholder engagement activities undertaken as part of the work which includes a questionnaire with key stakeholders (questions included in Appendix 5), and workshops with Wirral Youth Group, Wirral Borough Council Officers and Wirral Borough Council Members,

Section 5 provides a summary of the Clean Energy Opportunities and Implications Study (the full study is included in Appendix 6),

Section 6 provides an overview of how policy recommendations have been drafted and introduces the Policy Development Papers (full papers are included in Appendix 7).

Section 7 provides a summary of the work undertaken as part of the study, key recommendations and outlines the next steps.

2 Context Review

This section summarises a context review conducted to inform this commission, covering drivers for change, national legislation, policy and guidance; regional context (for the Liverpool City Region) and Local context (for the Wirral Borough). The context review focussed on legislative and policy drivers, as well as considering previous studies, relevant to embedding climate change and renewable energy into the local planning process. The full context review is available in Appendix 1.

2.1 Drivers for Change

Climate change has become a defining issue of our times, gaining significant attention on an international stage. Whilst it is a long-term challenge, it is clear that significant action needs to be taken now, at scale and pace, to address the causes and effects of climate change and shape how it will impact on people, our economy and the environment into the future.

Ambitious international carbon reduction commitments were agreed under the Paris Agreement, signed in 2016[8]. This outlined that in order to avoid the worst impacts of climate change, it is vital to secure the increase in the global average temperature to well below 2ºC above pre-industrial levels. Subsequently, in 2018 the IPCC released their Special Report 15 (SR15)[9]. which outlined that latest science indicated that 1.5 ºC was a more realistic target and that action would be needed to reduce global Greenhouse Gas emissions by over half of their 1990 levels in just over a decade (by 2030).

2.2 National Legislation

The UK government have set out their legal commitments and obligations relating to climate change. The national legislative context is underpinned by the Climate Change Act (2008)[10], which introduced a statutory target for the UK to reduce Greenhouse Gas emissions by 80% by 2050. This has since been updated in June 2019 under the Climate Change Act 2008 (2050 Target Amendment)[11] Order to a 100% reduction (or net zero) by 2050. The Climate Change Act places obligation on central government to prepare policies to meet these targets, reporting of climate change impacts and also sets out a framework for adaptation.

These commitments have been reflected within planning legislation to enable plan making and decision making which will support reaching these commitments. This national ambition is brought into the context of local planning through The Planning Act (2008)[12] and the Planning and Compulsory Purchase Act (2004)[13]. Section 182 of the Planning Act 2008 puts a legal duty on local authorities to include policies on climate change mitigation and adaptation in Development Plan documents. It required a change to the Planning and

[8] United Nations (2016) The Paris Agreement, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement, accessed 5/08/20

[9] IPCC (2018) Special Report 15 (SR15), https://www.ipcc.ch/srccl/, accessed 5/08/20

[10] UK Government (2008) The Climate Act, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5/08/20

[11] UK Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5/08/20

[12] UK Government (2008) Planning Act 2008, https://www.legislation.gov.uk/ukpga/2008/29/contents, accessed 12/08/20

[13] UK Government (2004) Planning and Compulsory Purchase Act, https://www.legislation.gov.uk/ukpga/2004/5/contents, accessed 12/08/20

Compulsory Purchase Act (2004) through the insertion of the following paragraph (subsection 1A):

'Development plan documents must (taken as a whole) include policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change'.

As such, this is reflected in Section 19(1A) of the Planning and Compulsory Purchase Act 2004 (PCPA) which states that "*policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change*".

The Neighbourhood Planning Act 2017[14] strengthens and consolidates the power of local communities to guide the development of neighbourhood planning within their local area. The Act set a new legal duty on local planning authorities to set out their strategic priorities within a strategic plan, including action on climate change.

One way that local authorities can bring forwards climate change mitigation in their local plan was set out in The Planning and Energy Act (2008)[15]. This sets out powers for local authorities to have development plan policies which impose reasonable requirements for a proportion of energy used to development in their area to be energy from renewable sources and/or to be low carbon energy from sources in the locality of the development. As such, this allows local planning authorities to set energy efficiency standards in their development plan policies that exceed the energy efficiency requirements of the Part L Building Regulations.

Section 43 of the Deregulation Act 2015 would withdraw this power to set energy efficiency standards from local authorities, however this has not yet been enacted and local authorities are still able to set requirements. It was anticipated that Section 43 would be enacted at the same time that Government introduced higher energy performance requirements nationally in 2016, through Building Regulations, which according to the Plan Making Written Ministerial Statement March 2015[16] were to be "set at a level equivalent to the (outgoing) Code for Sustainable Homes Level 4." However, after the General Election in 2015, Government scrapped its plans for zero carbon homes and the planned Building Regulations uplift. The amendments to the 2008 Act, to date, have not been enacted.

In 2020, there has been a consultation on proposed updates to the Building Regulations and the introduction of the Future Homes Standard[17]. Under this the government sets out its intention to 'introduce in 2020 a meaningful but achievable uplift to energy efficiency standards as a stepping stone to the [2025] Future Homes Standard. The intention is to make new homes more energy efficient and to future-proof them in readiness for low carbon heating systems.' The consultation proposed amendments to uplift standards of Part L Building Regulations, in conjunction with more stringent transitional arrangements for these standards to encourage quicker implementation. It also sought to clarify the role of planning authorities in setting energy efficiency standards. The Future Homes Standard would require new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency.

[14]UK Government (2017) Neighbourhood Planning Act, http://www.legislation.gov.uk/ukpga/2017/20/contents/enacted, accessed 12/08/20

[15] UK Government (2008) Planning and Energy Act, http://www.legislation.gov.uk/ukpga/2008/21/section/1, accessed 12/08/20

[16] UK Government (2015) Planning Update: written statement, https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2015-03-25/HCWS488/, accessed 12/08/20

[17] UKGBC (2019) The Policy Handbook, https://www.ukgbc.org/wp-content/uploads/2020/03/The-Policy-Playbook-v.1.5-March-2020.pdf, accessed 13/08/20

If taken forward, the amendments could commence in October 2020 alongside the implementation of the new Part L standards, or be delayed until 2025 when the new Future Homes Standard comes into force.

2.3 National Policy

UK Government has responded to its obligations to prepare policies to meet climate targets through the production of numerous sector specific policies and strategies relevant to this study, including the UK National Energy & Climate Plan (draft)[18], Clean Growth Strategy[19] and Industrial Strategy White Paper[20]. The recent March 2020 UK HM Treasury Budget[21] also set out a suite of policies and financial support to progress the government's clean growth agenda. In addition, the Department for Transport document, 'Decarbonising Transport: Setting the Challenge'[22], released in March 2020, set out government's intention to release a Decarbonising Transport Plan in late 2020.

The National Planning Policy Framework (NPPF) (2019)[23] is the key guiding document in local authority plan-making and development management. It requires plans to take a proactive approach to climate change mitigation and adaption. Climate change is referenced throughout the NPPF including acknowledgment that climate change adaptation and mitigation is one of the key pillars of sustainable development. Other guidance includes encouraging the reduction of Greenhouse Gas emissions, encouraging the reuse of existing resources, supporting renewable and low carbon energy, supporting community-led initiatives for renewable and low carbon energy development and guidance on utilising Section 106 and Community Infrastructure Levy contributions for climate change mitigation.

To sit alongside the NPPF, National Policy Statements (NPS)[24] have been produced to guide decision making on Nationally Significant Infrastructure Projects (NSIP). As the majority of major energy schemes are likely be NSIPs, there is a suite of NPS focused on energy developments (released in 2011). The Overarching National Policy Statement on Energy (EN-1) sets out guidance and existing policies that guide energy infrastructure and the contribution that NSIPs can make to meeting the UK's energy goals. The technology-specific NPS for Renewable Energy Infrastructure (EN-3) (2011) sets out guidance specifically for the development of energy from biomass and/or waste (>50 MW), Offshore wind (>100 MW) and Onshore Wind (>50 MW). The Energy White Paper, anticipated for release in 2020, will provide further steer on government's preferred direction for energy development.

[18] Department for Business, Energy & Industrial Strategy (2019) The UK's Draft Integrated National Energy and Climate Plan (NECP), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/774235/national_energy_and_climate_plan.pdf , accessed 13/08/20

[19] UK Government (2017) Clean Growth Strategy, https://www.gov.uk/government/publications/clean-growth-strategy, accessed 13/08/20

[20] UK Government (2017) Industrial Strategy: building a Britain fit for the future, https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future, accessed 13/08/20

[21] UK Government (2020) Budget 2020, https://www.gov.uk/government/publications/budget-2020-documents/budget-2020, accessed 13/08/20

[22] Department for Transport (2020) Decarbonising Transport: setting the Challenge, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878642/decarbonising-transport-setting-the-challenge.pdf, accessed 13/08/20

[23] UK Government (2019) National Planning Policy Framework, https://www.gov.uk/government/publications/national-planning-policy-framework--2, accessed 12/08/20

[24] UK Government (2011) National Policy Statements for energy infrastructure, https://www.gov.uk/government/publications/national-policy-statements-for-energy-infrastructure, accessed 13/08/20

With regards to community energy, the Community Energy Strategy[25] was published in 2014 which aims to make a step towards meeting the UK's commitment to encourage community owned renewable energy schemes. The strategy focuses on creating a supportive environment for community energy and removing specific barriers to growth. The strategy supports communities to produce, reduce us of, manage and purchase energy.

2.4 National Guidance

In May 2019, the UK Committee on Climate Change (CCC) released its report on 'Net Zero – The UK's contribution to stopping global warming'[26]. The UK CCC Net Zero report also advised that that by 2030, current plans would at best deliver around half of the required reduction in emissions, and the Committee stated that "Current policy is insufficient and 'clear stable and well-designed policy', designed to reduce emissions, is implemented rapidly and across the whole economy".

National Planning Practice Guidance (NPPG)[27] provides additional guidance to support the understanding and implementation of the National Planning Policy Framework (NPPF). The section on Climate Change provides advice on how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. The NPPG provides examples of how Local Plans can mitigate climate change by promoting a reduction in emissions:

- Reducing the need to travel and providing for sustainable transport;
- Providing opportunities for renewable and low carbon energy technologies e.g. through district heating networks that include tri-generation (combined cooling, heating and power);
- Providing opportunities for decentralised energy and heating e.g. maximising summer cooling through natural ventilation in buildings;
- Promoting low carbon design approaches to reduce energy consumption in buildings, such as passive solar design; and
- The provision of multi-functional green infrastructure.

2.5 Regional Context

The Liverpool City Region has set a target of zero carbon by 2040 and declared a Climate Emergency in June 2019[28]. As part of its commitment the Liverpool City Region Combined Authority is tackling climate change in a variety of ways[29] including:

- A zero-carbon target of 2040;

[25] Department for Energy & Climate Change (2014) Community Energy Strategy: Full Report, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf , accessed 13/08/20

[26] UK Committee on Climate Change (2019) Net Zero – The UK's contribution to stopping global warming https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/, accessed 5/08/20

[27] UK Government (2019) Climate Change, https://www.gov.uk/guidance/climate-change, accessed 13/08/20

[28] Liverpool City Region (2020) Energy and Environment, https://www.liverpoolcityregion-ca.gov.uk/what-we-do/energy-environment/, accessed 13/08/20

[29] Liverpool City Region (2019) Environment- General News, https://www.liverpoolcityregion-ca.gov.uk/combined-authority-sets-ambitious-targets-to-tackle-climate-emergency/, accessed 13/08/20

- The Mersey Tidal Commission;
- A £10m Green Investment Fund;
- £460m investment in new, state-of-the-art trains for Merseyrail network - improving and futureproofing green public transport;
- The cleanest bus fleet outside of London – with 7 out of 10 vehicles already low emission and 25 zero emission hydrogen buses arriving next year;
- Establishment of a Clean Air Taskforce;
- A "Brownfield First" approach to development;
- Investment into the first phase of a £16 million 600km cycling and walking network.

The Liverpool City Region Renewable Energy Capacity Study (2009)[30] and Stage Two Report (2011)[31] were commissioned to understand the extent to which each local authority within the region could meet the minimum requirements for renewable energy generation.

Wind resources in Wirral were considered to have the capacity to far exceed the targets for the whole of the Merseyside sub-region, in both onshore and building integrated wind (i.e. very good wind resource even in urbanised areas). Wirral was identified as having wind speeds deemed commercially attractive by the British Wind Energy Association, with the potential to site small clusters of large-scale wind turbines. However, despite having good wind resource, the report acknowledged that local planning could limit this potential, especially in relation to environmental considerations such as impacts on conservation areas and landscape character areas.

Wirral was also assessed as being able to make a moderate contribution to the RSS in solar photovoltaic (PV) delivery. District heating via biomass Combined Heat and Power (CHP) was identified as being able to meet and potentially exceed the targets in each authority, subject to the identification of a localised network of intensive heat users. Wirral Waters was the one priority zone identified as being suitable to support District Heating Biomass CHP and wind energy in the authority.

The Liverpool City Region Sustainable Energy Action Plan (SEAP) 2012[32] was prepared in partnership with the six City Region local authorities - Wirral, Liverpool, Sefton, St. Helens, Halton and Knowsley – to provide a vision and programme for the City Region to co-ordinate its energy sector ambitions. A key opportunity highlighted in the plan is for Wirral Waters, which could have capacity to provide 3.5 MWe of Combined Heat and Power. Appendix B of the SEAP report also provided a long list of project opportunities relating to renewable energy, including planning developments and masterplan aims.

[30] Arup (2009) Renewable Energy Capacity Study Liverpool City Region, http://www.knowsley.gov.uk/pdf/LC01_LiverpoolCityRegionRenewableEnergyCapacityStudy(Stage%201).pdf, accessed 13/08/20

[31] Arup (2011) Renewable Energy Capacity Study Liverpool City Region Stage, Two Report, http://www.knowsley.gov.uk/pdf/LC02_LiverpoolCityRegionRenewableEnergyCapacityStudy(Stage%202).pdf, accessed 13/08/20

[32] Arup (2012) Liverpool City Region Sustainable Energy Action Plan, https://www.liverpoollep.org/wp-content/uploads/2015/06/wpid-lcr-sustainable-energy-action-plan-07-2012.pdf, accessed 13/08/20

2.6 Local Context

The latest local strategy to address the climate crisis – Cool 2 - has been developed by a multi-sector partnership. Its development involved consideration of recent evidence and use of local emissions models and carbon budget tools. It also involved associated public engagement and consultation. Through endorsement of the Cool2 climate strategy[33] Wirral Borough Council has accepted that the Borough needs to follow a rapid decarbonisation trajectory to stay within a Paris Agreement compliant local carbon budget. This pathway leads towards net zero climate pollution (including carbon) by 2041 at the latest. Alongside this, the Council declared a Climate Emergency on 15th July 2019[34].This commits the council to develop a Climate Emergency Action Plan to eliminate its own emissions in support of the wider Cool 2 strategy

The Cool 2 strategy builds upon the work undertaken in the first Wirral Climate Change Strategy (2014-2019), updating the report in line with changes in global and national frameworks, considering the lessons learnt from the first strategy, local CO_2 emissions data and new tools. The report sets out the following targets:

- To stay within a local emissions 'budget' of 7.7 million tonnes (Mt) of CO_2 between 2020-2100 and to reach 'net zero' pollution as early as possible before 2041;
- To ensure a climate resilient Wirral adapted to cope with existing change and further unavoidable disruption this Century;

In regard to Local Planning, Wirral Council's current adopted plan is the Wirral Council Unitary Development Plan (UDP)[35], which was adopted in 2000. There is no specific reference to climate change within the UPD. In relation to Renewable Energy Policy REN1states that '*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'.*

Other polices and designations relevant to the findings of this report include Policy NCO1 – Principles for Nature Conservation and Policy LAN1 – Principles for Landscape. These policies specify that development that will adversely affect conservation sites will not be allowed in the borough, and all development must have regard to the visual impact upon the landscape. Proposals will not be permitted where their visual impact would be considered inappropriate.

Of particular relevance to Wirral is the Green Belt. Just under half (45%) of the land area of Wirral is currently designated as Green Belt within the UDP, which is afforded protection under both the NPPF and previous UDP Policy GB2 - Guidelines for Development in the Green Belt. While the Clean Energy Opportunities Study has considered how Green Belt land release can contribute to Wirral's zero carbon ambitions, Green Belt release for the provision of renewable energies would only be considered in very special circumstances.

[33] Wirral Council (2019) Cool 2, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/consultation-new-cool-2-climate-change-strategy, accessed 13/08/20
[34]Wirral Council (2019) Climate Emergency, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/climate-change-action, accessed 13/08/20
[35] Wirral Council (2002) Unitary Development Plan, https://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/local-plans/unitary-development-plan accessed 02/10/2020

In 2020 Wirral Borough Council published the Wirral Local Plan Issues and Options[36] document as a step towards preparing a new Local Plan. The Issues and Options document identifies the climate emergency as a key challenge to Wirral Council's Spatial Vision and recognises the opportunities for Wirral to take positive climate action as a result. As part of the Council's commitment to action on climate change, the Local Plan embeds climate change mitigation and adaption into the vision and objectives as set out in the Spatial Vision and Strategic Objectives, in particular including Strategic Objectives 1 and 4. The Wirral Local Plan Issues and Options has undergone consultation which closed in April 2020. At the time of writing, the Council are currently in the process of addressing comments from the consultation and drafting the regulation 19 Local Plan document for publication in due course.

As part of the draft Local Plan, spatial policy layers have been drafted to show proposed allocation areas within Wirral. A preliminary mapping exercise was undertaken to collate the draft spatial policy layers into a Spatial Opportunity Map (*Figure 1*) which could be used as a basis upon which to identify clean energy opportunities. Spatial data on planned developments was sought but was not available at the time of analysis and therefore is not presented within the map.

Wirral Council's current Unitary Development Plan (UDP) includes Policy REN1 – Principles for Renewable Energy. This policy states that:

'*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'.*

Other polices and designations relevant to the findings of this report include Policy NCO1 – Principles for Nature Conservation and Policy LAN1 – Principles for Landscape. These policies specify that development that will adversely affect conservation sites will not be allowed in the borough, and all development must have regard to the visual impact upon the landscape. Proposals will not be permitted where their visual impact would be considered inappropriate.

Just under half (45%) of the land area of Wirral is currently designated as Green Belt within the UDP, which is afforded protection under both the NPPF and UDP Policy GB2 - Guidelines for Development in the Green Belt. While the Clean Energy Opportunities Study presents how Green Belt land utilisation could contribute to Wirral's zero carbon ambitions. It is noted that the utilisation of Green Belt release for renewable energy would only be considered in very special circumstances.

[36] Wirral Council (2019) Wirral local Plan 2020-2035 Issues and Options, https://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/wirrals-new-local-plan/new-local-plan, accessed 13/08/20

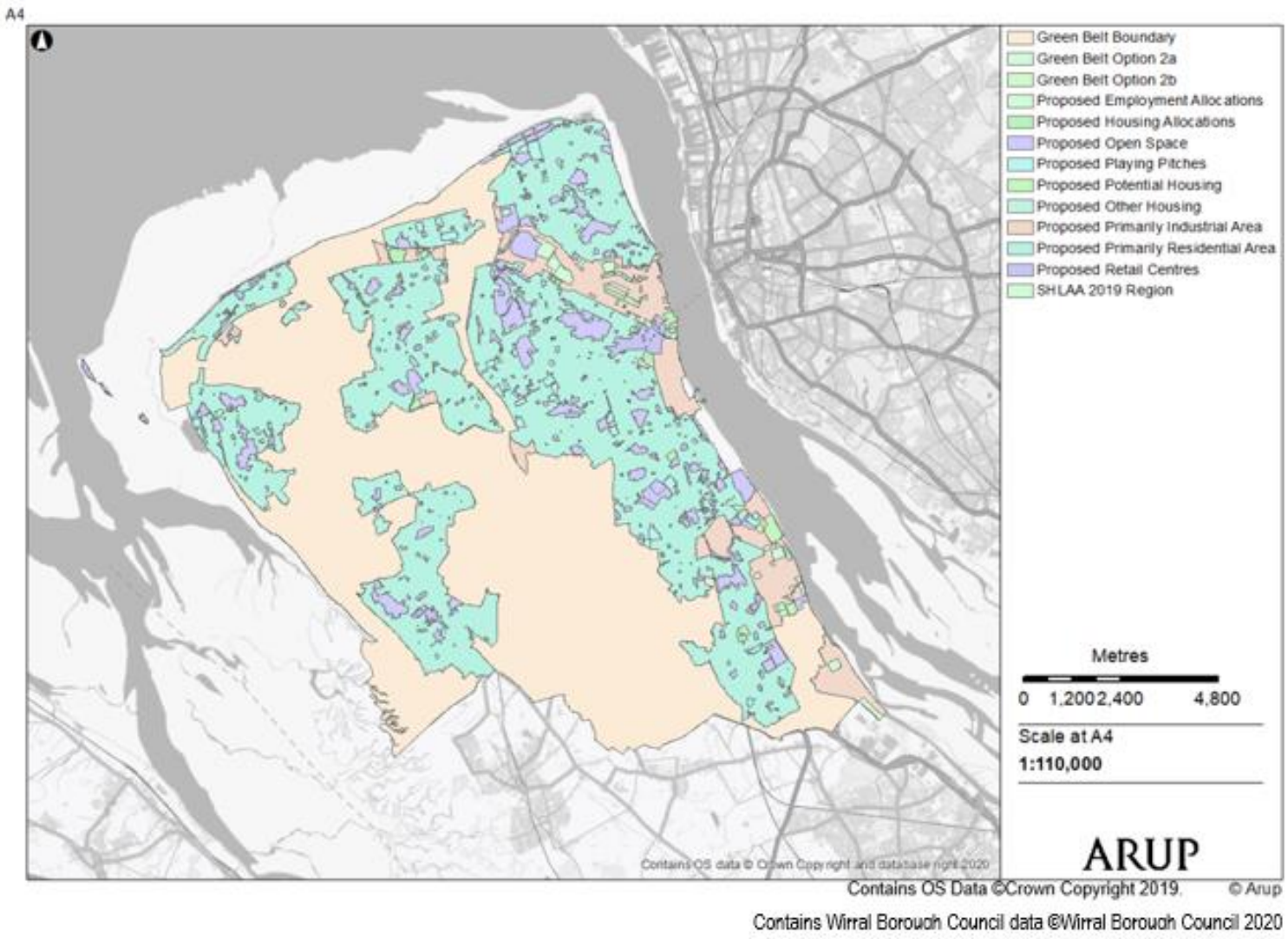


Figure 1: Spatial Opportunities Map

3 Review of Best Practice

A review of best practice was undertaken as part of the commission, relevant to embedding climate change and renewable energy considerations into local planning for the Wirral local area. Its aim is to highlight potential options to go above minimum standards with regards to climate change.

The Best Practice Review is split into two parts – Best practice standards; and Best practice review of Local Authority policies. The full contents of the review is provided in Appendix 2 and 4, and a summary of key considerations drawn from the review are set out below.

This evidence has informed potential policy wording for where the emerging Wirral Local Plan may be able to achieve more than minimum standards. It forms the basis upon which policies for Net Zero Carbon Development and Sustainable Building Design have been developed. The review also highlights best practice on renewable energy to support the Clean Energy Opportunities and Implications Study, which forms the basis of the Renewable Energy focused policies.

3.1 Best Practice Standards & Guidance

The review considers information from/on the following organisations and topics:

- Centre for Sustainable Energy (CSE)
- Energy hierarchy
- Royal Town Planning Institute (RTPI)
- UK Green Building Council (GBC)
- Building Research Institute (BRE) Group guidance & standards
- Passivhaus Accreditation Framework
- Energiesprong
- Ministry of Housing, Communities and Local Government Viability Guidance

The best practice review highlighted studies, information and guidance from leading industry bodies, e.g. Royal Town Planning Institute (RTPI)[37], which supports a strong planning stance that places net zero carbon at the heart of decision making. It also highlights the need to maximise opportunities to reduce and eliminate carbon emissions, avoiding future costly retrofitting challenges but also ensuring that the costs are fairly distributed.

From this best practice review key messages have been drawn to inform policy development, set out below, on the following topics: energy demand reduction; performance assurance; retrofit; heating and ventilation; and, viability.

[37] Royal Town Planning Institute (2019) Rising to the Climate Crisis, https://www.rtpi.org.uk/media/3568/rising-to-the-climate-crisis-1.pdf, accessed 17/08/20

Energy demand reduction

As outlined in the national policy context, local planning authorities can set energy performance standards for new housing or the adaption of buildings to provide dwellings that are higher than the building regulations (Part L), but only up to the equivalent of Level 4 of the Code for Sustainable Homes (this standard has now been withdrawn by central government).

Guidance from UK GBC (2020)[38] recommends that setting a 19% reduction on the Dwelling Emission Rate (DER) against the Target Emission Rate (TER) is equivalent to the energy performance requirements in Code for Sustainable Homes Level 4. As such, this is recommended for adoption within local plans, as has already been done in a number of local authorities.

Guidance from UK GBC (2020) also outlines that it is recommended that local authorities adopt a target to have all new homes and buildings to achieve net zero carbon emissions in operation by 2030 at the latest. This would be achievable by setting out a framework for undertaking an assessment of 'whole life' carbon impacts.

A comparison of Building Regulations, Energiesprong and Passivhaus Standards, carried out by Transition Zero[39], demonstrates significant potential energy demand reduction and associated carbon savings potential of pursuing measures that deliver higher than minimum standards. It shows a potential 108% improvement on total carbon emissions through implementing Paasivhaus vs Building Regulations Part L.

Performance assurance

Best practice guidance advocates an approach to 'leapfrog' Energy Performance Certificate baseline requirements and aim for higher standards as this will minimise the likely cost of future retrofit. As such, this includes a focus on long term goals such as bringing in alignment with BRE schemes.

The UK GBC (2020) [40] report suggests that local authorities signal a commitment to introducing a system of in-use testing and reporting. This would require a proportion of homes in a new development to be tested to gather in-use data and provide a performance report on key factors including but not limited to energy performance, indoor air quality and thermal comfort for a set period of time after occupation.

Retrofit

Best practice guidance expresses the importance of outlining policies about retrofit of existing housing stock, where these require planning permission. Retrofitting properties include methods such as insulation, fitting new windows and doors, introducing smart technologies. Guidance from the Centre for Sustainable Energy[41] outlines the opportunity to design policies that can tackle both fuel poverty and carbon emissions. This would allow for

[38] UK Green Building Council (2020) The Policy Playbook: Driving sustainability in new homes - a resource for local authorities VERSION 1.5. https://www.ukgbc.org/wp-content/uploads/2020/03/The-Policy-Playbook-v.1.5-March-2020.pdf, accessed 13/08/20
[39] Transition Zero. Performance requirements: Part L UK vs Energiesprong vs Passivhaus. Available at: http://transition-zero.eu/wp-content/uploads/2017/08/Performance-Requirements.pdf, accessed 14/08/20
[40] UK Green Building Council (2020) The Policy Playbook: Driving sustainability in new homes - a resource for local authorities VERSION 1.5. https://www.ukgbc.org/wp-content/uploads/2020/03/The-Policy-Playbook-v.1.5-March-2020.pdf , accessed 13/08/20
[41] Centre for Sustainable Energy (2018) Tackling fuel poverty, reducing carbon emissions and keeping household bills down: tensions and synergies, https://www.cse.org.uk/downloads/reports-and-publications/fuel-poverty/policy/insulation-and-heating/policy-tensions-and-synergies-CFP-mainreport-may-2018.pdf, accessed 13/08/20

more targeted interventions for housing where there is additional need and consideration should be taken about including policy to require an assessment of fuel poverty to be undertaken to inform policy making.

The Passivhaus standard EnerPHit is specifically focused on retrofitting. It is acknowledged that older buildings are much more difficult to bring up to Passivhaus standards, however they often have scope for the largest improvements in energy efficiency. Therefore, to achieve Passivhaus standard, EnerPHit requirements are slightly relaxed[42].

Heating and ventilation

Another key factor highlighted in the guidance review is heating and ventilation within housing, linked to energy demand reduction and retrofit. This could be considered for a separate policy in its own right or the use of BRE[43] or Passivhaus standards[44] could also be utilised to achieve this.

UK GBC (2020)[45] guidance outlines new and existing buildings have become priority concerns for policy makers and related fiscal measures targeting the energy and carbon performance and that local planning authorities should develop an overheating risk framework which includes mitigation for overheating. This will ensure that developments should follow the cooling hierarchy, utilise an early screening assessment to be used by developers/ the LPA to provide a simple, time-efficient assessment of risk over-heating, and adopt a detailed appraisal system when early screening flags a potential issue. This could be guided in supplementary guidance and utilised as evidence supporting an application for use by decision makers.

In the UK, Passivhaus Standard is a certification which relates specifically to heating and cooling performance of buildings. As such, it is recommended in guidance that local authorities take consideration of Passivhaus standards when considering policies for heating and ventilation.

Electric Vehicles

The RTPI guidance for local authorities on climate change in planning[46] highlights a recommendation to 'Consider how rapid and large-scale *electric* vehicle deployment will impact the plan period', which should be considered when developing policies.

3.2 Best Practice Review of Local Authority Policies

This section provides an overview of the practice of key UK local authorities from which best practice could be drawn to inform Wirral Local Plan approaches. A full review is included in Appendix 4.

[42] Passivbuildings (2014) EnerPHit https://www.passivbuildings.com/retrofit/enerphit/#:~:text=EnerPHit%20is%20the%20standard%20issued,that%20focuses%20on%20retrofit%20projects.&text=sets%20a%20slightly%20different%20standard%20requirement%20to%20the%20full%20Passivhaus%20standard.&text=emissions.&text=carbon%20emission%2C%20improve%20energy%20efficiency%20and%20ultimately%20achieve%20greater%20energy%20security , accessed 16/10/20

[43] Building Research Establishment (2020) BREEAM technical standards. https://www.breeam.com/discover/technical-standards/breeam-in-use/, accessed 13/08/20

[44] Passivhaus Trust (2019) What is Passivhaus? https://www.passivhaustrust.org.uk/what_is_passivhaus.php#2, accessed 13/08/20

[45] UK Green Building Council (2020) The Policy Playbook: Driving sustainability in new homes - a resource for local authorities VERSION 1.5. https://www.ukgbc.org/wp-content/uploads/2020/03/The-Policy-Playbook-v.1.5-March-2020.pdf, accessed 13/08/20

[46] Royal Town Planning Institute (2019) Rising to the Climate Crisis. https://www.rtpi.org.uk/media/3568/rising-to-the-climate-crisis-1.pdf, accessed 13/08/20

Ten local authority development plans were reviewed for their approach to renewable energy, building standards and other low carbon solutions. These are listed below:

- Reading Borough Local Plan
- Flintshire Local Development Plan
- Flintshire Unitary Development Plan
- Milton Keynes Plan:MK
- Draft New London Plan
- Swindon Borough Local Plan
- Draft Greater Manchester Spatial Framework including Spatial Energy Plan
- Manchester Core Strategy
- Kensington & Chelsea Local Plan
- Hull Local Plan

These local authorities and plans were agreed with Wirral Council as a combination of best practice nationally, and authorities with a similar geography and/or socio-economic demographic to Wirral.

Renewable Energy

All plans reviewed included policies related to renewable energy provision. This was largely delivered through four methods:

Requiring renewable energy production on site for certain scales of development

Of the Local Plans reviewed, only the current Flintshire Local Plan set thresholds for development of certain sizes that would have to meet its energy demand through renewable energy production. A minimum of 10% carbon reduction through renewable energy production equipment is required in the current development plan, except where viability, feasibility and adverse impacts on amenity would occur.

This has been updated in the most recent Flintshire Draft Local Plan to require residential development sites of 100 units or more and non-residential developments with a floorspace of 1000 sqm or more to submit an Energy Assessment that determines the feasibility of incorporating low carbon or renewable energy technology or connecting to nearby renewable or low carbon energy sources and heat networks.

The Draft Flintshire Local Plan also included a policy specifying that renewable or low carbon energy generation development may be permitted for large scale solar farms within defined areas in the proposals map, or for small scale/community renewable/low carbon projects where appropriate.

Additionally, one Plan set requirements for onsite renewables in site specific allocations in the borough of Kensington & Chelsea.

Policies that encourage Renewable Energy Development and Retrofitting

Many Plans stipulated that developments that incorporated renewable energy sources would be supported. Standalone renewable energy projects were often supported where appropriate/practical. Rather than mandating renewable energy for certain scales of development, these policies were less specific and would often only require development to consider or have some regard to meeting part of the predicted energy demand through on site

renewable energy. However, they were often complemented by policies requiring all development to consider an energy hierarchy discussed below.

The draft Greater Manchester Spatial Framework included a policy to promote the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy.

Developer Contributions

Section 106 and Carbon offsetting/allowable solutions were often used by local authorities to 'top up' any shortfalls in low carbon reductions in developments.

In the case of the Draft London Plan and Reading Borough Council Sustainable Design SPD, developer contributions are required where it can be clearly demonstrated that zero-carbon targets for major development cannot be fully achieved on-site, in this case funds must be paid into a local authority carbon offset fund.

Section106 and Community Infrastructure Levies were noted as mechanisms to deliver renewable energy infrastructure and climate change mitigation schemes in several Local Plans.

Energy Hierarchy

Several Plans incorporated energy hierarchies, either as a standalone policy or within Supplementary Planning Documents (SPD). These typically followed the structure below:

- Reduce initial energy demand;
- Employ energy efficiency measures within development;
- Utilise renewable energy sources to meet demand;
- Utilise low carbon energy sources; and
- Meet energy demand through conventional energy resources.

Sustainable Building Design

All Local Plans reviewed had several policies related to sustainable building design standards. These have been largely delivered through the two methods detailed below:

Energy Statements

The most recently reviewed Plans included a requirement for an Energy Statement/Assessment within applications of a certain size. The scale of development that would trigger this threshold varied, but was generally between 10 and 100 residential units, or 1,000sq.m for non-residential developments.

These Statements required applicants to demonstrate how the proposal has been designed to reduce energy demand and improve efficiency, including predicted energy demand and CO2 emissions and the feasibility of connecting to a district or community heating network.

Meeting Building Assessment Standards

Assessment methodologies such as BREEAM, CEEQUAL and Code for Sustainable Homes (now discontinued), and improvements on Part L Building Regulations were often utilised in

Local Plans. Almost all Local Plans reviewed included BREEAM requirements for certain scales of development, of at least 'very good' or 'excellent'.

Design Standards

Several Local Plans included policies requiring development to demonstrate how design has been utilised to maximise passive solar, heating and ventilation opportunities, as well as water conservation techniques. Other energy saving methods such as insulation, lighting and smart meters are also supported. Consideration of the future impacts of climate change on the development, particularly flooding, is required.

Supplementary Planning Documents (SPD)

All Local Plans included at least one SPD detailing sustainable design and construction methods and requirements. The majority of SPD's included the specifics of the reduction on Part L building requirements that development must reach. Best practice includes Reading Borough Council's approach, which specifies BREEAM requirements for certain use classes.

Electric Vehicle Charging Provision

Several Plans included minimum requirements for EV charging provision. The percentage of EV charging spaces differed between authorities but was generally in the range of 10-20% of total spaces.

Best practice of the authorities reviewed was within the Draft London Plan, which requires all residential car parking spaces to provide infrastructure for electric or Ultra-Low Emission vehicles. A minimum of 20% of spaces should have active charging facilities, crucially the policy is also futureproofed by specifying that there should be passive provision for all remaining spaces to allow future growth of EV spaces.

Carbon Offsetting/Allowable Solutions

Allowable solutions are utilised by local authorities where on-site provision of renewable technology was not appropriate. This is often treated as a 'last resort', and developers are encouraged to meet low carbon requirements within the development. Cash payments were used to 'top up' the remaining shortfall between the development and Local Plan stipulated carbon targets.

Energy Networks

The feasibility of connecting to a decentralised energy network, such as a district heating network or community heating network, was treated in a similar manner to Local Plan sustainable building design policies. In several Local Plans reviewed, best practice required development that met a certain threshold to consider the inclusion of decentralised energy provision unless it can be demonstrated that this was not suitable, feasible or viable.

The scale of development that would trigger this policy differed. In Reading Borough Council, schemes of over 20 residential dwellings or 1,000sq.m non-residential floorspace would be required to demonstrate that they have considered decentralised energy provision. Where an existing network was in place, the number of dwellings was reduced to 10 to consider connection to the energy network. This was commensurate with the Greater Manchester Spatial Framework. Within Flintshire, residential developments of over 100 units were required to determine the feasibility of connecting to nearby renewable or low carbon energy sources and heat networks.

The draft London Plan included a policy requesting developers and boroughs to engage with the local energy company to establish predicted energy requirements and infrastructure resulting from large scale development. Large scale development was also required to develop an Energy Masterplan to determine the most effective energy supply options.

Milton Keynes' Local Plan expects all new development in proximity of an existing or proposed CHP/CCHP station/local energy network to connect to the network unless it can be demonstrated that this is unviable, unjustified or a better alternative for carbon reduction exists.

Local Plans that required Energy Statements required development to consider the feasibility of connecting to a decentralised energy network.

Community Energy

Best practice in regard to supporting community ownership of renewable energy schemes has been highlighted from the Welsh Government, where national policy stipulates that all renewable/community energy schemes must have some element of local ownership[47].

Cornwall Council also demonstrates support for community energy schemes, including through split ownership, joint venture, equity shares and post-construction community buy-out. It's Renewable Energy Planning Advice[48] states: "The Council believes that this model of renewable energy deployment should receive particular support when considering the merits of renewable energy development at the planning decision stage."

3.3 Viability and Measuring Performance

Viability

Local authorities prepare viability assessments of their Local Plans as a means of demonstrating that policy requirements for contributions from development are realistic, and that the total cumulative cost of all relevant policies will not undermine deliverability of the plan, Viability assessments have to take into account all relevant policies, and local and national standards.

As part of the study, the best practice review has evaluated guidance on how to consider address viability alongside delivering ambitious policy to address climate change.

National guidance from the MGCLG suggest that policies must be clear as to who will pay for the implications of the policies, who is to gain, and why the decisions have been made. For example, if the local authority will be utilising S106/CIL funding, this should be set out[49].

In 2014, the BRE Group released a report considering the viability of achieving higher BREEAM ratings in non-residential development. The study concluded that while achieving higher BREEAM ratings does incur some additional upfront costs, this is less than 2% and

[47] Welsh Government (2020) Policy Statement: Local ownership of energy generation in Wales. Available at: https://gov.wales/sites/default/files/publications/2020-02/policy-statement-local-ownership-of-energy-generation-in-wales.pdf, accessed 04/10/20

[48] Cornwall Council (2016) Cornwall Renewable Energy Planning Advice, https://www.cornwall.gov.uk/media/18406307/cornwall-renewable-energy-planning-advice-march-2016.pdf, accessed 04/10/20

[49] MHCLG (2019) Viability https://www.gov.uk/guidance/viability, Accessed 28/09/20

can be paid back within 2-5 years through utility savings[50]. *Figure 2* shows estimated increase in costs to achieve different BREEAM standards.

Increase in capital costs for different building types and certification levels

Rating	School	Industrial	Retail	Office	Mixed Use
Very Good	0.2%	0.1%	0.2%	0.2%	0.15
Excellent	0.7%	0.4%	1.8%	0.8%	1.5%
Outstanding	5.8%	4.8%	10.1%	9.8%	4.8%

Source: Tata Steel, British Constructional Steelwork Association Limited, AECOM, Cyril Sweett, The Steel Construction Institute, Development Securities PLC, 2012.

Figure 2: BRE Group. 2016. The value of BREEAM A review of latest thinking in the commercial building sector

Viability Assessments have also been reviewed within the Local Authority best practice review, including the Viability Assessments of Authorities local to Wirral to provide local context on viability specifically. The findings of this review are limited as Viability Assessments are often focused on affordable housing, housing markets have changed rapidly since the Assessment was conducted or the Local Plan being assessed doesn't include relevant low-carbon policies.

The Milton Keynes Whole Plan Viability Study[51] explored the impact of Policy SC1 – Sustainable Construction, which requires a 19% carbon reduction improvement upon the requirements within Building Regulations Approved Document Part L 2013 and financial contributions to the Council's carbon offset fund for development proposals of 11 or more dwellings and non-residential development with a floor space of 1000 sq. m or more.

In regard to this, the Viability Study assumed professional fees for residential development would amount to 10% of build costs. The study considered these fees to be sufficient to cover the costs incurred by Policy SC1. Carbon offset payments were estimated at an average of £500 per dwelling in Milton Keynes. The study concluded that while the costs of meeting the lower carbon emissions can be substantial, in higher value/central areas there was significant buffer to accommodate the Plan policy requirements (including affordable housing, flood defences etc.). In brownfield and lower housing value areas the Plan was considered less viable when taken as a whole.

The Study notes that Policy SC3 - Community Energy Networks And Large Scale Renewable Energy Schemes poses an additional cost to developers. There is a lack of evidence base in published costs of district heating schemes in modern estate housing and so could require further research.

Housing markets differ nationally, and further investigation into local examples of viability has also been undertaken. Two relevant examples within the Merseyside area have been identified. Halton and St. Helens have considered the viability of low-carbon/renewable

[50] BRE Group (2014) Delivering Sustainable Buildings: Savings and Payback – Breakfast Briefing. https://tools.breeam.com/filelibrary/Presentations/DeliveringSustainableBuildingsSlides.pdf ,Accessed 28/09/20
[51] Milton Keynes Council (2017) Whole Plan Viability Study. https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/viability, accessed 04/10/20

development in their Whole Plan Viability Assessments. Both plans are currently undergoing or preparing for examination.

While Halton's Local Plan does not seek standards higher than Building Regulations, the Viability Assessment has cited BRE's research and considers the construction costs of all new non-residential development built to BREEAM Excellent standard to be an increase of approximately 2%. Costs range from just under 1% to 5.5% depending on the scheme, with offices being just under 2%.[52]

St. Helens Local Plan requires new development within strategic sites to ensure 10% of their energy needs are met through decentralised energy systems using renewable and low carbon energy. The Local Plan Economic Viability Assessment assesses the cost of meeting this 10% target. The analysis of three brownfield housing site allocations with no affordable provision has shown that this 10% target can be met, however if education and other S106 contributions are required it is considered that this target may not be achievable. Half of all greenfield sites assessed could meet both the 30% onsite affordable housing provision target and 10% renewable energy target, but again it is considered that this may not be achievable if education and S106 contributions are required[53].

Measuring performance through indicators

As part of considering best practice, the study also explored the use of indicators against which to measure progress in meeting policies/standards.

The Annual Monitoring Reports (AMR) of Local Authorities' considered as part of the Best Practice Review were reviewed for energy/carbon emissions monitoring. The majority of AMRs did not include carbon or energy use monitoring; however, two examples of best practice were found in the Milton Keynes[54] and London Plan[5556].

The review provided guidance for policy specific indicators, which have been developed for each of the proposed policies and set out in each of the Policy Development Papers in Appendix 6. A case study of the approach of Milton Keynes is also set out in Appendix 3. that the review also highlighted the importance of an established monitoring framework to measure progress towards Strategic Objectives, including monitoring annual carbon emissions by sector (e.g. commercial buildings; domestic buildings) and fuel type (e.g. electricity, gas) as supporting evidence of progress alongside policy specific indicators to understand how the measures are supporting the Borough's climate change targets[57].

3.4 Opportunities to Go Above Minimum Standards

This report recognises both the climate emergency and Wirral's net zero ambitions. In the previous section, other Local Authority local planning approaches to climate change mitigation and adaptation have been summarised. A summary of the opportunities for Wirral

[52] Halton Borough Council (2019) Whole Plan Viability Assessments, https://www3.halton.gov.uk/Pages/planning/policyguidance/pdf/evidencebase/viabilitystudy.pdf, accessed 6/10/20
[53] St Helens Council (2018) Economic Viability Assessment, https://www.sthelens.gov.uk/media/9480/eva-2019-full-doc.pdf, accessed 06/10/20
[54] Milton Keynes Council (2020) Annual Monitoring Report 2019/2020 https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/five-year-housing-land-supply-annual-monitoring-report accessed 14/08/20
[55] Greater London Authority (2019) Energy Monitoring Report 2018 https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/2018-energy-monitoring-report accessed 14/08/20
[56] Greater London Authority (2019) Carbon Offset Funds Report 2019 https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/carbon-offset-funds-report-2019 accessed 14/08/20
[57] Milton Keynes Council (2020) Annual Monitoring Report 2019/2020 https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/five-year-housing-land-supply-annual-monitoring-report accessed 14/08/20

to go above the minimum standards is presented here. These opportunities have been incorporated into the Policy Development Papers to inform potential policies.

It should be noted that there are currently uncertainties in the future of Local Plan making. These include the recent government consultation on the Future Homes Standard and its potential to result in the removal of Local Authorities' ability to set their own energy efficiency standards. The recent Planning White Paper also proposes to increase permitted development rights but would allow Local Authorities to set Local Design Codes. Therefore, a watching brief of opportunities in light of such changes is also recommended.

In summary the opportunities to go above minimum standards have been highlighted as:

Setting energy efficiency standards beyond Building Regulations Part L - Currently, Local Authorities can set their own energy efficiency standards beyond Building Regulations Part L, because the amendments to the 2008 Planning Act have not yet been enacted. This could change with the Future Homes Standard that would remove this ability altogether, but at the time of writing the results of this consultation have not been published. Examples include forward planning policies relating to the date at which net zero development will be required and the use of standards such as BREEAM and CEEQUAL, alongside stipulations such as achieving a minimum of 19% above Building Regulations Part L. Recommendations in this report reflect the current ability of Wirral to go beyond minimum standards when setting policy.

Requiring Energy & Climate Statements - An overarching requirement for all development to submit an Energy & Climate Statement detailing where energy savings can be made, and how low carbon/renewable technology has been properly considered in the development will encompass many of the policies discussed above. This has the added benefit of consolidating all information related to the energy performance of a scheme for planning officers when considering a development.

Developing Supplementary Planning Documents (SPD) - Supplementary Planning Documents (SPD) allow Local Plan's to expand upon sustainability policy further than the policy explanation text. This can be used to give development best practice guidance and requirements in becoming net zero/ net zero ready, or sustainability standards and accreditations for example. It is important to note that the introduction of Local Design Codes proposed in the Planning White Paper will not supersede SPDs. SPDs are grant Local Authorities more flexibility, as these are easier to update once produced.

Embedding the Energy Hierarchy - The Energy Hierarchy is an established policy in many Local Plans. There is an opportunity to add to this hierarchy and require any development that cannot meet the existing steps of the hierarchy to make financial contributions to address the residual carbon resulting from the development.

Outlining how to address residual carbon - Many Plans include guidance on the use of carbon offsetting to highlight to applicants how residual carbon could be managed in delivering towards climate targets.

Utilising Section 106/CIL - Section 106/CIL requirements can be used to contribute to low carbon/renewable energy schemes. It is anticipated that throughout the lifetime of the Wirral Local Plan, these will form a larger portion of developer contributions as climate change mitigation becomes even more important.

Promoting Electric Vehicle Infrastructure - Electric Vehicle infrastructure represents another opportunity. Currently, many of the Plans reviewed referenced EV infrastructure,

which was largely active provision. Furthermore, recognising that at present uptake of electric vehicles is comparatively low but demand is growing, the London Plan requires provision of passive infrastructure to accommodate future demand. This seeks to ensure the policy is futureproofed.

4 Stakeholder Views

4.1 Stakeholder Questionnaire

At the beginning of the commission, a questionnaire was shared with key relevant climate change and renewable energy stakeholders in Wirral to seek views on what is considered to be important climate change and renewable energy considerations for the Wirral and its Local Plan. Appendix 5 sets out the questionnaire shared with stakeholders.

Views were sought from the following organisations:

- Forestry Commission
- Coal Authority
- Energy Projects Plus
- Mersey Forest
- Scottish Power Energy Networks
- Peel Energy
- Peel Land & Property
- Peel Ports
- Wirral Community Renewables
- Merseyrail
- Unilever
- Cammell Laird
- United Utilities
- Cool Wirral Partnership
- Infrastructure Delivery Plan officers from the Council
- Orsted
- Liverpool City Region Combined Authority
- Cheshire West and Chester Council
- Flintshire County Council
- Merseyside Environmental Advisory Services (MEAS)
- Liverpool City Region Local Enterprise Partnership (LEP)
- Hooton Park Gasification (Cogen)
- Wirral University Teaching Hospital - covers Arrowe Park and Clatterbridge
- Wirral Growth Company (Muse)
- Riverside Housing
- THI North West Ltd
- Elan Homes
- Bellway Homes
- Taylor Wimpey
- One Vision Housing
- Chamber of Commerce
- Alpha Living
- Anchor
- Family Housing Association
- Forum Housing
- Heylo Housing
- Housing 21
- Inclusion Housing
- Onward Homes
- Jigsaw Homes
- Legal & General Affordable Homes
- Magenta Living
- Prima Group
- Pine Court Housing
- Plus Dane
- Regenda
- Redwing Living
- Riverside
- Sanctuary Housing Group
- Sovini Group
- Torus
- Wirral Methodist Housing Association

Responses were received from the following organisations:

- Wirral Methodist Housing Association,
- Wirral Community Renewables,
- Wirral University Teaching Hospital NHS Foundation Trust,
- United Utilities,
- COOL Wirral Partnership,
- Sovini Group,
- Extinction Rebellion Wirral.

Key messages from these responses that relate to this commission are summarised under each of the questions below. In some cases, feedback related to areas outside of this commission, which have been highlighted to support wider Local Plan development. In some cases feedback also related to areas outside of the role of local planning, which again have been presented here to support wider action on climate change. Feedback relevant to this commission has been used to inform the development of Policy Development Papers (as set out in Section 6.4).

What should be included within the Local Plan?

Overarching policy

Several stakeholders referred to the importance of having an overarching policy that is central to the plan and sets out the ways in which Wirral is aiming to meet its net zero targets. As such, the policies should not be peripheral to the plan and should be at the core of the plan development. Policies on specific topics should then link back to this overarching core policy.

New build standards

A number of respondents also referred to the introduction of standards for new build properties to reduce energy demand. These referred to specific targets like BREEAM Excellent for commercial developments and compliance with Part L of the Building Regulations. In addition, there were several specific statements in relation to requirements for new buildings, including the need for:

- Requirements for low energy demand and on-site renewable energy production
- Ensuring there are clear metrics for assessment of energy demand,
- Performance assurance regimes e.g. taking account of dwelling emission rates, target emission rates, compliance with standards,
- Ensuring the highest possible standards are achieved, acknowledging viability.

Clean energy and decarbonisation

There were also specific references in support of clean energy generation and decarbonisation. This includes the plan making specific reference to opportunities for clean energy development and identifying priority sites. One respondent referred to the need to address any infrastructure bottlenecks in the production of clean energy to make sure it is possible for all

to access the opportunity to utilise clean energy. This include supporting local community ownership of renewable energy where possible. Another respondent states that there must be requirements for infrastructure strategies to demonstrate effective communication between infrastructure providers, applicants and third parties.

Retrofit of existing properties

In addition to new build, several respondents drew attention to the importance of having a policy focused on the retrofit of existing properties, including specific guidance for heritage assets.

Climate adaptation

Another frequently referenced topic was climate change adaption to address the risk from flooding. Feedback is presented here to support ongoing work on climate change adaptation measures being developed alongside this commission. It was suggested that there should be a focus on addressing the risk from extreme weather events and flooding, considering the geography of Wirral and its particular risk from rising sea levels, flooding and coastal erosion.

Sustainable transport

Within the responses received, all referred to sustainable transport as being a key component of ensuring climate change considerations are embedded within the Local Plan. Feedback is presented here to support ongoing work on transport measures being developed alongside this commission. Feedback included the following:

- Ensuring that walking, cycling and public transport are safe and convenient options for travel,
- Shifting motor vehicles to low emissions and the introduction of EV charging infrastructure, including for public transport,
- Improved cycling infrastructure and zones where bikes are given priority,
- Survey and incentives for more people to utilise active transport or public transport,
- Discouragement of tourism that involves significant car park and a reliance on cars,

Securing high speed connectivity for every home and business to make it easier for people to work from home and remove the need to commute.

Green infrastructure

Finally, several respondents referred to the promotion of new greenspaces, green infrastructure and the potential to undertake more rewilding. Again, feedback is presented here to support ongoing work on natural environment measures being developed alongside this commission.

What are the key local challenges within Wirral in achieving climate change aims?

Key feedback from respondents highlighted the following challenges:

- The scale and pace of change required;

- Having the right delivery mechanisms in place to enable businesses and residents to play their part;
- Being able to undertake effective public engagement and ensuring community buy-in to enable behavioural change;
- Ensuring life-time cost viability of new builds;
- The potential for development viability arguments being used to undermine higher building standards;
- Existing infrastructure being car centric;
- The potential implications for Covid-19 on the Local Plan development.

What are the key local opportunities within Wirral in achieving climate change aims?

Key feedback from respondents highlighted the following opportunities:

- Potential to access solar and wind renewable energy opportunities;
- The potential for Wirral Borough Council to show strong leadership and attract inward investment;
- The rural space in Wirral and the potential for growing food;
- Making the most of existing innovative technology leaders;
- Potential opportunity for large scale developments such as Mersey Tidal Power Project;
- The potential to increase walking and cycling need, on the back of Covid-19 social distancing requirements;
- To allow for greater opportunity for building retrofit;
- Opportunity to bring forward a digital hub providing fast internet connectivity.

How can Wirral Borough Council best address or capitalise on these key challenges and opportunities?

The key message from the responses for this question was to ensure that Wirral Borough Council are working with the public and stakeholders to bring forward plans. Key feedback on how this could be achieved included:

- setting out a plan for how resources should be invested;
- raising public awareness of climate change and highlighting the importance of behavioural change;
- promotion of importance of environmental assets;
- raising awareness of climate goals;
- promoting up-skilling of businesses and the public in climate related matters;

- resource and funding support to business and communities to assist with making change and adapting to new measures set out in the Local Plan e.g. for Housing Associations to upgrade homes for adaptation to climate change;
- ensuring a strong Local Plan with clear and enforceable policies on climate change;
- ensure that a consistent approach to climate change mitigation and adaptation is adopted throughout all of Wirral Borough Council's departments.

4.2 Members and Officers

Engagement

A presentation was delivered to Wirral Borough Council Officers and Elected Members on the 23rd and 27th July 2020 respectively. This presentation provided:

- An overview of the commission and national context;
- An explanation of the interim results of the Clean Energy Opportunities and Implications Study;
- A discussion on potential policy options; and
- A summary and outline of the next steps of the commission.

Following this, a project Steering Group meeting with key Council Officers, held on the 4th August 2020, was used to refine policies further in response to Members and Officer's feedback.

Feedback

Key feedback and considerations from engagement with Wirral Borough Council Members and Officers included:

Renewable energy

The challenges with connection to and capacity on the electricity grid network was recognised, with a particular interest in the capacity to deliver solar PV installations. Next steps beyond this commission would require further feasibility study in collaboration with Scottish Power Energy Networks (SPEN). The Clean Energy Opportunities and Implications Study has highlighted the key areas of interest for renewable energy development to guide further investigations.

The potential for building mounted solar PV was also considered as an opportunity to deliver renewable energy in the Borough. The Clean Energy Opportunities and Implications Study will provide a high-level overview of potential capacity for building mounted solar PV in the Borough.

Sustainable Building Design

The ambition to deliver net zero carbon development was considered for compatibility with the proposed requirements for BREEAM and CEEQUAL standards. Consideration has been given in the development of policy to ensure requirements are consistent and where buildings cannot achieve net zero carbon at construction, that they will demonstrate carbon offsetting of residual emissions. Discussion on improving standards and delivery of retrofitting to support climate change ambitions noted that it would be difficult influence large scale retrofit through

a Local Plan, as the majority of building retrofitting projects would be classed as permitted development and therefore not require planning permission. It was advised that a separate, dedicated retrofitting programme could be an opportunity to influence the retrofit requirements in the Borough at a greater scale. However, where planning permission would be required, the policies developed as part of this commission could be used to influence building retrofit.

Electric Vehicle Charging Provision

Feedback suggested that support for provision of on-street EV charging in the Borough, alongside charging in parking areas, should be provided for in policy. In response, the proposed policy relating to EV charging has been refined to include support for EV charging provision for development that relies on on-street parking.

Net Zero Carbon Development

The challenge of requiring and delivering net zero carbon development and offsetting was recognised, as was the need for the requirement to meet climate commitments. It was recognised that the transition would need to be carefully managed to support applications to meet new requirements and to consider viability carefully. Carbon offsetting mechanisms were also discussed, including the potential for offsets to support environmental enhancement projects. The potential need for supplementary guidance to support new requirements was recognised.

Further Officer Engagement to co-design policy

Following the Member and Officer workshop, proposed policy wording was subject to further review and development by Officers at Wirral Borough Council to seek to ensure finalised policies were aligned with local context and climate and carbon ambition. In some cases, decisions were made by Wirral Borough Council Officers on the proposed policy wording included within this report including for Residential Development, Non-Residential Development and Electric Vehicle Charging Infrastructure.

4.3 Wirral Youth Parliament

The Project team from both Arup and Wirral Borough Council, delivered a presentation and discussion session on climate change to young people from the Wirral Youth Parliament on the 13th July 2020. The session provided:

- An introduction to climate change mitigation and adaptation
- A summary of action on climate change in the Borough
- A summary of action on climate change in key areas of opportunity:
    - Renewable Energy
    - Transport
    - Sustainable Building Design
    - Green Infrastructure
    - Flooding
- A group discussion on climate action and potential ideas for change.

The Wirral Youth Parliament gave a valuable insight into the attitude towards climate change and potential ideas for delivering change. Feedback from the Youth Group included:

- As a peninsula, Wirral should take advantage of the surrounding wind and water resources in suitable areas.
- There should be a focus on reusing brownfield land for housing rather than new Green Belt sites to be truly sustainable.
- We should start small, by retrofitting buildings with solar panels for example, then increase the scope for climate mitigation.
- There is a need for greater climate education starting at an early age to understand the scale of the challenge we are facing.

4.4 Key Messages from Stakeholder Views

A number of key messages were highlighted through the stakeholder engagement exercises. These include:

- The potential for solar energy as a significant opportunity and in particular, the potential for building mounted solar PV;
- The importance of retrofitting existing buildings within Wirral, either through the planning process or outside of the Local Plan through other mechanisms;
- The need to consider sustainable building design standard carefully within policy wording, with standards such as BREEAM, CEEQUAL and part L of the building regulations referenced by multiple respondents;
- The need to consider carbon offsetting and the importance that green infrastructure can play within this;
- A focus on sustainable transport was encouraged, particularly the provision of EV charging infrastructure within Wirral;
- Viability, which was considered in a number of ways: from a point of view of ensuring that any policy would not lead to unviable developments, but also that policy wording would be strong enough that developers couldn't use viability arguments to reduce carbon commitments on schemes.

5 Clean Energy Opportunities and Implications Study

5.1 Purpose of the Study

The Clean Energy Opportunities and Implications Study, forms part of the wider Wirral Local Plan Climate Change and Renewable Energy Study. It aims to provide a robust and credible evidence base to inform planning policies to be incorporated in the Wirral Local Plan, intended to support renewable and low carbon energy development in Wirral. This section provides an overview of the Study. The full study report can be found in Appendix 6.

5.2 Methodology

A constraints-based approach was applied to determine opportunity areas for renewable and low-carbon technologies across Wirral. *Figure 3* shows the key project stages which formed the overall methodology for this study.

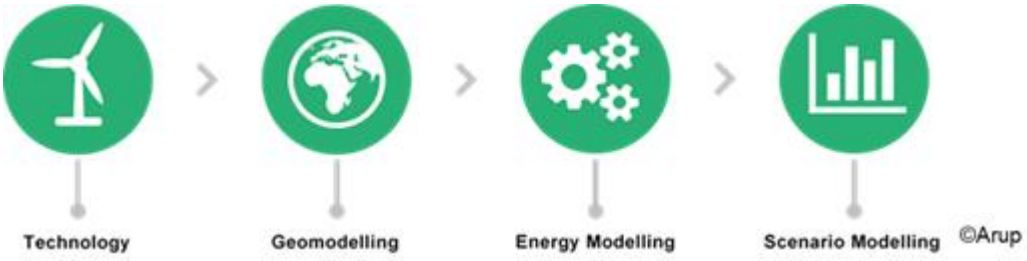


Figure 3: Study Methodology

5.3 Current Energy and Carbon Position

An initial assessment was undertaken to determine the current energy demand and carbon position of the Wirral Borough to provide the necessary understanding to provide a baseline against which renewable energy generation and emissions savings could be measured.

The total energy consumption for the Wirral Borough was estimated to be 5,552GWh and total carbon dioxide equivalent emissions for the Borough estimated to be 1,394 $ktCO_2e$[58]. Almost all emissions from energy use arose from gas consumption (40.7%), petroleum products (33.0%) and electricity use (25.7%).

[58] Based upon 2017 datasets as the most recent complete dataset for energy and emissions for the Borough. https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017 accessed 14/08/2020.; and, https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level accessed 14/08/2020.

5.4 Summary of Clean Energy Opportunities

The following presents a summary of the key findings of the study for each technology:

Onshore Wind Energy
Wind conditions in Wirral present an opportunity but due to the prevalence of urban developments on the East side of the Borough and planning and environmental designations on the West side, there is little potential to exploit the resource. This Study suggests may be opportunity to utilise some Green Belt land for onshore wind installations consisting of small (<80m tip height) or medium (80-110m tip height) sized turbines. Paragraph 147 of the NPPF sets out that such development would constitute inappropriate development and which, for a proposal to achieve planning permission, would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt.

Ground-Mounted Solar PV

Several opportunity areas for ground-mounted solar PV arrays were identified across the Borough, with the potential to provide total carbon dioxide equivalent savings of up to 192ktCO_2e to 2050 and total capacity of up to 117MW. The Study also revealed that solar PV potential would increase significantly if a proportion of Green Belt land was utilised for development of solar PV arrays. The Study concluded that the large scale use of Green Belt land for renewable energy installations is unlikely to be compatible with the purpose of Green Belt land, therefore any utilisation of Green Belt should be very carefully considered in terms of balancing impacts, e.g. ecology, visual impact and local character, against the benefit of renewable energy generation. As before, Paragraph 147 of the NPPF sets out that such development would constitute inappropriate development, which for a proposal to achieve planning permission would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt. Therefore, previously developed land, brownfield land and low-grade (4-5) agricultural land should be prioritised for siting of ground-mounted PV installations.

Landward Implications of Tidal Energy

The study concluded that the landward transmission grid infrastructure requirements of tidal energy schemes have the potential to be located in Wirral. However, such development is likely to be part of a Development Consent Order, with planning determined at a national level.

Biomass Energy

The study concluded that there is potential for biomass energy in the form of energy crops and forestry residues to provide up to 86GWh of renewable fuel energy resulting in estimated carbon savings of up to 472ktCO_2e for the period 2020-2050 when used in biomass boilers to provide low-carbon heat. There is a significant proportion of Wirral's agricultural land area that could be used to grow energy crops; however, the proportion of land used for energy crops must be balanced with the Borough's food production and financial returns for farmers. Recovery of forestry residues from managed woodland for use as biomass fuel could provide a modest contribution to the Borough's carbon targets and make use of an otherwise wasted, low cost resource.

Although considered a renewable fuel, biomass combustion produces localised emissions of SO_x, CO_x and NO_x which affect local air quality therefore appropriate consideration must be given to local emission dispersion and abatement when designing and installing biomass systems. Where smoke control areas exist, biomass installations must comply with the local smoke control area regulations.

District Heating

The study concluded that district heating supplied by low-to-zero carbon technologies represents a clear local opportunity. The carbon emissions analysis showed that the use of heat pumps or biomass technologies to supply heat networks could generate significant carbon savings compared to gas boiler heating up to 2050. The study identified a number of district heating priority zones with sufficient spatial heat density to support viable district heating schemes and an opportunity for open-loop ground source heating.

Building Integrated Renewables

With limited spatial availability for deployment of large-scale renewable energy technologies, building-integrated renewable energy technologies are expected to play an important role in achieving decarbonisation targets. An indicative analysis on roof-mounted solar PV revealed that carbon dioxide equivalent savings of up to 69ktCO_2e could be realised to 2050, if a typical 2.6kW solar PV system was to be installed on only 10% of the Wirral address base. Building-integrated renewable heating technologies such as solar thermal and heat pumps are expected to become increasingly prevalent, due to the Government's proposed ban on gas boilers in new-build homes from 2025 and home efficiency upgrade retrofits over time. In addition, commercial properties are typically characterised by higher energy demands, higher energy costs and greater spatial availability than domestic properties. There is typically therefore both greater incentive and spatial potential for building-integrated renewable energy technologies in commercial properties than domestic buildings.

Future technology

The study has focussed on technologically mature and commercially ready technologies, aligned to current national and local policy and strategy, which are relevant to inform Local Plan development. As a guide to Wirral Council, potential future technologies were considered. Regular (5 yearly) Local Plan Reviews and the use of technology agnostic policy wording alongside Supplementary Planning Documents, can provide flexibility in local planning policy to facilitate support for future technologies as they emerge. Emerging technologies have the potential to contribute to the decarbonisation of the energy system in Wirral at a commercial scale within the lifetime of the Local Plan (to 2035). It is considered that hydrogen and carbon capture, utilisation and storage (CCUS) are the most likely additional technologies to play a significant role in energy systems associated with Wirral in the future. It is also recommended that Wirral Council remain engaged in 'horizon scanning' for emerging renewable and low carbon energy opportunities.

5.5 Conclusions

The assessment concluded that there is potential for ground mounted solar PV, biomass energy, district heating and building-integrated technologies, but little potential for onshore wind. Some potential for supporting, landward transmission infrastructure for tidal energy was also recognised. From this study, recommendations were provided to support policy

development for the Wirral Local Plan, presented in Policy Development Papers as part of the wider Wirral Local Plan Climate Change and Renewable Energy Study.

The assessment provides a high-level view of clean energy opportunities. Further investigation to develop opportunities would be needed to understand the potential of individual opportunities, often delivered as part of project development by developers. This could include site surveys, environmental assessment and engagement with key stakeholders, e.g. SPEN. It is also recognised that electricity grid infrastructure will be a constraint to renewable energy development and smart grids, private wire and power purchase agreements will be important solutions.

6 Policy Recommendations

6.1 Development

The development of policy recommendations to embed climate change within the Wirral Local Plan has drawn upon the outputs of the work including:

- the context review of national, regional and local legislation, policy and guidance relating to climate change and planning,
- the best practice reviews of guidance and of other local authority's climate change local plan policies,
- stakeholder engagement through the questionnaire and the three workshops,
- and the Clean Energy Opportunities and Implementation Study.

Policy development involved drafting reasoned justifications for policy recommendations, providing strong links back to the evidence base developed in the best practice reviews. For policies relating to renewable energy, justification has been drawn from the best practice reviews in addition to the Clean Energy Opportunities and Implementation Study.

The Project team have also utilised their expertise in planning, energy, climate change and policy design; bringing together broad experience to support policy recommendations and potential wording.

6.2 Challenges

The potential for viability arguments to undermine policy objectives has been recognised throughout the development of policy for this study. For example, it is possible that some developers might seek to argue against the increased costs incurred by having a policy requirement to meet higher than minimum standards on buildings. The proposed policy and justifications have been designed to draw on best practice and, for renewable energy policies, are underpinned by dedicated research to support the decision-making process to maximise the likelihood of such standards being achieved. A detailed context review has been undertaken which highlights the international and national legislative, policy and strategic context within which need for challenging targets and policy wording is required. It also recognises the advice from organisations such as the UK Committee on Climate Change, alongside the local requirements as set out in Cool2. This context provides a broad evidence base upon which policies are based and are reflected in the Policy Development Papers which make specific reference to the legislative, policy and strategic context.

However, it is important to support the policy progression with proportionate evidence. This study has reviewed existing studies into viability of Local Plans that require similar low carbon/renewable energy requirements that has been included within Appendix 2. The higher standards proposed by this Study (and required to meet climate change targets) could impact on viability of schemes themselves or the Plan as a whole. This should be reviewed as part of the overall viability review process of the Local Plan to ensure it is aligned with the local market.

The requirement for the decision-making process around policy design to acknowledge different and often competing priorities was also recognised. The breadth of expertise in the policy development team, coupled with dedicated engagement sessions on policy design, was used to facilitate the policy design to be consistent and balanced (in a planning sense) and support the overall ambition of the brief to develop policy that makes a meaningful contribution towards addressing climate change.

It has also been recognised that it is difficult to set policy direction at a local level on topics that may not have been given a clear steer at a national level. For example, the delay of the publication of the Department for Business, Energy and Industrial Strategy (BEIS) Energy White Paper (expected in Winter 2020) could have potentially significant impacts on policy direction for renewable energy policy. A list of future direction of national policy has been included in Section 6.7 below to provide a guide for policy areas to monitor for change as policy development progresses. Best practice guidance has been reviewed which supplements national guidance to minimise this issue.

Another challenge that has been identified is the issue with balancing Local Plan policies with wider built environment legislation and policy agendas. A good example of this is within sustainable building design, as Local Plan policies will set targets that may require coordination across the council to deliver, such as working with colleagues in Building Regulations. By holding a Wirral Borough Council Officers workshop with attendees from across different departments of the Council, we have emphasised the importance of cross-department collaboration. This will need to continue as the plan moves forward to reduce any potential problems when balancing these priorities.

It should also be noted that policy recommendations will only have an impact on those developments which engage with the local planning process. Engagement with stakeholders has identified significant interest in building retrofit and building mounted renewables to support climate change action. In most cases, such activities would be covered by permitted development and so would not be influenced by the policy recommended in this study. Therefore, it is recommended that further consideration is made outside of the local planning process as to how such interventions can be influenced by the Council. The exception to this is where planning permission would be required, for example when there is a change of use to an existing building or the building is listed. This should be considered in line with wider Local Plan policies relating to heritage. The proposed Policy wording set out in the Policy Development Papers are considered to apply to retrofit where planning permission is required and also include a requirement to be ‘consistent with other relevant policies of the local plan’ to ensure delivery is in line with wider policies.

6.3 Engagement

One of the other key challenges highlighted through the policy development process was the need to gain public and stakeholder buy in, especially when dealing with potentially contentious policy issues.

The policy work has benefitted from engagement and discussion through two workshops – one with Wirral Borough Council Officers and one with Elected Members – to benefit from local knowledge, experience and advice.

As set out previously, this engagement has been supplemented with regular sessions with Wirral Borough Council Officers responsible for the Local Plan and climate change, who

have contributed to the co-design of policy wording throughout its development. In some cases, decisions were made by Wirral Borough Council Officers on the proposed policy wording included within this report. It was concluded to present options for policy wording in the Sustainable Building Design Policy Development Paper to support further internal work within Wirral Borough Council, as to the appropriate policy wording to take forward. Therefore, this report and supporting Policy Development Papers include options for policy wording on Sustainable Building Design.

6.4 Policy Development Papers

The research as part of this commission identified three key themes around which three Policy Development Papers have been developed:

- Net zero carbon development
- Renewable Energy
- Sustainable Building Design

Policy Development Papers are presented in Appendix 7.

The Policy Direction Papers present an overview of the work undertaken on each of the topics above and provide suggestions for wording for a range of potential climate change policies that could be embedded within the Local Plan. In addition to detailed policy, an overarching strategic policy has been recommended to set out the ambition for adaptation and mitigation to climate change, and is included within the Policy Development Paper for Net Zero Carbon Development. Each of the Policy Direction Papers draws together the following:

- Relevant national legislation, policies and guidance.
- An overview of the local context for Wirral (linking to the Cool and Cool2 climate strategies).
- Best practice from other authorities that have embedded climate change within local planning policy.
- Potential policy wording including: a brief justification, overview of potential risks/challenges and potential indicators for measurement.

6.5 Summary of Potential Policy Wording

A summary of proposed policy wording is provided in *Table 1* below. This wording should be considered in context as set out within the Policy Development Papers.

Table 1 Overview of potential policy wording

Policy Development Paper	Topic	Potential Policy Wording
Net Zero Carbon Development	Net zero	All development should consider and take measures to address climate change implications. This should include reducing carbon emissions associated with the construction, operation and decommissioning of developments, as well as designing in climate change adaptation measures to address the effects of a warming climate. As part of this, new development should be net zero carbon, requiring all new development to reduce its net carbon emissions from construction and operation to zero (with any residual carbon emissions addressed through compensation or carbon removal measures), demonstrated through the submission of an Energy and Climate Statement, to demonstrate how the development will achieve net zero carbon, including consideration of the energy hierarchy and how monitoring and reporting on performance will be delivered.
	Energy Hierarchy	Development should be delivered in accordance with the energy hierarchy, which in order of importance should: i. Minimise energy demand (using less energy and managing energy demand during construction and operation); ii. Maximise energy efficiency (include measures in the development to use energy efficiently); iii. Utilise renewable energy (maximise the use of building mounted and local sources of renewable energy); iv. Utilise low carbon energy (where renewable energy is not an option); and v. Utilise other energy sources (where low carbon and renewable energy is not an option). vi. compensate for or deliver carbon removal measures to address residual carbon emissions on-site vii. compensate for or deliver carbon removal measures to address residual carbon emissions off-site. The accompanying Energy and Climate Statement should fully address how the development is proposed to conform with the hierarchy.
	Section 106/CIL	Wirral Borough Council will support the provision of measures to mitigate and adapt to climate change to deliver the priorities of the Local Plan. This includes through obligations such as CIL and S106, seeking contributions, assessed on a case by case basis, towards measures to mitigate and adapt to climate change.
	Residual Carbon	Where a development cannot demonstrate net zero carbon can be met on-site, applicants should demonstrate how allowable solutions to residual carbon emissions can be addressed through carbon removal measures, secured through a S106 agreement.
Renewable Energy	Onsite Renewable and Low Carbon Energy	Development should be designed in a manner that maximises the use of renewable and low carbon energy supplies. How this is to be achieved should be fully explored in the Energy and Climate Statement. Unless it is

Policy Development Paper	Topic	Potential Policy Wording
		demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision, it must be demonstrated how: i. the use of onsite renewables to reduce carbon emissions has been maximised ii. new developments in proximity of an existing or proposed heat network or district energy network will connect to the network iii. where a development is not to be connected to a heat network, it should be demonstrated how the design makes the development 'district heating ready' to enable connection at a later date.
	Stand-alone Renewable and Low Carbon Energy Schemes	Delivery of renewable and low carbon energy schemes will be supported in appropriate locations and where consistent with other relevant policies of the Local Plan.
	Community Renewable and Low Carbon Energy	Community renewable and low carbon energy developments in appropriate locations will be supported, where consistent with other relevant policies of the Local Plan. The development of all renewable energy schemes should demonstrate an element of local ownership.
	Ground-mounted solar PV	Development of ground mounted solar PV will be supported in appropriate locations and where consistent with other relevant policies of the Local Plan.
	Wind energy	Development wind energy installations of small (indicatively <80m tip height) or medium (indicatively 80-110m tip height) sized turbines will be supported in appropriate locations and where consistent with other relevant policies of the Local Plan.
	Heat networks (connecting developments)	All new developments in proximity of an existing or proposed heat network or district energy network will be expected to: i. connect to the network unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision; Or, ii. where a development is not to be connected to a heat network, it should be demonstrated how the design makes the development 'district heating ready' to enable connection at a later date.
	Heat network (stations, networks and infrastructure)	Any developments of heat networks or district energy networks must demonstrate: i. a minimum of 85% of the energy supplied is from renewable or low-carbon sources. ii. how any heat produced will be productively used on-site or linked to a district energy network iii. how the design and capacity for future expansion to facilitate incorporation of new development and additional low-carbon technology, such as waste heat recovery, heat pumps and electric heating.

Policy Development Paper	Topic	Potential Policy Wording
Sustainable Building Design[59]	Residential Development	**Option 1 (net zero now)** *All applications for new residential dwellings should achieve net zero carbon, including all applications for minor residential dwellings, extensions, retrofit or bringing back into use empty homes.* *Where it is demonstrated that the scheme is not suitable, feasible or viable to meet net zero carbon, it should demonstrate the maximum contribution the scheme can make towards these requirements and as a minimum must achieve a minimum a 19% improvement dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.* *The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.* **Option 2 (net zero in future)** *All applications for new residential dwellings should demonstrate the maximum contribution the scheme can make towards net zero carbon and as a minimum must achieve a minimum a 19% improvement dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations, including all applications for minor residential dwellings, extensions, retrofit or bringing back into use empty homes.* *By [date to be confirmed, e.g. 2025, 2030], all applications for new residential dwellings should achieve net zero carbon, including all applications for minor residential dwellings, extensions, retrofit or bringing back into use empty homes.* *The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.*
	Non-residential Development	**Option 1 (net zero now)** *All applications for new non-residential development should achieve net zero carbon. This includes all works that require planning permission for retrofit or building extension.* *Where it is demonstrated that the scheme is not suitable, feasible or viable to meet net zero carbon, it should demonstrate the maximum contribution the scheme can make towards these requirements. At a minimum, all applications for new non-residential developments must achieve BREEAM 'Excellent'. This includes all works that require planning permission for retrofit or building extension. All applications for public realm, and other schemes that are not appropriate to be considered under BREEAM, at a minimum must achieve CEEQUAL 'Excellent'.* *The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.* **Option 2 (net zero in future)**

[59] This report and supporting Policy Development Paper present options for policy wording in the Sustainable Building Design Policy Development Paper to support further internal work as to the appropriate policy wording to take forward.

Policy Development Paper	Topic	Potential Policy Wording
		All applications for new non-residential development must achieve BREEAM 'Excellent'. This includes all works that require planning permission for retrofit or building extension. All applications for public realm, and other schemes that are not appropriate to be considered under BREEAM, at a minimum must achieve CEEQUAL 'Excellent'. *By [date to be confirmed, e.g. 2025, 2030], all applications for new non-residential development should achieve net zero carbon. This includes all works that require planning permission for retrofit or building extension.* *The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.*
	Electric Vehicle Charging Points	**Option 1 (25%)** *All applications for residential dwellings with off street parking must accommodate one active Electric Vehicle charging point per dwelling. All applications for non-residential development must include at least 25% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 25% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.* **Option 2 (increase to 100%, e.g. by 2030)** *All applications for residential dwellings with off street parking must accommodate one active Electric Vehicle charging point per dwelling. All applications for non-residential development must include at least 25% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 25% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.* *By [date to be confirmed, potentially aligned with 2030 in line with imminent government announcement on petrol diesel ban by 2030] all applications for non-residential development must include 100% of their car parking provision to be served by active electric vehicle charging infrastructure, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.* **Option 3 (increase to 50%, e.g. by 2027 and 100%, e.g. by 2030)** *All applications for residential dwellings with off street parking must accommodate one active Electric Vehicle charging point per dwelling. All applications for non-residential development must include at least 25% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 25% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.* *By [date to be confirmed, e.g. 2027 as a central date], all applications for non-residential development must include at least 50% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 50% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes*

Policy Development Paper	Topic	Potential Policy Wording
		By [date to be confirmed, potentially aligned with 2030 in line with imminent government announcement on petrol diesel ban by 2030] all applications for non-residential development must include 100% of their car parking provision to be served by active electric vehicle charging infrastructure, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.

6.6 Wider Policy Development Recommendations

To reach the ambitious national and local Greenhouse Gas emissions reductions, the updated Local Plan document must embed a wide range of mitigation and adaptation measures within its policies. Our research and policy development highlighted potential opportunities and supporting information for wider policy agendas, such as green infrastructure, transport and flood risk.

These topic areas sit outside of this work and are the subject of separate commissions and policy development. This section provides an overview of the wider measures that could be considered for adoption within the local plan, to feed into work being undertaken on parallel commissions to support wider policy development of Wirral Borough Council on these topics.

Support for strategic policy

Several key stakeholders in the stakeholder questionnaire highlighted the importance of integrating climate change into a high-level strategic planning policy within a Local Plan, to add weight to decision making and to provide a hook to tie together the wide range of measures required.

For example, The Royal Borough of Kensington and Chelsea Local Plan (adopted 2019) set out their commitment to climate change in their Strategic Objective 7 (SO7 objective for Respecting Environmental Limits) which states '*Our strategic objective to respect environmental limits is to contribute to the mitigation of, and adaption to, climate change, significantly reduce carbon dioxide emissions, maintain low and further reduce car use, carefully manage flood risk and waste, protect and attract biodiversity, improve air quality, and reduce and control noise within the borough.*'

The draft London Plan 2017 (anticipated for adoption in 2020) sets out high-level targets within its plan as thematic policies. Policy GG6 sets out the ambition that *'to help London become a more efficient and resilient city, those involved in planning and development must seek to improve energy efficiency and support the move towards a low carbon circular economy, contributing towards London becoming a zero-carbon city by 2050.'*

As such, it is recommended that Wirral Council link into their existing climate change strategy work (Cool and Cool 2) to embed the high-level ambitions for Wirral Greenhouse Gas emission reductions within the Local Plan, either through the strategic objectives or as a stand-alone thematic policy.

Zero carbon transport

An important topic highlighted in the stakeholder questionnaire was sustainable transport and particularly the promotion of walking and cycling. This is also noted as a central point of the Cool 2 strategy, including the aim to complete a switch to fossil fuel free local travel by around 2030. It is likely that this would be integrated within a 'Transport' chapter within the Local Plan, but it is important to tie this back to the benefits regarding a reduction in Greenhouse Gas emissions and therefore climate change mitigation.

The draft Greater Manchester Spatial Framework (2019) Policy GM-S 6 'Clean Air' sets out a wide range of measures for supporting improvements in air quality including restricting and carefully regulating developments that would generate significant point source pollution, requirements for submitting air pollution data, use of ultra-low- emission vehicles, street design to avoid trapping air pollution and controlling traffic and parking around vulnerable receptors.

The Policy Development Paper for Sustainable Building Design encourages the inclusion of a policy on electric vehicle charging infrastructure to support the transition to electric vehicles. However, it is also recommended that when developing the Local Plan 'Transport' chapter, there are strong links made back to the implications of this for Greenhouse Gas emissions reductions and the subsequent impacts for reaching overall emission reduction aims for Wirral.

Green infrastructure and nature-based carbon solutions

One of the key focuses of climate change mitigation is the use of green infrastructure and tree planting. There are a number of best practice example of how this has been developed in policy other local authority Local Plans.

Reading Borough Council (2019) Policy EN14 states that '*New development shall make provision for tree retention and planting within the application site, particularly on the street frontage, or off-site in appropriate situations, to improve the level of tree coverage within the Borough, to maintain and enhance the character and appearance of the area in which a site is located, to provide for biodiversity and to contribute to measures to reduce carbon and adapt to climate change. Measures must be in place to ensure that these trees are adequately maintained*.'

The draft Greater Manchester Spatial Framework (2019) Policy GM-S 2 promotes increasing carbon sequestration through the restoration of peat-based habitats, woodland management and tree-planting. Policy GM-G 7 states plans to plant a tree for every resident in Greater Manchester over the next 25 years as part of the City of Trees initiative.

The provision of green infrastructure is often linked directly to policies on sustainable building design or flood risk / adaptation. It should be considered how green infrastructure provision and the outputs of commissions on the topic, best fits into the Local Plan, either as its own stand-alone policy, or tied into other topics.

Flood risk and adaptation

Given the location of Wirral and its geography as a peninsular, several stakeholders raised concerns in the stakeholder questionnaire about the impacts of climate change on flood risk within Wirral. As such, it will be very important to tie existing work being undertaken on

flood risk with future likely impacts of climate change and how policies in the Local Plan can support climate change adaptation.

The following provides an overview of the breadth of policies included that relate to climate change:

Reading Borough Council Local Plan (adopted 2019) includes Policy EN18 which states that development should consider the effects of climate change. Where possible, it should be designed to reduce flood risk both on and off site. All major developments must incorporate SuDS.

Hull City Council Local Plan (adopted 2017) includes Policy 37 which states that '*Development may be required to improve the standard of flood defence infrastructure if required to make the development acceptable (taking into account climate change), and where the improvements required are not already planned and funded by risk management authorities within an appropriate timescale'.* In addition, Policy 39 outlines that '*a 30% allowance should be added to Drainage Impact Assessment restrictions to account for climate change*.'

As such, work should be undertaken with existing flood risk management organisations to understand the appropriate additional provision for addressing future potential climate change impacts within local plan policies for Wirral.

Fuel poverty

The requirement to consider where the burden of cost is felt for a transition to zero carbon is seen in both international, national and local considerations on climate change. The best practice review highlighted the need for consideration of including policy to require an assessment of fuel poverty to be undertaken to inform policy making, particularly to support the use of energy efficiency and renewable energy in domestic properties.

6.7 Future Direction of National Policy

The development of policies has further highlighted the relationship between the Local Plan and national policy. There are a number of developing national policy areas which could have implications for the Local Plan, and the policies recommended in this commission, in the future - a watching brief is recommended. In particular, the following policy areas should be considered once available:

- Department for Business, Energy and Industrial Strategy (BEIS) Energy White Paper (expected in Winter 2020)
- Department for Transport Decarbonising Transport (expected in Winter 2020)
- Ministry of Housing, Communities and Local Government Future Homes Standard (to be introduced by 2025; Consultation closed 7th February 2020).
- Environment Bill – with particular interest in implications for energy efficiency, waste, biodiversity net gain requirements and land use (Currently at Committee stage in the House of Commons and due for achieve Royal Assent in 2021).
- Agriculture Bill – with particular interest in implications for land use (Currently at Report stage in the House of Lords and due for achieve Royal Assent in 2021).

- Industry response to the BEIS announcement (in March 2020) that onshore wind and solar PV would be included within the next round of Contract for Difference Auction.
- Ministry of Housing, Communities and Local Government Planning White Paper (August 2020) - sustainable development sits at the heart of this White Paper but the impact on plan making will only become entirely clear through consideration of the primary legislation.

7 Conclusion

7.1 Summary and Recommendations

Summary

The purpose of the Wirral Local Plan Climate Change and Renewable Energy Study was to provide policy recommendations for embedding climate change and renewable energy within Wirral's upcoming Local Plan, to ensure the Council are supporting rapid decarbonisation in line with ds the local target to stay within a local carbon budget and reach 'net zero' climate pollution as early as possible before 2041 and supporting national and international climate change commitments. As such, it focusses primarily on the potential interventions through local planning for net zero carbon development, sustainable building design and renewable energy.

This report draws together knowledge developed in the context review, review of best practice, stakeholder engagement and Clean Energy Opportunities and Implications Study, into three Policy Development Papers. These Policy Development Paper focus on Net Zero Carbon Development, Sustainable Building Design and Renewable Energy, and provide recommended policy wording for embedding these topics within the future Wirral Local Plan.

The study undertook a number of key activities to inform policy recommendations, including:

- A Context Review - to provide insight into legislative, policy and guidance drivers at an international, national, regional and local level.
- A Best Practice Review – to highlight information, evidence and best practice for addressing climate change through local planning and to identify policy wording utilised in other authorities Local Plans.
- Stakeholder Views – gathered through a stakeholder questionnaire and workshops with Wirral Borough Council Officers and Elected Members and the Wirral Youth Parliament, to provide local insight and advice into policy development.
- Clean Energy Opportunities and Implications Study – to provide an updated evidence base for the potential opportunities for renewable and low carbon energy sources on the Wirral.
- Policy Recommendations – to draw together the findings of the study into recommendations for policy to embed climate change and renewable energy into the Local Plan.

Recommendations

The key recommendations for embedding climate change and renewable energy into local planning policy are summarised as follows:

- Wirral Borough Council develop an overarching strategic policy to set out the ambition for net zero carbon development across the Borough, underpinned by detailed policies and for all development to submit an Energy & Climate Statement detailing how the development meets requirements (recommendations are set out in the Net Zero Carbon Policy Development Paper).

- To guide net zero carbon development, it is recommended that policies be put in place regarding delivering development in line with actions needed to meet local and national climate targets, including in accordance with an energy hierarchy. Where residual carbon is demonstrated to be unavoidable through the Energy & Climate Statement policies have been recommended to seeking contribution to ambitions through Section 106/CIL and outlining requirements to address residual carbon through carbon removal measures.
- To support the deployment of renewable energy in the Borough, it is recommended that polices be put in place supporting:
    - Onsite renewable and low carbon energy generation
    - Stand-alone renewable and low carbon energy schemes, including specific policies on solar PV and wind energy
    - Community renewable and low carbon energy schemes
    - Heat networks (connections by developments and stations and network infrastructure)
- For sustainable building design, it is recommended that Wirral Borough Council pursue policies to guide development towards net zero carbon, including residential and non-residential development, and support for electric vehicle charging infrastructure provision.
- For all policies, viability should be considered as part of the viability assessment of the wider Local Plan and to establish a robust monitoring methodology against which to measure the success of policies implemented to address climate change.

7.2 Wider Considerations

Key wider considerations for policy recommendations of this study

When considering the potential for renewable energy development, there are a range of technical, environmental and legislative constraints that relate to each type of renewable energy technology. As such, the recommended policy wording is a starting point upon which to consider potential developments. It is expected that more detailed feasibility studies will be required to pursue identified opportunities.

The higher standards proposed by this study (and required to meet climate change targets) have the potential to impact on viability of schemes or the Plan as a whole and consideration of viability will be undertaken at of the Wirral Local Plan. This study has reviewed existing research and other Local Plan approaches to viability of Local Plans that require similar low carbon/renewable energy requirements within Appendix 3.

It should also be noted that policy recommendations will only have an impact on those developments which engage with the local planning process, which are largely new developments. Engagement with stakeholders has identified significant interest in building retrofit and building mounted renewables to support climate change action. Where a developing involving retrofit requires engagement with the local planning process, the proposed policies are anticipated to be used to deliver climate change and renewable energy interventions. However, in most cases, such activities would be covered by permitted development and so would not be influenced by the policy recommended in this study.

Therefore, it is recommended that further consideration is made as to how large scale retrofit interventions can be influenced by the Council outside of the local planning process.

Embedding climate change into wider policy topics & Council activities

The Wirral Local Plan Climate Change and Renewable Energy Study, forms part of a number of separate commissions, contributing to the Local Plan. Wider considerations, such as the natural environment, green infrastructure and flood risk / adaptation, are being pursued through separate commissions. Therefore, to provide added value, where relevant information has been highlighted for wider policy agendas and in addition to the measures included in the Policy Development Papers, this report has also highlighted best practice identified for wider topics. These topics include; zero carbon transport, green infrastructure, flood risk / adaptation and nature-based carbon solutions, which can also play an important role in meeting Wirral's climate change commitments. Information is provided to feed into work being undertaken on parallel commissions to support wider policy development of Wirral Borough Council on these topics.

Similarly, it is also recognised that the study forms part of wider action on climate change, beyond the local planning process. As such, embedding climate change and renewable energy within the Local Plan should be considered as one of a number of tools available to Wirral Borough Council for taking action to address climate change.

Appendix 1

Context Review

A1 Context review

International Commitments

Ambitious international carbon reduction commitments were agreed under the Paris Agreement[60] signed in 2016. The Paris Agreement, set out by the Intergovernmental Panel on Climate Change (IPCC) outlines the necessity to respond to the threat of climate change by holding the increase in the global average temperature to well below 2ºC above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5 ºC above pre-industrial levels.

On 8th October 2018, the IPCC released their Special Report 15 (SR15)[61]. The report provides an analysis of the impacts of global warming above 1.5ºC above pre-industrial levels. It set out the urgency with which climate action is needed; to reduce global Greenhouse Gas emissions by over half of their 1990 levels in just over a decade (by 2030) and reaching and sustaining net zero CO_2 emissions by around 2050.

National Legislation

Climate Change Act 2008

Under the Climate Change Act of 2008[62], the UK passed legislation that included the target of an 80% reduction in carbon emissions set against 1990 levels by 2050. On 27th June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order 2019[63] came into force. This amended the legally binding target within the Climate Change Act 2008 from an 80% reduction (compared to 1990 levels) in UK Greenhouse Gas emissions to 100%, or net zero, by 2050[64]. The current legislation allows for a small amount of Greenhouse Gas emissions to be addressed through offsetting to meet the net zero target, e.g. through removal of carbon from the atmosphere and/or trading in carbon units

UK Government departments are currently working to understand the policy implications and wider requirements to support a transition to net zero in the UK. This is seen in published materials such as the 'Clean Growth Strategy' and 'Decarbonising Transport: Setting the Challenge' – further discussion of this supporting policy is provided in this context review below.

The UK Committee on Climate Change was established to provide advice to central government and assesses climate change risk and opportunities on an ongoing basis. UK Committee on Climate Change's advice on reaching net zero carbon in the UK[65] concludes that:

- Most sectors will need to reduce emissions close to zero without offsetting;
- Many current plans are insufficiently ambitious or others proceeding too slowly;
- Policy needs to be ramped up significantly.

[60] United Nations Climate Change (2016) What is the Paris Agreement?,https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement , accessed 12/08/20
[61] IPCC (2018) Special Report Global Warming of 1.5 ºC, https://www.ipcc.ch/sr15/ , accessed 12/08/20
[62] UK Government (2008) The Climate Act, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5/08/20
[63] UK Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5/08/20
[64] House of Commons Library (2019) Net zero in the UK, https://commonslibrary.parliament.uk/research-briefings/cbp-8590/, accessed 12/08/20
[65] Committee on Climate Change (2019) Net Zero- The UK's contribution to stopping global warming, https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/, accessed 12/08/20

The UK CCC also advises that the transition to net zero carbon requires 'progress with far greater urgency', including:

- Quadrupling the renewable energy supply by 2050;
- All building stock being highly energy efficient with low carbon heating;
- Electric vehicles replacing petrol/diesel;
- Implementing carbon capture and storage;
- Increased tree planting;
- Reducing emissions on farms.

In order to reach emissions targets, the Climate Change Act established carbon budgets within the UK. Carbon budgets are a cap on the amount of carbon the country can produce, set in 5-year periods. This is a stepped target in which the budget gets progressively tighter, the UK has succeeded in meeting the first two budgets and is on track to meet the third budget set for 2018-2022. However, meeting the fourth budget target of a 51% reduction below 1990 levels will pose a significant challenge; a reduction of over 20% of our current carbon budget.

Several measures were taken to aid the completion of these targets. The Act places an obligation on central government to prepare policies to meet these targets. The Act also places a duty on the Secretary of State to produce a statement containing the following information in respect of each greenhouse gas; (a) state the amount for the year of UK emissions, UK removals and net UK emissions of that gas, (b) identify the methods used to measure or calculate those amounts, and (c) state whether any of those amounts represents an increase or decrease compared to the equivalent amount for the previous year.

Planning Act 2008

The Planning Act 2008[66] was introduced primarily to streamline the process for approving Nationally Significant Infrastructure Projects (NSIP).

Section 182 of the Planning Act 2008 puts a legal duty on local authorities to include policies on climate change mitigation and adaptation in Development Plan documents. It required a change to the Planning and Compulsory Purchase Act (2004) through the insertion of the following paragraph (subsection 1A):

'Development plan documents must (taken as a whole) include policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change'.

In addition, the Planning Act pertains to electricity generating stations generating more than 100 megawatts offshore, which should be decided by the Secretary of State (SoS).

Planning and Compulsory Purchase Act 2004

Section 19(1A) of the Planning and Compulsory Purchase Act 2004 (PCPA)[67] requires local planning authorities to include in their Local Plans "*policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change*".

[66] UK Government (2008) Planning Act 2008, https://www.legislation.gov.uk/ukpga/2008/29/contents, accessed 12/08/20
[67] UK Government (2004) Planning and Compulsory Purchase Act, https://www.legislation.gov.uk/ukpga/2004/5/contents, access 12/08/20

Building Regulations

Building Regulations[68] are a key mechanism in the UK for reducing CO_2 emissions in the built environment. The regulations are statutory instruments that are used to ensure that policy guidance is carried out in practice. The regulations drive energy efficiency and carbon reduction targets for new development and improvements to the performance of refurbished / retrofitted residential and commercial buildings. Part L of the Building Regulations sets out guidance on the conservation of fuel and power, including insulation regulations, boiler productivity, lighting and storage techniques for hot water.

Despite the Regulations, evidence has shown that a building's predicted energy usage and carbon emissions can differ widely from the actual output[6970]. This can be for several reasons, studies have cited incorrect assumptions in design, substitution for cheaper energy systems, and no mechanism to monitor performance post-development. To combat this, some Local Authorities have opted to include annual carbon emission monitoring policy requirements for new developments. This has been considered further in the policy recommendations.

Planning and Energy Act 2008

The Planning and Energy Act 2008[71] allows local planning authorities to set energy efficiency standards in their development plan policies that exceed the energy efficiency requirements of the Part L Building Regulations. Such policies must not be inconsistent with relevant national policies for England.

Section 43 of the Deregulation Act 2015 would withdraw this power to set energy efficiency standards from local authorities, however this has not yet been enacted and local authorities are still able to set higher requirements. It was anticipated they would be enacted at the same time that Government introduced higher energy performance requirements nationally in 2016, through Building Regulations, which according to the WMS were to be "set at a level equivalent to the (outgoing) Code for Sustainable Homes Level 4". However, after the General Election in 2015, Government did not deliver its proposals for zero carbon homes and the planned Building Regulations uplift. The amendments to the 2008 Act, to date, have not been enacted.

Provisions in the Planning and Energy Act 2008 also allow development plan policies to impose reasonable requirements for a proportion of energy used in development in their area to be energy from renewable sources and/or to be low carbon energy from sources in the locality of the development.

Future Homes Standard Consultation (2019-2020)

In 2020, a consultation was undertaken by the Ministry of Housing, Communities and Local Government (MHCLG) on proposed updates to the Building Regulations and the introduction of the Future Homes Standard[72]. Under this, the government sets out its intention to *'introduce in 2020 a meaningful but achievable uplift to energy efficiency standards as a stepping stone to the [2025] Future Homes Standard. The intention is to make new homes more energy efficient and to future-proof them in readiness for low carbon heating systems.'* The Future Homes Standard

[68] UK Government (2020) Building Regulations Approval, https://www.gov.uk/building-regulations-approval, accessed 13/08/20
[69] Innovate UK (2016) Non-domestic buildings: best practice and what to avoid, https://www.gov.uk/government/publications/low-carbon-buildings-best-practices-and-what-to-avoid, accessed 06/10/20
[70] Innovate UK (2016) Low-carbon homes: best strategies and pitfalls, https://www.gov.uk/government/publications/low-carbon-homes-best-strategies-and-pitfalls, accessed 06/10/20
[71] UK Government (2008) Planning and Energy Act, http://www.legislation.gov.uk/ukpga/2008/21/section/1, accessed 12/08/20
[72] UKGBC (2019) The Policy Handbook, https://www.ukgbc.org/wp-content/uploads/2020/03/The-Policy-Playbook-v.1.5-March-2020.pdf, accessed 13/08/20

would require new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency. It is anticipated that heat pumps and heat networks will provide the biggest contribution to producing low carbon heat for households, supported by better insultation to retain heat.

With regard to Part L standards, the consultation sets out two options to increase energy efficiency standards and requirements. The preferred option, Option 2, would require a 31% reduction in carbon emissions compared to current standards (Option 1 is a 20% reduction on current standards). MHCLG anticipate that this can be achieved through carbon-saving technology such as solar PV and better insulation. It is noted that this will result in lower bills for households but increased costs of construction.

As more stringent Part L requirements would increase costs for developers, the consultation document proposes removing the powers granted in the 2008 Planning Act that allows local planning authorities to set higher energy efficiency standards than those in the Building Regulations. The purpose of this is to create a uniform national standard, promoting supply chain efficiency and eliminating any uncertainty between developers and local authorities.

The consultation document asks:
'When, if at all, the government should commence the amendment to the Planning and Energy Act 2008 to restrict local planning authorities from setting higher energy efficiency standards for dwellings?

a. *In 2020 alongside the introduction of any option to uplift to the energy efficiency standards of Part L*
b. *In 2020 but only in the event of the introduction of a 31% uplift (option 2) to the energy efficiency standards of Part L*
c. *In 2025 alongside the introduction of the Future Homes Standard*
d. *The government should not commence the amendment to the Planning and Energy Act*

Cost estimates are given for both Options, with Option 2 adding £4850 to the build-cost of new homes and saving households £260 a year on energy bills.'[73]

If taken forward, the amendments could be introduced from October 2020[74] alongside the implementation of the new Part L standards, or be delayed until 2025 when the new Standard comes into force.

Plan Making Written Ministerial Statement March 2015

This statement clarified the government's position on local authorities setting energy performance standards in new developments[75]. The statement sets out the government's expectation that 'local planning authorities...should not set...any additional local technical standards or requirements relating to the construction, internal layout or performance of new dwellings.' The exception was energy performance, where local authorities would continue to be able to require energy performance standards higher than Building Regulations up to the equivalent of Code for

[73] Ministry of Housing, Communities and Local Government (2019) The Future Homes Standard 2019 Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings: Impact Assessment,. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/836925/REQUEST.pdf, accessed 06/10/20
[74] At the time of writing, October 2020, no amendments had been brought forward.
[75] UK Government (2015) Planning Update: written statement, https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2015-03-25/HCWS488/, accessed 12/08/20

Sustainable Homes Level 4 'until commencement of amendments to the Planning and Energy Act 2008', as outlined above.

Neighbourhood Planning Act 2017

The Neighbourhood Planning Act 2017[76] strengthens and consolidates the power of local communities to guide the development of neighbourhood planning within their local area. The Act set a new legal duty on local planning authorities to set out their strategic priorities within a strategic plan, including action on climate change. At a local level, neighbourhood plans provide communities with an opportunity to plan for renewable energy and climate change mitigation and adaptation at a local scale. Many options for mitigation and adaptation are extremely relevant for the local level, for example small scale renewable energy production, planting of green infrastructure, community woodland planting.

Energy Act 2011

The Energy Act 2011[77], provides a framework for enabling energy efficiency measures in properties by encouraging low carbon energy supplies, fairer energy markets and improved energy security. The Act includes provisions for a Green Deal whereby it creates a financing framework to enable improvements to the energy efficiency of households and non-domestic properties, funded by a charge on energy bills that avoids the need for consumers to pay upfront costs.

First introduced in the 2011 Energy Act, the Private Rented Sector Energy Efficiency Regulations[78] specify that from 1st April 2020, there will be a requirement for all existing domestic tenancies to achieve a minimum energy performance rating of E on their Energy Performance Certificate (EPC). This will extend to non-domestic properties from 1st April 2023.

Energy Act 2013

At a national level, the Energy Act 2013[79] establishes a legislative framework for delivering secure, affordable and low carbon energy. The act focuses on decarbonisation and Electricity Market Reform (EMR). For decarbonisation, the act enabled the Secretary of State to set a 2030 decarbonisation target range for the electricity sector. The Act also puts in place measures to attract investment which is required to replace current generating capacity and upgrade the grid by 2020. The Act may be relevant at a local level where major energy infrastructure projects and associated transmission infrastructure, interact with local planning authorities.

Energy Act 2016

The Energy Act 2016[80] together with the Infrastructure Planning (Onshore Wind Generating Stations) Order 2016[81] removed onshore wind farms of over 50MW in size from the NSIP regime and returned the decision-making powers to Local Planning Authorities (LPAs). Prior to this, larger onshore wind turbines of above 50 megawatts (MW) were treated as Nationally Significant Infrastructure Projects (NSIPs). This meant that they had to obtain development consent granted

[76]UK Government (2017) Neighbourhood Planning Act, http://www.legislation.gov.uk/ukpga/2017/20/contents/enacted, accessed 12/08/20
[77] UK Government (2011) Energy Act, https://www.legislation.gov.uk/ukpga/2011/16/contents/enacted, accessed 12/08/20
[78] UK Government (2017) Private Rented Sector Energy Efficiency Regulations (Domestic), https://www.gov.uk/government/consultations/private-rented-sector-energy-efficiency-regulations-domestic, accessed 12/08/20
[79] UK Government (2013) Energy Act, http://www.legislation.gov.uk/ukpga/2013/32/contents/enacted, accessed 12/08/20
[80] UK Government (2016) Energy Act, https://www.legislation.gov.uk/ukpga/2016/20/contents/enacted, accessed 13/08/20
[81] UK Government (2016) The Infrastructure Planning (Onshore Wind Generating Stations) Order, https://www.legislation.gov.uk/uksi/2016/306/contents/made, accessed 13/08/20

by the Secretary of State under the rules provided for in the Planning Act 2008, rather than obtaining planning permission from the LPA.

Wind Energy Written Ministerial Statement 2015

The Wind Energy Written Ministerial Statement 2015[82], outlines that when determining planning applications for wind energy development involving one or more wind turbines, local planning authorities should only grant planning permission if:

- the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and
- following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing.

It also states that suitable areas for wind energy development will need to have been allocated clearly in a Local or Neighbourhood Plan and that maps showing that wind resources are favourable in an area are not sufficient. It states that whether a proposal has the backing of the affected local community is a planning judgement for the local planning authority to take into consideration. Its effect has been to make the development and permissions for on-shore wind energy developments much more challenging and has seen a significant reduction in on-shore wind development in the period since 2015.

National Policy

National Planning Policy Framework 2019

The National Planning Policy Framework (NPPF)[83] is the guiding document in local authority plan-making and development management. It requires plans to take a proactive approach to climate change mitigation and adaption.

With regard to climate change, paragraph 8 of the NPPF acknowledges climate change adaptation and mitigation as one of the key pillars of sustainable development, it states:

"Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

a) an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services

[82] House of Commons (2015) Wind Energy Written Statement, https://www.parliament.uk/documents/commons-vote-office/June%202015/18%20June/1-DCLG-Planning.pdf, accessed 13/08/20

[83] UK Government (2019) National Planning Policy Framework, https://www.gov.uk/government/publications/national-planning-policy-framework--2, accessed 12/08/20

and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

Paragraph 148 explains that the planning system should help to shape places that contribute to radical greenhouse gas reductions, encourage the reuse of existing resources including existing building conversions and support renewable and low carbon energy and associated infrastructure. It states:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

Paragraph 149 explains that plans should take a proactive approach to mitigating and adapting to climate change, considering the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure. It states:

"Plans should take a proactive approach to mitigating and adapting to climate change, considering the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure."

Paragraph 151 states that to enable renewable and low carbon energy development, plans should provide a strategy that maximises the potential for sustainable energy sources, including the identification of opportunities for development to draw from sustainable energy sources and locating potential areas that could support renewable and low carbon development. It states:

"To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for calculating potential heat customers and suppliers."

Paragraph 147 acknowledges that in the Green Belt, many elements of renewable energy projects would be considered inappropriate development. Developers will need to demonstrate very special

circumstances to proceed, which may include the wider environmental benefits associated with renewable energy production. It states:

"When located in the Green Belt, elements of many renewable energy projects will comprise inappropriate development. In such cases developers will need to demonstrate very special circumstances if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources."

Paragraph 152 states that local authorities should support community-led initiatives for renewable and low carbon energy development. It states:

"Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning."

Paragraph 153 discussed the design of new development in relation to minimising energy consumption. It states:

"In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption."

Paragraph 154 discusses the determination of planning application for renewable and low carbon developments. It states:

"When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."

National Policy Statements for Energy Infrastructure (2011)

There are six National Policy Statements (NPS) for Energy[84]:

- Overarching National Policy Statement for Energy (EN-1)
- National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)
- National Policy Statement for Renewable Energy Infrastructure (EN-3)

[84] UK Government (2011) National Policy Statements for energy infrastructure, https://www.gov.uk/government/publications/national-policy-statements-for-energy-infrastructure, accessed 13?08?20

- National Policy Statement for Gas Supply Infrastructure and Oil & Gas Pipeline Infrastructure (EN-4)
- National Policy Statement for Electricity Networks Infrastructure (EN-5)
- National Policy Statement for Nuclear Power Generation (EN-6)

The Overarching National Policy Statement for Energy (EN-1) sets out the Governments policy for delivering major energy infrastructure. It was produced to guide applications for Nationally Significant Infrastructure Projects (NSIP) for major energy infrastructure developments. The NPS is aligned to the requirements under the Planning Act 2008 and provides instruction and guidance on the development of major energy infrastructure, considered in combination with the relevant technology specific NPS (set out above).

National Policy Statement for Renewable Energy Infrastructure (EN-3) (2011)

The NPS justifies the need for increased focus in the renewable energy sector to protect the security of supply through the transition to a low carbon economy. The Statement notes that renewable energy infrastructure of this scale will support the transition to a low carbon economy and have a positive effect on the climate change objective, as well as secondary benefits to the economy and skills.

The NPS for Renewable Energy Infrastructure is concerned with impacts and other matters specific to the following schemes:

- Energy from biomass and/or waste (>50 MW);
- Offshore wind (>100MW); and
- Onshore wind (>50MW)

This NPS sets out the considerations that planning applications for the above schemes should take into account and provides the primary guidance for the development of applications, structure and form of advice (e.g. by the Planning Inspectorate and the decision making tool for decision makers (Secretary of State for major energy infrastructure projects). The NPS is also likely to be a material consideration for applications made under the Town and Country Planning Act 1990 (as amended).

Industrial Strategy White Paper 2017

The government sets out the future challenges ahead of industries as part of the Industrial Strategy White paper[85]. Achieving 'Clean Growth' is one of the challenges it outlines. It states that to maximise the advantages of the global shift to clean growth for the UK, the strategy proposes to:

- Develop smart systems to cheap and clean energy across power, heating and transport;
- Transform construction techniques to dramatically improve efficiency;
- Make our energy intensive industries competitive in the clean economy;
- Put the UK at the forefront of the global move to high efficiency agriculture;

[85] UK Government (2017) Industrial Strategy: building a Britain fit for the future, https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future, accessed 13/08/20

- Make the UK the global standard setter for finance that supports clean growth;
- Support key areas of innovation, investing £725m over 4 years.

National Infrastructure Assessment 2018

The National Infrastructure Assessment[86] looks at the United Kingdom's future economic infrastructure needs up to 2050 and makes key recommendations for how to deliver new transport, low carbon energy and digital networks, how to recycle more and waste less, and how future infrastructure should be paid for. In relation to renewable energy the report states that the first crucial step to meeting the government low carbon ambitions is increasing deployment of renewable energy. It states that the Commission's modelling has shown that a highly renewable generation mix is a low-cost option for the energy system. The cost would be comparable to building further nuclear power plants after Hinkley Point C, and cheaper than implementing carbon capture and storage with the existing system. The electricity system should be running off at least 50 per cent renewable generation by 2030, as part of a transition to a highly renewable generation mix.

Clean Growth Strategy 2017

In October 2017, Government published the Clean Growth Strategy (CGS)[87] which described policies and proposals drafted to help the UK to meet its fourth and fifth Carbon Budgets (delivering a reduction of 57% greenhouse gas emissions reduction on 1990 level). The CGS sets out three possible pathways to decarbonise the UK's economy by 2050:

1. Electric: including full deployment of electric vehicles (EVs), electric space heating, and industry moves to 'clean fuels';

2. Hydrogen: including heating homes and buildings, fuelling many vehicles and the power industry;

3. Emissions removal: including construction of sustainable biomass power stations with carbon capture and storage technology.

The Clean Growth Strategy (CGS) also introduced the Green Finance Taskforce, a group combining public and private sector parties to advise the government on the delivery of investment that is considered sustainable and required to meet carbon targets.

The Green Finance Taskforce produced a strategy[88] that highlights the importance of local parties in directing green investment towards local priorities, which are likely to have stronger community backing. It notes that there is often a lack of skills and resources needed to unlock investment-ready opportunities in local areas. A case study from the Greater Manchester IGNITION project is included[89]. IGNITION, in collaboration with DEFRAs 'Pioneers' programme, aims to develop a financial model that enables investment in large-scale environmental projects that promote climate change adaptation and mitigation. This can create

[86] National Infrastructure Commission (2018) National Infrastructure Assessment, https://www.nic.org.uk/assessment/national-infrastructure-assessment/, accessed 13/08/20
[87] UK Government (2017) Clean Growth Strategy, https://www.gov.uk/government/publications/clean-growth-strategy, accessed 13/08/20
[88] UK Government (2019) Green Finance Strategy, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820284/190716_BEIS_Green_Finance_Strategy_Accessible_Final.pdf, accessed 13/08/20
[89] Greater Manchester Combined Authority (2020) IGNITION, https://www.greatermanchester-ca.gov.uk/what-we-do/environment/ignition/, accessed 13/08/20

new funding streams for local stakeholders to manage local risks. The strategy also includes a description of central government funding and knowledge sharing initiatives.

The CGS also announced up to £557m in further funding for Contract for Differences (CfD), a 15-year contract that offers low-carbon electricity generators payments for the electricity they produce. The scheme protects both renewable energy developers and consumers from volatile market prices.

Community Energy Strategy

The Community Energy Strategy 2014[90] is the UK's first Community Energy Strategy, intended to support meeting the UK's commitment to encourage community owned renewable energy schemes, with the ambition to enable every community that wants to form an energy group/take forward a project to do so.

The strategy focuses on creating a supportive environment for community energy and removing specific barriers to growth. The strategy has found that at least 5000 community energy groups have been active across the UK since 2008. The large proportion of these community energy groups is focused on renewable electricity, being solar PV and onshore wind. However, new approaches to renewable heat, reducing energy use, purchasing energy and managing demand have started to emerge.

The strategy understands that community energy may be a relatively small sector in the UK, but its vision is to drive growth by working with the community energy sector to set a clear level of ambition for community electricity generation. To create the right environment for community energy to grow, the strategy identifies several recommendations and opportunities for the involved parties:

- Partnerships with local authorities, commercial organisations and local networks are crucial, of which the strategy encourages.
- A community Benefits Register for onshore wind was created in 2014 which will help communities negotiate packages with developers for new projects. The renewable industry has committed to increase shared ownership of onshore renewables, enabling communities to be offered opportunity for some ownership by commercial developers.
- Neighbourhood planning offers an opportunity to reach the desired growth of community energy, but local authorities must show leadership to help deliver such projects.
- Community energy activities are more likely to succeed where access to information, advice and expertise is available. Groups need to be able to learn from each other and share what works in a post-project evaluation.

The Strategy also supports communities to produce, reduce, manage and purchase energy. It highlights that there are key issues faced by community electricity generation, which include access to investment as well as the ability to supply consumers directly. Community heat is at an earlier stage of development due to being more technical and complex, which offers an area for growth.

[90]Department for Energy & Climate Change (2014) Community Energy Strategy: Full Report, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf , accessed 13/08/20

UK National Energy and Climate Plan 2019 Draft

The UK National Energy and Climate Plan 2019[91] sets out the UK's approach to meeting the five objectives of the Energy Union: energy security; energy efficiency; decarbonisation; the internal energy market; and research, innovation and competitiveness.

The Plan describes the current state of the energy sector in the UK, outlining the government's current approach to climate change mitigation through policy, and how this is expected to affect the five objectives of the Energy Union in future. This is supported by a summary table containing all the relevant UK policies that contribute to achieving the UK's climate goals, taken from the UK's National Communication with the United Nations Framework Convention on Climate Change (UNFCCC).

The report also includes scenario testing on the UK's projected emissions to 2035, with business as usual, all current measures and all current and planned measure scenarios. It demonstrates that the government's current measures have the potential to reduce baseline emissions by approximately 20% over the current measures in place, with a further 10% reduction through implementation of planned measures.

Decarbonising Transport: Setting the Challenge

In March 2020, the UK Department for Transport released 'Decarbonising Transport: Setting the Challenge'[92], a report that set the direction for the development of policy and guidance to support the decarbonisation of the transport sector.

The document set out:

- how the Government intends to work with others to develop a transport decarbonisation plan;
- the challenge to meet to reduce transport emissions and ensuring we reach net zero transport emissions by 2050;
- reviews of existing climate policy in transport;
- reviews of existing forecasts of future transport emissions from each mode of transport, plus as a whole.

The transport decarbonisation plan will be published in later in 2020 and will have implications for transport planning across England.

UK Budget 2020

The most recent full UK HM Treasury Budget for this commission, given in March 2020[93], had implications for both housing and energy markets, demonstrating increasing investment in low carbon development. It highlights investment potential and funding opportunities to pursue climate change ambitions. The Budget included:

[91]Department for Business, Energy & Industrial Strategy (2019) The UK's Draft Integrated National Energy and Climate Plan (NECP), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/774235/national_energy_and_climate_plan.pdf , accessed 13/08/20

[92] Department for Transport (2020) Decarbonising Transport: setting the Challenge, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878642/decarbonising-transport-setting-the-challenge.pdf, accessed 13/08/20

[93] UK Government (2020) Budget 2020, https://www.gov.uk/government/publications/budget-2020-documents/budget-2020, accessed 13/08/20

- Merseyside was identified as a potential location for one of two future carbon capture and storage (CCS) clusters to be brought forward. Although the exact location is yet to be decided, it is understood the Ellesmere Port area is a potential site,
- Climate Change Levy rates have been frozen for electricity but increased for gas.
- The Domestic Renewable Heat Initiative (RHI), an initiative that reimburses households for converting to renewable energy sources, has been extended to March 2022. No extensions are proposed for Non-Domestic properties,
- A final £96m will be invested in the Heat Networks Investment Project, ending in March 2022. After this, the government will invest a further £270m into a new Green Heat Networks Scheme for new and existing heat networks to become more carbon friendly,
- The government will invest £500m to grow the UKs rapid charging network for electric vehicles. This will primarily be directed towards businesses to cover the cost of installing charging points on their premises,
- A Brownfield Housing Fund of £400m for pro-development councils looking to meet their housing requirements on brownfield land. The government will be inviting bids that are ambitious and represent a significant increase in housing supply on brownfield land,
- A Single Housing Infrastructure Fund will be launched to unlock new homes in areas of high demand across the country by funding the provision of strategic infrastructure and assembling land for development,
- An additional £10m to support the design and delivery of net zero policies and programmes.

Energy White Paper

A new Energy White Paper was expected to be published prior to the announcement that the UK was one of the first major economies in the world to pass laws to bring all greenhouse gas emissions to net zero by 2050[94]. The paper has been postponed a number of times and was anticipated for release in 2020. The Paper, when published, is expected to set out the pathway to net zero and the technologies that will receive financial support. The Local Plan and its policies will be required to take account of the Energy White Paper and the implications may be reflected in the nature of energy developments put forward on the Wirral.

National Guidance

UK Committee on Climate Change

In May 2019, the UK Committee on Climate Change (CCC) released its report on 'Net Zero – The UK's contribution to stopping global warming'[95], in response to a request from the Governments

[94] UK Government (2019) UK becomes first major economy to pass net zero emissions law, https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law, accessed 13/08/20
[95] Committee on Climate Change (2019) Net Zero- The UK's contribution to stopping global warming, https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/, accessed 13/08/20

of the UK, Wales and Scotland, asking the Committee to reassess the UK's long-term emissions targets. Its key findings/recommendations were:

- A new emissions target should be set for the UK of net-zero greenhouse gases by 2050[96] and that this target would deliver on the UK commitment to the Paris Agreement.
- A net zero by 2050 target is achievable utilising known technologies, in combination with improvements in people's lives.
- Current policy is insufficient and 'clear stable and well-designed policy', designed to reduce emissions, is implemented rapidly and across the whole economy.

The UK CCC Net Zero report also advised that that by 2030, current plans would at best deliver around half of the required reduction in emissions, and the Committee stated that this will require "stronger new build standards for energy efficiency and low carbon heat". To achieve this, it advised the Government should be looking towards bringing forward tighter legislation, policy and guidance to steer this process.

National Planning Practice Guidance

National Planning Practice Guidance (NPPG) provides additional guidance to support the understanding and implementation of the National Planning Policy Framework (NPPF). The Climate Change guidance[97] provides advice on how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change.

It states that planning has an important role in reducing the emissions of Greenhouse Gases through effective spatial planning, by setting out aims, policies and impacting on the location, mix and design of development to increase resilience.

To be found sound, Local Plans will need to reflect one of the NPPFs core aims which is to address climate change. This includes requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change, in line with the provisions of the Climate Change Act 2008.

The guidance explains that there are many opportunities to integrate climate change mitigation and adaptation objectives into the Local Plan, and that the Sustainability Appraisal (SA) can be used to help shape appropriate strategies.

The NPPG provides examples of how Local Plans can mitigate climate change by promoting a reduction in emissions:

- Reducing the need to travel and providing for sustainable transport;
- Providing opportunities for renewable and low carbon energy technologies e.g. through district heating networks that include tri-generation (combined cooling, heating and power);
- Providing opportunities for decentralised energy and heating e.g. maximising summer cooling through natural ventilation in buildings;
- Promoting low carbon design approaches to reduce energy consumption in buildings, such as passive solar design; and

[96] In Scotland, the recommendation was made for a target net-zero date of 2045, reflecting Scotland's greater relative capacity to remove emissions than the UK as a whole. In Wales, the recommendation was made for a 95% reduction in greenhouse gases by 2050.

[97] UK Government (2019) Climate Change, https://www.gov.uk/guidance/climate-change, accessed 13/08/20

- The provision of multi-functional green infrastructure.

In addition, it provides examples for adaptation to climate change:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime;
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development;
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality; and
- Promoting adaptation approaches in design policies for developments and the public realm.

The guidance expresses that collaboration with climate change partners is important during this process and identifies the following as key partners to consider utility providers, communities, health authorities, regulators and energy planners, statutory environmental bodies, Local Nature Partnerships, Local Resilience Forums and climate change partners.

The NPPG promotes the identification of climate risks as a basis for understanding how the planning system can have a positive impact for a local area. For example, risk assessments could consider implications for the built environment and development, infrastructure, services and biodiversity, and implications for vulnerable groups and community cohesion.

With regard to retrofitting, the NPPG states that it is important that where energy efficiency improvements require planning permission, local authorities should ensure that any advice to developers is co-ordinated to ensure consistency on energy, design and heritage matters. With regards to new housing, planning authorities will need to take account of government decisions on the Housing Standards Review when considering a local requirement relating to new homes.

The NPPG outlines that in their development plan policies, local planning authorities:

- Can set energy performance standards for new housing or the adaptation of buildings to provide dwellings, that are higher than the building regulations, but only up to the equivalent of Level 4 of the Code for Sustainable Homes.
- Are not restricted or limited in setting energy performance standards above the building regulations for non-housing developments.

Viability guidance is also given within the National Planning Practice Guidance (NPPG). It states that Section 106 and Community Infrastructure Levy contributions can be used to fund climate change mitigation measures such as green infrastructure and renewable energy developments. It outlines that expected contributions should be realistic, and properly evidenced, to increase developer certainty.

Housing Standards Review

The Housing Standards Review[98] was intended to consolidate the numerous standards, regulations and guidance surrounding housing development. Crucially, one outcome of the review was that the Code for Sustainable Homes could no longer be required within planning condition and instead was replaced by Building Regulations. As a result, Building Regulations Part L energy

[98] UK Government (2015) Housing standards review: technical consultation, https://www.gov.uk/government/consultations/housing-standards-review-technical-consultation, accessed 13/08/20

requirements were then set equivalent to the CSH level 4 (equivalent to a 19% improvement on the dwelling emission rate over previous regulations). This 19% improvement is now commonly seen in recent Local Plans, including those considered in this Study's review of Local Authority policies (set out in Appendix 4).

As the MHCLG notes in the 2020 Future Homes Standards consultation (see earlier section on Future Homes Standard Consultation (2019-2020) for detail), Local Authorities continue to have the ability to set their own energy performance standards beyond the 19% improvement (Part L) in their approved Local Plans. This is because the amendment to the Deregulation Act 2015 has not yet been implemented, which would withdraw this ability from local authorities.

Regional Context

Climate targets

Many UK regional governments are setting ambitious carbon reduction targets, including the Liverpool City Region, which has set a target of zero carbon by 2040 and declared a Climate Emergency in June 2019[99]. As part of its commitment the Liverpool City Region Combined Authority is tackling climate change in a variety of ways[100] including:

- The Mersey Tidal Commission[101],
- A £10m Green Investment Fund,
- £460m investment in new, state-of-the-art trains for Merseyrail network - improving and futureproofing green public transport,
- The cleanest bus fleet outside of London – with 7 out of 10 vehicles already low emission and 25 zero emission hydrogen buses arriving next year,
- Establishment of a Clean Air Taskforce,
- A "Brownfield First" approach to development,
- Investment into the first phase of a £16 million 600km cycling and walking network.

Liverpool City Region Renewables Energy Capacity Study 2009

The Renewable Energy Capacity Study (RES)[102] was commissioned to establish the extent to which each of the local authorities that make up the study area could meet the minimum requirements set in the (now revoked) North West Regional Spatial Strategy (RSS) for renewable energy generation. The study area encompassed the following Local Authorities: Liverpool, Wirral, Sefton, Knowsley, St Helens, Halton, Warrington and West Lancashire.

[99] Liverpool City Region (2020) Energy and Environment, https://www.liverpoolcityregion-ca.gov.uk/what-we-do/energy-environment/, accessed 13/08/20
[100] Liverpool City Region (2019) Environment- General News, https://www.liverpoolcityregion-ca.gov.uk/combined-authority-sets-ambitious-targets-to-tackle-climate-emergency/, accessed 13/08/20
[101] The Mersey Tidal Commission will oversee the consideration of the business case for a tidal range energy scheme in the Mersey and Liverpool Bay. Further information is available at: https://www.liverpoolcityregion-ca.gov.uk/metro-mayor-liverpool-city-region-could-become-world-leader-in-tidal-power/, accessed 06/10/20
[102] Arup (2009) Renewable Energy Capacity Study Liverpool City Region, http://www.knowsley.gov.uk/pdf/LC01_LiverpoolCityRegionRenewableEnergyCapacityStudy(Stage%201).pdf, accessed 13/08/20

The study concluded that the authorities in the study area have the necessary capacity to meet, and potentially exceed, the refined renewable energy targets set by the RSS, on a purely technological basis.

Wind resources in Wirral were considered to have the capacity to far exceed the targets for the whole of the Merseyside sub-region, in both onshore and building integrated wind (i.e. very good wind resource even in urbanised areas). However, despite having good wind resource, the report acknowledged that local planning could limit this potential, especially in relation to environmental considerations such as impacts on conservation areas and landscape character assessments.

Wirral was assessed as being able to make a moderate contribution to the RSS in solar photovoltaic (PV) delivery, however solar PV at the time carried higher costs of delivery which were seen to be a barrier to implementation.

Several renewable energy options were developed for the Merseyside sub-region. Wirral was identified as having wind speeds deemed commercially attractive by the British Wind Energy Association, with the potential to site small clusters of large-scale wind turbines. If this is deemed unsuitable, another option was to develop single wind turbines over several sites.

In all authorities, district heating via biomass Combined Heat and Power (CHP) was identified as being able to meet and potentially exceed the targets in each authority, subject to the identification of a localised network of intensive heat users.

The study concluded with numerous recommendations to exploit the study area's renewable energy potential. Among these, it notes that planning has a role in assisting renewable energy delivery through suitable guidance and reasonable policy. A full list of recommendations is available within the document.

Liverpool City Region Renewables Energy Capacity Study Stage Two Report 2011

The Renewable Energy Capacity Study Stage Two Report[103] was commissioned to provide more detailed spatial evidence for each authority of the previous study area. It identified priority zones for the delivery of low and zero carbon energy technology, and broad areas which have potentially the least constraints for wind energy development in particular.

It was suggested that within Wirral, the local valued landscapes and environmental designations could be an obstacle to onshore wind energy development and no areas of least constraint were identified across Wirral.

Wirral Waters was the one priority zone on the Wirral identified as being suitable to support District Heating Biomass CHP and wind energy in the authority. The report noted that the approximate viable CHP capacity was 3.5 MWe, but this figure was dependent on timing and phasing of the scheme.

The Study's Stage Two Report also provides more detailed spatial evidence for each of the City Region's local planning areas by identifying priority zones for delivery of low and zero carbon energy technologies, and identifying broad areas of potentially least constraint for wind energy development. The report highlights that Wirral Waters as a Combined Heat and Power Priority Zone which has the potential to provide approximately 3.5 MWe. No Priority Zones for areas of least constraint for wind were identified for Wirral.

[103] Arup (2011) Renewable Energy Capacity Study Liverpool City Region Stage, Two Report, http://www.knowsley.gov.uk/pdf/LC02_LiverpoolCityRegionRenewableEnergyCapacityStudy(Stage%202).pdf, accessed 13/08/20

The report contains an appendix of all identified major developments in Wirral that were not recommended for District Heating Priority Zone Status due to a lack of information or certainty around its deliverability.

Liverpool City Region Sustainable Energy Action Plan 2012

The Sustainable Energy Action Plan (SEAP)[104] was prepared in partnership with the six City Region Local Authorities – Wirral, Liverpool, Sefton, St. Helens, Halton and Knowsley – to provide a vision and programme for the City Region to co-ordinate its energy sector ambitions, advance projects and bring greater resilience to its energy networks.

The SEAP developed a baseline to inform decision-making. The key findings from the baseline established in the plan are that in 2005 the City Region consumed over 37,000 GWh of energy. This was made up of 20% electricity, 51% gas, 29% petroleum products, and less than 1% from renewable, waste, coal and manufactured solid fuels.

From this energy consumption a total of 11,500kt CO_2e was emitted. This was made up of 38% electricity, 33% gas, 28% petroleum products and 1% from renewable, waste, coal and manufactured solid fuels.

Between 2005 and 2009 energy consumption across the City Region had reduced by 19% and CO_2e by 16%. For Wirral, the baseline in 2005 demonstrated that domestic gas makes up a high percentage of the energy used within Wirral, and there is also a relatively high amount of energy used by the industry and commercial sector when compared to the other Local Authorities within the City Region with the exception of Liverpool City, making these sectors a key opportunity for intervention (*Figure 4*).

[104] Arup (2012) Liverpool City Region Sustainable Energy Action Plan, https://www.liverpoollep.org/wp-content/uploads/2015/06/wpid-lcr-sustainable-energy-action-plan-07-2012.pdf, accessed 13/08/20

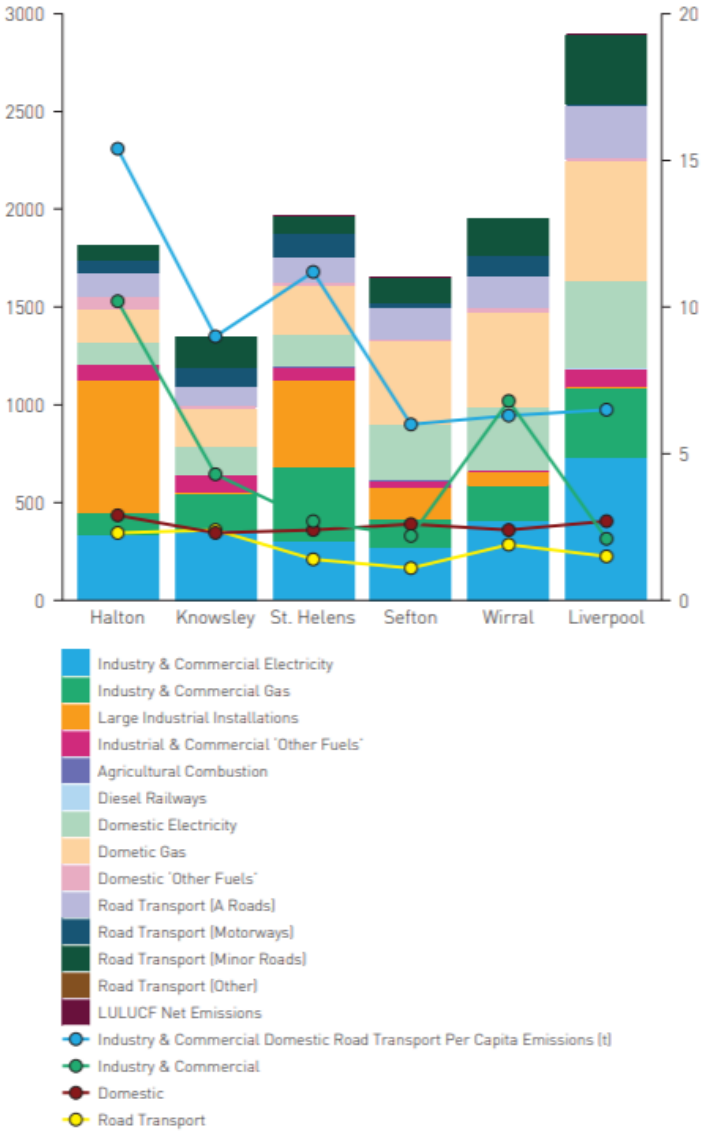


Figure 4: 2005 Department of Energy & Climate Change Estimated CO_2 by sectors & Estimated CO_2 per capita in the City Region (SEAP, 2011)

The report outlines that City Region's Gross Value Added (GVA) per capita remains well below the UK average, as does the average number of businesses per 1,000 population. There is a need for significant growth in the City Region's business base (from 47,471 to 62,164 businesses) in order for it to catch up with the rest of the country. As such, it is important that the region looks to develop opportunities to bring forward development in the region whilst also reducing energy consumption and CO_2 emissions. To achieve this, the Plan sets out that Liverpool City Region will need to achieve an absolute decoupling of CO_2 emissions from economic growth.

To achieve this, the Plan sets out that the Liverpool City Region must ensure that it makes the transition to a knowledge economy by developing a greater balance between industrial, commercial and service sector economic growth and / or through increased productivity by improvements and efficiency of processes and labour skills. The SEAP outlines that emissions targets in Wirral were set to reduce emissions by 60% by 2025 from a baseline year of 2010.

The report notes that there is over 4.4 GW of potential resource capacity identified for renewable and low carbon energy generation within the Region. It states that the City Region has potential resources energy capacity for the following:

- Energy from Biomass: 24 MW;
- Energy from combined heat and power generation: 500MW;
- Energy from Waste Water: 273 MW;
- Energy from Waste: 77 MW;
- Microgeneration: 2,990 MW;
- Wind: 632 MW; and,
- Tidal Project: 700 MW.

The Plan also set out potential for up to 2,000 homes to be fitted with micro-generation technologies as part of a wider retrofitting programme across the City Region. In addition, the Plan set out 8 priority areas identified for district heating with a capital investment value of £200 million.

Local Context

Climate targets

Through support for the Cool2 climate strategy[105] Wirral Borough Council has committed to a borough-wide goal of net zero climate pollution (including carbon) by 2041 at the latest. Crucially the borough-wide goal is focused on keeping within a Paris Agreement compliant local carbon budget. that necessitates rapid decarbonisation. The Council also declared a Climate Emergency on 15th July 2019[106] and is developing a Climate Emergency Action Plan to reduce its own emissions more rapidly still as an expel for others to follow.

Wirral Climate Change Strategy (Cool) (2014-2019)

The Wirral Climate Change Strategy (Cool) (2014-2019)[107] set six aims to mitigate and adapt to climate change across the Borough. Within each of these six aims, the strategy provides guidance on actions for each of the aims it explains the objectives to be met, steps to achieve this, and sources to potentially draw support from.

The six aims are:

1. Make Wirral more energy efficient;
2. Generate and source more local energy needs from renewable sources;

[105] Wirral Council (2019) Cool 2, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/consultation-new-cool-2-climate-change-strategy, accessed 13/08/20
[106] Wirral Council (2019) Climate Emergency, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/climate-change-action, accessed 13/08/20
[107] Wirral Council (2014-2019) Cool Climate Change Strategy 2014-2019, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/cool-climate-change-strategy, accessed 13/08/20

3. Use more sustainable modes of transport, more fuel-efficient vehicles and less polluting means of getting around;
4. Reduce the indirect negative impacts that residents' decisions have for climate pollution in Wirral and elsewhere;
5. Identify risks and vulnerabilities from expected changes and bring forward plans and actions to limit negative impacts and improve resilience; and
6. Build capacity for action by strengthening local networks and partnerships and by developing wider awareness and education initiatives.

In relation to sustainable building design and renewable energy, the 2014-2019 Strategy defines Wirral Council's aim to reduce energy demand and make the borough more energy efficient. This includes:

- Improving building fabric and upgrading heat systems and controls;
- Adopting more energy efficient plant, processes, appliances and lighting;
- Design/adapt buildings to make use of natural light, passive heating and cooling;
- Introduce district heating networks and combined heat and power systems (CHP).

The strategy outlines numerous schemes and bodies that Wirral residents and businesses can seek support from. Potential support includes the Cosy Loan / Cosy Home scheme, Renewable Heating Incentive, and On-Farm Anaerobic Digestion Fund.

The Cool plan underpinned progression across key climate change action aims. This included delivering a slow decline in domestic electricity and gas consumption within Wirral, a push for installation of solar photo voltaic panels across Wirral including a doubling of solar generation capacity between 2017 to 2018 and progression of walking and cycling infrastructure provision including securing a Cycling and Walking to Work Fund. There are areas where progress is still to take place. For example, the 2018 progress report highlights that residual household waste was reported as continuing to increase through the plan period.

The plan period for the Cool Strategy ended in 2019. The total number of new energy efficiency improvements that have been installed in homes during this period was below the anticipated targets set out in the original Plan. The Wirral Climate Change Strategy (Cool) (2014-2019) is replaced by the Cool 2 Strategy.

Cool 2: A strategy for Wirral in the face of the global climate change (2020 onwards)

The Cool 2[108] strategy builds upon the work undertaken in the first strategy, updating it in line with changes in global and national frameworks, considering the lessons learnt from the first strategy, local CO_2 emissions data and new tools to help reduce emissions.

The report sets out the following targets:

- To stay within a local emissions 'budget' of 7.7 million tonnes (Mt) of CO_2 between 2020-2100 and to reach 'net zero' pollution as early as possible before 2041;

[108] Wirral Council (2019) Cool 2, https://www.wirral.gov.uk/about-council/climate-change-and-sustainability/consultation-new-cool-2-climate-change-strategy, accessed 13/08/20

- To ensure a climate resilient Wirral adapted to cope with existing change and further unavoidable disruption this Century;
- Complete a switch to fossil fuel free local travel by around 2030.

The Strategy provides a review of the current local context for emissions within the Wirral. The largest source of CO_2 emissions in the Wirral is from homes (42.5%), the second largest is from industrial and commercial activities (31.2%) and the third largest is transport (26.3%).

It states that in Wirral CO_2 emissions have fallen across all sources between 2005 and 2016, with an annual average reduction of 3.8% (*Figure 5*). However, to reach the goals set out in the report, there needs to be an average reduction of CO_2 emissions by 13.4% each year.

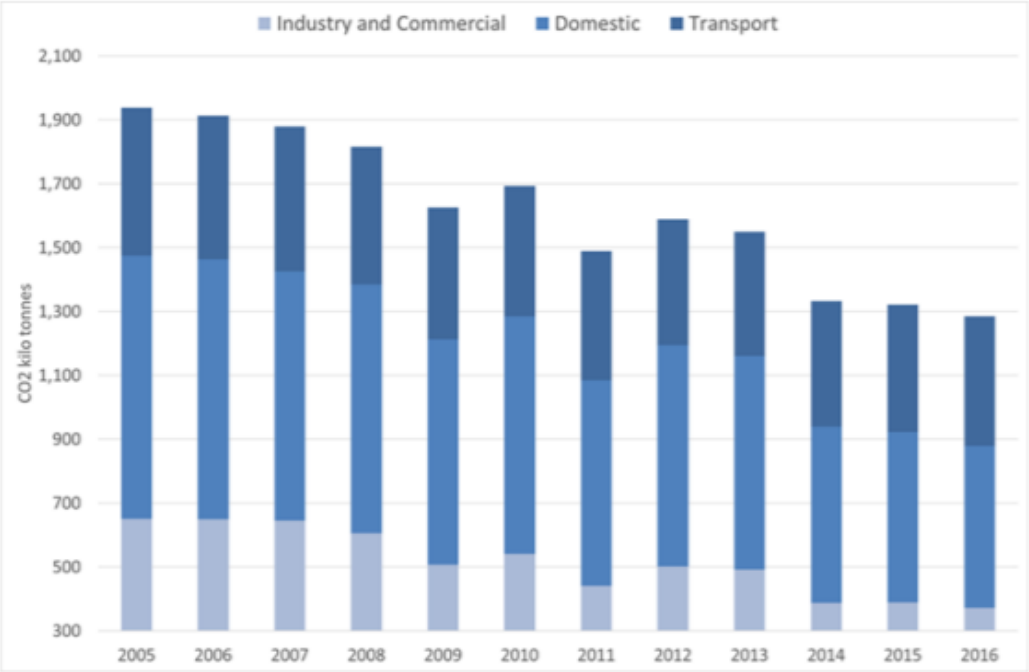


Figure 5: a graph showing Wirral CO_2 emissions between 2005-2016 (Cool 2)

Therefore, to achieve this goal the strategy sets out the following key targets:

- Leaner use of energy: To reduce the overall demand for energy in Wirral across residential, commercial and industrial sectors by ensuring all homes currently below Energy Performance Certificate (EPC) Band C that can be upgraded are improved to this level or better by around 2030. (It also sets out the following key target: At least 100,000 homes need upgrading to be more energy efficient over the next 10 years. This is generally considered to be above Band C EPC rating.)
- Clean energy: To generate and/or source all our local energy needs from zero carbon and renewable sources by around 2041.
- Clean Travel: A complete transition to fossil fuel free local travel by around 2030.

- Wiser decisions: To use resources – materials, land and food - in a sustainable way so that our collective decisions do not add indirectly to the burden of climate damaging pollution in Wirral or elsewhere – cutting waste, changing land uses and our diets.
- Storing more carbon: To capture more carbon naturally by increasing woodland cover in line with national recommendations and by protecting soils and natural habitats.

This commission, to embed climate change and renewable energy into the Local Plan will support progress on Leaner use of energy, Clean energy and Clean travel in particular.

Wirral Unitary Development Plan (UDP) 2000

In regard to Local Planning, Wirral's current adopted plan is the Wirral Borough Council Unitary Development Plan (UDP)[109], which was adopted in 2000. There is no specific reference to climate change within the UPD. In relation to Renewable Energy Policy REN1states that '*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'.*

Other polices and designations relevant to the findings of this report include Policy NCO1 – Principles for Nature Conservation and Policy LAN1 – Principles for Landscape. These policies specify that development that will adversely affect conservation sites will not be allowed in the borough, and all development must have regard to the visual impact upon the landscape. Proposals will not be permitted where their visual impact would be considered inappropriate.

Of particular relevance to Wirral is the Green Belt. Just under half (45%) of the land area of Wirral is currently designated as Green Belt within the UDP, which is afforded protection under both the NPPF and previous UDP Policy GB2 - Guidelines for Development in the Green Belt. While the Clean Energy Opportunities Study has considered how Green Belt land release can contribute to Wirral's zero carbon ambitions, Green Belt release for the provision of renewable energies would only be considered in very special circumstances.

Wirral Local Plan 2020 - 2035 Issues and Options

Wirral Borough Council has published and consulted upon the Regulation 18 Local Plan document[110]. The Local Plan identifies the climate emergency as a key challenge to Wirral Borough Council's Spatial Vision and recognises the opportunities for Wirral to take positive climate action as a result. Possible actions include electric vehicle charging provision, energy efficient practices and combined heat and power in new development.

The Local Plan seeks to position Wirral in the best place to tackle future changes and challenges of climate change via strategic development location choices and design standards.

As part of the Council's commitment to action on climate change, the Local Plan embeds climate change mitigation and adaption into the vision and objectives as set out in the Spatial Vision and Strategic Objectives, in particular including:

[109] Wirral Council (2002) Unitary Development Plan, https://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/local-plans/unitary-development-plan accessed 02/10/2020
[110] Wirral Council (2019) Wirral local Plan 2020-2035 Issues and Options, https://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/wirrals-new-local-plan/new-local-plan, accessed 13/08/20

Strategic Objective 1:

"To support sustainable approaches to the location, design, construction, operation and impact of new development.

- *To position Wirral to face the future changes and challenges of Climate Change via strategic development location choices and design standards.*
- *To reduce carbon emissions in line with national and local targets.";* and,

Strategic Objective 4:

"Ensure the responsible use of land and natural resources to mitigate and adapt to Climate Change and promote the transition to a low carbon Borough.

- *To ensure sustainable resource use by reducing waste, increasing recycling and safeguarding potential minerals reserves.*
- *To promote appropriate renewable energy and green technologies.*

The issue of housing and its implications for Wirral has also been a key issue tackled within the Local Plan and will be a key challenge in balancing viability with action on climate change in delivering policy. The regeneration of Birkenhead, particularly the 'Wirral Waters' area (identified as a priority zone in the RES study), is expected to contribute significantly to the Local Plan's housing requirements. The Council's preferred option is one of Urban Intensification. This would concentrate new development within the existing urban area, avoiding Green Belt development.

The Local Plan evidence base includes a Green Belt Review that identifies parcels of land for their contribution to the five purposes of the Green Belt. Almost all greenfield land within Wirral lies within the Green Belt, which will form an important consideration in developing policy. The Council is also seeking to locate future employment needs in the eastern portion of Wirral, which could present opportunity to maximise sustainable modes of transport and energy efficiency measures. The Local Plan also notes in paragraph 5.18 that there is an opportunity for the Local Plan to require higher standards than those specified within the Building Regulations, as allowed within the Planning and Energy Act 2008.

In relation to sustainable building design, in order to meet housing needs across the Borough, strong emphasis has been placed on the re-use of the quantum of empty homes. This provides significant opportunity to improve energy efficiency in currently vacant homes.

The emerging Local Plan also discusses the opportunity to 'opt in' to require new properties to be provided at a higher standard under the Building Regulations, where there is clear evidence of local need and where it can be shown to be viable.

At the time of writing, the Wirral Local Plan and its Issues and Options document has been drafted and has undergone consultation. The Council are currently in the process of addressing comments from the consultation and drafting the regulation 19 Local Plan document for publication in due course. Therefore, detail may be subject to change to respond to feedback and/or meet local requirements.

Wirral Council Tree, Hedgerow and Woodland Strategy 2020-2030

One early step identified in the Cool 2 strategy is the production of a tree strategy. The Wirral Council Tree, Hedgerow and Woodland Strategy[111] was produced in collaboration with The Tree Council, and local organisations under the umbrella group of Wirral Initiative on Trees (WiT). It provides overarching strategic guidance for trees up to 2030 in Wirral.

The Strategy provides context and justification for the strategy, the benefits of trees for community health and wellbeing, and their role in Wirral's Climate Emergency Action Plan are discussed.

The vision for trees in Wirral is as follows:

'In the ten-year span of this strategy over 210,000 trees will be planted, at least 21,000 per year. In doing so we will replace many times over the number of trees unavoidably lost with the caveat of the unknown quantity of trees which may be lost to ash dieback. The trees that are planted will see Wirral's tree canopy cover doubled by the time they are fully grown. We will adopt the principle of "the right tree for the right place" in order to ensure the most resilient tree population possible. We will establish a clear picture of Wirral's tree stock and its benefits. We will work constructively with individuals and groups to deliver this vision.'

This will be achieved by committing to the following outcomes:

- Safe management of the trees and woodlands owned or under management by the Council.
- Raising tree cover in Wirral by a minimum of 10% by 2030, doubling Wirral's tree canopy cover by the time the trees are fully grown.
- Futureproofing tree stock and ensuring it is resilient to climate change and other challenges.
- Identifying key areas for tree planting in Wirral to boost carbon sequestration and other ecosystem services.
- Working with local, regional and national stakeholders to share best practice and knowledge around trees, woodlands and hedgerows.

Stakeholder engagement is needed at all levels to realise this Strategy. Stakeholder groups include residents and communities, third sector organisations such as WiT or Mersey Forest and within the Council itself. Wirral Council have proposed an annual review of this strategy with stakeholders to ensure outcomes are being progressed.

As part of the outcome of this Strategy, Wirral Council will develop a risk management programme, detailing how Wirral will risk assess trees and undertake any works required.

Wirral Council have a commitment to community engagement. This includes establishing a robust partnership and community engagement programme to put the strategy into practice and establishing a working partnership with private, community and charitable owners of land, businesses and local developers in the management of trees, hedgerows and woodlands, contributing to an increased canopy/tree cover across Wirral and the establishment of new copses and hedgerows. Some of the funding sources used to pay for the planting strategy include capital

[111] Wirral Council (2020) Tree, Hedgerow and Woodland Strategy, 2020-2030, https://democracy.wirral.gov.uk/documents/s50068869/Wirral%20Tree%20Strategy%20Final%20May%202020%20Appendix%201.pdf, accessed 13/08/20

bids, partnership bids with private businesses and bidding for central government funding opportunities Key existing policy in relation to trees and development is the Wirral Council UDP Policy GR7. In assessing the protection to be given to trees on development sites, Wirral Council will consider the general health, structure, size and life expectancy, visual value and value for nature conservation. Buildings, structures and hard surface areas are required to be sited in order to:

- substantially preserve the wooded character of the site or of the surrounding area;
- provide for the protection of trees of greatest visual or wildlife value and other vigorous healthy trees;
- ensure that trees to be retained have adequate space in order to prevent damage to their canopy or root structures during construction and to allow for the future growth of canopy and roots to normal mature sizes;
- prevent the removal of trees by occupiers of the development to obtain reasonable sunlight to habitable rooms, secure an open unshaded garden area, or to remove perceived dangers to life and property;
- protect trees on adjacent land which may be affected by the development proposed.

Where development involving the loss of trees is to be permitted, the Local Planning Authority will, as a condition of planning consent, require replacement trees to be planted elsewhere on the site where this is required in order to protect or preserve local amenity.

Planning conditions will include provision for the future maintenance of newly planted stock, including the replacement of failures, until the newly planted stock is established and capable of normal unaided growth; and during the construction period, measures related to the protection of trees to be retained.

Work to trees, including felling, removal, thinning and crown lifting should be completed prior to construction commencing in accordance with a scheme of work agreed in advance with the Local Planning Authority.

Appendix 2

Best Practice Standards and Guidance

A2 Best Practice Standards and Guidance

Centre for Sustainable Energy (CSE)

The Centre for Sustainable Energy (CSE) has a number of resources available to guide and provide evidence to local authorities on delivering measures to address climate change.

Local Sustainable Energy Assessment Matrix

A Local Sustainable Energy Assessment Matrix[112] has been produced by CSE. This gives guidance to local authorities as to how to assess their area's current performance on sustainable energy delivery, and therefore identifies opportunities for improvement.

Tackling fuel poverty and cutting carbon emissions

In a report titled 'Tackling fuel poverty, reducing carbon emissions and keeping household bills down: tensions and synergies'[113], four high level principles are explained to aid policy-making in tackling fuel poverty and cutting carbon emissions:

- 'choose the sweet spot' of policies that can tackle both fuel poverty and carbon emissions – This will require more routine assessments of both fuel poverty and carbon emission causes and impacts to find possible overlaps to target. This principle would target the energy performance of homes, particularly through better insulation, and encourage better targeting of energy subsidies.
- ensure that short-term plans lay the foundations to build up to longer-term targets – An example would be to 'leapfrog' Energy Performance Certificate upgrades. This would save the considerable cost of returning to a property to retrofit performance upgrades to meet future targets that are already currently known, revealing the benefit of making investments sooner rather than later.
- clarify policy choices, to be clear who will pay for these policies, who is to gain, and why these decisions have been made – Policies generally garner more public support if they demonstrate fairness and effectiveness, supporting those in need without generating costs for those who can't afford them or have no responsibility to pay.
- regularly reviewing the implemented policies against a set of carbon emission and fuel poverty indicators, to increase the effectiveness of said policies.

District heat networks

Produced by the Department of Energy & Climate Change (now a part of BEIS), a report titled 'Research into barriers to deployment of district heating networks'[114] also noted the difficulty in expanding both local authority and developer led district heating networks in the future. The report

[112] Centre for Sustainable Energy (2017) Local Sustainable Energy Assessment Matrix https://www.cse.org.uk/downloads/toolkits/policy/community-energy/planning/local-sustainable-energy-assessment-matrix.pdf, accessed 13/08/20
[113] Centre for Sustainable Energy (2018) Tackling fuel poverty, reducing carbon emissions and keeping household bills down: tensions and synergies. https://www.cse.org.uk/downloads/reports-and-publications/fuel-poverty/policy/insulation-and-heating/policy-tensions-and-synergies-CFP-mainreport-may-2018.pdf, accessed 13/08/20
[114] Department of Energy & Climate Change (2013) Research into barriers to deployment of district heating networks. https://www.cse.org.uk/downloads/reports-and-publications/policy/community-energy/insulation-and-heating/planning/renewables/research-into-barriers-to-deployment-of-district-heating-networks.pdf, accessed 13/08/20

notes local authorities' unique position in being able to combine local knowledge, organisation and their key functions as service providers to enable district heating networks.

For local authorities, a lack of resources was cited as the primary barrier to expanding heat networks, both financial and human, in the form of staff resourcing, legal advice and procurement. Other barriers include a lack of knowledge in district heating, and difficulty in gathering all necessary stakeholders from the outset.

Both local authorities and developers cited a lack of qualified consultants, ensuring transparency in heat pricing and a lack of generally accepted contractual arrangements as key issues. In addition, incentives to provide waste-to-energy plants were considered insufficient.

Neighbourhood Plans

The CSE has relevant guidance for communities on producing a Neighbourhood Plan in a climate emergency[115]. It stresses the importance of both community and local planning authority engagement, and consensus building within the neighbourhood to create a successful plan. This is aided by several suggestions to promote greater engagement within the community and with the local planning authority.

The report then breaks down six topic areas of:

- Renewable Energy
- Sustainable Buildings
- Sustainable Transport
- Flooding, Extreme Weather and Water Conservation
- Green Infrastructure and Biodiversity
- Transitioning to a Low Carbon Economy, and Service Provision

Within each of these topic areas, best practice policies from Neighbourhood Plans around the country are given, as well as other actions and community projects that can be implemented to further realise each of the six topics.

The report closes by discussing next steps following successful adoption of the Neighbourhood Plan, and ensuring it is implemented properly. Other localism powers are described, such as Community Infrastructure Levy's, Neighbourhood Development Orders or Community Right to Build Orders.

Energy Hierarchy

The Energy Hierarchy is a hierarchy of preferred energy options from most favourable to least, to be considered when proposing new development. It broadly follows the below structure:

1. Reduce initial overall energy demand;
2. Implement energy efficiency measures for unavoidable energy demand;
3. Meet energy demand through renewable energy sources;
4. Meet energy demand through low carbon emitting sources;
5. Meet energy demand through traditional fossil fuels.

[115] Centre for Sustainable Energy (2018) Neighbourhood Planning in a climate emergency. https://www.cse.org.uk/downloads/reports-and-publications/policy/planning/renewables/neighbourhood-planning-in-a-climate-emergency-feb-2020.pdf, accessed 13/08/20

Its use in Local Development Plan documents was popularised in the 2011 London Plan[116] as only three steps, but was later amended to include steps four and five. It's use in planning policy is increasingly being seen, with the steps providing a guide to planning applications and their consideration.

Royal Town Planning Institute (RTPI)

Guidance on Planning for Climate Change

The RTPI report 'Rising to the Climate Crisis A Guide for Local Authorities on Planning for Climate Change'[117] provides guidance for local authority evidence gathering for local plans.

Recommendations include joint working across neighbouring local authorities to produce more robust and cost-effective evidence bases. The report suggests local authorities first establish their baseline position, in both carbon emissions and through supply and demand for sustainable energy mapping exercises. Local communities should be engaged in this process from the very start. It is recommended that local communities assist local authorities in assessing their area for renewable and decentralised energy opportunities.

In determining planning applications and policy decisions, the report offers the following recommendations:

- Policy targets for use of renewable and low carbon energy should be based on strong evidence base and linked to the wider target of cutting carbon emissions.
- Local authorities should ensure that local building standards have robust justification and do not duplicate Building Regulations.
- Consider the stages and timing of implementation, so as to not impede developments in the short term. Recognise that feasibility for higher building standards differs from project to project.
- Focus on the long-term goals, as BRE schemes are updated regularly to reflect increasing standards, local authorities should consider setting standards aligned to annual targets.
- Consider how rapid and large-scale electric vehicle deployment will impact the plan period.
- Engage constructively with developers to deliver sustainable buildings and local environments that enable low-carbon living.
- Where applicable, place greater weight on climate mitigation in determining planning applications. This includes placing greater weight on the contribution of renewable energy schemes to wider environmental, social and economic goals.
- The report echoes the NPPF guidance in recognising that some renewable energy projects will impact on the openness of the Green Belt, and what special circumstances would be appropriate to consider.

The report recommends adopting established assessment frameworks such as those discussed below, produced by the BRE group.

[116] London Plan (2011) The London Plan https://web.archive.org/web/20130312053344/http://www.london.gov.uk/sites/default/files/LP2011%20Chapter%205.pdf, accessed 13/08/20
[117] Royal Town Planning Institute (2019) Rising to the Climate Crisis. https://www.rtpi.org.uk/media/3568/rising-to-the-climate-crisis-1.pdf, accessed 13/08/20

Planning for A Smart Energy Future (2019)

This report[118] was produced for planning policy and decision makers to create future planning policy that can 'catch up' to the clean growth opportunities offered by smart energy.

The report's key findings and recommendations were:

- Given the longevity of development, nothing should be planned without having successfully demonstrated it is fit to take its place in a net-zero emissions future. This is to save costly retrofitting down the line;
- Planning will require more top-down leadership from both local and national actors to break out of the 'business as usual' mould and deliver transformational change. Collaboration is essential between all actors involved in new development, including local authorities, councillors, developers and communities;
- Local authorities must improve access to resources and training to properly keep up with the pace of existing and emerging energy technologies and whether these meet energy standards set in policy;
- Local Enterprise Partnerships (LEPs) can work with local authorities, and in collaboration with the Ministry of Housing, Communities and Local Government (MHCLG) and the Department for Business, Energy Innovation and Skills (BEIS) to more closely align spatial goals and achieve these by seeking available funding.

For planners, this means that smart energy should be central and inseparable from the process, from new homes to employment, transport and infrastructure. Embedding smart energy objectives across a range of local authority functions has proven effective. Businesses, communities and distribution network operators are keen to work with local authorities to unlock evidence and resources, as well as supporting innovative business models based on smart technology.

UK Green Building Council (UKGBC)

The UKGBC is a membership organisation formed in 2007 who's aim is to radically transform the way that the built environment in the UK is planned, designed, constructed, maintained and operated, in order to build more sustainable buildings.

The UKGBC publish a range of guidance documents to promote best practice within the industry – their most recent and relevant guidance documents have been summarised below.

Net Zero Carbon Buildings: A Framework Definition (2019)

The framework[119] sets out key definitions to understand what net zero carbon means with regard to construction and operational energy. For construction it states that net zero carbon is "*When the amount of carbon emissions associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy*."

With regard to operational energy, net zero carbon is considered to be "*When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A*

[118] Royal Town Planning Institute (2019) Planning for a Smart Energy Future https://www.rtpi.org.uk/media/1435/planning-for-a-smart-energy-future.pdf, accessed 13/08/20

[119] UK Green Building Council (2019) Net Zero Carbon Buildings: A Framework Definition. https://www.ukgbc.org/wp-content/uploads/2019/04/Net-Zero-Carbon-Buildings-A-framework-definition.pdf, accessed 13/08/20

net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."

Recommended steps to take to try to achieve these points are set out in *Figure 6.*

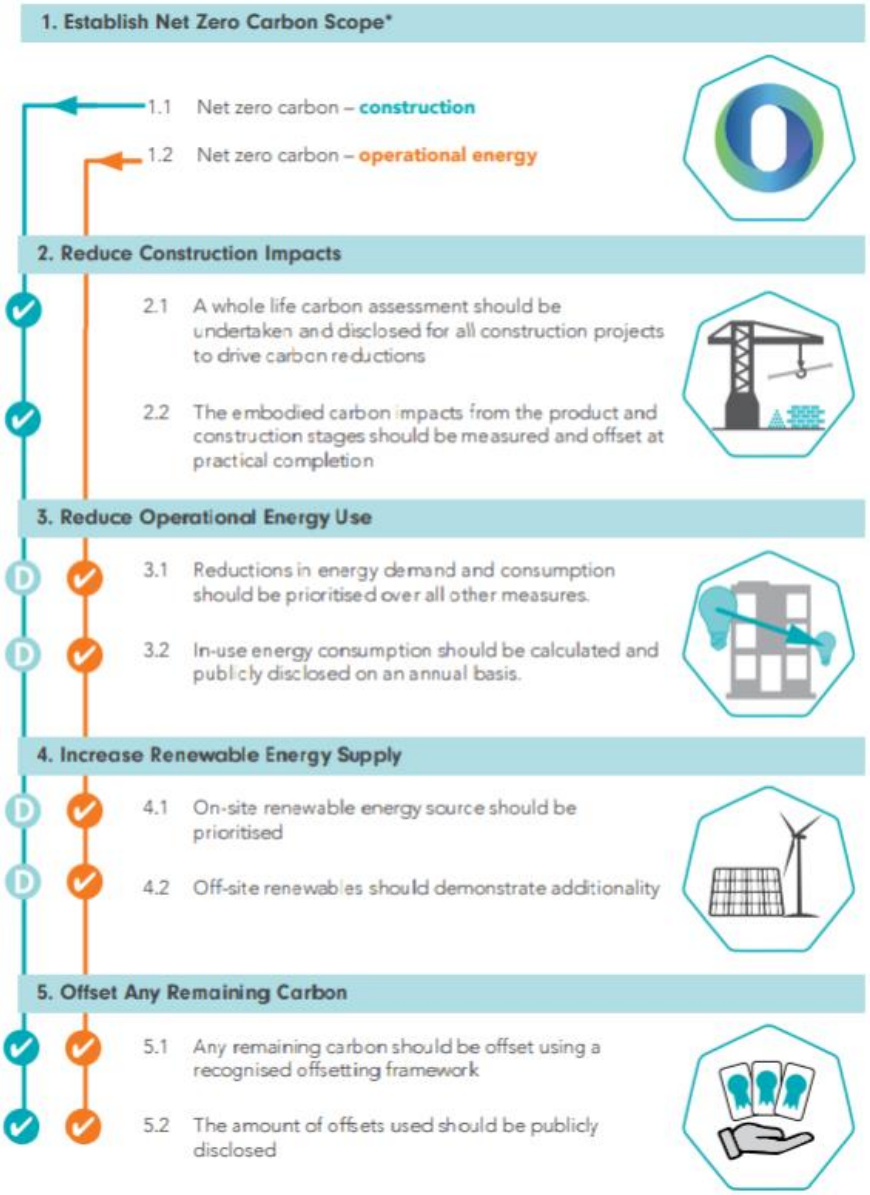


Figure 6: Steps to take to achieve net zero carbon buildings (UK Green Building Council, 2019)

The Policy Playbook: Driving sustainability in new homes – a resource for local authorities (2020)

This research paper[120] provides a pack of information for cities and local authorities to use in driving forward sustainability into new homes policy.

With regard to carbon and energy demand reductions, the report suggests that local planning authorities set a requirement for new homes as follows;

[120] UK Green Building Council (2020) The Policy Playbook: Driving sustainability in new homes - a resource for local authorities VERSION 1.5. https://www.ukgbc.org/wp-content/uploads/2020/03/The-Policy-Playbook-v.1.5-March-2020.pdf, accessed 13/08/20

- A 19% reduction on the Dwelling Emission Rate (DER) against the Target Emission Rate (TER) based on the 2013 Edition of the 2010 Building Regulations (Part L) whilst meeting the TER solely from energy efficiency measures as defined within the SAP calculation model.
- In addition, the requirements for new homes delivered through local authorities' own procurement processes, and homes built on land disposed of by local authorities should at least match this requirement and where possible act as a trailblazer for higher standards.

This is considered to be an economically viable suggestion because a 19% improvement beyond Part L 2013 can be achieved entirely through energy efficiency measures (enhanced insulation, glazing, airtightness and high efficiency heating and hot water heat recovery). For those building to the Part L 2013 notional specification it is possible to achieve a 19% improvement through the use of solar photovoltaics (PV) or other renewables.

With regard to net zero carbon, the report suggests that local planning authorities should set a target of:

- All new homes (and buildings) to be net zero carbon emissions in operation by 2030 at the latest.

It is suggested that this could be achieved by setting requirements for modelling of 'whole life' carbon impacts for new developments and set requirements for monitoring and report of energy performance of major new developments for the first years of operation.

The report highlights the potential requirement to mitigate overheating risk as part of policy requirements. As such, the report recommends that local planning authorities should develop an overheating risk framework which includes mitigation for overheating, making sure new developments should follow the cooling hierarchy, utilise an early screening assessment to be used by developers/ the Local Planning Authority to provide a simple, time-efficient assessment of risk over-heating, and adopt a detailed appraisal system when early screening flags a potential issue.

In relation to assuring performance, the Policy Playbook also suggests that local authorities signal a commitment to introducing a system of in-use testing and reporting. This would require further consultation and a period of transition, but in essence a proportion of homes in a new development would be tested to gather in-use data and provide a performance report on key factors including but not limited to energy performance, indoor air quality and thermal comfort for a set period of time after occupation.

Building Research Establishment (BRE) Group Guidance & Standards

BREEAM & CEEQUAL

The Building Research Establishment Environmental Assessment Method (BREEAM)[121] and Civil Engineering Environmental Quality Assessment and Award Scheme (CEEQUAL)[122] are both technical standard assessment methodologies to promote sustainability in the built environment. They are commonly used as tools to drive best practice in the build environment and increasingly commonly seen as requirements in planning.

[121] Building Research Establishment (2020) BREEAM technical standards. https://www.breeam.com/discover/technical-standards/breeam-in-use/, accessed 13/08/20
[122] Building Research Establishment (2019) CEEQUAL technical manual https://www.ceequal.com/version-6/, accessed 13/08/20

BREEAM has been developed for the assessment of buildings and CEEQUAL for the assessment of civil engineering, infrastructure, landscaping and the public realm. BRE has produced a suite of guidance documents for local authorities to promote these standards within Local Plans[123].

To ensure robust integration into the Local Plan, the Planning Practitioner Guidance report[124] suggests the local authorities must first understand the local area need and the viability of raising efficiency standards. Local authorities should look to neighbouring authorities to define levels that complement neighbouring ambitions.

Other local authority approaches have set different requirements by development type and/or local priority. It may be appropriate to increase requirements through the Local Plan period, as standards generally increase nationally.

Crucially, authorities must ensure that their requirements for BREEAM, HQM and CEEQUAL are clearly outlined in the Local Plan, to prevent a potential challenge if these standards are conditioned in a permission.

Home Quality Mark (HQM)

The HQM[125] is part of the BRE 'family of quality and sustainability standards' (which also includes BREEAM and CEEQUAL) and was developed to help everyone to fully understand the quality, performance and attributes of a new-build home. It is measured out of five stars, with a one-star rating meaning a home meets key baselines beyond minimum standards, while a five-star rating signifies outstanding sustainability standards significantly higher than minimum standards.

HQM focuses on three main aspects of sustainability: living costs; health and wellbeing; and environmental footprint. While it is not currently as widely adopted as BREEAM or CEEQUAL, its use as a 'preferred option' within Local Plans is growing.

Passivhaus Accreditation Framework

Passivhaus[126] is an energy performance standard that has been running since the early 1990s. Its aim is to improve the sustainability of buildings by dramatically reducing the requirements for space heating and cooling, whilst also creating excellent indoor air quality and comfort levels. Passivhaus buildings achieve a minimum 75% reduction in space heating requirements over standard UK new build practice.

A Passivhaus building is defined as: "*a building in which thermal comfort can be achieved solely by post-heating or post-cooling the fresh air flow required for a good indoor air quality, without the need for additional recirculation of air*." – Passivhaus Institute.

The Passivhaus certification is a quality control process that aims to ensure that buildings will perform as designed. It provides performance certification for the following: products/components, designers/ consultant, tradespeople/installers and buildings.

[123] Building Research Establishment (2019) Local Planning Authority Guidance. https://www.breeam.com/engage/research-and-development/consultation-engagement/local-government/, accessed 13/08/20
[124] Building Research Establishment (2019) BREEAM, Home Quality Mark and CEEQUAL Practitioner Guidance for Planning Professionals. https://www.bregroup.com/wp-content/uploads/sites/3/2019/03/1.-BREEAM_Practitioner-Guidance-for-Planning-Professionals_v1-March-2019.pdf, accessed 13/08/20
[125] Home Quality Mark (2018) Technical Manual: England. https://www.homequalitymark.com/wp-content/uploads/2018/09/HQM-ONE-Technical-Manual-England.pdf, accessed 13/08/20
[126] Passivhaus Trust (2019) What is Passivhaus? https://www.passivhaustrust.org.uk/what_is_passivhaus.php#2, accessed 13/08/20

It is stated that to achieve the Passivhaus Standard in the UK, it typically involves design modelling using Passivhaus produced software, very high insulation levels, extremely high performance windows with insulated frames, airtight building fabric, 'thermal bridge free' construction and a mechanical ventilation system with highly efficient heat recovery.

The Passivhaus targets for a European climate are set out in *Table 2*.

Table 2 Performance targets for a European climate (Passivhaus, 2019)

	Targets
Primary energy demand	= or <120kWh/m² per year
Space heating demand	= or <15kWh/m² per year
Space cooling demand	= or <15kWh/m² per year
Specific cooling load	= or <10kW/m²
Airtightness	= or < 0.6 air changes/hr @ n50

EnerPHit is a separate Passivhaus standard focused on retrofitting. It recognises that it is much more difficult to bring existing buildings up to Passivhaus standards, as this has not been considered in the initial design. Therefore, to achieve Passivhaus standard, EnerPHit requirements are slightly relaxed (*Table 3*).

Table 3 EnerPHit Requirements

Outline specification	UK New-Build	New Passivhaus	EnerPHit
Total energy demand for space heating kWh/m2/year	55	<=15	<=25
Building envelope airtightness x building volume/hour	6+	<=0.6	<=1

Energiesprong

Energiesprong is a company with an alternative approach to whole house refurbishment and new build standard. Their aim is to create a net-zero energy home with a lifetime cost that is no more than a building regulation compliant house. The initiative has been introduced from the Netherlands and Energiesprong houses have begun to be built in the UK, including 10 homes from Nottingham City Council's council housing stock[127].

There are three key principles that underpin the approach:

- A focus on performance outcome instead of compliance;
- Principles supported by a long history of best practice rather than just requirements; and

[127] Energiesprong (2018) CCC 2018 Progress Report: UK can learn from Energiesprong whole house retrofit. https://www.energiesprong.uk/newspage/ccc-2018-progress-report-energiesprongc, accessed 13/08/20

- Technologically agnostic. This means that the approach is not concerned with the method or technology used to create net-zero homes, but is only concerned with the performance output.

Specific assurances that are inbuilt into the model include energy performance modelling, solution providers to agree specification, performance gaps addressed through pre-agreed contractual resolution plans, and in use monitoring of space heating energy, hot water use and energy, internal and external temperature, small power consumption and renewables performance.

The initial Energiesprong model is aimed at social landlords, with the higher upfront costs funded by an additional charge made possible due to the guaranteed lower tenant energy bills. By aggregating demand to create scale, costs are driven down which leads to the same level of financial viability as the much lower performing building regulation-compliant option.

A comparison of Building Regulations, Energiesprong and Passivhaus Standards, carried out by Transition Zero[128], demonstrates significant potential energy demand reduction and associated carbon savings potential of pursuing measures that deliver higher than minimum standards (*Figure 7*). It shows a potential 108% improvement on total carbon emissions through implementing Paasivhaus vs Building Regulations Part L.

	Unit of measure	BRUKL	ESUK2	PH
Space heating energy demand	kWh/m²year	43	25	8
ENERGY CONSUMPTION				
Space heating	kWh/m²year	46	12	4
Domestic hot water	kWh/m²year	42	6	6
Pump, fans and electric keep hot	kWh/m²year	1	5	5
Lighting	kWh/m²year	5	5	5
Photovoltaic	kWh/year	-854	-2,563	-2,563
Total energy	kWh/m²year	83	-5	-13
CARBON DIOXIDE EMISSIONS				
Space heating	$kgCO_2/m^2year$	9.95	6.22	4.59
Domestic hot water	$kgCO_2/m^2year$	8.98	3.26	3.01
Pump, fans and electric keep hot	$kgCO_2/m^2year$	0.51	2.76	2.70
Lighting	$kgCO_2/m^2year$	2.74	2.74	2.72
Photovoltaic	$kgCO_2$/year	-443	-1,330	-1,330
Total CO_2	kWh/m²year	16.37	-2.46	-1.38

Figure 7: A comparison of energy consumption and carbon dioxide emissions for Building Regulations Part L, Energiesprong and Passivhaus (Transition Zero)

[128] Transition Zero. Performance requirements: Part L UK vs Energiesprong vs Passivhaus. Available at: http://transition-zero.eu/wp-content/uploads/2017/08/Performance-Requirements.pdf, accessed 14/08/20

Appendix 3

Viability & Measuring Performance

A3 Viability & Measuring Performance

Understanding and addressing viability

Consideration of viability will be undertaken of the Wirral Local Plan as a whole. To inform this, as part of the study, the best practice guidance review considered guidance and case studies to understand how national guidance and other authorities have sought to address viability alongside delivering ambitious policy to address climate change.

The NPPG Viability guidance states that *'Policy requirements, particularly for affordable housing, should be set at a level that takes account of affordable housing and infrastructure needs and allows for the planned types of sites and development to be deliverable, without the need for further viability assessment at the decision making stage.*

It is the responsibility of site promoters to engage in plan making, consider any costs including their own profit expectations and risks, and ensure that proposals for development are policy compliant. Policy compliant means development which fully complies with up to date plan policies. A decision maker can give appropriate weight to emerging policies. The price paid for land is not a relevant justification for failing to accord with relevant policies in the plan. Landowners and site purchasers should consider this when agreeing land transactions.[129] *'*

The Local Authority best practice review highlighted that there is little information available on the viability of reducing carbon emissions within development, and noted that these discussions are typically held on a site-by-site basis with developers.

Case studies (Milton Keynes, Merseyside area & London): Some authorities have commissioned Viability Assessments as part of their evidence bases that consider the viability of the proposed Local Plan policies. These have largely been concerned with affordable housing and developer contributions in the past, but recently the draft London Plan[130] and Milton Keynes Local Plan[131] have included the viability of low-carbon development and setting energy standards.

The BRE Group released a report in 2014 considering the viability of achieving higher BREEAM ratings in non-residential development. The study concluded that while achieving higher BREEAM ratings does incur some additional upfront costs, this is less than 2% and can be paid back within 2-5 years through utility savings[132].

Viability Assessments have been reviewed within the best practice review, including the Viability Assessments of Authorities local to Wirral to provide local context on viability specifically. The findings of this review are limited, Viability Assessments are often focused on affordable housing, housing markets have changed rapidly since the Assessment was conducted or the Local Plan being assessed doesn't include relevant low-carbon policies.

[129] Ministry of Housing, Communities and Local Government (2019) Viability https://www.gov.uk/guidance/viability accessed 14/08/20
[130] Greater London Authority (2017) London Plan Viability Study https://www.london.gov.uk/sites/default/files/london_plan_viability_study_dec_2017.pdf, accessed 14/08/20
[131] Milton Keynes Council (2017) Whole Plan Viability Study 2017 https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/viability accessed 14/08/20
[132] BRE Group (2014) Delivering Sustainable Buildings: Savings and Payback – Breakfast Briefing. https://tools.breeam.com/filelibrary/Presentations/DeliveringSustainableBuildingsSlides.pdf ,Accessed 28/09/20

The Milton Keynes Whole Plan Viability Study[133] explored the impact of Policy SC1 – Sustainable Construction, which requires a 19% carbon reduction/improvement upon the requirements within Building Regulations Approved Document Part L 2013 and financial contributions to the Council's carbon offset fund for development proposals of 11 or more dwellings and non-residential development with a floor space of 1000 sq. m or more.

In regard to this, the Viability Study assumed professional fees for residential development would amount to 10% of build costs. The study considered these fees to be sufficient to cover the costs incurred by Policy SC1. Carbon offset payments were estimated at an average of £500 per dwelling in Milton Keynes. The study concluded that while the costs of meeting the lower carbon emissions can be substantial, in higher value/central areas there was significant buffer to accommodate the Plan policy requirements (including affordable housing, flood defences etc.). In brownfield and lower housing value areas the Plan was considered less viable when taken as a whole.

The Study notes that Policy SC3 - Community Energy Networks and Large Scale Renewable Energy Schemes poses an additional cost to developers. There is a lack of evidence base in published costs of district heating schemes in modern estate housing and so could require further research.

The London Plan Viability Study[134] presented several cost scenarios for meeting residential uplift over Building Regulations (£/unit). These are presented in *Figure 8* below.

LEAN % reduction target	Notional	0%-4.9% (current London performance)	5%-9.9%	10%-14.9%	15%-19.9%
Upper Quartile	£0	£6,300	£8,010	£7,920	£8,560
Median		£5,000	£5,710	**£6500**	£7,870
Lower Quartile		£4,350	£4,130	£5,550	£7,330

Figure 8: Greater London Authority (2017) London Plan Viability Study costs of achieving various energy standards

In regard to the energy efficiency policies, the report states '*these represent modest costs as a proportion of development value and typically have limited impact on overall viability.'*

Housing markets differ nationally, especially between the South East/London and North West of England. Therefore, further investigation into local examples of viability has been undertaken. Two relevant examples within the Merseyside area have been identified.

Halton and St. Helens have considered the viability of low-carbon/renewable development in their Whole Plan Viability Assessments. Both plans are currently undergoing or preparing for examination.

While Halton's Local Plan does not seek standards higher than Building Regulations, the Viability Assessment has cited BRE's research and considers the construction costs of all new non-residential development built to BREEAM Excellent standard to be an increase of approximately 2%. Costs range from just under 1% to 5.5% depending on the scheme, with offices being just under 2%[135].

[133] Milton Keynes Council (2017) Whole Plan Viability Study. https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/viability, accessed 04/10/20
[134] Greater London Authority (2017) London Plan Viability Study https://www.london.gov.uk/sites/default/files/london_plan_viability_study_dec_2017.pdf accessed 14/08/20
[135] Halton Borough Council (2019) Whole Plan Viability Assessments, https://www3.halton.gov.uk/Pages/planning/policyguidance/pdf/evidencebase/viabilitystudy.pdf, accessed 6/10/20

St. Helens Local Plan requires new development within strategic sites to ensure 10% of their energy needs are met through decentralised energy systems using renewable and low carbon energy. The Local Plan Economic Viability Assessment assesses the cost of meeting this 10% target. The analysis of three brownfield housing site allocations with no affordable provision has shown that this 10% target can be met, however if education and other S106 contributions are required it is considered that this target may not be achievable. Half of all greenfield sites assessed could meet both the 30% onsite affordable housing provision target and 10% renewable energy target, but again it is considered that this may not be achievable if education and S106 contributions are required[136].

Measuring performance through indicators

As part of considering best practice, the study also explored the use of indicators against which to measure progress in meeting policies. The Annual Monitoring Reports (AMR) of Local Authorities' considered as part of the Best Practice Review were reviewed for energy/carbon emissions monitoring. The majority of AMRs did not include carbon or energy use monitoring; however, two examples of best practice were found in the Milton Keynes[137] and London Plan[138][139].

The review provided guidance for policy specific indicators, which have been developed for each of the proposed policies and set out in each of the Policy Development Papers in Appendix 6. The review also highlighted the importance of an established monitoring framework to measure progress towards Strategic Objectives, including monitoring annual carbon emissions by sector (e.g. commercial buildings; domestic buildings) and fuel type (e.g. electricity and gas) as supporting evidence of progress alongside policy specific indicators to understand how the measures are supporting the Borough's climate change targets[140].

In addition, National guidance stipulates that in schemes that require planning obligations, authorities can charge a monitoring fee through section 106 to cover the cost of monitoring and reporting on delivery of that section 106 obligation.

Case study - Milton Keynes: Local Authority best practice includes Milton Keynes, which has established a Monitoring Framework to measure progress towards each Strategic Objective within the Local Plan in an Annual Monitoring Report (AMR)[141]. This includes monitoring yearly carbon emissions by sector (Industry and Commercial, Domestic and Transport) and fuel type (Electricity, Gas, Other). This data is taken from annual BEIS local authority CO_2 emissions data[142]. As the plan was adopted in 2019, limited information is available on the AMR.

Policy SC1 – Sustainable Construction part K.6 requires developers to *'Put in place a recognised monitoring regime to allow the assessment of energy use, indoor air quality, and overheating risk for 10% of the proposed dwellings for the first five years of their occupancy, and ensure that the*

[136] St Helens Council (2018) Economic Viability Assessment, https://www.sthelens.gov.uk/media/9480/eva-2019-full-doc.pdf, accessed 06/10/20

[137] Milton Keynes Council (2020) Annual Monitoring Report 2019/2020 https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/five-year-housing-land-supply-annual-monitoring-report accessed 14/08/20

[138] Greater London Authority (2019) Energy Monitoring Report 2018 https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/2018-energy-monitoring-report accessed 14/08/20

[139] Greater London Authority (2019) Carbon Offset Funds Report 2019 https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/carbon-offset-funds-report-2019 accessed 14/08/20

[140] Milton Keynes Council (2020) Annual Monitoring Report 2019/2020 https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/five-year-housing-land-supply-annual-monitoring-report accessed 14/08/20

[141] Milton Keynes Council (2020) Annual Monitoring Report 2019/2020 https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/five-year-housing-land-supply-annual-monitoring-report accessed 14/08/20

[142] This information is also available to Wirral Borough Council and has previously been used by the Wirral intelligence service to produce a carbon emissions report for the Borough.

information recovered is provided to the applicable occupiers and the planning authority.' within the submitted Energy Statement. This information then feeds back into the AMR.

Monitoring indicators in the Monitoring Framework for Milton Keynes include:

- Percentage of energy in new developments from renewable sources
- Amount of renewable energy provided from strategic energy developments
- New dwellings achieving CSH level 4
- New developments with a community energy network
- National Indicator 185: CO_2 reduction from Local Authority operations
- National Indicator 186: Per capita reduction in CO_2 emissions in the Local Authority area
- National Indicator 188: Planning to adapt to climate change

The most recent AMR following adoption of the Milton Keynes Local Plan notes that while '*New dwellings achieving Code for Sustainable Homes level 4*' is an indicator of the Borough's carbon reduction performance, there is not currently a mechanism to assess new development for their compliance with CSH level 4 and additionally, the Policy does not mention or require CSH level 4. However, it is possible to measure energy efficiency and carbon reduction measures through other areas of the Policy such as renewable energy contribution and emissions reduction on Part L Building Regulations, which can be attained from the Energy Statement and developer monitoring regime.

The AMR also aims to include carbon offset funding incomings and outgoings data. This will only be made available in December 2020 in an Infrastructure Funding Statement.

Carbon offsetting contribution calculations have been considered in a supporting Sustainable Construction SPD, that also includes guidance on how developments can accord with Policy SC1. This includes multiplying the annual emissions by the estimated building lifetime (typically 30 years). This methodology will be reviewed as part of the Local Plan review.

Case Study - London: The review also identified the London Plan Energy Monitoring Report[143], including a Carbon Offset Funds Report in tandem. The latest Carbon Offset Funds Report 2019[144] surveyed all 35 LPAs within Greater London to report on any barriers to collecting and spending carbon offset funds, instances where an offset payment had not been made by a developer and the reasoning for this. The report states that reasons given included site viability and deliverability of affordable housing, raising the question of how much weight should be given to each developer contribution. A similar survey method could be adopted by Wirral Borough Council, asking developers to comment on barriers to low-carbon development to be collected and reported on within Wirral Borough Council's Annual Monitoring Report.

[143]Greater London Authority (2019) Energy Monitoring Report 2018 https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/2018-energy-monitoring-report accessed 14/08/20
[144] Greater London Authority (2019) Carbon Offset Funds Report 2019 https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/carbon-offset-funds-report-2019 accessed 14/08/20

Appendix 4

Review of Local Authority Policies

A4 Review of Local Authority Policies

This appendix includes all reviewed Local Authority policies related to climate change adaptation and mitigation. The reviewed Local Authorities policies are categorised by theme. This review fed into the best practice review covered in Section 3.

Energy Hierarchy

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	N/A
Flintshire County Council Local Plan	2011	Signposted to Flintshire County Council Supplementary Planning Guidance Note No.20 Sustainable Buildings- Energy Conservation and Renewable Energy. Paragraph 1.14 This sets out the order in which a reduction in energy should be considered and the order of priorities should be as follows: • reduce the need for energy • use energy more efficiently • use renewable energy • ensure that fossil fuels used are used in a clean and efficient manner
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	Signposted to Flintshire County Council Supplementary Planning Guidance Note No.20 Sustainable Buildings- Energy Conservation and Renewable Energy. Paragraph 1.14 This sets out the order in which a reduction in energy should be considered and the order of priorities should be as follows: • reduce the need for energy • use energy more efficiently • use renewable energy • ensure that fossil fuels used are used in a clean and efficient manner
Hull City Council Local Plan	2017	N/A
The London Plan	Draft 2017	Policy SI2 - Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy: 1) Be lean: use less energy and manage demand during construction and operation. 2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure. 3) Be green: generate, store and use renewable energy on-site.
Greater Manchester Spatial Framework	Draft 2019	Policy GM-S 2 The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including an expectation that new development will:

Local Authority	Local Plan Adoption Date	Planning Policy
		• Be zero net carbon from 2028 by following the energy hierarchy (with any residual carbon emissions offset), which in order of importance seeks to: i. Minimise energy demand; ii. Maximise energy efficiency; iii. Utilise renewable energy; iv. Utilise low carbon energy; and v. Utilise other energy sources.
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	Policy EN4 All development must follow the principle of the Energy Hierarchy, being designed: • to reduce the need for energy through design features that provide passive heating, natural lighting and cooling; • to reduce the need for energy through energy efficient features such as improved insulation and glazing; • to meet residual energy requirements through the use of low or zero carbon energy generating technologies.
Royal Borough of Kensington and Chelsea Local Plan	2019	Policy CE1 Requires that CO2 and other GHG emissions are reduced in accordance with the following hierarchy: 1. energy efficient building design, construction and materials, including the use of passive design, natural heating and natural ventilation; 2. provision of on-site renewable and low-carbon energy sources; 3. decentralised heating, cooling and energy supply, through Combined Cooling Heat and Power (CCHP) or similar, while ensuring that heat and energy production does not result in unacceptable levels of local air pollution in particular on-site allocations such as Kensal, Wornington Green, and Earl's Court;
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	N/A
Milton Keynes Council Local Plan	2019	Policy SC1 Implement the Energy Hierarchy within the design of new buildings by prioritising fabric first, passive design and landscaping measures to minimise energy demand for heating, lighting and cooling.

Renewable Energy

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	Policy CC4 Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq. m shall consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.; - Where there is existing decentralised energy provision present within the vicinity of an application site, further developments of 10 dwellings or more or non-residential development of 1,000 sq. m or more will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible. Policy CC9 Highest priority will be given to provision of energy infrastructure, including decentralised energy projects where relevant.
Flintshire County Council Local Plan	2011	Policy EWP1 There will be a presumption in favour of renewable energy schemes subject to them meeting the other relevant requirements of the Plan. Policy EWP3 All major new residential and non-residential developments will be required to incorporate renewable energy production equipment on site to reduce predicted carbon emissions by a minimum of 10% except where: 1. it would not be viable given the type of development, its location and design; 2.it would have an adverse effect on amenity which would outweigh the benefits of the technology; or 3. it is not possible to incorporate renewable energy production to achieve the full 10%. Policy EWP5 Other forms of renewable energy generation must consider scale, surroundings, existing transport network
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	Policy STR4 Development should incorporate where possible on-site energy efficiency and renewable energy generation Policy STR14 The Council will seek to mitigate the effects of climate change and ensure appropriate environmental protection in the County through encouraging energy efficient development, environmentally acceptable renewable and zero / low carbon energy generation and combined heat and power and communal / district heating networks Policy EN11 Some forms of development may be appropriate in the Green Barrier, including renewable and low carbon energy generation Policy EN12 Residential development sites of 100 units or more and non-residential developments with a floorspace of 1000 sqm or more, will be required to submit an Energy Assessment to determine the feasibility of incorporating low carbon or renewable energy technology or connecting to nearby renewable or low carbon energy sources and heat networks

Local Authority	Local Plan Adoption Date	Planning Policy
		Policy EN13 Renewable or low carbon energy generation development may be permitted for: 1. For large scale solar PV farms (5 MW and above) within Solar Indicative Local Search Areas (specific solar PV land allocations given in proposals map) 2. For small scale and/or community-based proposals (less than 5MW) for wind, solar, biomass, energy from waste, anaerobic digestion and hydropower in appropriate locations;
Hull City Council Local Plan	2017	Policy 18 Development that generates, transmits and/or stores renewable and/or low carbon energy will be supported where the impact is or can be made acceptable. Arrangements should be put in place for the effective decommissioning of renewable and low carbon energy technology when it gets to the end of its useful life. The aim should be to prevent abandoned technology from blighting areas of the city. Development that includes renewable or low carbon technology as an integral part of the design will be encouraged. New development will be expected to connect to a district energy network, if there is a suitable one in place, and if it is viable and feasible to do so. Policy 18 All allocated employment sites are potentially suitable for wind turbines. Applications for wind turbines must demonstrate they are acceptable in the following regard: local amenity, including noise, air quality, water quality, traffic, vibration, dust, visual impact, shadow flicker and odour; b. biodiversity, particularly in relation to national and international designations, and priority species and habitats and geodiversity; c. historic environment, such as Conservation Areas and Listed Buildings; d. telecommunications, so as not to interfere or block radio communications and radar systems; e. the cumulative impact of development. Assessment of the impact of wind turbine development on biodiversity should, where appropriate, specifically address the impact of the proposal on SPAs, Ramsar sites, and SSSIs."
The London Plan	Draft 2017	Policy SI8 New waste processing developments will be encouraged where they contribute towards renewable energy generation, especially renewable gas from organic/biomass waste, and/or provide CHP / combined cooling heat power Policy SI3 Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy requirements and infrastructure arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development Energy masterplans should be developed for large-scale development locations which establish the most effective energy supply options. (requirements of energy masterplans listed) Development Plans should: 1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including upgrades to existing infrastructure

Local Authority	Local Plan Adoption Date	Planning Policy
		2) identify existing heating and cooling networks and opportunities for expanding existing networks and establishing new networks. Major development proposals within Heat Network Priority Areas should have a communal heating system in accordance with a heat hierarchy (heating hierarchy detailed). Where a heat network is planned but not yet installed, the development should be designed for connection at a later date.
Greater Manchester Spatial Framework	Draft 2019	Policy GM-S 2 Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy; Taking a positive approach to renewable and low carbon energy schemes. Policy GM-S 3 Delivery of renewable and low carbon energy schemes will be supported with particular emphasis on the use of decentralised energy networks in areas identified as "Heat and Energy Network Opportunity Areas". These will be identified where: a. Existing heat/energy networks are operational or have been commissioned; b. Proposals for new heat networks/energy networks are being progressed, or future opportunities have been identified in city-region master planning. c. Sufficient density of existing heat demand occurs; and d. Significant future development is proposed at the strategic development locations. Within the identified "Heat and Energy Network Opportunity Areas", there will be: a. A requirement that new residential developments over 10 dwellings or other developments over 1,000 m^2 floorspace should evaluate the viability of: i. Connecting to an existing or planned heat/energy network (where such a network has been identified within the Heat Network Opportunity Areas); and/or ii. Installing a site-wide or communal heat/energy network solution. b. A requirement, where unviable to connect to an existing network or install a site-wide or communal heat/energy network, for new development to incorporate appropriate capability to enable future connection (e.g. adequate space in plant-room for plate heat exchangers, capped-off flow/return connections); c. A 'presumption in favour of network connection' where new residential developments over 10 dwellings and other developments over 1,000 sq. m floorspace are within 500m of an existing heat network, or where a network is being delivered; d. An expectation that new industrial development will demonstrate that opportunities for using waste heat locally have been fully examined, and included in proposals unless proven to not be viable; e. An expectation that where publicly-owned buildings and assets adjoin new major development sites, opportunities for these buildings and assets to connect to site-wide proposals will be considered; and f. An expectation that any site-wide networks will be designed so as to enable future expansion to adjoining buildings or assets as appropriate. 3.In support of the above, all decentralised heat/energy network viability assessments are required to demonstrate consideration and analysis of: a. Identification of existing and proposed heat/energy loads; b. Identification of heat/energy supply sources; c. Identification of opportunities to utilise renewable and low carbon energy sources;

Local Authority	Local Plan Adoption Date	Planning Policy
		d. Identification of opportunities to utilise waste and secondary heat sources; e. Impact of proposals and technology choices on local air quality; f. Design according to national best practice in relation to efficient heat network design (e.g. CIBSE CP1 Heat Networks: Code of Practice for the UK, or equivalent); and g. Adopting appropriate consumer protection standards (e.g. HeatTrust, or equivalent).
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	Policy H2 Proposals will be expected to show how they contribute to decentralised low and zero carbon energy infrastructure as set out in the energy policies (EN4 - EN7). Policy EN5 Strategic areas identified to target for increased decentralised low and zero carbon energy supplies. Within these areas, new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO2 reduction funded by contributions. Policy EN7 There will be a general presumption in favour of low and zero carbon decentralised energy schemes, subject to the following considerations: • That any new generating plant capable of producing heat and cooling as well as electricity should be located in a way that facilitates future connection to a local distributed energy system; • That any energy centre, including generating plant, standby/boiler plant and substations, shall be located and designed to a high quality so as to integrate with and contribute to the townscape; • Biofuels should be obtained from sustainable sources and processes and in a way that minimises transport impacts, following a sequential approach in order to minimise CO2 emissions – firstly prioritising local and regional sources, followed by national, European and international; • Consideration should be given to biofuel delivery by rail and waterways where possible. • Where large-scale fuel or feedstock delivery is required by road the energy centre must be located in or adjacent to light industrial, industrial or leisure uses with any impact on local residential amenity minimised. Policy EN16 Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.
Royal Borough of Kensington and Chelsea Local Plan	2019	The plan includes numerous site-specific policies on-site renewable energy sources to serve the development of Kensal Canalside and future development. Policy CE5

Local Authority	Local Plan Adoption Date	Planning Policy
		States that it will resist biomass combustion and CCHP unless it will not have a detrimental impact on emissions increases. Instead seek to increase renewable technology to make carbon savings. Policy CE1 DHN and community energy schemes will be encouraged
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	Policy IN4: Any heat produced as part of a renewable energy or CHP installation should be productively used on-site or linked to a district energy network. Progress will be measured against a local low carbon electricity target of 200MWe by 2020. A locally delivered modular district energy network shall be enabled and supported which is: • focused around areas of high and constant heat demand; • and • capable of incorporating additional low and zero carbon energy • sources and generation technologies e.g. biomass, waste and • combined heat and power. Appropriate renewable and low carbon energy infrastructure which has benefits for local communities and the local economy will be encouraged and supported. Energy efficiency and low carbon energy generation schemes brought forward by communities, or with major community benefits, will be encouraged and supported in principle. LDO1 Supports the roll out of district heating networks and heat pumps
Milton Keynes Council Local Plan	2019	Policy SC1 Requires that proposals for more than 11 dwellings and non-residential developments of over will require onsite renewables to reduce carbon emissions. Policy SC2 Low carbon and renewable energy schemes will be attributed significant weight in their favour, and will be supported where it can be demonstrated that there will not be any significant negative social, economic, or environmental impacts associated with them. Proposals for over 100 homes and non-residential developments of over 1,000 sq. m. will be expected to consider the integration of community energy networks in the development. This consideration should form part of development proposals and consider the site's characteristics and the existing cooling, heat and power demands on adjacent sites. All new developments in proximity of an existing or proposed combined heat and power (CHP), combined cooling, heat and power (CCHP) station or local energy network will be expected to connect to the network unless it can be demonstrated that: 1. a better alternative for reducing carbon emissions from the development can be achieved; or 2. heating and/or cooling loads of the scheme do not justify a CHP connection; or 3. the cost of achieving this would make the proposed development unviable Policy SC3

Local Authority	Local Plan Adoption Date	Planning Policy
		Encourages low carbon and renewable developments led by the community, provided any negative impacts can be mitigated. There is a separate SPD regarding specific requirements for applications relating to wind turbines. Policy SC3 Wind turbines should avoid unacceptable shadow flicker and electro-magnetic interference and be sited an appropriate distance away from occupied properties, consistent with the size and type of the turbine. In the case of energy generation through wind power, permission will only be granted for proposals where: 1. The proposed site is identified in a Neighbourhood Development Plan or other Development Plan Document as a suitable site for wind energy generation; and 2. Following consultation with local residents, it can be demonstrated that the planning impacts identified can be fully addressed, and therefore the proposal has the backing of the local community; and 3. The proposal complies with national and local guidance, including the Council's Wind Turbines SPD and Landscape Sensitivity to Wind Turbine and Solar PV Development document. Policy SC3 Planning permission will be granted for proposals to develop low carbon and renewable energy sources (including community energy networks) unless there would be: 1. Significant harm to the amenity of residential area, due to noise, traffic, pollution or odour; 2. Significant harm to wildlife species or habitat; 3. Unacceptable landscape and visual impact on the landscape, including cumulative impacts; 4. Unacceptable harm to the significance of heritage assets; and 5. Unacceptable impact on air safety.

Zero Carbon Development and Sustainable Building Design

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	Policy H5 All major new-build residential development should be designed to achieve zero carbon homes. All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations. Policy CC2 All major non-residential developments or conversions to residential are required to be BREEAM 'excellent' where possible. All minor non-residential developments or conversions to residential are required BREEAM 'very good'. All non-residential development or conversions to residential should incorporate water conservation as set in BREEAM. Policy CC3 Where possible, new buildings should be oriented to maximise natural heating and ventilation opportunities. Development should incorporate mitigation and resilience measures for flooding as a result of climate change. Trees/planting should be used for natural shading. Policy TF5 Development should make the following provision for electric vehicle charging points: • All new houses with dedicated off-street parking should provide charging points; • Within communal car parks for residential or non-residential developments of at least 10 spaces, 10% of spaces should provide an active charging point. Sustainable Design SPD An Energy Statement should be submitted with major developments to demonstrate how the proposal meets policies CC2, CC4 and H5, and S106 contribution required to achieve zero carbon homes. SPD includes a Sustainable Design Checklist for residential development. 10 dwellings or more required to be zero carbon, or if unachievable, minimum 35% improvement on 2013 Part L standards and planning contribution to offset remaining carbon to zero. Specific BREEAM requirements for certain use classes for non-residential development
Flintshire County Council Local Plan	2011	Policy EWP2 In all new development the Council must be satisfied that sufficient steps have been taken in the siting, aspect, form and design of new buildings to minimise the wasteful consumption of energy and resources both in the construction and use of buildings. Signposted to Flintshire County Council Supplementary Planning Guidance Note No.20 Sustainable Buildings- Energy Conservation and Renewable Energy. It outlines that: Welsh Government has adopted BREEAM to assess the sustainability of buildings. Since 1st September 2009 applications with a floorspace of 1,000 sq. m or more or on a site of one hectare or more have to meet the BREEAM 'Very Good' standard and achieve the mandatory credits for 'Excellent' under issue Ene1 – Reduction of CO2 Emissions.

Local Authority	Local Plan Adoption Date	Planning Policy
		Welsh Government (WG) has adopted the Code for Sustainable Homes as its preferred tool for assessing the sustainability of new homes and set out levels to be achieved. All new dwellings in Wales are now required to attain code level 3 of the Code for Sustainable Homes and obtain 6 credits under issue ENE1 – Dwelling Emission Rate.
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	Policy EN12 Residential development sites of 100 units or more and non-residential developments with a floorspace of 1000 sqm or more, will be required to submit an Energy Assessment to determine the feasibility of incorporating low carbon or renewable energy technology or connecting to nearby renewable or low carbon energy sources and heat networks Policy PC4 Development should ensure: 1. it is designed so as to be resilient and adaptable to the effects of climate change; 2. it incorporates planting, landscaping and design features which mitigate the effects of climate change such as increased rainfall events and high temperatures; 3. it makes efficient use of resources through sustainable construction techniques and materials, including layout, siting and orientation to maximise solar gain, water conservation and waste reduction; and 4. it incorporates renewable energy technologies and carbon sinks where appropriate
Hull City Council Local Plan	2017	Policy 17 Development should demonstrate how the design will reduce energy and water use and mitigate flooding, pollution and over-heating. Principles of passive solar design should be followed. BREEAM Very Good minimum for non-residential development.
The London Plan	Draft 2017	Policy GG6 To help London become a more efficient and resilient city, those involved in planning and development must: Seek to improve energy efficiency and support the move towards a low carbon circular economy, contributing towards London becoming a zero carbon city by 2050. Ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, and avoiding contributing to the urban heat island effect. Policy S12 Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance. A zero-carbon target for major residential developments has been in place for London since October 2016. This target will be extended to include major non-residential developments on final publication of this Plan. Policy SI4 Development proposals should minimise adverse impacts on of the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. Policy T6

Local Authority	Local Plan Adoption Date	Planning Policy
		All residential car parking spaces must provide infrastructure for electric or Ultra-Low Emission vehicles. At least 20 per cent of spaces should have active charging facilities, with passive provision for all remaining spaces Policy Si2 - In meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should aim to achieve 10 per cent, and non-residential development should aim to achieve 15 per cent through energy efficiency
Greater Manchester Spatial Framework	Draft 2019	Policy GM-S 2 New development should: • incorporate adequate electric vehicle charging points to meet likely long-term demand; • Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy; • Taking a positive approach to renewable and low carbon energy schemes; • An interim requirement that all new dwellings should seek a 19% carbon reduction against Part L of the 2013 Building Regulations until net zero deadline in 2028, • Achieve a minimum 20% reduction in carbon emissions (based on the dwelling emission or building emissions rates) through the use of on site or nearby Renewable and / or low carbon technologies; and • Include a carbon assessment to demonstrate how the design and layout of the development sought to maximize reductions in whole life CO2 equivalent carbon emissions. Policy GM-S 6 Promotes significantly expanding the network of electric vehicle charging points, both for public and private use, including as part of new developments; Policy GM-H 3 Innovation in housing development will be supported where it is consistent with the principles of good design and contributes to local distinctiveness, including the use of modern methods of manufacturing that can help to improve the speed of delivery and increase building standards
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	Policy EN4 • Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies. • Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings. • Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes. • The use of building materials with low embodied carbon in new development and refurbishment schemes. Policy EC1 Development proposals should have regard to Climate change resilience demonstrating how CO2 emissions will be minimised with an aim of zero

Local Authority	Local Plan Adoption Date	Planning Policy
		carbon emissions, through energy efficiency, renewable energy and contributing to low and zero carbon decentralised energy infrastructure; Policy EN6 Applications for residential development of 10 or more units and all other development over 1,000 sq. m will be expected as a minimum to meet the following targets unless this can be shown not to be viable. (table is listed defining network development areas, electricity intense buildings and micro generation areas which have different targets for domestic and non-domestic emissions): • Network Development - CHP/District heating anchor or connection. Where not feasible a 15% increase on Part L 2010 • Electricity intense buildings - 15% increase on Part L 2010 • Micro generation area - 15% increase on Part L 2010 • This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO2emissions for all phases of the development.
Royal Borough of Kensington and Chelsea Local Plan	2019	Policy CE1 Major residential development requires an assessment to demonstrate meeting carbon reduction requirements in London Plan. Non-residential development of 1,000sqm+ must meet BREEAM very good with 60% of unweighted credits available in energy, water and materials sections. This includes conversions and refurbishments of 1,000sqm or more. Policy CL2 All development must be sustainable in its use of resources, including energy, in construction and operation
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	Policy DE2 All residential development to meet CSH level 5 from 2016 onwards. All non-residential development to meet BREEAM excellent Policy DE2 Part L is a minimum requirement of new development. Policy DE2 Sustainable Construction requires demonstration of passive solar benefits through the layout and design of the site. Requires CSH and BREEAM standards in major new development. CSH level 5 by 2016 and BREEAM Excellent by 2013.
Milton Keynes Council Local Plan	2019	Policy SC1 Requires that proposals for more than 11 dwellings and non-residential developments of over 1000sqm an Energy and Climate Statement will be required demonstrating that the proposal achieves a carbon reduction improvement upon the Part L building regulations or higher, provide onsite renewables to further reduce carbon emissions, calculate indoor air quality and overheating risk performance, requires an 'as built' performance for the air quality and overheating proposals including a monitoring scheme for the first five years of a development's occupancy with information provided to the LPA and occupiers. The policy also supports and encourages retrofitting. The Council also have advice on calculating carbon neutrality which must include energy demand from regulated and unregulated sources.

Local Authority	Local Plan Adoption Date	Planning Policy
		Policy SC1 Supports the re-use of land and buildings, reusing materials, green roofs, managing waste and consider the lifecycle of the building and the adaptability of plans. The Sustainable Construction SPD requires a sustainability statement for applications for more than 5 dwellings or 1000sqm floorspace of non-housing or mixed developments. This includes new build, conversion, renovation or extension and if it's an outline application there will be a condition to complete the statement. A S106 agreement will be included a carbon offset payment. Carbon offset payments will always be required, even if achieving BREEAM 'Excellent' rating. The SPD also supports passive solar design, landscaping, district heating, insulation, low energy lighting, roof lights and smart metres. Policy D4 States that proposals for 50 or more dwellings will be encouraged to provide 10% of new dwellings to include innovative design features including MMC including modular/off site construction techniques. The Sustainable Construction SPD states that the Part L building regulations are the baseline that all new buildings will meet. Energy Assessments are required for applications and the minimum energy efficiency standard requires a 25% reduction in carbon emissions compared to building regulations, as based on best practice from 2006.

CIL and/or S106 Requirements

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	N/A
Flintshire County Council Local Plan	2011	N/A
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	N/A
Hull City Council Local Plan	2017	Policy 52 The council will Support the provision of appropriate new infrastructure, including to mitigate and adapt to climate change, working with partner organisations and the East Riding of Yorkshire Council where necessary, to deliver the priorities of the Local Plan. S106/CIL will be used to facilitate this delivery
The London Plan	Draft 2017	Policy SI8 In new waste infrastructure developments, S106 contributions may be used to deliver the necessary means for infrastructure to meet the minimum CO2 standard, for example investment in the development of a heat distribution network to the site boundary, or technology modifications that improve plant efficiency.
Greater Manchester Spatial Framework	Draft 2019	N/A
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	Policy PA1 Through such obligations as CIL and S106, the Council may seek contributions with priority assessed on a site by site basis for climate change mitigation/adaption
Royal Borough of Kensington and Chelsea Local Plan	2019	Policy C1 S106/CIL may include energy efficiency and renewable energy
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	N/A
Milton Keynes Council Local Plan	2019	The Urban Development Tariff SPD outlined that site specific S106 agreements can be put in place which could include construction standards.

Carbon Price/ Carbon Offsetting/ Allowable Solutions Fund

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	See Sustainable Building Design table
Flintshire County Council Local Plan	2011	N/A
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	N/A
Hull City Council Local Plan	2017	N/A
The London Plan	Draft 2017	Policy SI2 Where it is clearly demonstrated that the zero-carbon target for major development cannot be fully achieved on-site, any shortfall should be provided: 1) through a cash in lieu contribution to the relevant borough's carbon offset fund, and/or 2) off-site provided that an alternative proposal is identified, and delivery is certain. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver greenhouse gas reductions. The operation of offset funds should be monitored and reported on annually
Greater Manchester Spatial Framework	Draft 2019	Policy GM-S 2 Increasing carbon sequestration through the restoration of peat-based habitats, woodland management and tree-planting; Policy GM-G 7 Plant a tree for every resident in Greater Manchester over the next 25 years as part of the City of Trees initiative
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	Policy EN6 Where the Council identifies an 'allowable solution', for example within an energy proposals plan, that would produce higher carbon reductions at no extra cost than that of achieving the '% Minimum requirement' (or required under building regulations if greater) the higher percentage reduction will be required. The cost comparison is based on the cost of incorporating the 'allowable solution' at design stage
Royal Borough of Kensington and Chelsea Local Plan	2019	Mayor's Housing SPG The council will accept payments in lieu for offsetting any remaining carbon, over and above the 35% reduction on site.
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	Policy DE2 Allowable solutions funding can be made where on-site provision of renewable technology is not appropriate. Funds gathered will be used for wider energy efficiency and energy generation initiatives.
Milton Keynes Council Local Plan	2019	Policy SC1 Requires payments to a carbon offset fund to support the aim to achieve development in Milton Keynes as zero carbon and to support reducing emissions by the use of renewable/low carbon technology. However, it is currently unclear if this is still enforced. This fund is gained by S106 agreements.

Climate Change Adaptation

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	Policy CC2 Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change. Policy CC3 All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development: - Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements; - Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc.; - Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and - All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change. Policy CC7 All development will be assessed to ensure it is adaptable - capable of adaptation over time. Policy EN14 New development shall make provision for tree retention and planting within the application site, particularly on the street frontage, or off-site in appropriate situations, to improve the level of tree coverage within the Borough, to maintain and enhance the character and appearance of the area in which a site is located, to provide for biodiversity and to contribute to measures to reduce carbon and adapt to climate change. Measures must be in place to ensure that these trees are adequately maintained.
Flintshire County Council Local Plan	2011	Policy D1 Good design should ensure new development mitigates the causes of climate change
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	Policy STR4 all development should: - Be designed to be adaptable, safe and accessible, to respond to climate change, and for housing, adapt to changing needs over time; Policy STR13 All development will support measures to minimise the consequences of climate change

Local Authority	Local Plan Adoption Date	Planning Policy
Hull City Council Local Plan	2017	Policy 52 To ensure the delivery of infrastructure requirements, and to ensure the strategic and sustainability objectives of the Plan are met, the Council will support the provision of appropriate new infrastructure, including to mitigate and adapt to climate change, working with partner organisations and the East Riding of Yorkshire Council where necessary, to deliver the priorities of the Local Plan
The London Plan	Draft 2017	Policy G1 Development Plans should identify opportunities for addressing environmental and social challenges through strategic green infrastructure interventions. Policy G5 Major development proposals should contribute to the greening of London through urban greening as a fundamental element of site and building design. Policy G7 London's urban forest and woodlands should be protected and maintained. Boroughs should identify opportunities for tree planting in strategic locations. Policy G8 Boroughs should protect existing allotments and encourage provision of space for community gardening, including for food growing, within new developments or as a meanwhile use on vacant or under-utilised sites. Boroughs should identify potential sites for commercial food production. Policy GG6 To help London become a more efficient and resilient city, those involved in planning and development must ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating against and avoiding contributing to the urban heat island effect. Policy SI5 Development proposals should support wastewater treatment infrastructure investment to accommodate London's growth and climate change impacts
Greater Manchester Spatial Framework	Draft 2019	Policy GM-S 4 Key measures to overcome challenges will include designing indoor and outdoor environments to provide a reduction and respite from more extreme temperatures and winds associated with climate change and greater urbanisation
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	Policy EN8 In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list: • Minimisation of flood risk by appropriate siting, drainage, and treatment of surface • areas to ensure rain water permeability; • Reduction in urban heat island effect through the use of Green Infrastructure such as • green roofs, green walls, increased tree cover and waterways; • The need to control overheating of buildings through passive design; • The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation.

Local Authority	Local Plan Adoption Date	Planning Policy
		Policy EN 9 The encouragement of green roofs, green walls, tree planting and other forms of green infrastructure to allow for the adaption to climate change in heavily urbanised areas.
Royal Borough of Kensington and Chelsea Local Plan	2019	N/A
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	Policy SD1 All development proposals will assess and address the impact of climate change through mitigation and/or adaption measures.
Milton Keynes Council Local Plan	2019	Policy SD1 The layout, form and detailed design of development should be responsive to predicted changes in climate. Policy NE4 Existing green infrastructure network will be extended into urban extensions, to provide ecosystem services such as support climate change adaptation and mitigation.

Flood risk in relation to climate change

Local Authority	Local Plan Adoption Date	Planning Policy
Reading Borough Council Local Plan	2019	EN18 Development should consider the effects of climate change. Where possible, it should be designed to reduce flood risk both on and off site.
Flintshire County Council Local Plan	2011	N/A
Flintshire County Council Draft Local Plan	Consultation on new local plan finished in 2019, anticipating adoption in 2020	N/A
Hull City Council Local Plan	2017	Policy 37 Development may be required to improve the standard of flood defence infrastructure if required to make the development acceptable (considering climate change), and where the improvements required are not already planned and funded by risk management authorities within an appropriate timescale Policy 39 A 30% allowance should be added to Drainage Impact Assessment restrictions to account for climate change
The London Plan	Draft 2017	N/A
Greater Manchester Spatial Framework	Draft 2019	N/A
Manchester City Council Local Plan	Adopted in 2012 but currently undergoing Local Plan Review	N/A
Royal Borough of Kensington and Chelsea Local Plan	2019	Policy CE2 Development within FZ2 and 3, in Critical Drainage Areas, or sites greater than 1ha must incorporate suitable flood risk measures to account for site conditions. Measures should include addressing all flood depths for the 1 in 100-year storm event plus climate change. Major development is required to:
Swindon Borough Council Local Plan	Adopted in 2015 but currently undergoing Local Plan Review	N/A
Milton Keynes Council Local Plan	2019	Policy FR1 Development within areas of flood risk from any source of flooding, will only be acceptable if it is clearly demonstrated that it is appropriate at that location, and that there are no suitable available alternative sites at a lower flood risk. Various requirements set out for development proposed in flood risk areas, including ensuring opportunities are taken as far as possible to improve existing flood risk, considering climate change.

Appendix 5

Stakeholder Questionnaire

A5 Stakeholder Questionnaire

Name:

Organisation:

Contact details:

Are you happy for your responses to be shared publicly as part of reporting on Wirral's climate change work? Yes / No

Wirral Borough Council is in the process of updating its Local Plan. As part of this work, we are looking at how out planning policy can be designed to deliver against our commitment to address a Climate Emergency.

We have commissioned a piece of work to look at clean energy opportunities within the Wirral Borough and best practice in planning policy to address climate change to guide and inform the development of our Local Plan policies.

As part of this work, we are inviting you to input via the questionnaire below to inform our understanding of existing and future action within the Borough and ideas on how the Local Plan can contribute to climate action.

For context, Wirral's 'Cool: A Climate Change Strategy' and updated strategy, known as 'Cool2: A strategy for Wirral in the face of the global climate emergency' sets out a strategy for the Borough to address the climate emergency. To meet Wirral's contribution to addressing climate change requires cutting CO_2 by an at least an average of 13.4% each year compared to the present reduction of around 3.8 % per year, i.e. around three and a half times more.

1. What do you feel the policies within the Wirral Local Plan should include to help deliver Wirral's commitments to address climate change (these might be priorities, strategies or ideas for mitigation)?
2. What do you consider to be the key challenges and opportunities for the delivery of renewable energy and climate change mitigation within Wirral?
3. Based on your response to question two, how can Wirral best address or capitalise on these key challenges and opportunities?
4. What are your climate change goals and/or deliverables within the Wirral Borough?
5. What has been your experience of delivering renewable energy or climate change mitigation within Wirral to date?
6. What could Wirral Council do to assist you in the delivery of your renewable energy and climate change action?
7. What could you do to assist Wirral Council in achieving its emission reduction targets?
8. If applicable, would your organisation consider a heat / power purchase agreement (H/PPA) with a local renewable energy provider?
9. Can you recommend any current best practice policy, guidance or plans that Wirral Council should consider in the development of their renewable energy and climate change Local Plan policies?
10. Do you know of any contacts or organisations that Wirral Council might seek to partner with in the delivery of renewable energy and climate change mitigation in Wirral?

Appendix 6

Wirral Clean Energy Opportunities and Implications Study

Wirral Clean Energy Opportunities and Implications Study

Wirral Borough Council

Contents

Glossary

Glossary	
ASHP	Air Source Heat Pump
BEIS	Department for Business, Energy & Industrial Strategy
CHP	Combined heat and power
CO_2e	Carbon dioxide equivalent
(S)COP	(Seasonal) Coefficient of performance
DEFRA	Department for Environment, Food and Rural Affairs
DG	Distributed generation
DH	District heating
ECS	Energy Crop Scheme
EIA	Environmental Impact Assessment
GIS	Geographic Information Systems
GSHP	Ground source heat pump
GWh, GW	Gigawatt hours, gigawatts
HV(DC)	High voltage (direct current)
kg, kt	Kilogrammes, kilotonnes
km	Kilometres
$ktCO_2e$	Kilotonne of Carbon dioxide equivalent ($1ktCO_2e$ = $1000tCO_2e$)
kWh. kW, kWp	Kilowatt hours, kilowatts, kilowatt peak
LV	Low voltage
LZC	Low-to-zero carbon
m	Metres
MV	Medium voltage
MWh, MW	Megawatt hours, megawatts
NAEI	National Atmospheric Emissions Inventory

Glossary	
NOx	Nitrogen Oxides
NPPF	National Planning Policy Framework
Odt	Oven dried tonnes
ONS	Office for National Statistics
PPA	Power Purchase Agreement
PV	Photovoltaics
RHI	Renewable Heat Incentive
SAC	Special Area of Conservation
SHLAA	Strategic Housing and Land Availability Assessment
SPA	Special Protection Area
SP(EN)	Scottish Power (Electricity Networks Ltd)
SOx	Sulphur Oxides
SRC	Short rotation coppice
SSSI	Site of Special Scientific Interest

Executive Summary

Purpose of the study

The Clean Energy Opportunities and Implications Study aims to provide a robust and credible evidence base to inform planning policies to be incorporated in the Wirral Local Plan, intended to support renewable and low carbon energy development in Wirral.

Methodology

A constraints-based approach was applied to determine opportunity areas for renewable and low-carbon technologies across Wirral. *Figure 9* shows the key project stages which formed the overall methodology for this study.

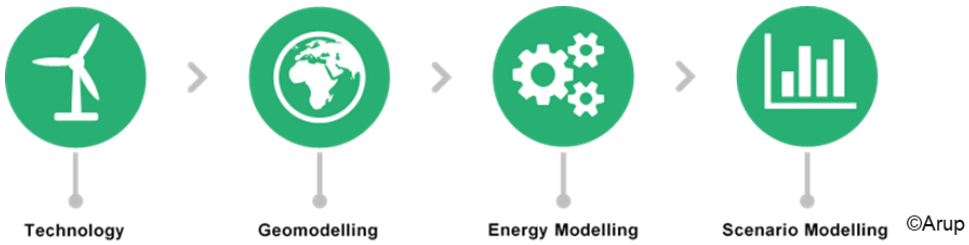


Figure 9: Study Methodology

Current energy and carbon position

An initial assessment was undertaken to determine the current energy demand and carbon position of the Wirral Borough to provide the necessary understanding to provide a baseline against which renewable energy generation and emissions savings could be measured.

The total energy consumption for the Wirral Borough was estimated to be 5,552GWh and total carbon dioxide equivalent emissions for the Borough estimated to be 1,394 $ktCO_2e$[145]. Almost all emissions from energy use arose from gas consumption (40.7%), petroleum products (33.0%) and electricity use (25.7%).

Summary of Clean Energy Opportunities

The following presents a summary of the key findings of the study for each technology:

Onshore Wind Energy: Wind conditions in Wirral present an energy generation opportunity but due to the prevalence of urban developments on the East side of the Borough and planning and environmental designations on the West side, there

[145] Based upon 2017 datasets as the most recent complete dataset for energy and emissions for the Borough. BEIS (2019) UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2017 https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017 accessed 14/08/2020.; and BEIS (2019) Total final energy consumption at regional and local authority level https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level accessed 14/08/2020.

is little potential to exploit the resource. This Study suggests there may be opportunity to utilise some Green Belt land for onshore wind installations consisting of small (<80m tip height) or medium (80-110m tip height) sized turbines. . Paragraph 147 of the NPPF sets out that such development would constitute inappropriate development and which, for a proposal to achieve planning permission, would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt.

Ground-Mounted Solar PV: Several opportunity areas for ground-mounted solar PV arrays were identified across the Borough, with the potential to provide total carbon dioxide equivalent savings of up to 192ktCO_2e to 2050 and total capacity of up to 117MW. The Study also revealed that solar PV potential would increase significantly if a proportion of Green Belt land was utilised for development of solar PV arrays. The Study concluded that the large scale use of Green Belt land for renewable energy installations is unlikely to be compatible with the purpose of Green Belt land , therefore any utilisation of Green Belt should be very carefully considered in terms of balancing impacts, e.g. ecology, visual impact and local character, against the benefit of renewable energy generation. As before, Paragraph 147 of the NPPF sets out that such development would constitute inappropriate development, which for a proposal to achieve planning permission would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt. Therefore, previously developed land, brownfield land and low-grade (4-5) agricultural land should be prioritised for siting of ground-mounted PV installations.

Paragraph 147 of the NPPF sets out that such development would constitute inappropriate development, which for a proposal to achieve planning permission would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt.

Landward Implications of Tidal Energy: The study concluded that the landward transmission grid infrastructure requirements of tidal energy schemes have the potential to be located in Wirral. However, such development is likely to be part of a Development Consent Order, with planning determined at a national level.

Biomass Energy: The Study concluded that there is potential for biomass energy in the form of energy crops and forestry residues to provide up to 86GWh of renewable fuel energy resulting in estimated carbon savings of up to 472ktCO_2e for the period 2020-2050 when used in biomass boilers to provide low-carbon heat. There is a significant proportion of Wirral's agricultural land area that could be used to grow energy crops; however, the proportion of land used for energy crops must be balanced with the Borough's food production and financial returns for farmers. Recovery of forestry residues from managed woodland for use as biomass fuel could provide a modest contribution to the Borough's carbon targets and make use of an otherwise wasted, low cost resource.

Although considered a renewable fuel, biomass combustion produces localised emissions of SO_x, CO_x and NO_x which affect local air quality therefore

appropriate consideration must be given to local emission dispersion and abatement when designing and installing biomass systems. Where smoke control areas exist, biomass installations must comply with the local smoke control area regulations.

District Heating: The Study concluded that district heating supplied by low-to-zero carbon technologies represents a clear local opportunity. The carbon emissions analysis showed that the use of heat pumps or biomass technologies to supply heat networks could generate significant carbon savings compared to gas boiler heating up to 2050. The Study identified a number of district heating priority zones with sufficient spatial heat density to support viable district heating schemes and an opportunity for open-loop ground source heating.

Building Integrated Renewables: With limited spatial availability for deployment of large-scale renewable energy technologies, building-integrated renewable energy technologies are expected to play an important role in achieving decarbonisation targets. An indicative analysis on roof-mounted solar PV revealed that carbon dioxide equivalent savings of up to 69ktCO_2e could be realised to 2050, if a typical 2.6kW solar PV system was to be installed on only10% of the Wirral address base. Building-integrated renewable heating technologies such as solar thermal and heat pumps are expected to become increasingly prevalent, due to the Government's proposed ban on gas boilers in new-build homes from 2025 and home efficiency upgrade retrofits over time. In addition, commercial properties are typically characterised by higher energy demands, higher energy costs and greater spatial availability than domestic properties. There is typically therefore both greater incentive and spatial potential for building-integrated renewable energy technologies in commercial properties than domestic buildings.

Future technology: The study has focussed on technologically mature and commercially ready technologies, aligned to current national and local policy and strategy, which are relevant to inform Local Plan development. Emerging technologies have the potential to contribute to the decarbonisation of the energy system in Wirral at a commercial scale within the lifetime of the Local Plan (to 2035). It is considered that hydrogen and carbon capture, utilisation and storage (CCUS) are the most likely additional technologies to play a significant role in energy systems associated with Wirral in the future. It is also recommended that Wirral Borough Council remain engaged in 'horizon scanning' for emerging renewable and low carbon energy opportunities.

Conclusions: The assessment concluded that there is potential for ground mounted solar PV, biomass energy, district heating and building-integrated technologies, but little potential for onshore wind. Some potential for supporting landward transmission infrastructure for tidal energy was also recognised. From this study, recommendations were provided to support policy development for the Wirral Local Plan, presented in Policy Development Papers as part of the wider Wirral Local Plan Climate Change and Renewable Energy Study.

The assessment provides a high-level view of clean energy opportunities. Further investigation to develop opportunities would be needed to understand the potential of individual opportunities, often delivered as part of project development by developers. This could include site surveys, environmental assessment and engagement with key stakeholders, e.g. SPEN. It is also recognised that electricity

grid infrastructure will be a constraint to renewable energy development and smart grids, private wire and power purchase agreements will be important solutions.

1. Introduction

This report presents the outputs from the Wirral Clean Energy Opportunities and Implications Study, commissioned as part of the Wirral Local Plan Climate Change and Renewable Energy Study. The study aims to form a robust and credible evidence base to inform the development of planning policy covering renewable and low carbon energy developments through the Wirral Local Plan in the context of climate change and the need for a widespread shift to clean energy. The study highlights areas of opportunity for implementation of renewable and low-carbon energy considering appropriate technical, environmental and statutory constrains and the characteristics of the Borough.

The following section presents the context for the study and the methodology used to undertake the analysis.

1.1 Context

Wirral Borough Council is currently in the process of developing a new Local Plan. There is increasing responsibility on all local authorities to implement strategies which will reduce carbon emissions and contribute to national emission reduction targets. This is reinforced by the National Planning Policy Framework (NPPF), which requires local authorities to maintain a positive approach to low-carbon development and states that local authorities should identify opportunities for renewable, low-carbon, decentralised energy and decarbonisation of heat.

Wirral Borough Council has already made a commitment to mitigating Climate Change by declaring a Climate Emergency in 2019. The Council has also recently endorsed the new Cool2 climate strategy which defines the nature of the local challenge and sets out the necessary steps to be taken. A key challenge to mitigate climate change is to stay within a remaining local carbon budget estimated by independent experts to be 7.7 million tonnes of CO_2 to 2100. Underpinning the strategy is a need to transition to renewable energy sources by 2041

This study aims to highlight opportunity areas for implementation of clean energy technologies. It focussed on technologically mature and commercially ready technologies, aligned to current national and local policy and strategy, which are relevant to inform local plan development. These technologies are:

- Onshore wind energy
- Stand-alone solar PV arrays
- Landward implications of tidal energy
- Biomass energy
- Low-carbon heat
- Building integrated renewables

1.2 Methodology

A constraints-based approach was applied to determine opportunity areas for renewable and low-carbon technologies across Wirral. *Figure 10* shows the key project stages which formed the overall methodology for this study.

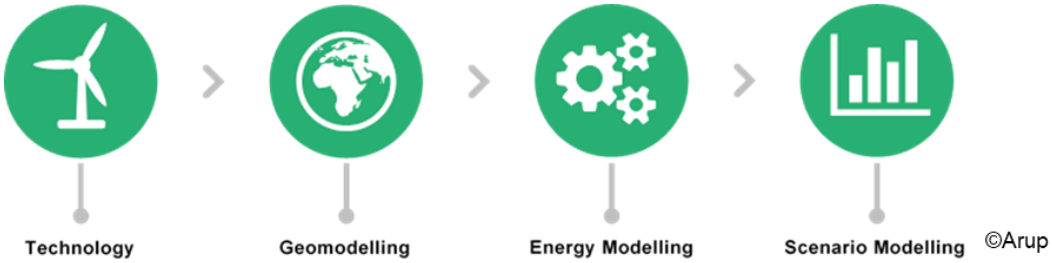


Figure 10: Study Methodology

Following an initial inception meeting to determine the project scope, key objectives and drivers, the following stages were carried out:

1. **Technology:** Low-carbon and renewable energy technologies and interventions were identified and defined. The key constraints (environmental, technical, planning etc.) and opportunity metrics were defined for each technology.
2. **Geomodelling:** The technology constraints and opportunity metrics identified in the first stage were used as the basis for a multicriteria geospatial modelling analysis to identify areas of least constraint and clean energy opportunities in the borough. The identified opportunities were mapped and visualised using ArcMap® GIS Software. Where applicable, modelling was conducted for the period to 2050 in line with UK Government climate targets and decarbonisation projections.
3. **Energy Modelling:** The opportunity areas identified in the geomodelling stage were used to determine potential capacities for each technology. Technologies were modelled using energyPRO® software and local weather and resource data (e.g. wind speed, solar irradiation) in order to determine theoretical yields and carbon savings for the period to 2050 in line with UK Government climate targets and decarbonisation projections.
4. **Scenario Models:** The results of the previous stages were used to model a range of scenarios. Microsoft Power BI software was utilised to demonstrate scenario development for engagement sessions with Officers and Members, e.g. varying the extent of greenbelt utilisation for solar PV and onshore wind. Scenarios were presented to Wirral Borough Council Officers and Elected Members in two workshops, which enabled feedback to be included in the optioneering process. Analysis of scenarios are also presented in this report.

The scope of the study covers principle opportunities for renewable energy generation and decarbonisation of heat, for the existing and mature technologies, in the Borough but does not cover emerging technologies or transport-based energy. The key outcomes of the study are presented in this report.

2 Current Energy & Carbon Position

An initial assessment was undertaken to determine the current energy demand and carbon position of the Wirral Borough. An understanding of these metrics is necessary to provide a baseline against which renewable energy generation and emissions savings can be measured.

The following section presents a summary of the current energy consumption and associated carbon dioxide equivalent (CO_2e) emissions in Wirral.

2.1 Energy Consumption

Total energy consumption by sector and by fuel type in Wirral was estimated in line with data from the UK Government Total Final Energy Consumption at Regional and Local Authority Level 2017 data set (the most recent dataset available). Based on this data the total energy consumption for the Wirral Borough was estimated to be 5,552GWh.

Figure 11 and *Figure 12* present the proportion of total energy consumption by sector and by fuel type respectively.

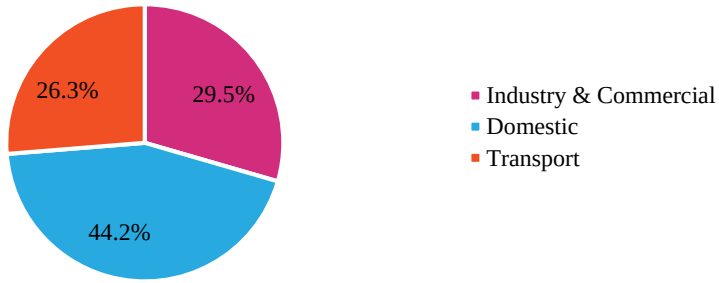


Figure 11: Proportion of Wirral Annual Final Energy Consumption by Sector[146]

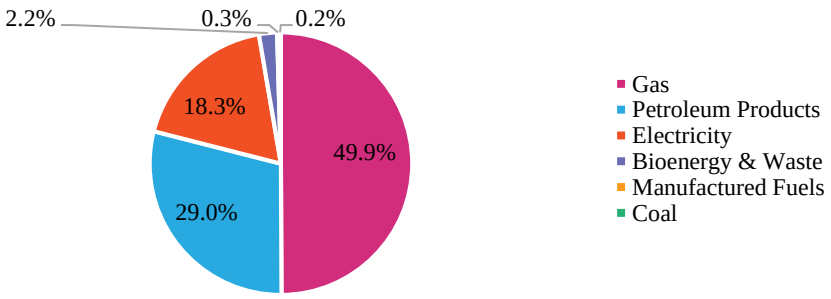


Figure 12: Proportion of Wirral Annual Final Energy Consumption by Fuel Type[147]
(Manufactured Fuels accounts for 0.3%, Coal for 0.2%, Bioenergy & Waste for 2.2%)

[146] Latest available UK BEIS Total Final Energy Consumption at Regional and Local Authority Level, 2017. BEIS (2019) UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2017. https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017 accessed 14/08/2020.

[147] Latest available Local Authority CO_2 Emissions Estimates 2017. BEIS (2019) UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2017 https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017 accessed 14/08/2020

The results of the demand analysis show that the domestic sector represents the largest proportion of final energy consumption in the Borough. This conclusion aligns with what would be expected for the Borough, as a high proportion of the address base is domestic buildings. The results also show that gas, electricity and petroleum products are the fuel types which constitute the highest proportions of final energy consumption in Wirral.

Improvements to building energy performance due to efficiency measures are expected to reduce energy consumption on a per-building basis over time; however additional development and local population growth could lead to an increase in total energy consumption over all. This increase in growth reinforces the need for higher standards in new developments. Similarly, shifts to electrified heating and transport are expected to lead to a higher proportion of final energy consumption being met by electricity and a reduction in the proportions met by gas and petroleum products over time. The extent and timeframes over which these trends materialise will be influenced by a combination of policy, market trends and consumer behaviour. Current legislation stipulates that the UK must achieve net zero greenhouse gas emissions by 2050.

2.2 Emissions

The total carbon dioxide emissions ($ktCO_2$) for the Borough by sector were estimated in line with the latest available UK Local Authority and Regional Carbon Dioxide Statistics (2017) data set. The total carbon dioxide equivalent emissions by fuel type ($ktCO_2e$) were estimated using the results of the energy demand assessment as a basis and applying the relevant emissions factors from the UK Government Greenhouse Gas Reporting Conversion Factors[148]. The 2017 emissions factors have been used to be consistent with latest Local Authority Level Statistics (2017) used in other elements of the assessment. The total carbon dioxide equivalent emissions for the Borough were estimated to be 1,394 $ktCO_2e$.

[148] Used as the corresponding year's Conversion Factors against the UK Local Authority and Regional Carbon Dioxide Emissions National Statistics 2017. BEIS (2019) UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2017 https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017 accessed 14/08/2020

Figure 13 and *Figure 14* present the proportion of total energy consumption by sector and by fuel type respectively.

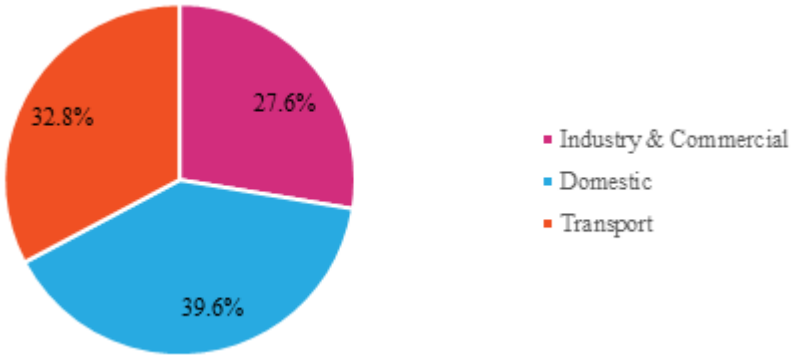


Figure 13: Proportion of Wirral Annual Carbon Dioxide Emissions (CO_2) by Sector

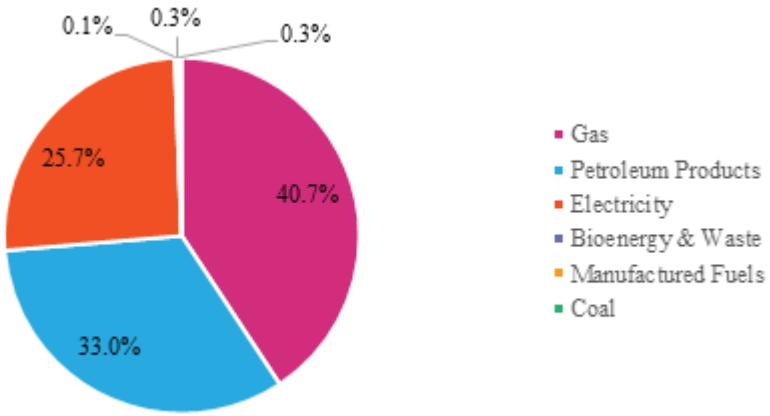


Figure 14: Proportion of Wirral Carbon Dioxide Equivalent Emissions (CO_2e) by Fuel Type[149]. (Bioenergy & Waste accounts for 0.1%, Manufactured Fuels 0.3% and Coal 0.3%)

[149] UK Government Greenhouse Gas Reporting using figures from year corresponding to the latest available Local Authority Emissions Data (2017) for consistency. BEIS (2020) Greenhouse gas reporting: conversion factors 2020 https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020, accessed 14/08/2020.

The results of the carbon emissions assessment show that gas consumption contributes the largest proportion of energy based CO_2e emissions in the Borough. Electricity and petroleum products also represent significant proportions of the emissions base. Emissions from coal, manufactured fuels, bioenergy and waste are comparatively negligible.

The average emissions factor for the UK electricity grid is projected to reduce over time due to the increased penetration of renewables and adoption of lower-carbon energy sources to meet UK carbon targets (*Figure 15*). In line with this, a transition from fossil fuel vectors to electrified solutions is underway. A move from traditional gas boiler-based heating to electric technologies such as heat pumps/electrode boilers and a transition from petrol vehicles to electric vehicles is expected to yield significant carbon savings and will become increasingly prevalent over the coming decades. This is reinforced by recommendations to UK government (and their associated response/plans) to ban gas boilers in new developments by 2025[150]. The amount and proportion of emissions associated with gas use is therefore expected to reduce over time.

Renewable energy will play an increasingly important role in this transition. An increase in local, decentralised renewable generation will ameliorate some of the additional stress that will be placed on the electricity distribution network due to widespread electrification.

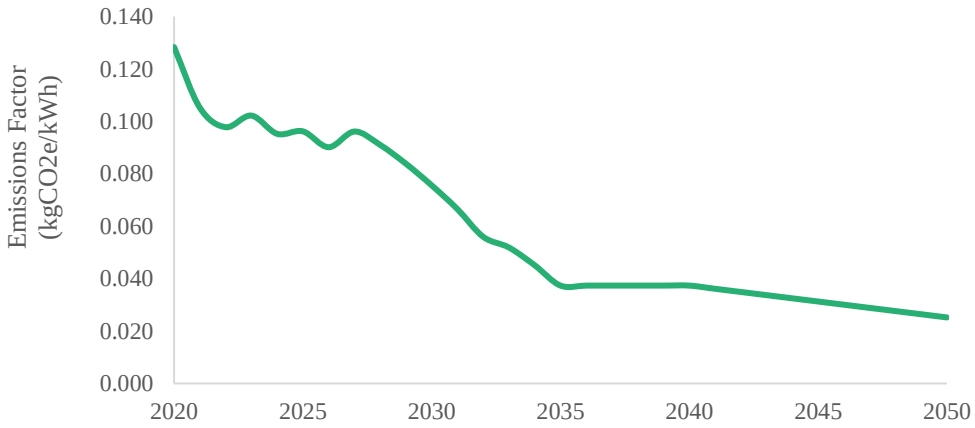


Figure 15: BEIS Grid-average Generation-based Electricity Emissions Factor to 2050[151]

The introduction of lower carbon vectors such as hydrogen and biogas into the natural gas grid could also to lead to a reduction in the UK grid gas emissions factor over time. However, there is a much higher degree of uncertainty regarding the extent and timescales for this reduction, due to a number of technical, commercial and safety factors associated with changes to grid gas composition, and the source of any hydrogen gases used to displace natural gas.

[150] UK Committee on Climate Change, (2019) UK housing: fit for the future? https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf , accessed 14/08/20.
[151] BEIS (2020) Green Book Supplementary Guidance: Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal, Data Table 1 https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal, accessed 14/08/2020

Emissions benefits from renewable energy

With regards to carbon accounting, the end user of energy is the party responsible for the associated carbon emissions. When an energy user uses electricity from the National Grid, they are the beneficiary of the carbon emissions benefit associated with a greater proportion of renewables in the UK energy mix[152]. In the case of purchasing 100% renewable energy tariffs, again it is the end user of the energy who is the beneficiary of the carbon benefit[153].

In the context of this commission, i.e. in the case of local governments/Local Authorities, where renewable energy installations occur within the Authorities boundary, but the energy is transmitted via the National Grid, it would not be possible to 'claim' the carbon emissions benefits of the renewable energy generated. This is as it has already been accounted for in the grid national average emissions factor.

Depending on the boundary of the carbon foot-printing for the Borough, where renewable energy has been generated and used within the Borough, has not been transmitted via the National Grid and is energy which replaces an existing energy demand that would otherwise have been drawn from the grid, it could be possible to consider these carbon benefits against the carbon impact of the Borough (but not the Local Authority itself)[154].

[152]All energy which is fed into the National Grid, i.e. energy which is transported by transmission through the National Grid infrastructure, forms part of the UK's national energy mix. The carbon emissions associated with the national energy mix is calculated annually by the Department for Business, Energy and Industrial Strategy (BEIS), and is known as the 'grid national average [carbon] emissions factor'. As an increasing proportion of the energy mix is generated from renewable energy (and transmitted through the National Grid) the grid national average emissions factor reduces. This means the carbon intensity of the energy is less and so the carbon emissions associated with energy used by electricity users is reduced.

[153] This is the case in general, but it should be noted that different reporting mechanisms handle emissions associated with purchased of 100% renewable energy in different ways.

[154] Where energy is not fed into the National Grid, e.g. transmitted by private wire to a user or into a closed, local grid, again it is the user of the energy who is the beneficiary of the carbon benefit. In this case the renewable energy does not form part of the national energy mix and so does not contribute to the grid national average carbon emissions factor. The renewable energy has been generated and used within the boundary of the Borough without interacting with the National Grid (and so has not been accounted for in the grid national average emissions factor). For example, the emissions benefit could be used to demonstrate progress towards Wirral as a Borough becoming net zero carbon by 2041. However, caution must be taken with this approach not to 'double count' the emissions benefits with the energy user who is the ultimate beneficiary.

3 Clean Energy Opportunities

The following section presents the results of the Clean Energy Opportunities investigation. The section presents:

- the key opportunity and constraint metrics defined for each of the considered technologies;
- a map indicating the constraints mapped geospatially;
- indicative energy yield and carbon saving estimates.
- building-integrated technologies;
- grid infrastructure capacity.

The study considers the key constraints and opportunity metrics associated with each technology to identify areas of least constraint. These areas demonstrate the potential sites of opportunity for each technology,. A summary of these opportunities is provided here, and associated GIS layers made available for future progression of opportunities identified.

More detailed technical requirements, such as cable routes, performance specifications and site layouts, would be most suitable for consideration on a project by project basis once opportunity sites have been selected for development. Once selected for development, site-specific feasibility assessments, Environmental Impact Assessments (EIA) and necessary due diligence will also be required.

3.1 Onshore Wind

Onshore wind energy consists of wind turbine generators, which utilise rotor blades to harness the power of the wind and drive a generator which produces electricity. Multiple wind turbines arranged in an array form a wind farm. Smaller scale, single turbine installations are also common. *Figure 16* presents the indicative physical size of wind turbines and their approximate generation capacity.

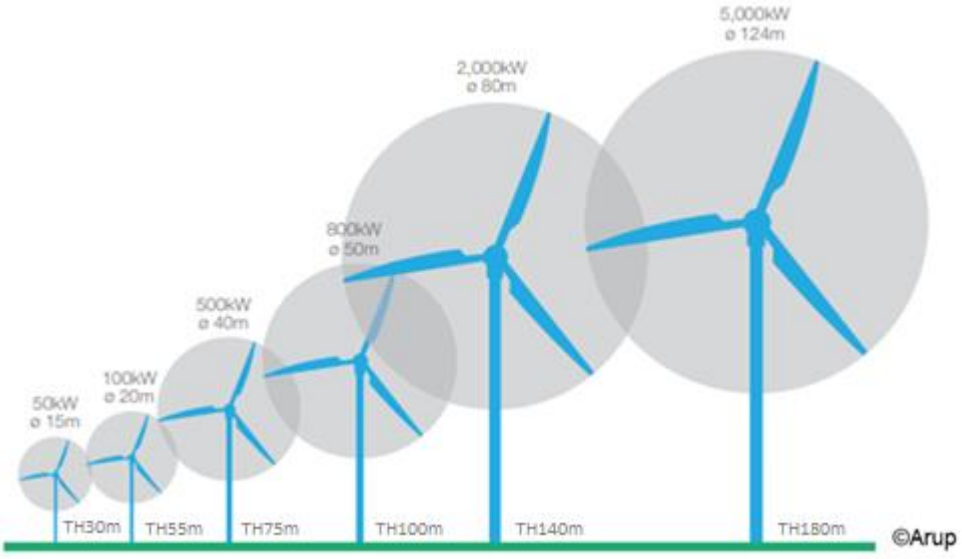


Figure 16: Indicative Wind Turbine Sizes and Generation Capacities (TH = tip height, Ø = turbine diameter).

For the purposes of this analysis, wind turbine sizes have been categorised into four groups as shown in *Table 4*. The numbers in the table are based on Arup project experience and are for indicative purposes only.

Table 4: Onshore Wind Turbine Classification (based on Arup project experience)

Category	Wind Turbine Tip Height Range (m)	Typical Capacity Range (MW)
Small	<80	<0.5
Medium	80-110	0.5-1.5
Large	111-150	1.51-3
Very Large	>150	>3

Large onshore wind installations consisting of multiple turbines are typically connected to the grid. Smaller scale installations can export to the grid or supply power directly to local users via a private wire with a commercial arrangement, such as a Power Purchase Agreement (PPA).

3.1.1 Onshore Wind Energy Constraints Matrix

The constraints and opportunity metrics for onshore wind energy are presented in *Table 5*. The metrics were used as the basis for the geomodelling analysis and are aligned with UK statutory requirements and best-practice guidelines for onshore wind energy development. The table presents the constraint type by category (environmental, cultural, heritage etc.), the associated assumptions, the data

source and the appropriate rationale (statutory requirement/best practice guideline) for inclusion in the analysis.

This assessment focuses on stand-alone onshore wind energy installations (wind farms and single turbine installations). A summary of building-integrated technologies (including building-integrated wind) is included in a later section.

Table 5: Onshore Wind Energy Opportunity and Constraint Matrix

Constraint Type	Assumption	Data Source	Rationale
Opportunity			
Wind Speed	Minimum wind speed of 6.5 m/s at 50m above sea level.	Global Wind Atlas 3.0	A minimum wind speed of 6.5m/s at 50m height is considered sufficient to support commercial wind development (Arup project experience – yield and competitiveness for CfD auctions).
Wind Turbine Size	Turbine sizes considered: • Very Large: 150 – 200m tip height (hub height + blade radius) • Large: 110 – 150m tip height (hub height + blade radius) • Medium: 80 – 110m tip height (hub height + blade radius) • Small: less than 80m tip height (hub height + blade radius)	Arup Project Experience	Arup project experience.
Wind Turbine Array Density	Turbine sizes considered: • Very Large: 4 turbines per km^2	Arup analysis.	Analysis undertaken based on assumed minimum spacing between turbines informed by project experience. Actual

Constraint Type	Assumption	Data Source	Rationale
	• Large: 4 turbines per km^2 • Medium: 9 turbines per km^2 • Small: 36 turbines per km^2		wind turbine spacing will be determined by the developer using site-specific modelling (e.g. wake modelling) and local constraints.
Environmental			
Conservation & Wildlife	Land designations excluded: • National & Local Nature Reserves • Special Protection Areas (SPA) • Special Areas of Conservation (SAC) • Ramsar Sites • Sites of Special Scientific Interest (SSSI)	Natural England (Open Government Data)	Land designations excluded based on the following: • Conservation of Habitats & Species Regulations 2010 • Wildlife and Countryside Act 1981 • National Planning Policy Framework • Natural Environment and Rural Communities Act
Woodland	Land designations excluded: • Woodland (National Forest Inventory) • Ancient Woodland	Forestry Commission (Open Government Data) Natural England (Open Government Data)	It is not recommended that woodland areas are considered for wind energy development where it would result in the removal of existing woodland. This aligns with industry best practice of woodland being a constraint[155]. Development of woodland areas would also conflict with the Wirral Borough Councils

[155] For example, Renewables First advice on the siting of wind turbines. Available at: https://www.renewablesfirst.co.uk/windpower/community-windpower/location-size-no-of-wind-turbines/, accessed 16.10.2020

Constraint Type	Assumption	Data Source	Rationale
			Tree, Hedgerow and Woodland Strategy (2020-2030) (Overarching aim 1: to protect, regeneration and care for Wirral's existing trees, hedgerows and woodlands). In addition, National Planning Policy Framework (NPPF) paragraph 157 development states that development resulting in the loss or deterioration of irreplaceable habitats such as ancient woodland and ancient and veteran trees should be refused.
Surface Water	A minimum distance of 50m between wind turbine development and surface water bodies.	Ordnance Survey VectorMap District	A minimum distance has been allocated as a good practice measure to minimise impact on surface water bodies in terms of contaminants, noise and vibration during construction.
Cultural & Heritage			
Cultural & Heritage	Land designations excluded: • Listed Buildings • World Heritage Sites • Parks & Gardens • Scheduled Monuments • Registered Battlefields • Archaeological Interest Sites	Historic England (Open Government Data) Wirral Council Data	Land designations excluded based on the following: • National Planning Policy Framework • The Convention Concerning the Protection of World Cultural and Natural Heritage

Constraint Type	Assumption	Data Source	Rationale
	• Archaeological Alert Sites		• National Heritage Act 1983. • Ancient Monuments and Archaeological Areas Act, 1979
Infrastructure & Land Use			
Address Proximity	A minimum distance between wind energy developments and address points has been set for each wind turbine classification category. Exclusion zones have been allocated in line with best practice for wind energy developments considering noise and safety. • Small and Medium turbines: 250m buffer zone • Large and very large turbines: 500m buffer zone	Wirral Council Data (Ordnance Survey Address Base Plus)	Exclusion zones have been allocated in line with the Department for Communities & Local Government (DCLG), (now Ministry of Housing, Communities & Local Government) 'Planning Practice Guidance for Renewable and Low Carbon Energy' and considering ETSU-R-97 'Assessment and Rating of Noise from Wind Farms'.
Roads	Exclusion zones have been allocated for each wind turbine classification category equivalent to the wind turbine tip height +10%.	Ordnance Survey VectorMap Open	Exclusion zones have been allocated in line with the DCLG 'Planning Practice Guidance for Renewable and Low Carbon Energy'.
Railways	Exclusion zones have been allocated for each wind turbine classification	Ordnance Survey VectorMap Open	Exclusion zones have been allocated in line with the DCLG 'Planning Practice

Constraint Type	Assumption	Data Source	Rationale
	category equivalent to the wind turbine tip height +10%.		Guidance for Renewable and Low Carbon Energy'.
Public Rights of Way & Bridleways	Exclusion zones have been allocated for each wind turbine classification category equivalent to the wind turbine tip height +10%.	Ordnance Survey VectorMap Open	Exclusion zones have been allocated in line with the DCLG 'Planning Practice Guidance for Renewable and Low Carbon Energy'.
National Grid Transmission Lines	Exclusion zones have been allocated for each wind turbine classification category equivalent to the wind turbine tip height +10%.	Ordnance Survey VectorMap Open	Exclusion zones have been allocated in line with the DCLG 'Planning Practice Guidance for Renewable and Low Carbon Energy'.
Green Belt	Green Belt land is excluded[156].	Wirral Borough Council	Wind turbines are classed as inappropriate development in the Green Belt. Very special circumstances would have to be demonstrated at planning application stage. Paragraph 147 of the National Planning Policy Framework states that for renewable energy projects, 'developers will need to demonstrate very special circumstances if projects are to proceed. Such very special circumstances may include the wider environmental

[156] However, this assessment does present separately a consideration of potential energy generation / carbon benefits of utilisation of Green Belt land.

Constraint Type	Assumption	Data Source	Rationale
			benefits associated with increased production of energy from renewable sources.'
Development Land	Land designated in the Strategic Housing Land Availability Assessment (SHLAA) is excluded.	Wirral Borough Council	Land allocated for future development in the SHLAA are excluded.

3.1.2 Onshore Wind Constraints and Opportunities

The following section presents the results of the geospatial modelling assessment and highlights the key areas of constraint and opportunity for onshore wind energy in Wirral.

In *Figure 17* the wind speed profile across the Wirral Borough is presented.

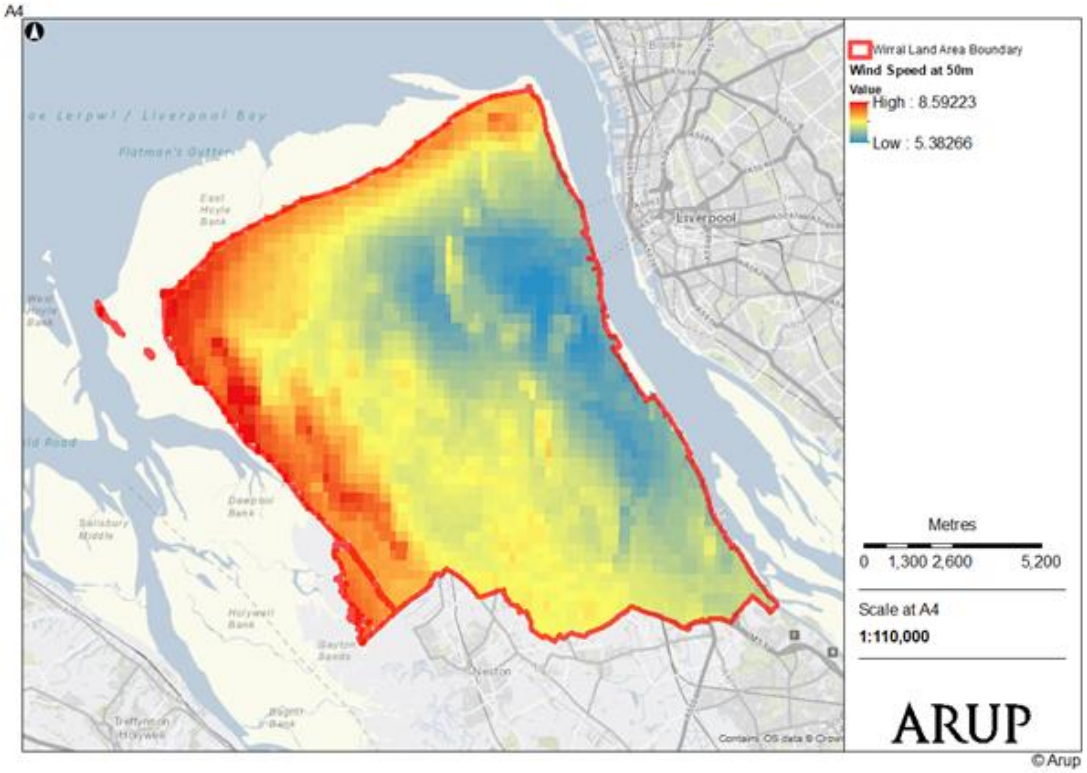


Figure 17: Mean Wind Speed (m/s) at 50m Height Across Wirral Land Area[157]

Average wind speeds greater than 6.5 m/s at a height of 50m are typically considered sufficient to support commercially viable onshore wind projects. *Figure 17* shows that wind speeds are highest on the western and southern parts of Wirral, particularly near the coastline. The areas in shades of yellow to red are considered to have wind speeds that are high enough to support commercially viable onshore wind energy installations. More accurate, site-specific monitoring of wind speeds and wake modelling will be required prior to the implementation of onshore wind energy installations.

Following the mapping of wind speeds across the Borough, the key constraints were geospatially mapped to identify opportunity areas. *Figure 18* and *Figure 19* present the key constraints for small/medium and large/very large onshore wind energy installations respectively.

[157] Data Obtained from the Global Wind Atlas 3.0, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU). The Global Wind Atlas 3.0 is released in partnership with the World Bank Group, utilizing data provided by Vortex, using funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalwindatlas.info, under the Creative Commons Creative Commons Attribution 4.0 International license, CC BY 40.

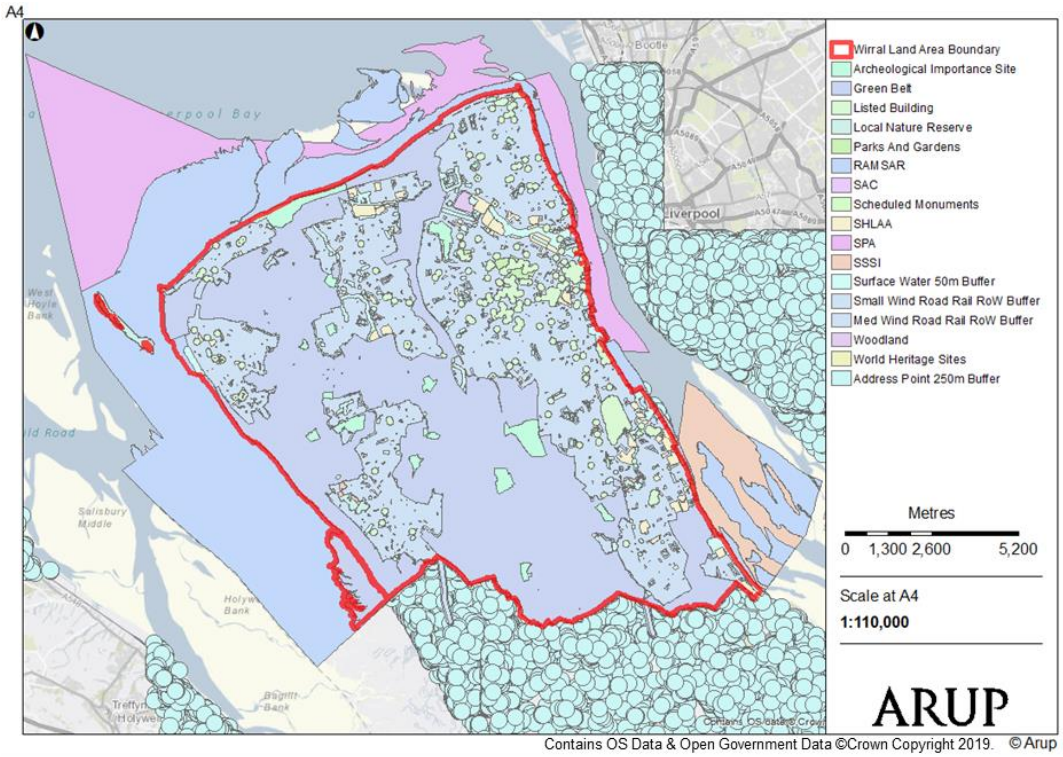


Figure 18: Onshore Wind Energy Constraints (Small/Medium Installations). Contains information licensed under the Open Government Licence v3.0 (©Natural England, ©Forestry Commission, ©Historic England, ©Environment Agency) and ©Wirral Borough Council.

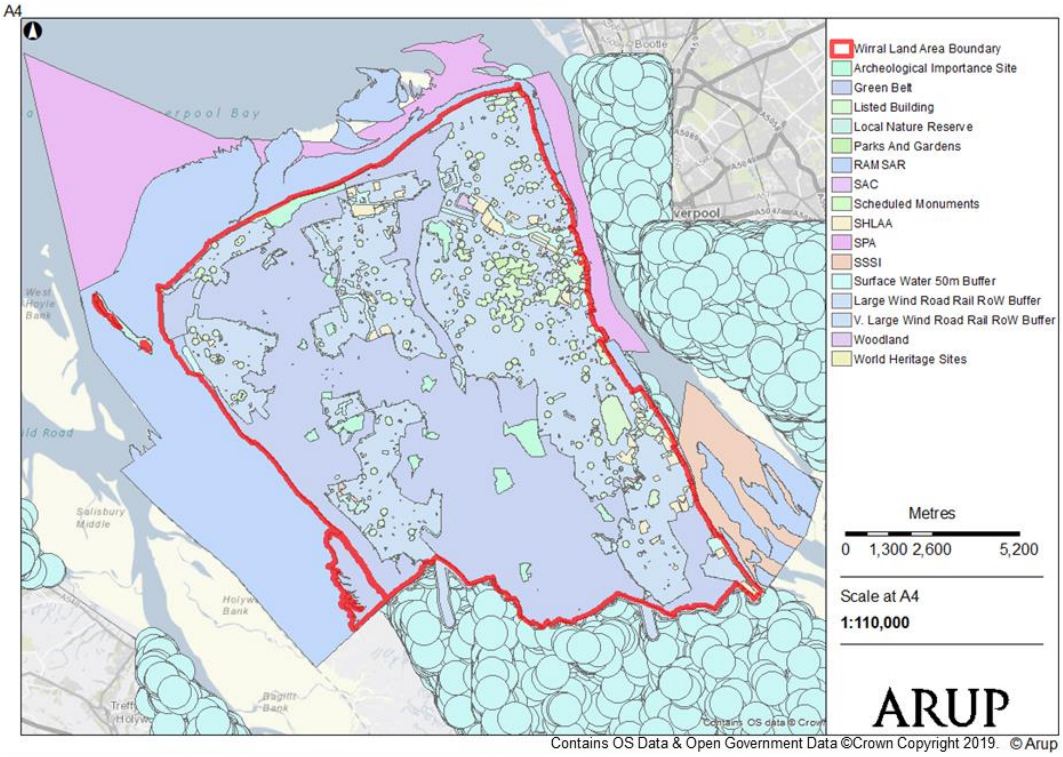


Figure 19: Onshore Wind Energy Constraints (Large/Very Large Installations). Contains information licensed under the Open Government Licence v3.0 (©Natural England, ©Forestry Commission, ©Historic England, ©Environment Agency) and ©Wirral Borough Council.

The figures show that in general Wirral is highly constrained in terms of onshore wind energy deployment and that there is little-to-no suitable land available for implementation of onshore wind farms. This is reflective of the Borough's characteristics in that generally, the eastern side of the Wirral is urbanised and densely populated, whereas the western side is characterised by rural land, which is protected by Green Belt and environmental protection designations.

Air traffic and airports were considered as a potential constraint. However, in considering the potential constraints, it was acknowledged that precedent has already been set for wind turbine developments in close proximity to airports in the region, in particular Liverpool John Lennon Airport. For example, the Peel Holdings wind turbine installations at the Port of Liverpool and the Mersey Estuary at Frodsham. As such, the application of a constraint could have eliminated potentially viable opportunities. Therefore, it would be recommended that any potential wind energy developments on the Wirral be considered on a case by case basis and in light of relevant information pertaining to existing wind turbine developments in the region with regards to aircraft and airports.

The minimum distance between wind farm installations and address points represents one of the most prohibitive constraints in the analysis. It is noteworthy that the minimum distance between wind turbines and address points has been allocated in line with best practice guidance and the EU ETSU-R-97 guidelines[158]. When developing onshore wind installations, it is strongly recommended to adhere to these guidelines to avoid the impact of noise and shadow flicker on the local address base; however, the constraint is not a statutory requirement. It may therefore be considered possible to site small-single turbine installations within the exclusion zone, subject to the agreement of the nearby address base and other statutory constraints.

Example scenarios could include:

- A farm owner looking to install a wind turbine (or small array) on farm land, within 250m of the farmhouse,
- A community energy group achieving permission from all nearby residents to site a wind turbine in the exclusion zone on the basis of locally produced clean energy outweighing potential shadow flicker and noise implications.

The Green Belt designation is also a major prohibitive constraint in the analysis. However, consideration of utilisation of some Green Belt land for renewable energy developments can be made in line with the NPPF, where very special circumstances and where the wider benefits to the community are demonstrated. Paragraph 147 of the National Planning and Policy Framework (NPPF)[159] states the following:

[158] Department of Trade and Industry (1996) The Assessment & Rating of Noise from Wind Farms https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy__Searchable_.pdf accessed 14/08/20

[159] Ministry of Housing, Communities and Local Government (2019) National Planning and Policy Framework https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf, accessed 14/08/20

"*When located in the Green Belt, elements of many renewable energy projects will comprise inappropriate development. In such cases developers will need to demonstrate very special circumstances if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources*.".

Paragraph 146 also includes "*development brought forward under a Community Right to Build Order or Neighbourhood Development Order*" as a situation which would not be inappropriate in the Green Belt. Further consideration of Green Belt has also been made in the Best Practice Review and in the development of Policy Development Papers.

Considerations of the utilisation of Green Belt land to facilitate renewable energy development should carefully consider the need and circumstances within which the proposal is made. This may seek to take into account whether opportunities to develop renewable energy on brownfield sites and the use of building mounted solutions, have been fully utilised. The analysis revealed that if the Green Belt were to be utilised for onshore wind energy development, some small opportunity areas exist for onshore wind installations with small/medium turbines (however none exist for large/very large turbines, as they remain constrained by the 500m minimum distance to the local address base). These opportunity areas are presented in the map in *Figure 20.*

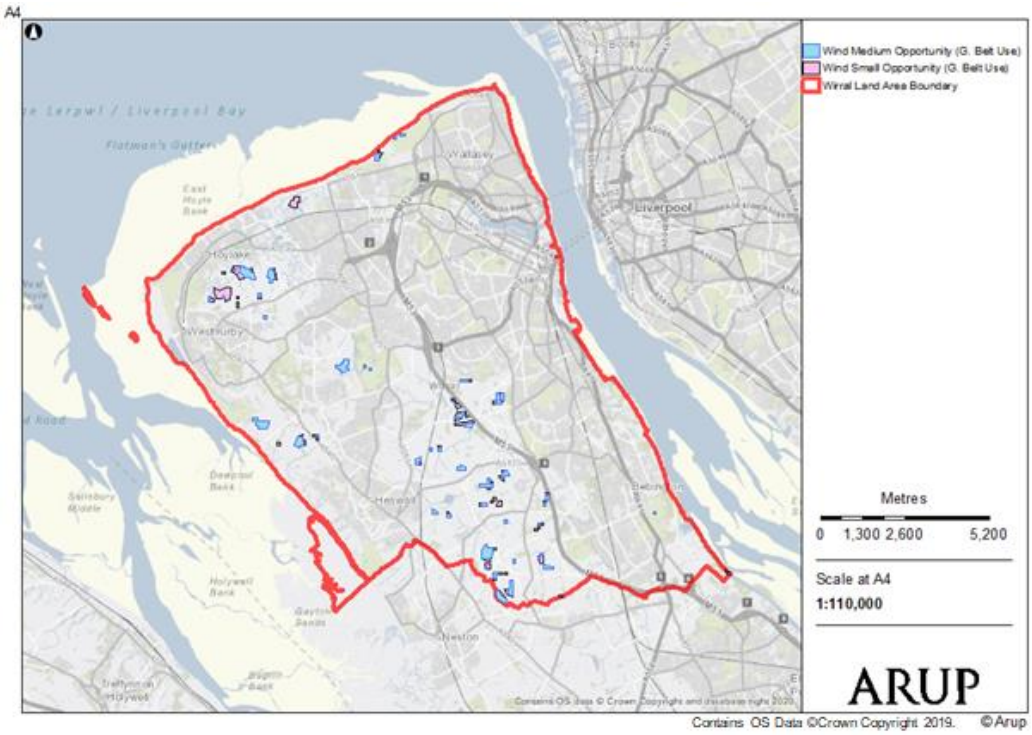


Figure 20: Onshore Wind Opportunity Areas (Onshore Wind Installations Consisting of Small or Medium Turbines, with Green Belt Utilisation)

3.3.3 Energy Yield and Carbon Savings

The opportunity areas identified in the constraints analysis were used to determine potential capacities for onshore wind energy installations consisting of small/medium sized turbines (when the Green Belt is utilised). Local weather and resource data were used to inform energyPRO® models to determine theoretical yields and carbon savings for the period 2020 to 2050. In actuality, it will not be practicable to utilise all of the available opportunity area for onshore wind installations, therefore a number of scenarios were modelled considering development on various proportions of the opportunity area. *Figure 21* presents the theoretical capacity for onshore wind energy.

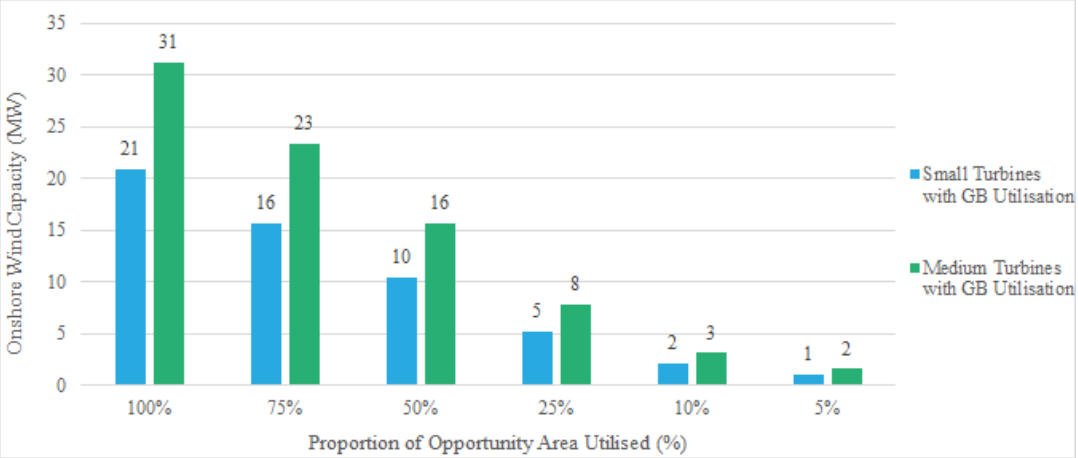


Figure 21: Onshore wind energy capacity based on opportunity area utilisation. Percentages given on the x axis represent the proportion (as a percentage) of the area identified within this study as potentially suitable for onshore wind installation, utilised for onshore wind installation (modelled in energyPRO®)

The figures for annual onshore wind yield (*Figure 22* and *Figure 23*) were used to inform estimates for theoretical carbon savings for the period 2020 to 2050 in line with the BEIS Grid-average Generation-based Electricity Emissions Factor to 2050 (*Figure 15*).

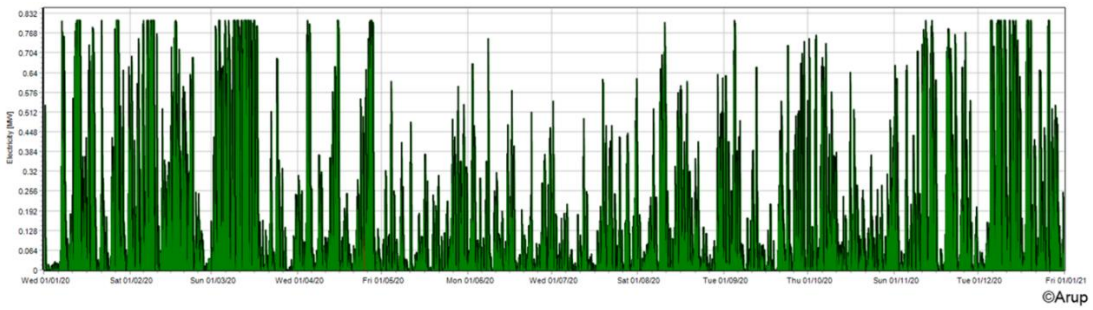


Figure 22: Annual Generation Profile for a 0.8MW Onshore Wind Turbine in Wirral

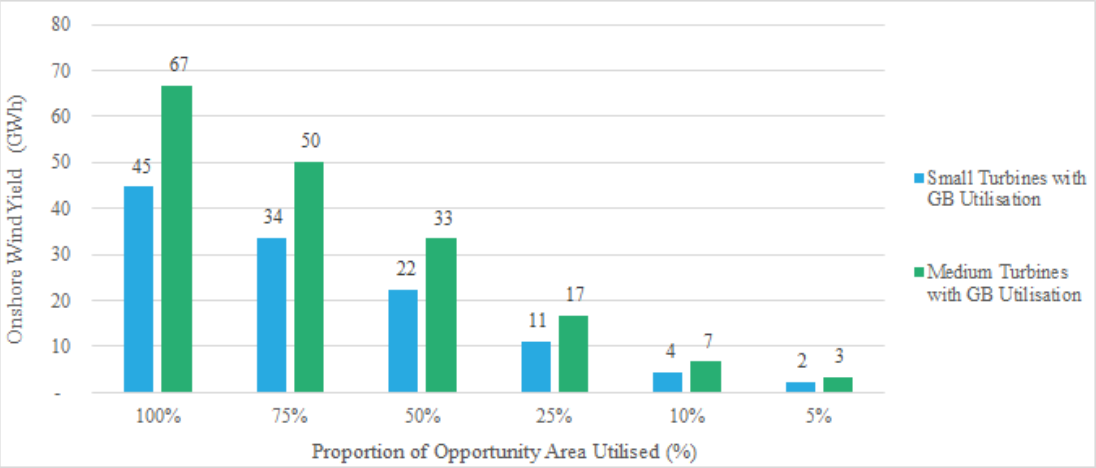


Figure 23: Annual Onshore Wind Yield Based on Opportunity Area Utilisation. Percentages given on the x axis represent the proportion (as a percentage) of the area identified within this study as potentially suitable for onshore wind installation, utilised for onshore wind installation.

The calculated CO_2e savings are presented in *Figure 24*.

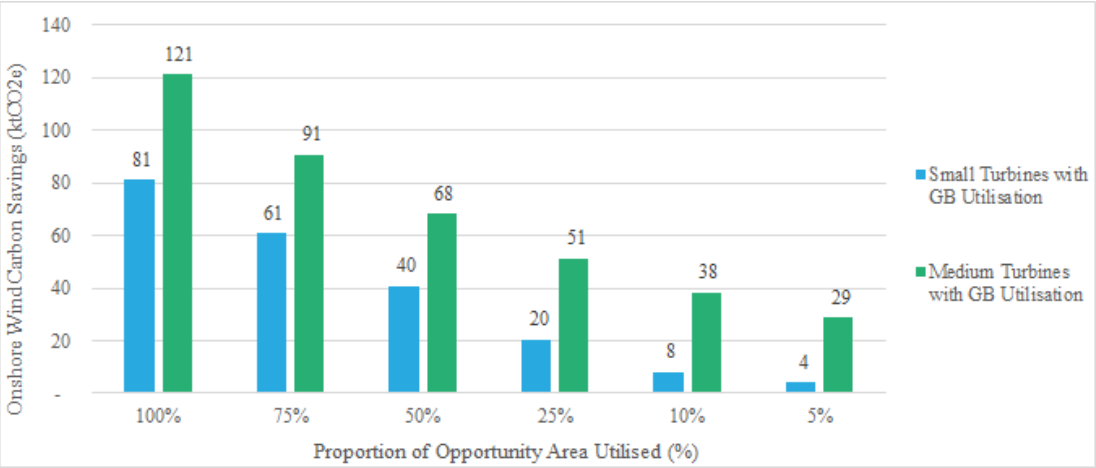


Figure 24: Onshore Wind Energy Total Carbon Dioxide Equivalent Savings for the period 2020 to 2050

In summary, the analysis concludes that the Wirral is generally unsuitable for onshore wind energy development and there are no opportunity areas for deployment of onshore wind energy without impacting on the Green Belt Where very special circumstances are demonstrated by a developer , it may be considered possible to site wind turbine arrays consisting of small or medium sized turbines in specific opportunity areas in the Green Belt. If fully utilised, onshore wind installations in these opportunity areas could theoretically generate an estimated 67 GWh (medium size turbines) and save 121 $ktCO_2e$ for the period 2020 to 2050. Para 147 of the NPPF sets out that such development would constitute inappropriate development, which for a proposal to achieve planning permission would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt. Considering natural beauty, agricultural land, ecology and local character.

3.2 Solar PV

A solar photovoltaic (PV) system, is an electrical installation which uses arrays of solar PV panels to convert solar energy into electricity. Solar PV panels can be mounted on the ground (ground-mounted PV), mounted on a structure floating on a water body (floating solar PV) or integrated into the building envelope on a roof or in a façade (building-integrated PV). This assessment focuses on ground-mounted and floating solar PV installations and a summary of building-integrated technologies is included later in the report. The layout and configuration of systems can differ depending on the load type and energy supply requirements. An indicative layout is presented in *Figure 25*.

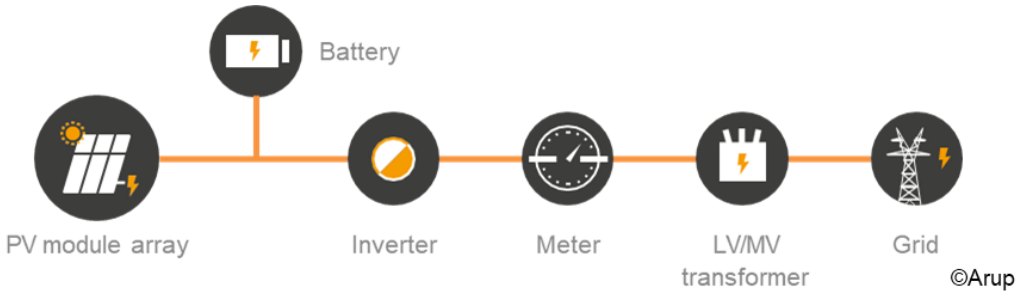


Figure 25: Indicative Configuration for Solar PV System

Ground mounted solar PV arrays are typically connected to the grid. Installations can also export power directly to local users via a Private Wire and commercial arrangement such as a Power Purchase Agreement (PPA).

3.2.1 Solar PV Constraints Matrix

The constraints and opportunity metrics used to identify opportunity areas for ground-mounted solar PV are presented in *Table 6*. The metrics used in the analysis are aligned with UK regulations and best-practice guidelines for solar energy developments. Opportunity areas for floating solar PV systems were found by identifying suitable water bodies across the Wirral, such as docks and waterways.

Similar to the discussion for wind energy, air traffic and airports were considered as a potential constraint. However, it is possible to design in mitigation into schemes to avoid potential interactions with air traffic, such as altering the tilt angle of solar PV panels to avoid glare, use of anti-reflective film on panels and screening with strategic planting of hedgerows and coppice. As such, the application of a constraint could have eliminated potentially viable opportunities. Therefore, it would be recommended that any potential solar PV energy developments on the Wirral be considered on a case by case basis and with project level assessment of potential impacts and mitigation.

Table 6: Solar PV Opportunity and Constraints Matrix

Constraint Type	Assumption	Data Source	Rationale
Opportunity			
Solar PV Output Potential	Minimum solar PV output potential of 900 kWh/kWp (per year).	Global Solar Atlas 2.0[160]	A minimum solar PV output of 900 kWh/kWp (per year) is considered sufficient to support commercially viable solar development (Arup project experience).
Ground-mounted Solar Array Density	Array density of 0.061kW/m^2	Arup project experience.	Actual solar PV array density will be dependent on-site specific geometry, topography and footprint of ancillary equipment such as substations. The array density accounts for solar PV module footprints, panel spacing and also the footprint of associated ancillary equipment such as substations.
Environmental			
Conservation & Wildlife	Land designations excluded: • National & Local Nature Reserves • Special Protection Areas (SPA) • Special Areas of Conservation (SAC)	Natural England (Open Government Data[161])	Land designations excluded based on the following: • Conservation of Habitats & Species Regulations 2010 • Wildlife and Countryside Act 1981

[160] Global Solar Atlas 2.0, a free, web-based application is developed and operated by the company Solargis s.r.o. on behalf of the World Bank Group, utilizing Solargis data, with funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalsolaratlas.info

[161] Natural England data licensed under the Open Government Licence v3.0.

Constraint Type	Assumption	Data Source	Rationale
	• Ramsar Sites • Sites of Special Scientific Interest (SSSI)		• National Planning Policy Framework • Natural Environment and Rural Communities Act
Woodland	Land designations excluded: • Woodland (National Forest Inventory) • Ancient Woodland	Forestry Commission (Open Government Data[162]) Natural England (Open Government Data[163])	It is not recommended that woodland areas are considered for wind energy development where it would result in the removal of existing woodland. This aligns with industry best practice of woodland being a constraint[164]. Development of woodland areas would also conflict with the Wirral Borough Councils Tree, Hedgerow and Woodland Strategy (2020-2030) (Overarching aim 1: to protect, regeneration and care for Wirral's existing trees, hedgerows and woodlands). In addition, National Planning Policy Framework (NPPF) paragraph 157 development states that development resulting in the loss or deterioration of irreplaceable habitats such as ancient woodland and ancient

[162] Forestry Commission data information licensed under the Open Government Licence v3.0.
[163] Natural England data licensed under the Open Government Licence v3.0.
[164] For example, Renewables First advice on the siting of wind turbines. Available at: https://www.renewablesfirst.co.uk/windpower/community-windpower/location-size-no-of-wind-turbines/, accessed 16.10.2020

Constraint Type	Assumption	Data Source	Rationale
			and veteran trees should be refused.
Surface Water	A minimum distance of 10m between solar farm arrays and surface water bodies.	Ordnance Survey VectorMap District[165]	Industry best practice suggests that although potentially suitable for floating solar PV, a minimum distance of 10m from surface water bodies to ground-mounted PV arrays has been allocated as a good practice measure to account for potential water body overflow, and to minimise impact on the water body in terms of contaminants, noise and vibration during construction.
Cultural & Heritage			
Cultural & Heritage	Land designations excluded: • Listed Buildings • World Heritage Sites • Parks & Gardens • Scheduled Monuments • Registered Battlefields • Archaeological Interest Sites • Archaeological Alert Sites	Historic England (Open Government Data[166]) Wirral Council Data	Land designations excluded in line with: • National Planning Policy Framework • The Convention Concerning the Protection of World Cultural and Natural Heritage • National Heritage Act 1983. • Ancient Monuments and Archaeological Areas Act, 1979
Infrastructure & Land Use			

[165] OS data © Crown copyright and database right 2020 licensed under the Open Government Licence v3.0.
[166] Historic England data licensed under the Open Government Licence v3.0.

Constraint Type	Assumption	Data Source	Rationale
Building Proximity	A minimum distance of 20m from urban areas.	Office for National Statistics (ONS) Built-up Areas[167]	A 20m buffer zone is allocated around urban areas to minimise the impact of shading from buildings (based on Arup project experience).
Roads, Railways, Public Rights of Way & Bridleways	Roads, railways and public rights of way are excluded.	Ordnance Survey VectorMap Open[168]	Industry best practice is that roads, railways and public rights of way are not suitable for locating typical commercial PV systems.
Green Belt	Green Belt land is excluded.	Wirral Borough Council	Green Belt land is protected and strict limitations on Green Belt development may make it unsuitable for siting of solar PV. Para 147 of the National Planning Policy Framework states that siting of renewables in Green Belt may be possible where 'very special circumstances are demonstrated'.
Agricultural Land	High grade agricultural land (Grade 1-3) is excluded.		Brownfield land, previously developed land and low-grade (4-5) agricultural land should be prioritised for siting of ground-mounted PV installations, Utilisation of agricultural land

[167] Office for National Statistics data licensed under the Open Government Licence v3.0.
[168] OS data © Crown copyright and database right 2020 licensed under the Open Government Licence v3.0.

Constraint Type	Assumption	Data Source	Rationale
			should be balanced with food production.
Development Land	Land designated in the SHLAA is excluded.	Wirral Borough Council	Land allocated for future development in the SHLAA are excluded.

3.2.2 Ground-mounted Solar PV Constraints and Opportunities

The following section presents the results of the geospatial modelling assessment and highlights the key areas of constraint and opportunity for ground-mounted solar PV in Wirral. The assessment also highlights potentially suitable water bodies for siting of floating solar PV systems.

The solar PV output potential profile across the Wirral Borough is shown in *Figure 26*.

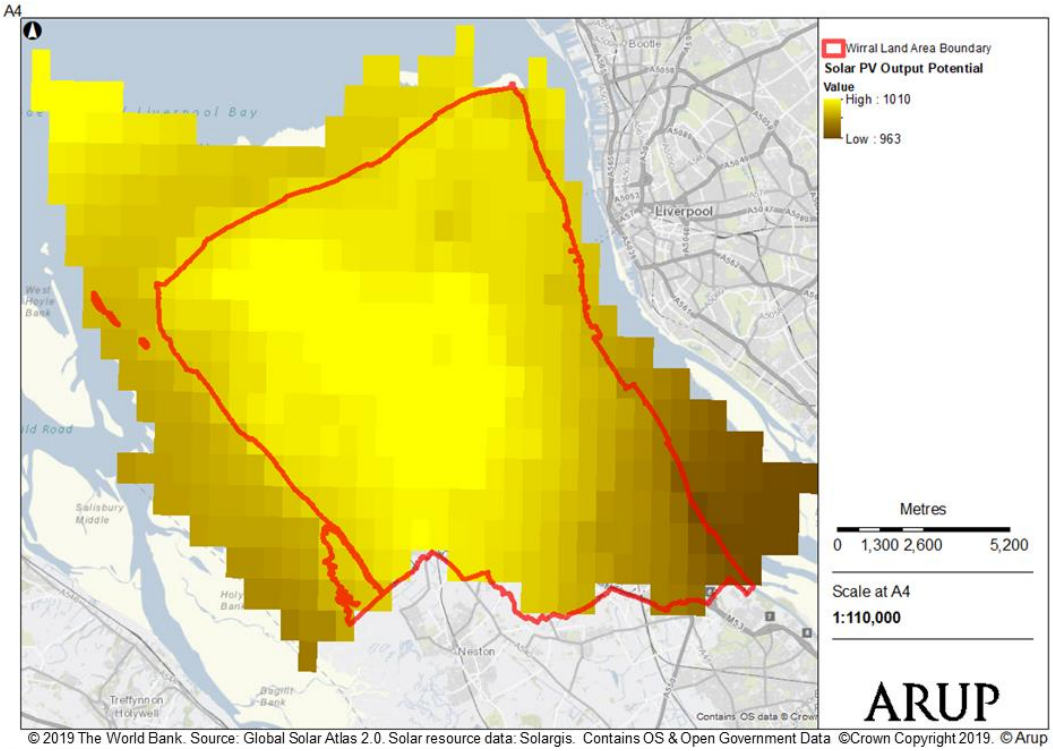


Figure 26: Solar PV Output Potential (Annual kWh/kWp) Across Wirral Land Area[169]

A solar PV output potential greater than 900kWh/kWp (annually) can be considered sufficient to support commercially viable solar PV projects in the UK (indicative figure, based on Arup project experience). *Figure 26* shows that the solar PV output potential is sufficient across the Borough to support solar PV installations, with the highest potential in the central region. More accurate, site-specific monitoring of factors such as solar insolation, shading conditions and localised temperature will be required prior to installation of solar PV systems.

Following the mapping of solar PV output potential across the Borough, the key constraints were geospatially mapped to identify areas of least constraint for solar energy deployment. *Figure 27* presents the constraints associated with solar energy development.

[169] *Data* obtained from the Global Solar Atlas 2.0, a free, web-based application is developed and operated by the company Solargis s.r.o. on behalf of the World Bank Group, utilizing Solargis data, with funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: *https://globalsolaratlas.info*, under the Creative Commons 4.0 Attribution International License, CC BY 4.0.

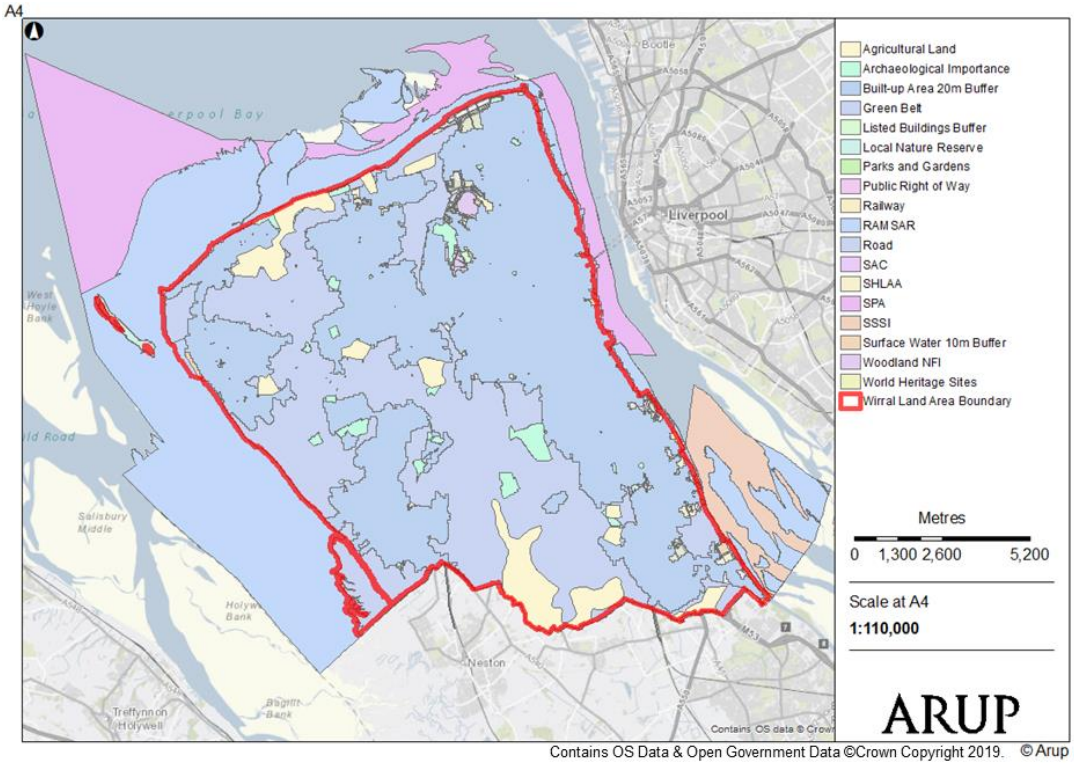


Figure 27: Ground-mounted Solar PV Constraints. Contains information licensed under the Open Government Licence v3.0 (©Natural England, ©Forestry Commission, ©Historic England, ©Environment Agency) and ©Wirral Borough Council.

The figure shows that the Wirral is highly constrained in terms of ground-mounted solar PV deployment and there are limited areas of land, which would be available for siting of ground-mounted solar PV systems. This is due to the distribution of urbanised areas and rural areas under protected designations across the Borough.

As with onshore wind energy, the Green Belt designation is a major prohibitive constraint in the analysis. As discussed in Section 4.1.2 developing on Green Belt land is inadvisable, however Paragraph 147 of the National Planning Policy Framework[170] states that siting of renewable energy in Green Belt land may be possible where 'very special circumstances' and 'the wider benefits to the community' are demonstrated. In line with this, it may be possible to allow some solar PV development on Green Belt land

It is also possible to incorporate ground-mounted solar PV systems in a way which supports biodiversity and enhances the agricultural value of the land, yielding both ecological and economic benefits[171]. For instance, solar PV arrays can be installed in a configuration which enables free-ranging poultry and sheep to graze underneath panels, also providing shelter. This also presents benefits in terms of managing the grassland on site. Similarly, beehives can be kept under panels to support honeybee colonies. Opportunities for growth of hay, vegetables and high-value crops are also possible with suitable array layouts.

[170] Ministry of Housing, Communities and Local Government (2019) National Planning and Policy Framework https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf, accessed 14/08/20

[171] BRE (2014) Agricultural Good Practice Guidance for Solar Farms. Ed J Scurlock

Visual impact and glare from ground-mounted solar PV arrays can be mitigated with strategic planting of hedgerows and coppice around the site, e.g. to mitigate potential effects on air and road traffic. Specific implications associated with glare will be specific to the design of the solar PV array, in terms of tilt angle, PV module type, deviation from south and visual screening measures. Glare implications for aviation should be considered during the design process.

Floating solar PV consists of solar panels mounted on a structure, which is floating on a water body. The main advantage of floating solar PV systems is that they do not take up land (except for ancillaries) and are therefore suitable for areas with limited land availability. An assessment was undertaken to identify potentially suitable water bodies for siting of floating solar PV in Wirral.

Figure 28 shows the opportunity areas identified for ground-mounted PV considering all appropriate constraints. An additional layer has also been included in the figure to demonstrate the potential opportunity area if Green Belt land was made available for development of solar PV arrays. Water bodies which may be suitable for floating solar PV development are also shown on the figure.

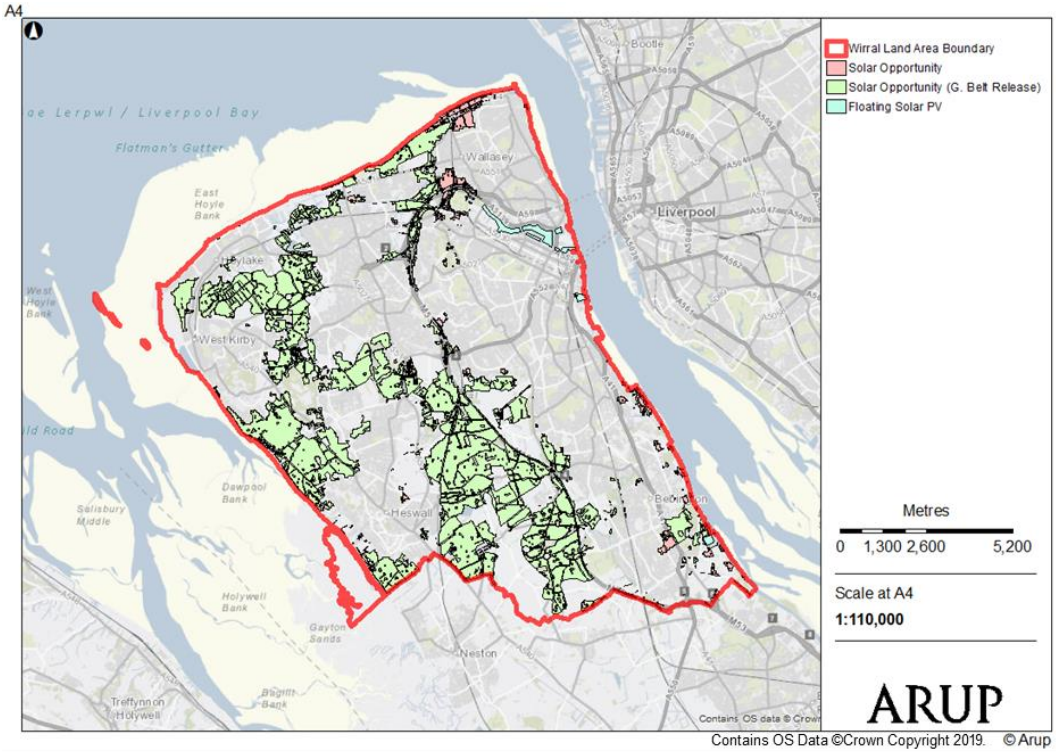


Figure 28: Ground-mounted Solar PV Opportunity Areas[172]

The figure shows that there is significantly more land available for solar PV development if the Green Belt is not included as a constraint. Para 147 of the NPPF suggest that such development would likely constitute inappropriate development, and for which a proposal to achieve planning permission would need to demonstrate a case for very special circumstances. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt.

[172] Contains public sector information licensed under the Open Government Licence v3.0.

An assessment was undertaken to determine potentially suitable water bodies for siting of floating solar PV. Although there are no reservoirs or lakes in Wirral, there are a number of number of docks present which could theoretically be used to site floating solar PV installations. This includes the Vittoria Dock and Great Float in Birkenhead and the Queen Elizabeth II Dock near Eastham. In addition to providing clean energy, floating solar installations can reduce water evaporation and prevent algal growth, providing benefits in terms of dock management. However, it is understood that where the docks are in use, with an active throughflow of vessels and would therefore currently be unsuitable for siting of PV panels. It may be possible to identify parts of docks which are no longer in use, in discussion with the port owner, which could be pursued to identify opportunities for small floating solar installations. Additionally, floating solar PV installations are more expensive than ground-mounted alternatives. It is recommended that floating solar PV installations could be considered where a dock is or was to become obsolete, including engagement with the relevant dock owners, and where economic barriers can be overcome.

The appraisal considers applications for commercially mature solar technologies; however it is acknowledged that there are a number of innovation projects which could lead to wider applications of solar PV in the future. This includes the potential for solar PV technology to be integrated into roads and footways. It is recommended that Wirral council considers the potential for these innovative solar PV technologies further once they are commercially viable.

3.2.3 Energy Yield and Carbon Savings

The opportunity areas identified in the geomodelling stage were used to determine potential capacities for solar PV. Local weather and resource data were used to inform energyPRO® models to determine theoretical yields and carbon savings for the period 2020 to 2050. In actuality, it will not be practicable to utilise all of the available opportunity area for solar PV installations, therefore a number of scenarios were modelled considering development on various proportions of the opportunity area. *Figure 29* presents the theoretical capacity for ground-mounted PV panels in each scenario.

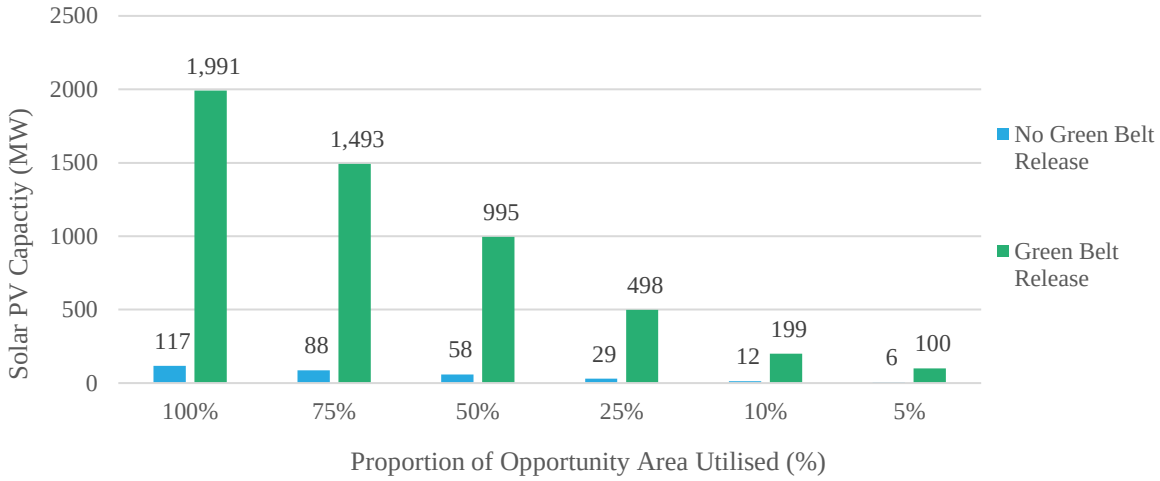


Figure 29: Ground-mounted Solar PV Capacity Based on Opportunity Area Utilisation. Percentages given on the x axis represent the proportion (as a percentage) of the area identified within this study as potentially suitable for Solar PV installation, utilised for solar PV installation.

Figure 30 shows the solar PV generation profile for a theoretical ground-mounted solar PV array occupying different proportions of the total opportunity area in Wirral, as modelled in energyPRO®.

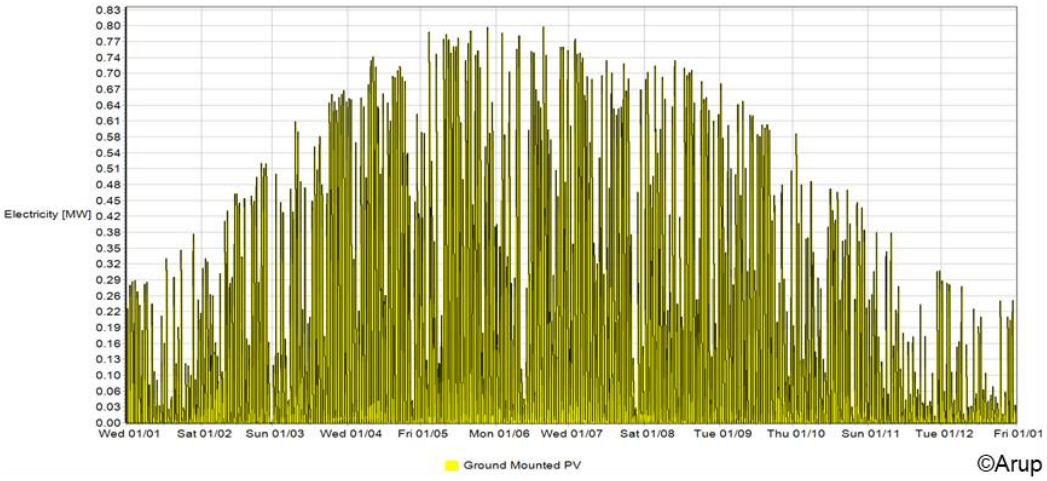


Figure 30: Annual Generation Profile for a 1MW Ground-mounted Solar PV System in Wirral

Figure 31 shows the annual energy yield from solar PV systems in each scenario.

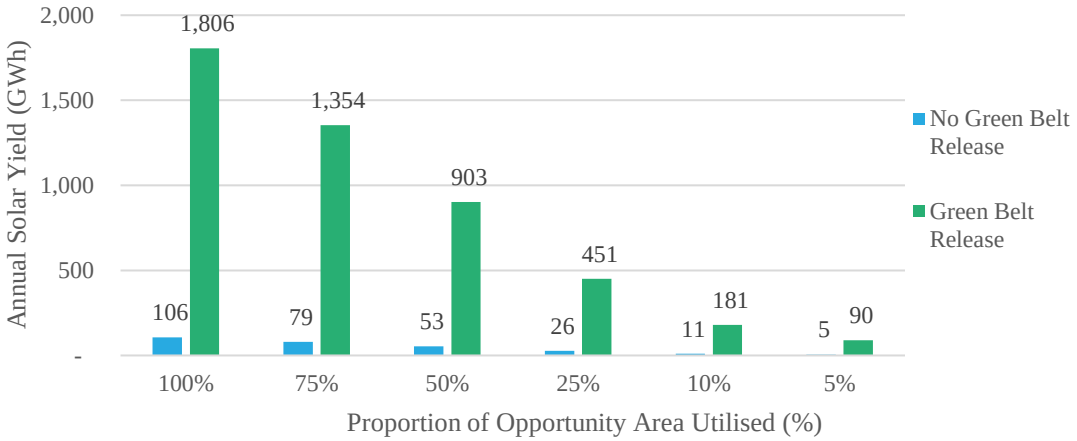


Figure 31: Annual Ground-mounted Solar PV Yield Based on Opportunity Area Utilisation. Percentages given on the x axis represent the proportion (as a percentage) of the area identified within this study as potentially suitable for Solar PV installation, utilised for solar PV installation.

The figures for annual solar PV yield were used to inform estimates for theoretical carbon savings for the period 2020 to 2050 in line with the BEIS Grid-average Generation-based Electricity Emissions Factor to 2050 (*Figure 32*). The calculated CO_2e savings are presented in *Figure 32.*

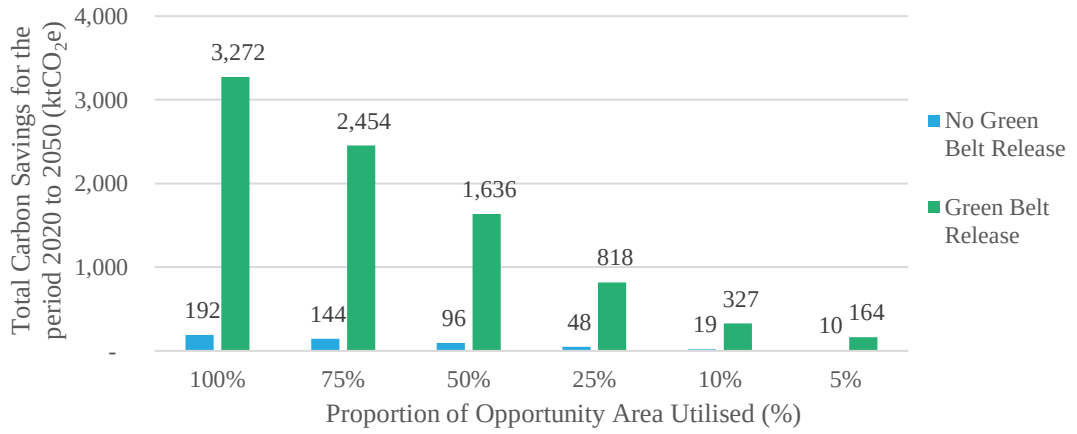


Figure 32: Ground-mounted Solar PV Total Carbon Dioxide Equivalent Savings for the period 2020 to 2050

In summary, although relatively constrained in terms of available capacity for solar PV installations, opportunity areas exist, which if fully utilised could theoretically generate an estimated 106GWh renewable electricity and save 192 $ktCO_2e$ for the period 2020 to 2050. Utilisation of the Green Belt would significantly increase the amount of land available for solar PV development and increase carbon savings; however, any use of Green Belt should be very carefully considered in terms of impacting on areas of natural beauty, agricultural land, ecology and local character.

3.3 Landward Implications of Tidal Energy

Tidal range energy can be produced via either a barrage or lagoon structure and generates energy from the ebb and flow tides, through holding back water within or behind the structure. The most notable, recent project in the UK to progress through a Development Consent Order, is Swansea Bay Tidal Lagoon, which gained DCO consent for a tidal lagoon in South Wales in 2015[173]. In a statement to Parliament in 2018, the Secretary of State for Business, Energy and Industrial Strategy BEIS, concluded that the government would not support the financial costs of Swansea Bay Tidal Lagoon as "the costs that would be incurred by consumers and taxpayers would be so much higher than alternative sources of low carbon power" and it had "not demonstrated that it could be value for money"[174]. The DCO consent for the scheme has now lapsed[175].

In 2009, Peel Energy sought to identify, design and gain consent for a tidal barrage scheme in the Mersey Estuary. It concluded that 'Peel will not be progressing the development work, until it has confidence in the financial and regulatory framework for tidal power'[176].

Currently, Liverpool City Region Combined Authority are leading work in the region to develop a proposal for a Mersey Tidal Power Project[177]. The Project would see a tidal range energy scheme to seek to position the City Region as a world leader in tidal power.

The Project has progressed through an initial feasibility study, led by industry-leading technical and financial advisers to develop the options and configurations for the scheme for further consideration – a tidal barrage and two tidal lagoon options. Next steps include reducing the options to a single preferred option and to develop the business case further.

As with any major marine energy infrastructure project of this scale, grid connection and landward transmission of energy will be a consideration in the development of a tidal range energy scheme. Given the proximity of Wirral Borough to the Mersey and Liverpool Bay, there is potential for a Mersey Tidal Power Project, depending on the option and configuration progressed, to be located in close proximity to the Wirral Borough. As such, it is possible that options for landward transmission of energy from a Mersey Tidal Power Project would consider potential routes within the boundary of the Wirral Borough

[173] Planning Inspectorate (2020) Tidal Lagoon Swansea Bay https://infrastructure.planninginspectorate.gov.uk/projects/wales/tidal-lagoon-swansea-bay/, accessed 14/08/20.
[174] Secretary of State for Business, Energy and Industrial Strategy (Greg Clarke) statement to Parliament (2018) Proposed Swansea Bay tidal lagoon https://www.gov.uk/government/speeches/proposed-swansea-bay-tidal-lagoon, accessed 14/08/20.
[175]Business, Energy and Industrial Strategy (2020) Swansea Bay Tidal Lagoon: Development Consent Order https://committees.parliament.uk/publications/1842/documents/18007/default/, accessed 28/9/20
[176] Peel Energy (2020) Maine & Tidal: Mersey Estuary http://www.peelenergy.co.uk/marine-and-tidal, accessed 14/08/20.
[177] Information in this section is available publicly is contained in project update papers put to the Metro Mayor and Members of the Liverpool City Region Combined Authority in July 2019 and March 2020, available at: http://moderngov.merseytravel.uk.net/documents/s38086/Phase%20Two%20-%20Mersey%20Tidal%20Project%20Update.pdf accessed 14/08/20; and https://moderngov.merseytravel.gov.uk/documents/s43805/Mersey%20Tidal%20Project%20Update.pdf accessed 14/08/20 respectively; and Liverpool City Region (2019) Liverpool City Region could become a world leader in tidal power https://www.liverpoolcityregion-ca.gov.uk/metro-mayor-liverpool-city-region-could-become-world-leader-in-tidal-power/; and Liverpool City Region (2020) Metro Mayor Steve Rotherham cites national need for Mersey Tidal Power Project to "keep the lights on" and avoid future energy crisis https://www.liverpoolcityregion-ca.gov.uk/metro-mayor-steve-rotheram-cites-national-need-for-mersey-tidal-power-project-to-keep-the-lights-on-and-avoid-future-energy-crisis/, accessed 14/08/20.

Council. It is envisaged that opportunities exist for major projects such as Mersey Tidal power Project to provide increasing amounts of dependable power generation into the future, which has the potential to be electrolysed to hydrogen for injection into existing gas networks. The development of a Mersey Tidal Power Project could explore opportunities to connect to the Cheshire Energy Hub hydrogen initiative to support the availability of hydrogen across the North West, which in turn could support Wirral's future hydrogen needs.

In such circumstances, ancillary development at the coast, such as transmission assets and substations and associated cable route to connect to the National Grid, would need to be developed to connect a Mersey Tidal Power Project with the grid. In such a scenario, and recognising the existing grid infrastructure, as presented elsewhere in this report, the most likely potential major grid infrastructure connection point in close proximity to the Wirral for connection to would be the Capenhurst substation(s). Such development could be similar in nature to the proposals for the High Voltage Direct Current (HVDC) cable[178] on the Wirral.

With regards to planning considerations, the grid infrastructure requirements of a major tidal range energy infrastructure project would be part of an NSIP and so fall under the Development Consent Order, with decisions being made at a national level.

However, it must be noted, that no plans have yet been considered or shared publicly on the potential cable options or routes for a Mersey Tidal Power Project, and so it is not clear if this scenario would be considered or whether it is feasible. In addition, it should be noted that the recent transmission infrastructure for Burbo Bank Wind Farm Extension, was located on the North Wales coast, with substation upgrade at St. Asaph[179]. Therefore, it is possible that transmission infrastructure may not necessarily be progressed on the Wirral for a Mersey Tidal Power Project.

3.4 Biomass Energy

Biomass is organic matter which can be used as fuel for producing heat and electricity. Biomass can take many forms including purposely grown energy crops (sugar beet, wheat, miscanthus, short rotation coppice e.g. Willow, Poplar etc.) and forestry residues (trimmings obtained from management of afforested land). When combusted, biomass releases low net-CO_2 emissions as the quantities of CO_2 released are approximately equivalent to those taken in by the plant during photosynthesis and growth. Biomass fuel is therefore considered a renewable energy source. However, emissions associated with maintaining the biomass crop and transportation should be considered when considering the carbon intensity of

[178] Prysmian Group (2012) Prysmian secures the highest value cable project ever awarded https://uk.prysmiangroup.com/uk_news003.html, accessed 14/08/20.
[179] Information is no longer available on the Planning Inspectorate's website as 5 years have elapsed. However, information is available on the transmission infrastructure in a review conducted by OFGEM (2018) Offshore Transmission: Cost Assessment for
the Burbo Bank Extension transmission assets
https://www.ofgem.gov.uk/system/files/docs/2018/04/cost_assessment_for_the_burbo_bank_extension_transmission_assets_0.pdf, accessed 14/08/20.

it as a fuel source. Biomass fuel is therefore considered a renewable energy source.

It is noteworthy that although biomass is considered a renewable fuel, biomass combustion also releases localised emissions such as CO_x, NO_x and SO_x, which impact local air quality. Appropriate consideration must therefore be given to local emission dispersion and abatement when designing and installing biomass systems and where smoke control areas exist, biomass installations must comply with the local smoke control area regulations.

In this analysis two primary sources of biomass fuel are considered: energy crops and forestry residues. The following section presents the results of the constraints-based analysis and opportunities for biomass fuel in Wirral. The analysis does not include consideration of storage of biomass fuels, for which there are alternative considerations and constraints, such as fire risk.

Consideration is made of agricultural land of grades 1, 2 and 3 as the most productive land for growing energy crops, as guided by our research[180], which suggests that *"areas with the highest biomass yields co-locate with food producing areas on high grade land"*[181]. However, it is recognised that all agricultural land, including grades 4 & 5 have some potential for the growth of energy crops, however, yields are likely to be lower and less economically viable.

3.4.1 Biomass Energy Constraints Matrix

The constraints and opportunity metrics used to identify opportunity areas for biomass are presented in *Table 7*. The metrics used in the analysis are aligned with UK regulations and best-practice guidelines for biomass energy developments.

A review of existing investigations into biomass energy opportunities for Wirral highlighted the '*Green Infrastructure Opportunities in Liverpool City Region'* Study. The study provides some high level consideration of biomass, which is supplemented by the more bespoke analysis and identification of opportunities on the Wirral carried out by the Clean Energy Opportunities and Implications Study.

[180] Centre for Sustainable Energy (2009) Bristol Citywide Sustainable Energy Strategy. https://www.cse.org.uk/downloads/reports-and-publications/policy/planning/Bristol_Citywide_Sustainable_Energy_Study.pdf, accessed 14/08/20
Lovett, Andrew & Sünnenberg, Gisela & Richter, Goetz & Dailey, Gordon & Riche, Andrew & Karp, Angela. (2009). Land Use Implications of Increased Biomass Production Identified by GIS-Based Suitability and Yield Mapping for Miscanthus in England. BioEnergy Research. 2. 17-28. 10.1007/s12155-008-9030-x. accessed 14/08/20

Table 7: Biomass Energy Opportunity and Constraint Matrix

Constraint Type	Assumption	Data Source	Rationale
Opportunity			
Energy Crops: Agricultural Land Grade 1,2 or 3	Energy crops can be grown on agricultural land Grade 1,2 or 3. Depending on the type of energy crop, annual yields would be in the order of 13 oven dried tonnes per hectare (odt/ha)	Natural England (Open Government Data[182]) Forest Research (Great Britain's Organisation for Forestry, UK Gov[183])	Agricultural land grades 1, 2 and 3 has suitable qualities for growth of most energy crops including wheat straw and SRC. Opportunities for growth of miscanthus and SRC on marginal land may exist subject to specific site-based investigation; however, yields per ha would be expected to be significantly lower.
Forestry Residues:	Residues can be obtained from woodland areas. Annual yields would be in the order of 2odt/ha.	Forestry Commission, National Forest Inventory (Open Government Data[184]) Forest Research (Great Britain's Organisation for Forestry, UK Gov.)	Residues can be obtained as a by-product of woodland management, including offcuts, clippings and non-saleable wood.
Environmental			
Conservation & Wildlife	Land designations excluded: • National & Local Nature Reserves • Special Protection Areas (SPA) • Special Areas of Conservation (SAC) • RAMSAR Sites • Sites of Special Scientific Interest (SSSI)	Natural England (Open Government Data)	Applications for planting of energy crops are subject to Environmental Impact Assessment (EIA) (Forestry) (England and Wales) Regulations 1999[185].

[182] Natural England data licensed under the Open Government Licence v3.0.
[183] Forest Research data licensed under the Open Government Licence v3.0.
[184] Forestry Commission data licensed under the Open Government Licence v3.0.
[185] UK DEFRA (2013) Energy Crops Scheme, England Rural Development Programme http://publications.naturalengland.org.uk/publication/46003, accessed 14/08/20

3.4.2 Biomass Energy Constraints and Opportunities

The following section presents the results of the geospatial modelling assessment and highlights the key areas of constraint and opportunity for biomass in Wirral.

Figure 33 presents an overview of suitable agricultural land area (Grade 1, 2 and 3) and woodland areas across Wirral.

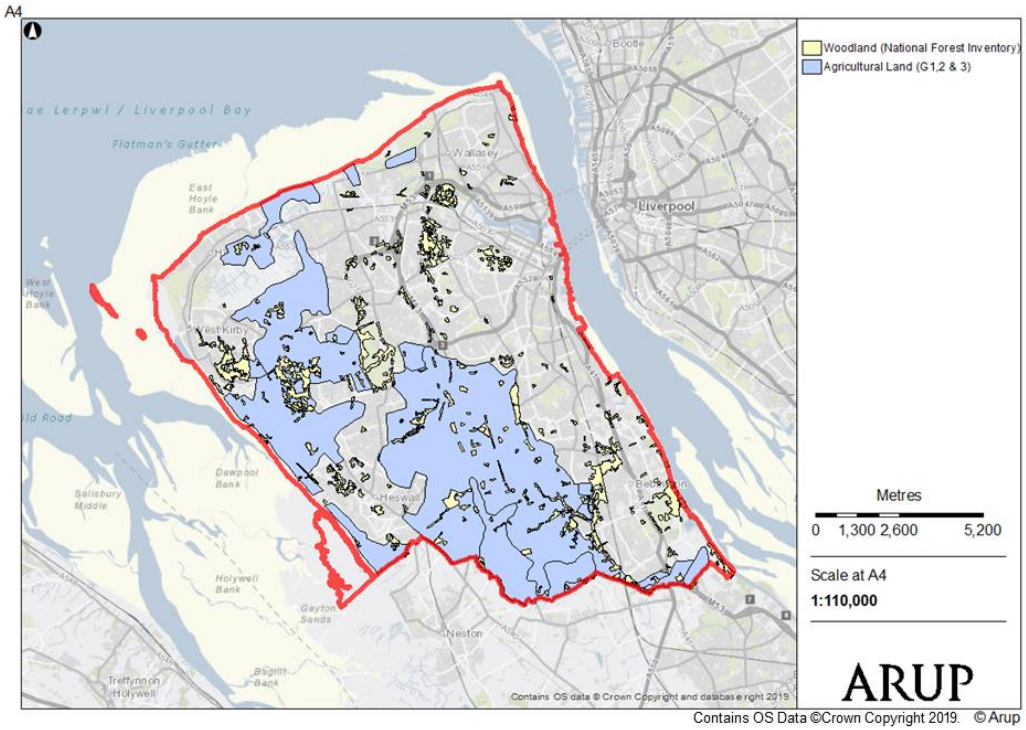


Figure 33: Agricultural Land (Grade 1, 2 & 3) and Woodland Areas Across Wirral (red line indicates the Wirral Land Area Boundary). Contains information licensed under the Open Government Licence v3.0 (©Natural England, ©Forestry Commission).

The figure shows that a significant proportion of the Wirral land area is characterised by agricultural land at grade 1, 2 or 3, predominantly on the West side of the Borough. The ADAS Agriculture and Land Study 2019[186], sets out that most agricultural land in Wirral is either grade 3a or 3b (with some potential for some land to be grade 2 subject to site-specific assessments). Patches of woodland area are spread across the Borough. The UK Government body Forest Research presents guideline figures for theoretical yields from different forms of biomass. For the purposes of this analysis, annual yields of 13odt/ha and 2odt/ha have been assumed for energy crops and forestry residues respectively[187].

Forestry residues can be collected with minimal impact on the local environment. Applications for energy crop growth may be subject to EIA regulations. In line with this a number of environmental designations have been included as

[186] ADAS. 2019. Agriculture and Land Study Available at: https://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/local-planning-evidence-and-research-report-54, accessed 29.09.20
[187] Forest Research (2020) Potential Yields of Biofuels per ha p.a. https://www.forestresearch.gov.uk/tools-and-resources/biomass-energy-resources/reference-biomass/facts-figures/potential-yields-of-biofuels-per-ha-pa/, accessed 14/08/20

constraints for energy crop growth in the analysis. *Figure 34* presents an overview of these constraints.

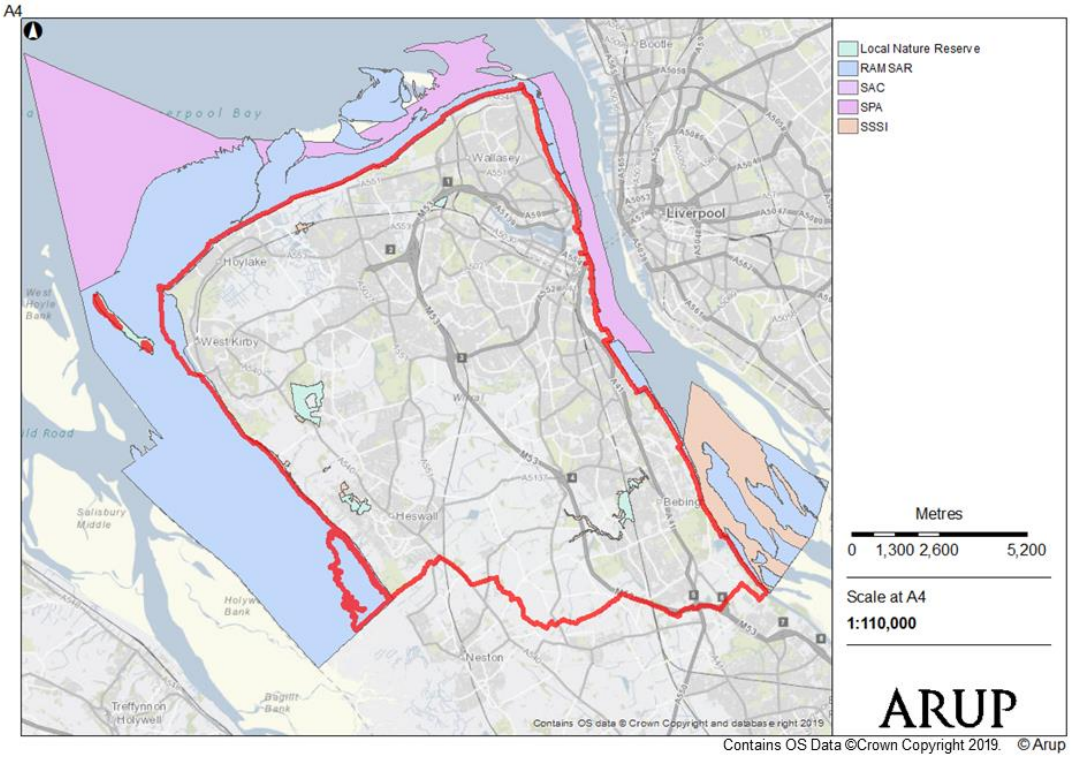


Figure 34: Biomass Energy Crop Environmental Constraints (red line indicates the Wirral Land Area Boundary). Contains information licensed under the Open Government Licence v3.0 ©Natural England.

The figure shows that the environmental designations are only applicable to a small proportion of the agricultural land area. *Figure 35* shows the resulting opportunity areas for energy crops and forestry residues.

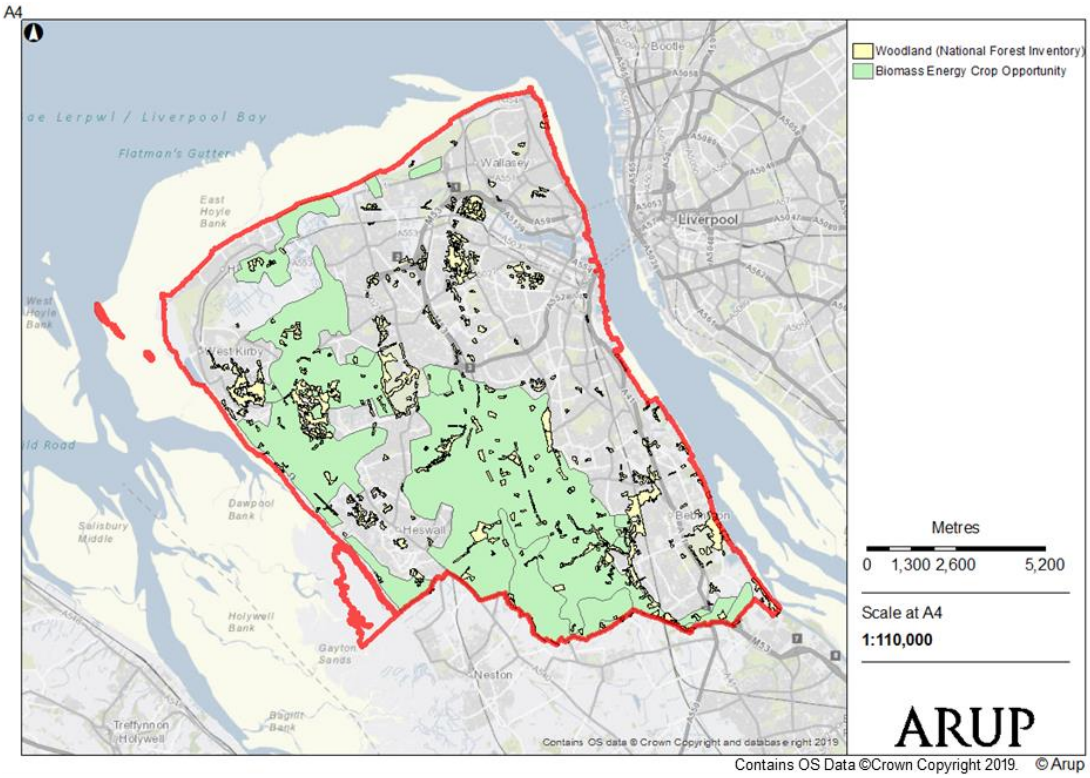


Figure 35: Biomass Energy Crop Opportunity Areas (red line indicates the Wirral Land Area Boundary). Contains information licensed under the Open Government Licence v3.0 ©Forestry Commission.

3.4.3 Energy Yield and Carbon Savings

The opportunity areas identified in the geomodelling stage were used to determine potential energy yields and theoretical carbon savings associated with the use of biomass fuel to supply biomass boilers and biomass CHP systems.

Growth of energy crops on agricultural land diverts land away from food production. Generally, food crops would be expected to provide higher economic yields than energy crops, however those interested in planting perennial energy crops (SRC, Miscanthus) may be eligible for a grant under the UK Energy Crops Scheme (ECS)[188].

When allocating land for energy crop production there needs to be a compromise, which balances food production, economic returns for farmers and renewable energy supply. In this analysis various scenarios were modelled considering different proportions of opportunity area utilisation, up to a maximum of 30%. Additionally, it is unlikely that all woodland area in Wirral is managed to an extent that would yield significant quantities of biomass, therefore a similar scenario-based approach was applied to the forestry residue analysis.

[188] UK DEFRA, (2013) Energy Crops Scheme, England Rural Development Programme. http://publications.naturalengland.org.uk/publication/46003, accessed 14/08/20

The assumptions for the energy yield per oven dried tonne of biomass, which were used to inform the analysis are presented in *Table 8.*

Table 8: Energy Yield per Oven Dried Tonne for Biomass Fuel Types[189]

Fuel Type	Net Calorific Value (MJ/kg)
Energy Crops (assumed Miscanthus/SRC Willow)	13
Forestry Residues	13

Figure 36 presents the theoretical fuel energy yield for energy crops and forestry residue biomass in each scenario.

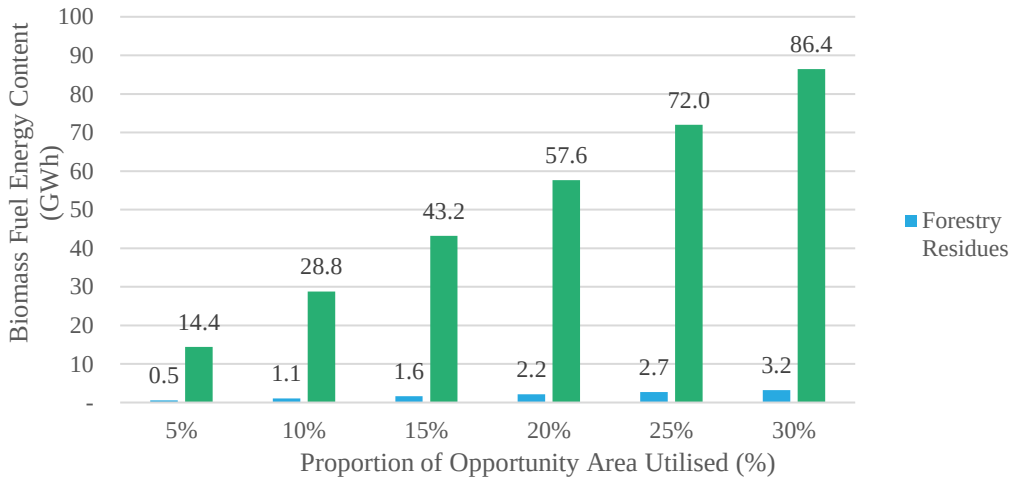


Figure 36: Annual Biomass Fuel Energy Yield by Proportion of Opportunity Area Utilised

The annual biomass fuel energy yield figures were used to inform estimates for theoretical carbon savings, noting that carbon savings would only be achieved if the use of biomass displaced the use of gas or another fossil fuel. The theoretical carbon savings were calculated for two scenarios:

- Carbon savings associated with the use of biomass to supply biomass boilers to generate heat vs conventional heat generation using grid gas boilers.
- Carbon savings associated with the use of biomass to supply biomass CHP systems to generate heat and electricity vs heat generation using grid gas boilers and electricity import from the grid. Savings associated with electricity generation were calculated in line with BEIS Grid-average Generation-based Electricity Emissions Factor to 2050 (*Figure 15*).

[189] Forest Research (2020) Potential Yields of Biofuels per ha p.a. https://www.forestresearch.gov.uk/tools-and-resources/biomass-energy-resources/reference-biomass/facts-figures/potential-yields-of-biofuels-per-ha-pa/, accessed 14/08/20

The calculated carbon dioxide equivalent savings are presented in *Figure 37*.

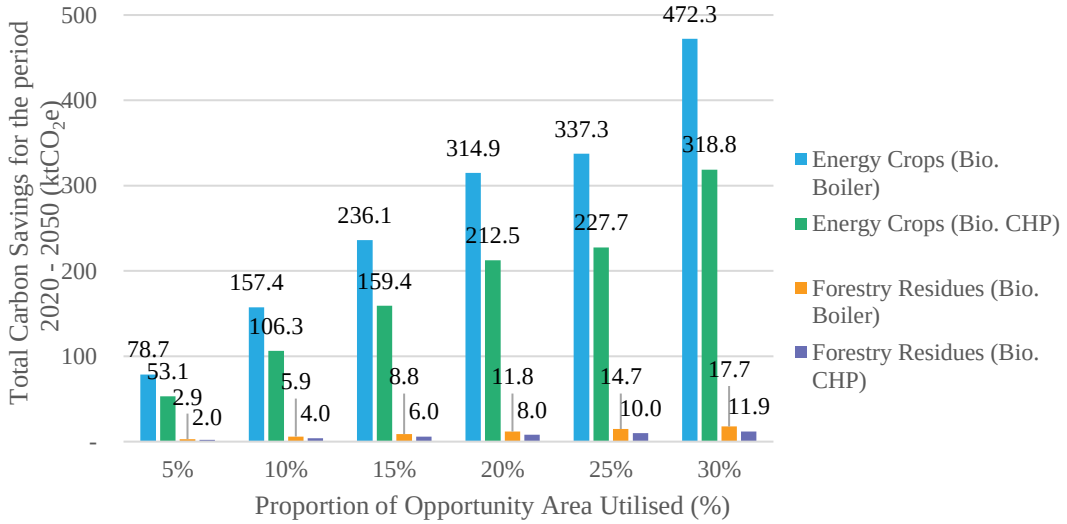


Figure 37: Biomass Energy Total Carbon Dioxide Equivalent Savings for the period 2020 to 2050

In summary, there are a number of opportunity areas for energy crop growth and acquisition of forestry residue biomass across Wirral. The acquired biomass could be used to supply biomass boilers and CHP systems which would make a modest contribution to the Borough's carbon reduction targets for the period 2020 to 2050. The renewable energy needs of the Borough will need to be balanced against the Borough's food production and economic returns for farmers. Growing energy crops to produce biomass gives farmers an opportunity to diversify and those seeking to plant perennial energy crops could be eligible for establishment grants under the UK Energy Crop Scheme.

Wider consideration: The potential role of agricultural land in biomass production

Sustainable biomass has been identified to play an important role in delivering the UK Government's Clean Growth Strategy[190]. An assessment by the UK Committee on Climate Change (CCC)[191] sets out that biomass production must be part of a wider system of sustainable land use. It estimates that an upper-end estimate would require around 7% of current agricultural land to be used for energy crops by 2050 to meet carbon reduction commitments. It also highlights the potential for agricultural strategies to play a role in enabling a sustainable supply of energy crops.

Agricultural land has role to play in growing energy crops or use of agricultural residues for biomass for energy, where it does not compete with or undermine food production and where carbon stocks in soils are protected and enhanced. Further investigation could look to identify the potential role and scale of contribution of agricultural land used for biomass production on the Wirral, in

[190] BEIS (2017) Clean Growth Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf accessed 14/08/20
[191] UK Committee on Climate Change (2018) Biomass in a low-carbon economy https://www.theccc.org.uk/publication/biomass-in-a-low-carbon-economy/ accessed 14/08/20

addition to the considerations for expansion of existing afforested areas and identification of potential new areas for planting of sustainable biomass resources.

Agricultural subsidy systems are likely to be a key policy driver in the development of a sustainable biomass production system. The transition (post-Brexit and post-transition) from the European Union Common Agricultural Policy (EU CAP) subsidy system to a UK-based agricultural subsidy system will likely play an important role[192].

The UK Government's 25 Year Environment Plan[193] (published in 2018) sets out how a new environmental land management system based on providing public money for public goods, such as environmental enhancement. Within its proposals it identifies opportunities to incentivise tree planting on private and the least productive agricultural land, including for bio-energy production purposes. It sets out a 5-year transition phase from current subsidy systems to the new system of public money for public goods with limits on larger subsidy payments. In addition, the Agriculture Bill[194] is currently[195] passing through Parliament. It sets out proposals for expenditure on agricultural purposes, including direct payments for the agricultural sector. Development and delivery of legislation and policy positions like these and the implementation of new subsidy processes, present an opportunity to maximise carbon emission reductions from agricultural land.

Beyond this, consideration could also be made for the role of community groups in biomass production. The opportunities highlighted in this study, could be progressed through engagement and involvement of local communities to maximise the wider benefits available.

Wood Allotment Initiative

A wood allotment initiative is a community scheme which enables individuals to register for access to a specified number of trees in need of 'thinning' within a forested area for their own use, such as firewood (virgin biomass). Such schemes enable individuals to more easily access forestry residues for use as renewable fuel and present benefits to woodland owners in terms of woodland management.

The Mersey Forest Partnership manages a wood allotment scheme across the Merseyside region and provides a platform to connect woodland owners with individuals seeking access to wood allotments[196] . The Mersey Forest Wood Allotments platform shows that in Wirral, there may be opportunity for a wood allotment initiative in the Upton Meadow Wood, owned by The Woodland

[192] HM Government (2018) Brexit UK Agriculture Policy. Further information is available at: https://www.parliament.uk/documents/commons-library/Brexit-UK-agriculture-policy-CBP-8218.pdf, accessed 14/08/20.
[193] HM Government (2018) 25 Year Environment Plan. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf, accessed 14/08/20
[194] HM Government (2020) Agriculture Bill. https://publications.parliament.uk/pa/bills/lbill/58-01/112/5801112.pdf, accessed 14/08/20
[195] As at August 2020.
[196] Mersey Forest Wood Allotments http://www.woodallotments.org.uk/ accessed 02/10/20.

Trust[197]. This potential is also highlighted in Section 5.1 of the Woodland Trust's Upton Meadown Millennium Wood Management Plan (2019-2024)[198]. Development of a wood allotment scheme in Wirral may facilitate wider utilisation of forestry residues for use as renewable biomass fuel.

3.5 Low Carbon Heat

There are a number of commercially available technologies which can be used to generate renewable and low-carbon heat, including biomass boilers, heat pumps and combined heat and power. These technologies can be used to supply individual buildings or multiple buildings connected to a district heating (DH) network also referred to as a heat network.

District heating represents an affordable, efficient and low carbon solution to the space heating and hot water needs of buildings in densely populated areas. Sufficient spatial heat density (typically 30 kWh/m^2) is required to support commercially viable heat networks in the UK[199]. These systems consist of a distribution network carrying heated water from the generation source to end users, thereby avoiding the need for individual systems. As a result, these networks can facilitate deployment of a larger amount of renewable heat than by individual stakeholders. As many heat demands are aggregated together, district heating networks can capitalise on economies of scale with higher plant efficiencies and better pollution control than individual gas boilers. District heating can also aggregate different renewable heat sources together (geothermal energy, heat pumps, waste heat recovery) to make best use of locally available resources.

A barrier to delivery is buy-in from multiple parties for the commercial development of heat networks. Without a local public sector promoter the extent of heat networks can often be limited which limits the opportunities for economies of scale Any district heating network developed on the Wirral would need to be supported by detailed follow-on studies to develop the opportunities towards commissioning, to consider site-specific constraints such as heating system temperatures and primary heat resource availability. The nature of these constraints lends themselves to more detailed project level studies, rather than a Borough wide assessment, which might otherwise exclude potentially suitable opportunities.

The Wirral Cool 1 and Cool 2 strategies identify heat networks as a key part of the transition to zero carbon and provide support for a shift from fossil fuel heating to heat networks. Arup was informed that a recent heat mapping study was completed by Sustainable Energy Consultants for the UK Government Department for Business Energy and Industrial (BEIS), which focussed attention on opportunity in Birkenhead and the regeneration of the docks through the major Wirral Waters redevelopment programme. It is understood that following this, a more detailed feasibility study has been commissioned to further investigate the

[197] Interactive Map: Mersey Forest Wood Allotments http://www.woodallotments.org.uk/ accessed 02/10/20.
[198] Woodland Trust Upton Meadow Millennium Wood Management Plan (2019-2024), Section 5.1 accessed 02/10/20
[199] Greater London Authority (2011) Decentralised Energy Capacity Study Phase 1 https://www.london.gov.uk/sites/default/files/de_study_phase1.pdf accessed 14/08/20

opportunity. Future consideration of heat network opportunities should take this work into account. An example district heating network configuration is presented in *Figure 38*.

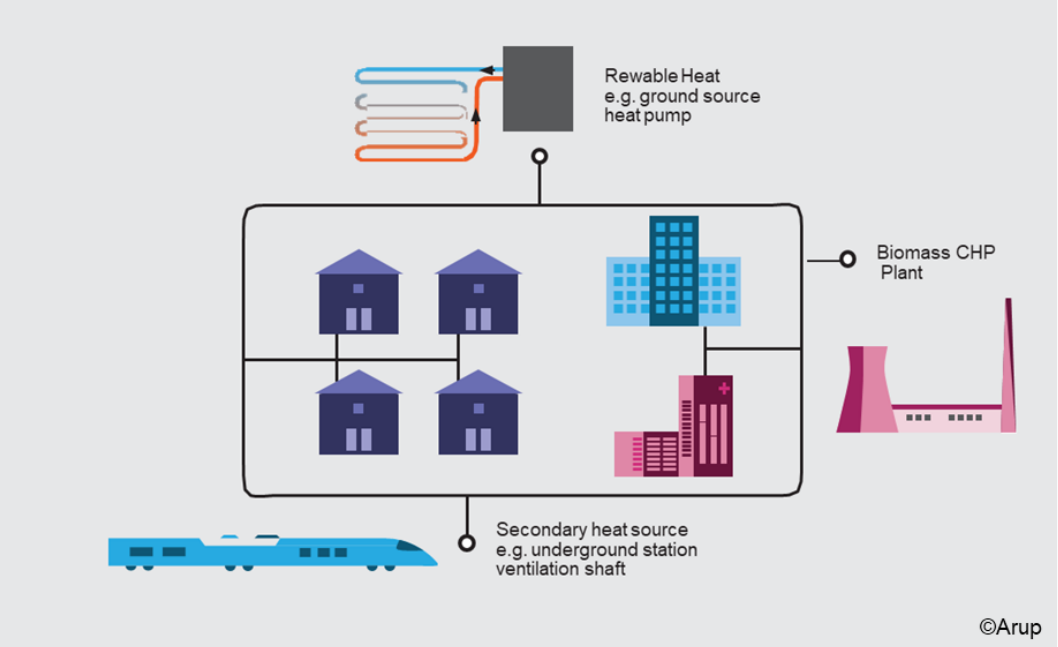


Figure 38: Example Heat Network Configuration

The following section presents a heat demand mapping analysis to determine additional opportunity areas for district heating networks. Building integrated renewable heating technologies are covered in more detail in Section 3.6.

3.5.1 Heat Demand Mapping

A heat mapping analysis was undertaken to determine the areas of the Wirral with the highest spatial heat density. Postcode-level gas statistics (UK Government) were used to estimate heat demand per 1km^2 for domestic buildings[200]. Carbon dioxide emissions data published as part of the National Atmospheric Emissions Inventory (NAEI) scheme was used to estimate heat demand for non-domestic buildings[201]. The NAEI maps the emission quantities for different types of pollutant at a 1km^2 resolution for the UK. Using the NAEI CO_2 figures in combination with an understanding of local-authority level energy consumption[202], it was possible to calculate heat demand density at a 1km^2 resolution for non-domestic consumers. The domestic and non-domestic demands were summed to determine the total heat demand per 1km^2.

The heat demand density at a 1km^2 resolution across the Wirral Borough is shown in *Figure 39.*

[200] HM Government (2017) Postcode Level Gas Statistics: 2017 (Experimental) https://www.gov.uk/government/statistics/postcode-level-gas-statistics-2017-experimental accessed 14/08/20
[201] BEIS (2019) National Atmospheric Emissions Inventory, Emissions Map https://naei.beis.gov.uk/emissionsapp/ accessed 14/08/20
[202] BEIS (2019) Total final energy consumption at regional and local authority level https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level accessed 14/08/2020.

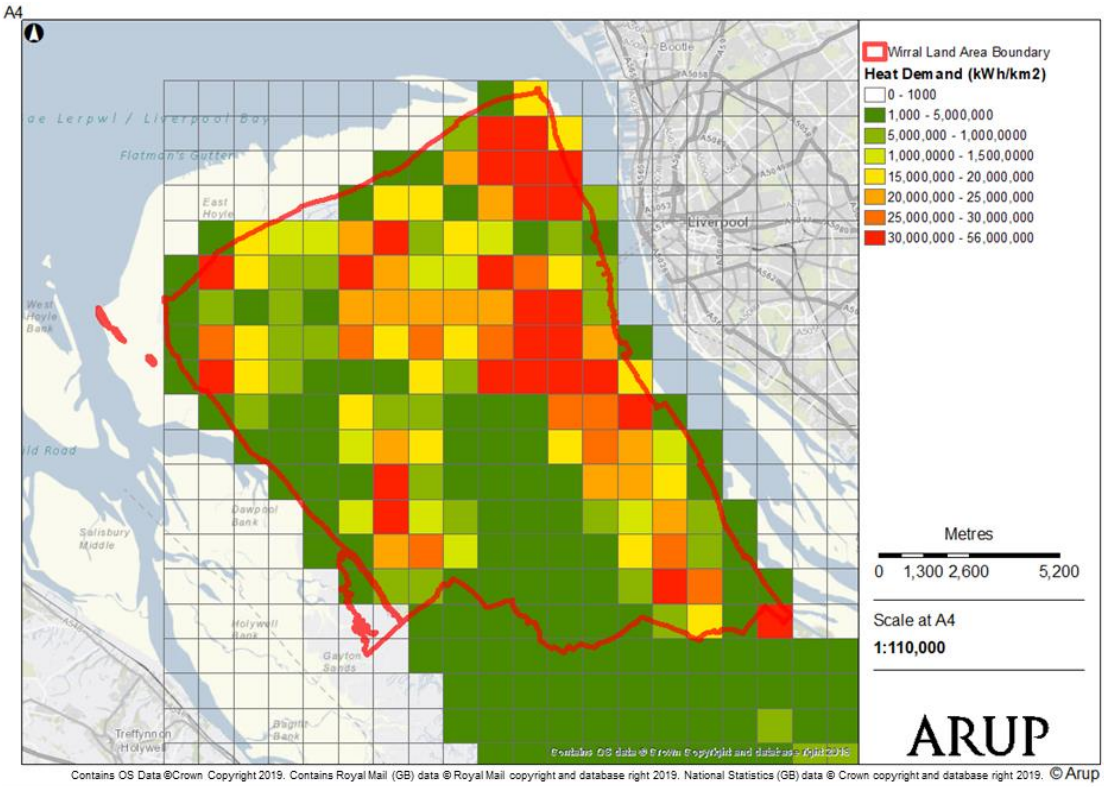


Figure 39: Heat Demand Density at 1km^2 Resolution Across the Wirral Borough[203]

A spatial heat density of 30 kWh/m^2 can be considered sufficient to support viable heat network schemes in the UK[204]. *Figure 39* shows that there are a number of areas in the Borough (red squares) with sufficient spatial heat density to support heat network installations, with the highest potential in densely populated North-East area of the Borough. The results of the analysis were used to determine district heating priority zones, in which heat network developments could be encouraged by local planning policy wording.

A spatial overview of the identified district heating priority zones is presented in *Figure 40.*

[203] © Crown copyright and database rights 2019 licenced under BEIS's Public Sector Mapping Agreement with Ordnance Survey (licence No. 100037028) and Defra's Public Sector Mapping Agreement with Ordnance Survey (licence No. 100022861).
[204] Greater London Authority (2011) Decentralised Energy Capacity Study Phase 1 https://www.london.gov.uk/sites/default/files/de_study_phase1.pdf accessed 14/08/20

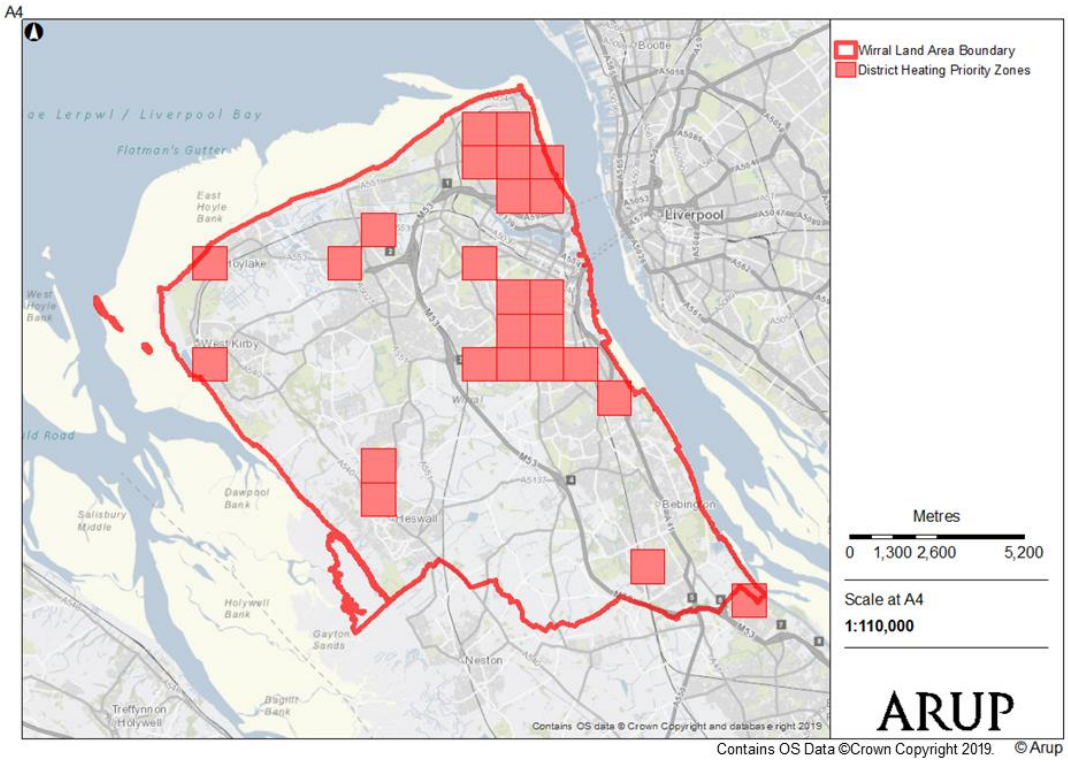


Figure 40: District Heating Priority Zones

It is important to consider that the large-scale data used to inform the assessment can only provide a high-level indication of spatial heat density. Prior to implementation, necessary due diligence, Environmental Impact Assessments and site-specific feasibility studies considering factors such as heat source availability, techno-economic performance and building system compatibility will need to be undertaken.

3.5.2 Open-loop Ground Source Heat Opportunity

Heat pumps absorb low-grade heat from a primary heat source (e.g. air, ground, water) and raise its temperature using a compressor to supply heat (space heating and hot water) to buildings. Ground source heat pumps absorb heat from the ground using closed-loop or open-loop borehole arrays. These ground source heat pump systems are electrically powered with typical observed efficiencies up to 350% (coefficient of performance [COP] of 3.5, in line with Arup project experience) and can be powered by renewable energy. Ground source heat pumps are therefore considered a low-carbon heating technology with the potential to deliver significant carbon savings.

Whilst undertaking the clean energy opportunity analysis, it was identified that the Wirral peninsula sits atop one of the UK's primary aquifers. This presents a significant, good opportunity for open-loop ground source heat pump systems, which could supply low-carbon heat to individual buildings and heat networks schemes. An overview of the aquifer potential is presented in *Figure 41*. The figure also shows source protection zones, which are the main constraint to this technology opportunity, in which open-loop ground source heat pumps and the associated borehole arrays would not be permitted. The analysis also shows some good opportunity to corresponding district heating priority zones in *Figure 41*.

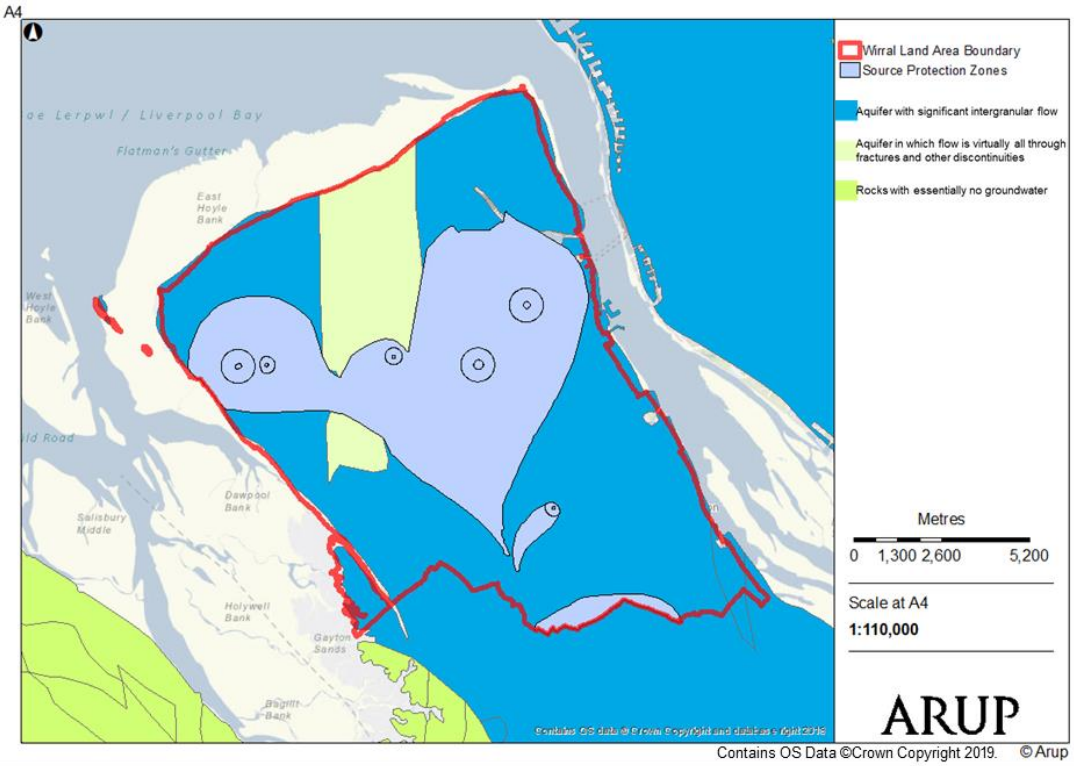


Figure 41: Aquifer Potential in Wirral[205][206]

[205] Based upon BGS Hydrogeology 625k with the permission of the British Geological Survey ©UKRI. All rights Reserved.
[206] Contains public sector information licensed under the Open Government Licence v3.0.

3.5.3 Energy Yield and Carbon Savings

The district heating priority zones were used to determine the potential carbon savings for the period 2020 to 2050 compared to and assumed to be displacing conventional gas boiler heating, when a variety of low-to-zero (LZC) carbon technologies are used to supply the district heating networks. Due to a number of site-specific technical, commercial and environmental constraints, such as local resource availability (e.g. ground thermal yield, local water body, building heating system compatibility, lack of buy-in from potential heat off-takers etc.) it will likely not be feasible to satisfy all of the heat demand in the DH priority zones with a heat network. Therefore, a number of scenarios were modelled considering varying proportions of heat demand met by DH networks supplied by LZC technologies.

The total heat demand in the DH priority zones was estimated to be approximately 958 GWh equivalent to around 38% of Wirral's total heat demand. *Figure 42* shows the theoretical carbon savings for the period 2020 to 2050 compared to and assumed to be displacing conventional gas boiler heating, when varying proportions of the DH priority zone heat demand are met by heat networks supplied by LZC technologies. In district heating networks, additional generation is typically required to supplement the primary LZC heating technology and provide resilience. This is usually provided by gas boilers, which currently represent the most cost-effective supplementary generation technology, but is increasingly transitioning to low-carbon electrode boilers.

For the purposes of the analysis and to provide a conservative estimate for carbon savings, the analysis assumes that 85% of the heat network demand will be supplied by an LZC technology, with the remaining 15% of the demand supplied by supplementary backup gas boilers. As supplementary generation transitions to electrode boilers, and as the grid decarbonises due to increased penetration of renewables, carbon savings are expected to be greater. The efficiency and performance of the LZC systems will be highly dependent on the specific operating conditions of the network (i.e. source temperatures, heating temperatures, network design etc.), therefore high-level technical assumptions have been used as the basis for the analysis (outlined at the end of the report).

Carbon saving estimates are high-level, to be used for indicative purposes only and are highly subject to the specific operational conditions of each system and the decarbonisation trajectories of the electricity and gas grids over time.

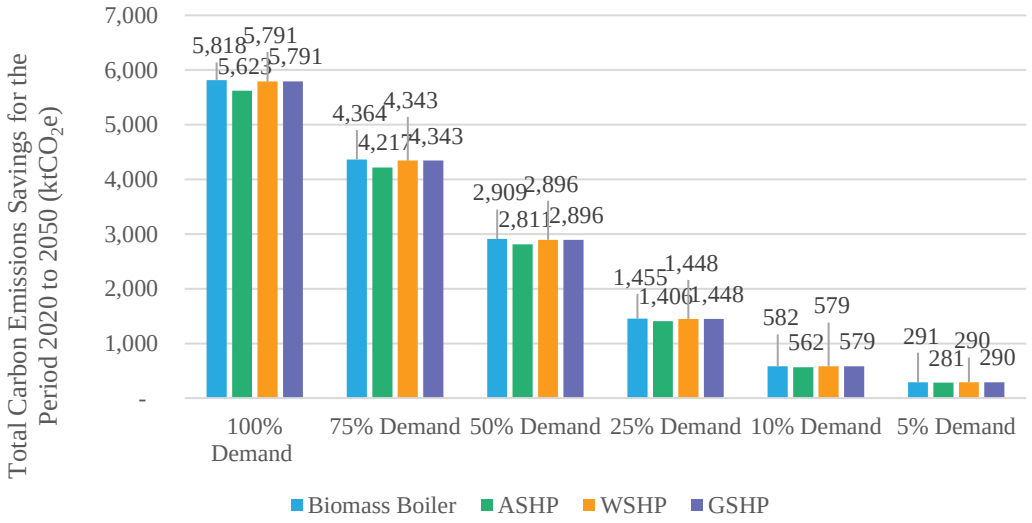


Figure 42: Total District Heating Carbon Savings for the period 2020 to 2050 by LZC Technology and Proportion of DH Priority Zone Heat Demand Met

In summary there are a number of areas across the Wirral with sufficient spatial heat density to support commercially viable heat networks. It is noted that more detailed studies are ongoing into heat networks, for which this analysis provides further context. A number of DH priority zones were identified, in which district heating schemes should be encouraged by local planning policies. The results of the energy yield and carbon assessment show that district heating schemes supplied by LZC technologies have the potential to make a significant contribution to the Borough's carbon reduction targets for the period 2020 to 2050.

3.6 Building Integrated Technologies

Building integrated renewable energy consists of renewable energy technologies integrated into the building envelope using methods such as roof mounting or façade integration. Building integrated renewables enable building owners and operators to reduce their energy-based carbon emissions and realise cost savings whilst also empowering them with increased resilience, flexibility and ownership of their energy supply. Generation from building integrated renewables can reduce a consumer's power draw from the grid, thereby freeing up capacity and supporting a reduction in peak demand stress on the local electricity network (grid). Multiple building-integrated renewable technologies can be combined into the building envelope to increase efficiency and maximise use of local renewable resources.

It is difficult to quantify, at a Borough level, specific opportunities for building-integrated renewables in Wirral as their potential is highly related to building-specific constraints. It is acknowledged that increased uptake of building-integrated renewables will be primarily linked to planning policy relevant for new developments; however with increased awareness regarding energy-based emissions and incentivisation schemes such as the Renewable Heat Incentive (RHI), retrofitting of building-integrated renewable energy technologies, such as solar PV and heat pumps is expected to become increasingly prevalent.

Quantifying the extent of this retrofit and uptake of specific technologies in developments is not possible with any degree of confidence, and therefore this analysis presents a matrix of building-integrated renewable energy technologies, design considerations and high-level carbon emissions intensity by technology, which can be used to develop scenarios from.

The UK Renewable Heat Inventive (RHI) scheme offers payments per unit of low-carbon heat generated to incentivise uptake of renewable heating technologies The non-domestic RHI scheme is planned to be closed to new applicants in March 2021; however extensions have been made to the domestic RHI scheme[207], enabling homeowners to claim payments for using renewable heating technologies. Tariff rates for each technology are changed regularly and are published by Ofgem[208]. A high-level summary of possible additional measures to incentivise uptake of building-scale renewables is presented in *Figure 43* below.

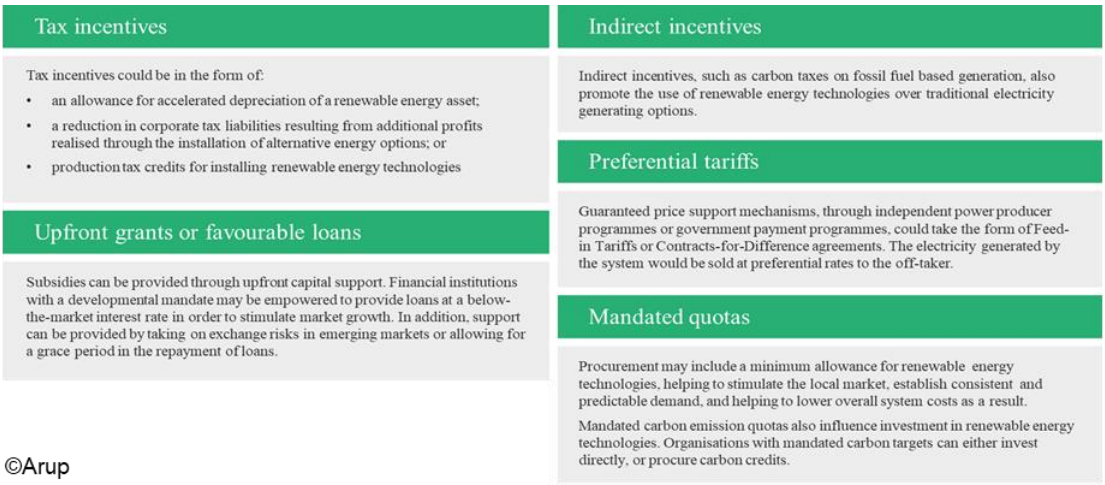


Figure 43: Financial Incentives and Subsidies to Support Building-Integrated Renewables

[207] BEIS (2020) Changes to the Renewable Heat Incentive Scheme (RHI), https://www.gov.uk/government/publications/changes-to-the-renewable-heat-incentive-rhi-schemes accessed 14/08/2020
[208] Ofgem (2020) Environmental Programmes, Renewable Heat Incentive (RHI) https://www.ofgem.gov.uk/environmental-programmes/domestic-rhi accessed 14/08/20

3.6.1 Building-integrated Renewable Energy Matrix

Table 9 presents a matrix of building-integrated renewable energy technologies, detailing descriptions of each technology, design considerations and indicative generation-based emissions intensity (carbon dioxide equivalent emissions per kWh generated).

Table 9: Building-Integrated Renewable Energy Matrix

Technology	Description	Basic Design Consideration	Generation-based Carbon Emissions Intensity ($kgCO_2e/kWh$)
Solar PV	An electrical installation that converts solar energy into electricity using solar PV panels mounted on a roof or integrated into a building façade. Building integrated solar is well established and proven in the UK.	• Solar insolation • Roof pitch angle • Deviation from south • Shading (trees and other buildings) • Load-bearing strength of supporting structure	Considered zero carbon.
Micro-wind Turbine Generator	Building-integrated wind consists of micro wind turbine generators integrated into the building envelope by mounting on building structures. Building-integrated wind is typically characterised by poor technical performance, limited power potential and low cost-competitiveness compared to other building-integrated technologies, such as solar PV due to a number of technical and economic factors.	• Wind speed • Air flow turbulence • Visual impact • Noise & vibration implications • Load-bearing strength of supporting structure • Safety	Considered zero carbon.

Technology	Description	Basic Design Consideration	Generation-based Carbon Emissions Intensity ($kgCO_2e/kWh$)
Solar Thermal	Solar thermal energy consists of solar thermal collectors, which harness solar energy to heat water for use in buildings (roof-mounted or façade integrated).	• Solar insolation • Roof pitch angle & deviation from south • Shading • Load-bearing strength of supporting structure	Considered zero carbon.
Air Source Heat Pump	Air source heat pumps absorb low-grade heat from the air and raise its temperature using a compressor to supply space heating and hot water to buildings	• Average air temperature • Noise • Cold plumes • Building-side heating temperatures (COP is lower at higher delivery temperatures)	Assuming seasonal coefficient of performance (SCOP) of 2.5*. 2020**: 0.051 2035**: 0.015 2050**: 0.010
Ground Source Heat Pump	Ground source heat pumps absorb low-grade heat from the ground and raise its temperature using a compressor to supply space heating and hot water to buildings.	• Ground thermal yield & recharge potential • Spatial availability • Geology • Environmental impact (boreholes or slinkies) • Building-side heating temperatures	Assuming a SCOP of 3.5*. 2020**: 0.037 2035**: 0.011 2050**:0.007
Water Source Heat Pump	Water source heat pumps absorb low-grade heat from a water body and raise	• Average water temperature &	Assuming a SCOP of 3.5*. 2020**: 0.037

Technology	Description	Basic Design Consideration	Generation-based Carbon Emissions Intensity ($kgCO_2e/kWh$)
	its temperature using a compressor to supply space heating and hot water to buildings.	thermal recharge potential • Hydrology • Environmental impact (reduction in water temperature) • Building-side heating temperatures	2035**: 0.011 2050**:0.007
Biomass	Biomass boilers are similar to gas boilers, except they use biomass fuel, such as wood chips, pellets or logs to generate heat.	• Local air quality • Biomass storage space • Most viable in medium/large developments where heat demand >15kW.	0.015[209]
*COP's are indicative and based on Arup project experience. Observed coefficients of performance will be highly dependent on the specific operating conditions and configuration of the heat pump system (e.g. source temperature, delivery temperature, operating regime etc.) ** Based on BEIS Greenbook UK Average Grid-electricity Generation Based Carbon Emission factor projections[210]			

To demonstrate a potential scenario for the uptake of building-mounted renewables, *Table 10* presents the theoretical carbon savings for the period 2020 to 2050 associated with installation of roof-mounted solar panels on 10% of the Wirral address base with an average installed capacity of 2.6kW per address. These assumptions were agreed during a workshop with Wirral Borough Council Officers (23rd July 2020).

The theoretical carbon savings for the period 2020 to 2050 associated with biomass boilers are presented in Section 3.4.3. As the viability of heat pump technologies is highly dependent on locally available primary heat sources (e.g.

[209] BEIS (2020) Greenhouse gas reporting: conversion factors 2020 https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020, accessed 14/08/2020
[210] BEIS (2020) Green Book Supplementary Guidance: Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal, Data Table 1 https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal, accessed 14/08/2020

ground heat, suitable water source etc.) and specific building heating systems, it is concluded that there is currently insufficient certainty in heat pump uptake to reasonably estimate carbon savings for heat pump systems.

Table 10: Total Theoretical Carbon Savings for the period 2020 to 2050 for Roof-mounted PV Systems on 10% of Wirral Address Base

Metric	Value
Total PV Capacity	41.9 MW
Total Carbon Dioxide Equivalent Saving for the period 2020 to 2050	69 $ktCO_2e$

Commercial properties are typically characterised by higher energy demands, higher energy costs and greater spatial availability than domestic properties. Building-integrated renewables can also support commercial developments in meeting their sustainability objectives and reducing their energy costs, whilst improving customer perception. There is typically therefore both greater incentive and spatial potential for building-integrated renewable energy technologies in commercial properties than domestic buildings. Potential opportunities on the Wirral are therefore linked to large buildings and high energy users. An analysis of high electricity users on the Wirral is set out on *Figure 48* and presents an opportunity for future engagement on larger scale building-mounted renewables and retrofit potential in the Borough. By linking this to best practice building standards, such as BREEAM and Passivhaus, as identified in the Best Practice Review as part of the wider Wirral Local Plan Climate Change and Renewable Energy Study, further gains could be made in reducing emissions from commercial buildings.

In summary, building integrated renewable energy technologies are expected to make an important contribution to decarbonising both heat and electricity in Wirral. There are a number of mechanisms which can incentivise uptake and retrofit of building-integrated renewables such as the RHI scheme and the measures presented in *Figure 43*. Installation of building-integrated renewables will be subject to local, building-specific constraints. Multiple renewable energy technologies can be integrated into the building envelope to maximise efficiency, carbon savings and utilisation of local energy resources.

3.7 Future Technologies

The Clean Energy Opportunities and Implications Study aims to provide a robust and credible evidence base to inform planning policies to be incorporated in the Wirral Local Plan, intended to support renewable and low carbon energy development in Wirral. The Study has focussed on technologically mature and commercially ready technologies, aligned to current national and local policy and strategy, which are relevant to inform Local Plan development.

With a requirement for a regular (5 yearly) Local Plan Review, policies can be reviewed and updated to ensure that they reflect changing and developing

technologies. Ensuring that any supporting Supplementary Planning Document is also kept under regular review will also add a further level of explanation and background as technology changes and develops. In particular, it is considered this could be most likely to relate to hydrogen and carbon capture, utilisation and storage (CCUS) based on current horizon scanning (set out below). The 'Onsite Renewable and Low Carbon Energy' and Stand-alone Renewable and Low Carbon Energy Schemes' policies set out in the Renewable Energy Policy Development Paper are technology agnostic and so also allows more generally for the positive consideration of new and emerging technologies in the future.

As a guide to Wirral Borough Council the following section considers where future/emerging technologies might play a role in supporting ambitions to decarbonise.

Emerging technologies have the potential to contribute to the decarbonisation of the energy system in Wirral at a commercial scale within the lifetime of the Local Plan (to 2035). It is considered that hydrogen and carbon capture, utilisation and storage (CCUS) are the most likely additional technologies to play a significant role in energy systems associated with Wirral in the future. The following section presents a summary of the local opportunity for these technologies in the vicinity of Wirral.

Such technologies are still in a developmental stage and so not suitably developed to allow for constraints analysis or recommendations for local planning at this stage. In many cases the technologies are subject to emerging national government policy and private sector investment, which are beyond the scope of consideration of this study. It is therefore recommended that Wirral Borough Council remain engaged in 'horizon scanning' for emerging renewable and low carbon energy technologies, including exploring collaborations and partnerships with bodies leading the development of emerging technologies, which could further support it meeting its climate change ambitions in the future.

3.7.1 Hydrogen

Hydrogen is an alternative fuel which produces water when used (e.g. in fuel cells, or when burnt in boilers and engines). Hydrogen is a product of a process and can be produced using several different methods with differing levels of carbon intensity:

- Brown hydrogen: Through reformation of methane without carbon capture and storage (CCS)
- Blue hydrogen: Through reformation of methane using carbon capture and storage
- Green hydrogen: Through electrolysis of water using renewable energy produced either on site or via the grid[211]

Blue and green hydrogen represent energy vectors which can be used to store and deliver energy produced from clean sources. This makes hydrogen a particularly

[211] Arup, 2020. Establishing a Regional Hydrogen Economy Available at: https://www.arup.com/-/media/arup/files/publications/e/establishing-a-regional-hydrogen-economy.pdf, accessed 16.10.20

attractive fuel choice for sectors which are typically difficult to decarbonise such as heating, industry and transport as part of the energy system (see *Figure 44*). Using existing gas infrastructure, hydrogen could provide a clean and reliable source of energy for heating and appliances, where retrofit for electrification could prove too costly or technically unviable. Heavy industry, such as glass-making and steel works use high temperature furnaces which emit large volumes of CO_2. A move to hydrogen fuel offers a large opportunity to decarbonise these processes. In transport, hydrogen's rapid refuelling times make it ideally suited to use cases where there are shot refuelling time requirements as well as limited space for charging multiple electric vehicles at depots. Hydrogen's high energy density also makes it a useful fuel for heavier vehicle fleets with long range requirements.

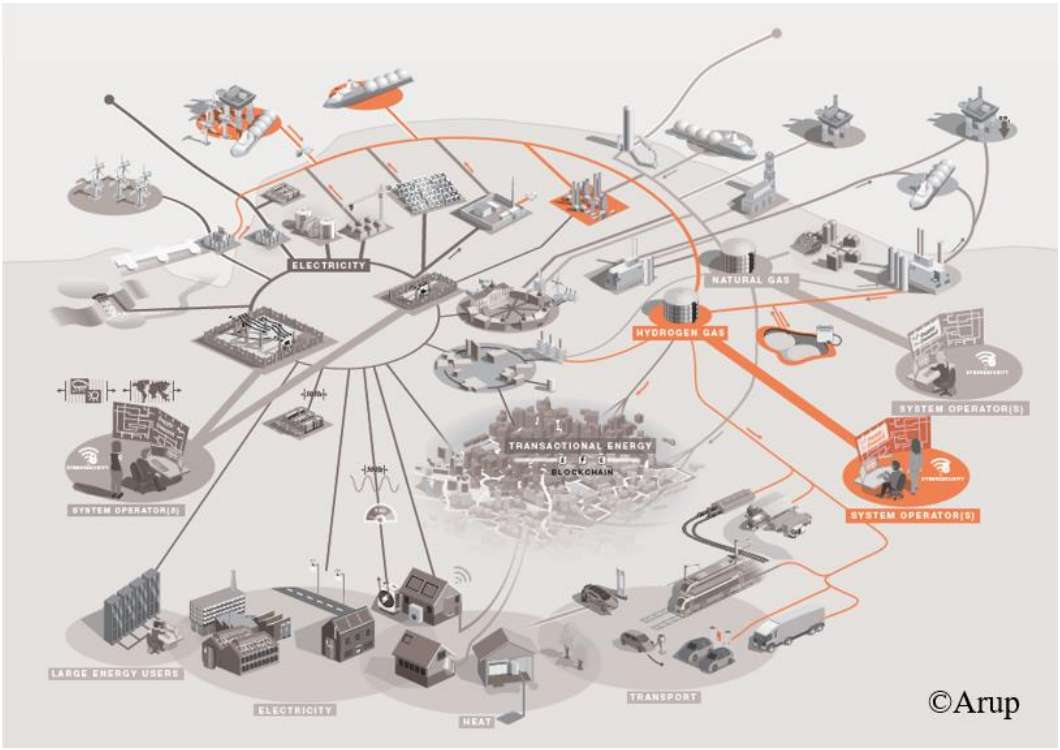


Figure 44 - Applications of hydrogen technology in the energy system (©Arup)[212]

Considerable progress has been made within the hydrogen industry in production, transportation and use; however, the hydrogen market is still emerging and relatively immature. This represents a challenge for developing a hydrogen economy, as hydrogen infrastructure requires significant capital investment and presents risk to financiers. Widespread uptake of hydrogen and the resulting economies of scale are expected reduce the cost of hydrogen fuel making it cost competitive with alternative energy sources.

Wirral is situated in the vicinity of HyNet North West, a significant project focused on the production of hydrogen from natural gas and the creation of the UK's first carbon capture utilisation and storage (CCUS) infrastructure. The project is anticipated to be a ready local Hydrogen supply from 2027. *Figure 45 -*

[212] Arup, 2020. Establishing a Regional Hydrogen Economy Available at: https://www.arup.com/-/media/arup/files/publications/e/establishing-a-regional-hydrogen-economy.pdf, accessed 16.10.20

Cadent HyNet NW Graphic (©Cadent HyNet) presents an overview of the HyNet project[213].

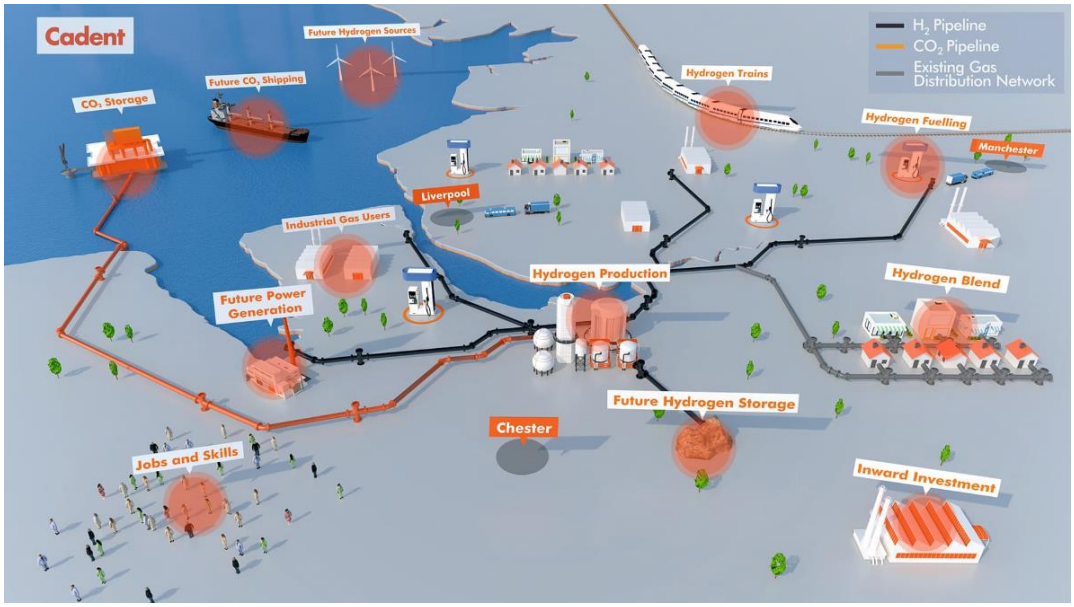


Figure 45 - Cadent HyNet NW Graphic (©Cadent HyNet)

Wirral is well positioned to take advantage of a local hydrogen opportunity as it develops. It is recommended that Wirral Borough Council take a coordinated approach to plan for the integration of hydrogen fuel vectors into the local energy system as the local hydrogen economy develops. The timescales for maturity and commercial viability of hydrogen will be dependent on private sector investment and through the direction of UK national energy policy. The most immediate opportunities are for industrial fuel switching to hydrogen, supported by developing a hydrogen distribution network. Utilising this distribution infrastructure could also facilitate refuelling stations for heavy good vehicles. The development of hydrogen for homes is still in trial phases[214].

3.7.2 Carbon Capture & Storage

Carbon capture and storage (CCS) involves capturing CO_2, transporting it to a storage site, and injecting it underground so that it is not released into the atmosphere. As CCS technology matures, options for utilisation of the captured CO_2 will be available, facilitating carbon capture utilisation and storage (CCUS). CCUS can capture up to 90% of the carbon that is produced during power and heat generation or from industrial processes such as steel or cement production before it enters the atmosphere. It is therefore considered an enabling technology which will play an important role in the UK's transition to net zero Greenhouse Gases.

Biomass energy carbon capture and storage (BECCS) involves capturing and storing the carbon produced as a product of using biomass fuel. When biomass fuel is used, the quantity of CO_2 released is approximately equivalent to the quantity of CO_2 taken in by the biomass during photosynthesis and growth.

[213] HyNet North West, HyNet at a Glance, Cadent, https://hynet.co.uk/ accessed 04/10/20.
[214] HyNet North West. Available at: https://hynet.co.uk/ accessed 16/10/20.

Capturing and storing this CO_2. The concept of the technology is that it effectively removes carbon from the atmosphere leading 'negative emissions'. BECCS technology may represent a means of addressing residual carbon emissions as part of the transition to net zero Greenhouse Gas emissions.

Carbon capture and storage is an immature technology and there are a number of complex technical and commercial challenges to be overcome before widespread adoption. The significant capital expenditure required for CCS infrastructure and the ongoing long-term costs and liability associated with stored CO_2 mean there are significant commercial challenges to overcome. BECCS technology in particular does not currently exist at a commercial scale and there are several significant issues that need to be addressed before this technology can be considered an option for the future. Due to the challenges associated with commercialising CCS, central Government will have a key role to play, both in investment and energy policy, to support CCS to establish its place in the UK energy system and enable the essential contribution the technology will make towards meeting net zero Greenhouse Gas emissions.

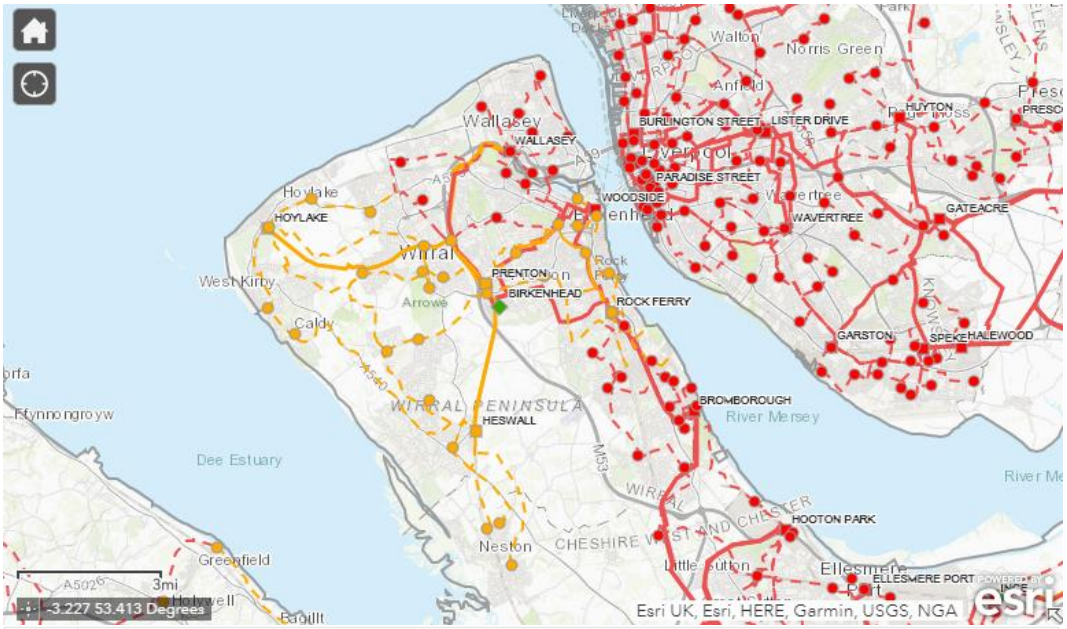
The HyNet North West project is seeking to develop the UK's first carbon capture and storage infrastructure, through the reuse of the oil and gas fields in Liverpool Bay for storage of captured carbon. Wirral may be well positioned to take advantage of this local opportunity due to its position as a coastal authority adjacent to the oil and gas fields in Liverpool Bay. This could be an involvement with transmission infrastructure or the potential integration of CCS into the local energy system as the CCS sector develops. As with the hydrogen market, the timescales for maturity and commercial viability of the CCS market will be highly dependent on private sector investment and support through the development of UK national energy policy.

3.8 Grid Infrastructure Capacity

A key potential constraint to renewable energy installations, and wider electrification as part of the transition to net zero, is the infrastructure element of the electricity network (grid). Renewable power installations most commonly require a grid connection to facilitate export of generated renewable electricity to the grid. There must be sufficient capacity available on the electricity network to accommodate the connection, otherwise the renewable energy developer may be required to pay for electricity network capacity upgrades. Renewable energy developments are therefore constrained by the available electricity network capacity. This can also be a constraint to building mounted renewables, electrification of heat and electric vehicle charging infrastructure.

Scottish Power Energy Networks Ltd (SPEN) is the Distribution Network Operator (DNO) for the region, responsible for operating and maintaining the electricity distribution network. SPEN produces the Distributed Generation SP Manweb Heat Map, which provides a high-level overview of potential opportunities to connect distributed generation (DG) to the 11kW, 33kW and 132kV network in the SP Manweb PLC license area. Correspondence with SPEN has indicated that a more detailed project and site-specific study would need to be completed by SPEN to assess whether a connection can be accommodated.

A capture of the SP Manweb Distributed Generation Heat Map is shown in *Figure 46.*



Category	Description
Green	All operational factors are within tolerable limits and so opportunities may exist to connect additional Distributed Generation without reinforcing the network (subject to detailed studies).
Amber	At least one factor is nearing its operational limit and hence, depending on the nature of the application, network reinforcement may be required. However, this can only be confirmed by detailed network analysis.
Red	At least one factor is close to its operational limit and so installation of most levels of Distributed Generation and a local connection is highly unlikely. It may also require extensive reinforcement works or given the lack of a local connection, require an extensive amount of sole user assets to facilitate such a connection.

Figure 46: SP Manweb Distributed Generation Heat Map, © 2020 Scottish Power Ltd[215]

Figure 46 shows that grid capacity is relatively constrained across the Wirral Borough. A significant proportion of substations in the eastern, more densely populated side of Wirral have '*at least one factor close to its operational limit'*, with '*installation of most levels of Distributed Generation and local connection … highly unlikely'*. There is higher network capacity availability towards the more rural west side of Wirral, where connection may be possible, but 'network reinforcement may be required'.

In line with this, connection of renewable power installations in the core opportunity areas identified may be challenging; however, connection of these installations in Green Belt land towards the East may be more feasible. As discussed, paragraph 147 of the NPPF states that many aspects of renewable energy projects will be considered inappropriate development in the Green Belt. The very special circumstances required to develop within the Green Belt would need to be properly explained and justified, balancing the wider environmental benefits of the of the scheme with the impact upon the Green Belt.

[215] Scottish Power (2020) SP Manweb Distributed Generation Heat Map
https://www.spenergynetworks.co.uk/pages/sp_manweb_heat_maps.aspx

3.8.1 Smart Grids

As the energy system transitions from the conventional, linear energy supply model to a more decentralised, multidirectional model, more flexible and resilient modes of operation are required. One such mode of operation is the smart grid approach to energy management. Smart grids enable responsive energy distribution that is better able to cope with growing demand and new intermittent supply technologies, such as solar PV.

A smart grid is an electricity network incorporating energy supply, energy storage and communications systems that can intelligently respond to nodes connected to it. Smart grids are applicable at small scale (e.g. multiple small buildings, micro-grids) to large scale (district scale interconnectivity of many buildings); however common to all smart grids is the integration of high-speed bi-directional communications between systems and the gird. Smart grids are able to better manage supply and demand leading to a number of benefits such as:

- Better prediction and matching of energy generation and demand
- Higher overall system efficiencies
- Real-time monitoring of assets facilitating active demand management and load shifting which can:
    - Significantly reduce peak stress on the grid and reduce energy network capacity requirements
    - Facilitate higher utilisation of intermittent renewable energy assets
    - Reduce the need for potentially costly and polluting peak capacity and back-up plant elements such as diesel generators (used for 'peak shaving')
- Enhanced resilience against threats including climate change and market volatility

Figure 47 presents a concept smart grid configuration.

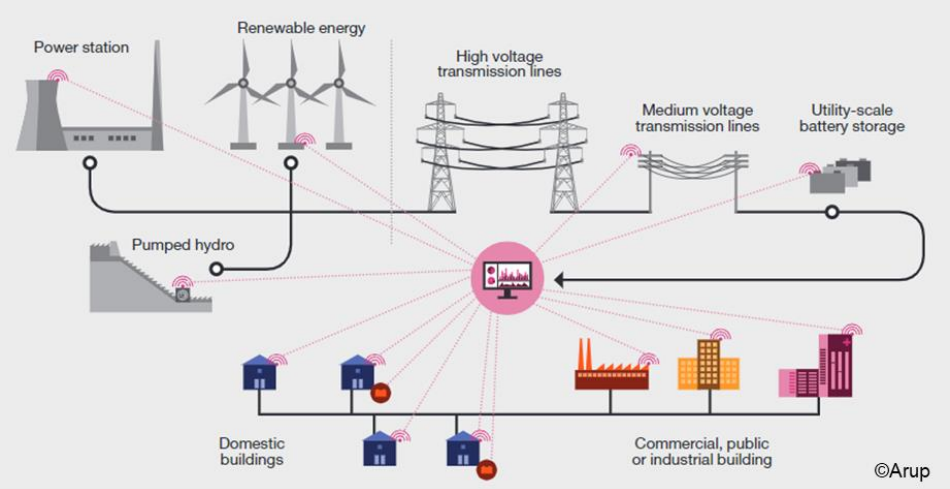


Figure 47: Concept Smart Grid Configuration

The principles of smart energy management can also be integrated and retrofitted into individual building design enabling building owners to better manage their energy supply. Data sharing between many aggregated smart energy management systems can also facilitate load-shifting and demand management at scale to reduce grid peak capacity requirements and alleviate peak stress on the local electricity network.

3.8.2 Private Wire and Power Purchase Agreements

A private wire is a localised electricity system linking electricity generating plant to a power consumer. In private wire systems, the electricity generator supplies electricity to a consumer directly rather than via the grid/local electricity distribution network. This arrangement drives the business case for private wire systems, as system and network charges associated with the electricity grid can be avoided and particularly where grid infrastructure upgrades might be needed to facilitate the development of a renewable energy scheme.

Private wire systems often contain a connection to the local distribution network for resilience purposes in case the primary electricity generator (e.g. solar array, biomass CHP) fails or requires maintenance; however as generated electricity is predominantly supplied directly to the consumer for most of the year, private wire systems can free up capacity on the electricity grid and alleviate stress on the local distribution network.

Private wire and PPAs facilitate a commercial arrangement which benefits the generator (typically guaranteed income over a time period at a higher rate than the grid export rate) and also the consumer (which typically pays a lower rate than for grid-electricity as network and system charges are avoided). Private wire arrangements also offer resilience against grid failures and blackouts.

The commercial arrangements between the generator and consumer can be specified in a power purchase agreement (PPA). The PPA will typically stipulate all of the key terms of the commercial arrangement including commencement, payment terms, minimum electricity supplied and penalties for under delivery. Power purchase agreements can be used to guarantee returns for electricity generators and insulate consumers against electricity market price fluctuations over specific timescales. PPAs can often yield higher returns than direct sale and export of electricity to the grid and can therefore be used to support renewable energy developments. They can also be used by an organisation to demonstrate the purchase of renewable energy and associated carbon benefits.

Private wire and PPA arrangements are typically most suitable for large renewable energy generators (solar arrays and wind farms) and large electricity consumers. A high-level analysis was undertaken to determine large industrial and commercial scale electricity users across the Wirral Borough. *Figure 48* presents a list of the identified consumers which are likely to have high electricity consumption and therefore high potential for a commercial private wire and PPA arrangement.

Consumers which may be potentially suitable for renewable private wire and PPA arrangements were determined by identifying consumers, which are typically characterised by high electricity use (e.g. factories, hospitals, retail parks), and by

reviewing the BEIS NAEI Emissions Inventory Map which shows large point sources of emissions[216]. Additionally, a private wire arrangement and power purchase agreement could be developed with Merseyrail to supply the local rail network with renewable power. A similar concept is being trialled at Aldershot Station by the Riding Sunbeams initiative founded by the climate charity Possible and Community Energy South[217]. A report produced by Riding Sunbeams states that the Liverpool and Wirral Community Renewables group identified multiple sites which could theoretically host and connect 17MWp of solar PV[218] providing an estimated 10% of Wirral's annual rail traction demand.

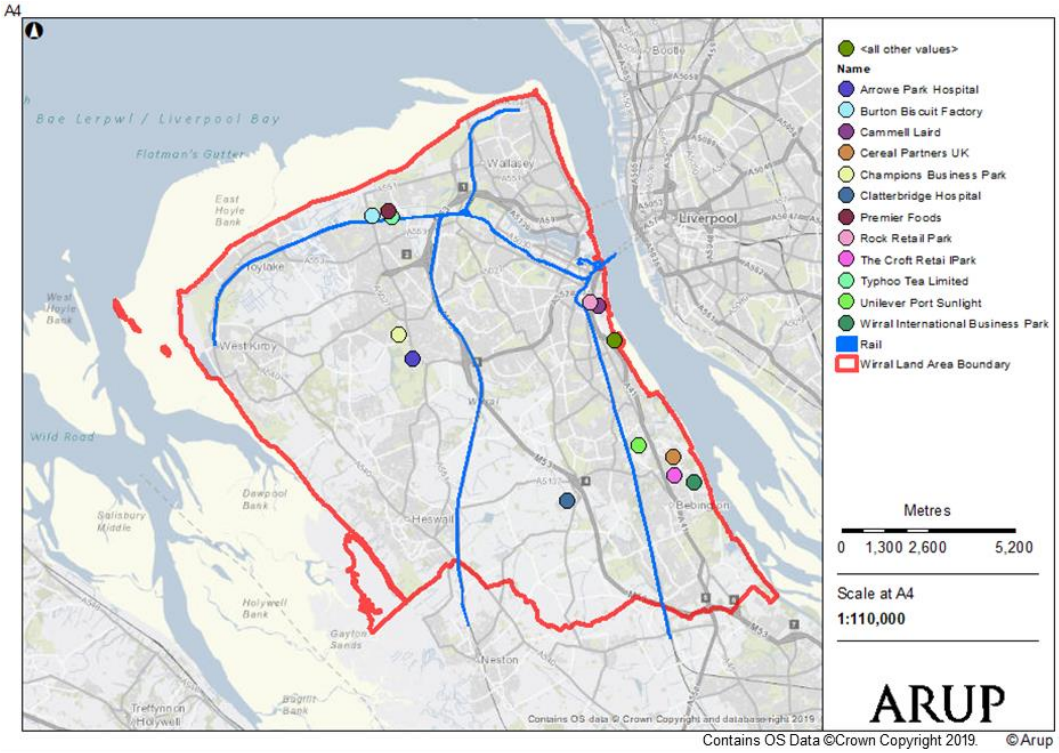


Figure 48: Large Electricity Consumers on the Wirral, indicating Potential for Renewable Private Wire and PPA Arrangements

[216] BEIS (2019) National Atmospheric Emissions Inventory Map, https://naei.beis.gov.uk/emissionsapp/, accessed 14/08/2020
[217] Riding Sunbeams (2020) Who We Are https://www.ridingsunbeams.org/about, accessed 14/08/2020
[218] Riding Sunbeams, Powering Our Railways with Solar PV https://static1.squarespace.com/static/5c7014458dfc8ca9655f10c5/t/5c73e0bb7817f79f73b5c0ea/1551098050918/RidingSunbeams_Report_final.pdf, accessed 05/10/2020.

4 Conclusion

The assessment has shown that there is potential for ground mounted solar PV, biomass energy, district heating and building-integrated technologies, but little potential for onshore wind. Some potential for supporting landward transmission infrastructure for tidal energy was also recognised

Onshore Wind Energy

Although there is limited potential for onshore wind energy, primarily due to urban nature of the East side of the Borough and the environmental designations on the West side. There may be opportunity to utilise Green Belt land to develop onshore wind installations consisting of small (<80m tip height) or medium (80-110m tip height) sized turbines, where very special circumstances can be demonstrated in line with Paragraph 147 of the NPPF. There may also be opportunity for wind turbine installations. Paragraph 147 of the NPPF sets out that such development would constitute inappropriate development and which, for a proposal to achieve planning permission, would require a case for very special circumstances to be proven. This would need to set out the wider environmental benefits of the of the scheme balanced with the impact upon the Green Belt.

Solar PV

Several opportunity areas for ground-mounted solar PV arrays have been identified, with the potential to provide total carbon dioxide equivalent savings of up to 192ktCO_2e to 2050 and total capacity of up to 117MW. The results of the Study showed that the potential for solar PV could be significantly increased if a proportion of the Green Belt were to be utilised to accommodate solar development. The Study concluded that the large scale use of Green Belt land for renewable energy installations is unlikely to be compatible with the purpose of Green Belt land , therefore any utilisation of Green Belt should be very carefully considered in terms of balancing impacts, e.g. ecology, visual impact and local character, against the benefit of renewable energy generation.. Furthermore, very special circumstances must be demonstrated for any renewable energy development on Green Belt land in line with Paragraph 147 of the National Planning Policy Framework. Solar PV can be installed in a way which supports biodiversity and enriches the agricultural value of the land. Therefore, previously developed land, brownfield land and low-grade (4-5) agricultural land should be prioritised for siting of ground-mounted PV installations. It is recommended that Wirral Borough Council considers an enabling policy approach which encourages development of solar PV systems where appropriate.

Landward implications of tidal energy

There is potential for development of tidal energy in the waters around the Wirral, principally being considered as part of current work on a Mersey Tidal Power Project. Such development could result in landward implications for Wirral, including landward grid transmission infrastructure. The study concluded that the landward transmission grid infrastructure requirements of tidal energy schemes have the potential to be located in Wirral. However, such development is likely to be part of a Development Consent Order, with planning determined at a national level.

Biomass

There is a significant proportion of Wirral's agricultural land area which could be used to grow energy crops and forestry residues to provide up to 86GWh of renewable fuel energy resulting in estimated carbon savings of up to 472ktCO_2e for the period 2020-2050 when used in biomass boilers to provide low-carbon heat. Energy crops used as biomass fuel have the potential to contribute to the Borough's carbon reduction targets; however, the proportion of agricultural land used for energy crops must be balanced against the food production and financial returns for farmers. Recovery of forestry residues from woodland management for use as biomass fuel represents a low-cost, 'low-hanging' fruit option, with the potential to provide a modest carbon saving for the period 2020 to 2050. It is recommended that the council encourages growth of energy crops and recovery of forestry residues for use as biomass fuel where appropriate. Although considered a renewable fuel, biomass combustion produces localised emissions of SO_x, CO_x and NO_x which affect local air quality therefore appropriate consideration must be given to local emission dispersion and abatement when designing and installing biomass systems. Where smoke control areas exist, biomass installations must comply with the local smoke control area regulations.

Heat

District heating supplied by low-to-zero carbon technologies represents one of the most effective methods for decarbonising heat in the Wirral Borough. A number of district heating priority zones were identified, with sufficient spatial heat density to support heat network schemes. The analysis showed that low-to-zero carbon district heating schemes have the potential to generate significant carbon savings for the period 2020 to 2050 compared with conventional gas boiler heating. Development of district heating schemes and the specific technologies used to supply them will be dependent on the primary heat sources available (e.g. ground heat availability, local water source etc.) and the specific building heating requirements (e.g. temperatures, operating regime). The analysis revealed that Wirral sits atop one of the UK's primary aquifers, which presents an opportunity for open-loop ground source heating (ground source heat pumps). It is recommended that Wirral Borough Council considers an enabling policy approach which encourages the development of heat networks, where appropriate, with a minimum of 85% of heat supplied to networks provided by a low-to-zero carbon source.

Building mounted technologies

Building-integrated renewable energy technologies, such as roof-mounted solar PV, solar thermal and heat pumps are expected to play an important role in meeting the Borough's decarbonisation targets. Commercial properties are typically characterised by higher energy demands, higher energy costs and greater spatial availability (e.g. to accommodate installations) than domestic properties. An indicative analysis on roof-mounted solar PV revealed that carbon dioxide equivalent savings of up to 69ktCO_2e could be realised to 2050, if a typical 2.6kW solar PV system was to be installed on only10% of the Wirral address base. There is typically therefore both greater incentive and spatial potential for building-integrated renewable energy technologies in commercial properties than domestic buildings. It is recommended that the council considers a policy approach which

encourages developers to integrate building-scale renewable technologies into new developments, both residential and non-residential, where feasible and encourages retrofit to existing buildings where the planning system can facilitate this.

Future Technologies

This study has focussed on technologically mature and commercially ready technologies, aligned to current national and local policy and strategy, which are relevant to inform Local Plan development. As a guide to Wirral Borough Council, potential future technologies were considered. Regular (5 yearly) Local Plan Reviews and the use of technology agnostic policy wording alongside Supplementary Planning Documents, can provide flexibility in local planning policy to facilitate support for future technologies as they emerge. Emerging technologies have the potential to contribute to the decarbonisation of the energy system in Wirral at a commercial scale within the lifetime of the Local Plan (to 2035). It is considered that hydrogen and carbon capture, utilisation and storage (CCUS) are the most likely additional technologies to play a significant role in energy systems associated with Wirral in the future. There are potential opportunities in linking in to the developments of HyNet and the North West Industrial cluster, where carbon capture, utilisation and storage (CCUS) and hydrogen production projects are developing. Such technologies are still in a developmental stage and so not suitably developed to allow for constraints analysis or recommendations for local planning at this stage. It is therefore recommended that Wirral Borough Council remain engaged in 'horizon scanning' for emerging opportunities in the development of emerging technologies.

Wider Considerations

The development of renewable energy technologies will be reliant on transmission infrastructure. In the case of electricity, transmission infrastructure (the grid) is constrained and alternative transmission solutions such as smart grids and private wire and power purchase agreements, may be needed to facilitate the development of renewable energy in the Borough.

The assessment provides a high-level view of clean energy opportunities. It is recommended that further investigation to develop opportunities would be needed to understand the potential of individual opportunities. This could include site surveys, environmental assessment and engagement with key stakeholders, e.g. SPEN.

The key purpose and output from this study provided recommendations to support policy development for the Wirral Local Plan, presented in Policy Development Papers as part of the wider Wirral Local Plan Climate Change and Renewable Energy Study.

Assumptions

Below is a list of key technical assumptions used in the analysis, which are not previously listed in the body of the report.

Item	Value	Unit	Reference
Gas boiler efficiency	85%	%	Arup project experience
Biomass boiler efficiency	80%	%	Arup project experience
Biomass CHP thermal efficiency	50%	%	Arup project experience
Biomass CHP electrical efficiency	25%	%	Arup project experience
Solar PV Module Inclination	38	Degrees	Arup project experience (optimum tilt angle)
Solar PV Module Maximum Power	0.2006	kW	SunTech STP275-20/Wfw solar PV module specifications
Solar PV Module Temperature Coefficient of Power	-0.41%	%	SunTech STP275-20/Wfw solar PV module specifications
Solar PV Module Nominal Operating Cell Temperature (NOCT)	45	℃	SunTech STP275-20/Wfw solar PV module specifications
Solar PV Module Aggregated Losses from Module to Grid	2.5%	%	Arup project experience.
Wind Turbine Hub Height	60	m	Enercon-E48 800kW wind turbine specification
Wind turbine Power Curve	Power curve based on Enercon-E48 800kW wind turbine specification	-	Enercon-E48 800kW wind turbine specification

Appendix 7

Policy Development Papers

Policy Development Paper

Net Zero Carbon Development

Introduction

This Policy Direction Paper provides background context for the development of a net zero carbon development focused policy, as part of embedding climate change action within the Wirral Local Plan 2020-2035.

This Paper forms part of a suite of Policy Development Papers, which also include Papers on 'Renewable Energy' and 'Sustainable Building Design' recommending policies to address climate change in the Local Plan.

This Policy Direction Paper sets out:

- relevant national legislation, policies and guidance that should be considered when developing net zero carbon development focused policies,
- an overview of the local context for Wirral and linking to the climate change strategy for Wirral (Cool & Cool2),
- highlights best practice learning from other local authorities that have taken steps to embed climate change within their local planning policies,
- provides recommendations for potential policies for the Local Plan.

Context

Ambitious carbon reduction commitments have been agreed at an international level to secure the increase in the global average temperature to below 1.5ºC to avoid the worst impacts of climate change[219]. To enable this, action is needed to reduce global Greenhouse Gas emissions by over half of their 1990 levels in just over a decade (by 2030).

The Climate Change Act (2008) introduced a statutory target for the UK to reduce Greenhouse Gas emissions by 80% by 2050[220]. In June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order was passed to introduce a statutory target of a 100% reduction (or net zero) of Greenhouse Gas emissions by 2050[221].

Action needs to be taken now to embed these ambitious targets within policy, to deliver necessary emissions reductions, as well as to protect against the effects of climate change which will occur. The planning system plays an important role in the transition to net zero, ensuring that new development is adaptable and resilient to these challenges and decarbonisation measures are facilitated through the planning system where appropriate.

Local Plan documents set out the long-term strategic priorities for development of an area. As such, they are an important tool for guiding how local action will be taken to align with these ambitious international and national statutory emissions targets.

Facilitating greater consideration of climate change action and delivery of measures to mitigate and adapt to climate change within Wirral will be a key step towards addressing climate change.

Key Legislation, Policy and Guidance

Legislation

- **Climate Change Act (2008):** introduced statutory Greenhouse Gas emission reduction targets and 5-yearly carbon budgets in the UK.
- **The Planning and Compulsory Purchase Act (2004)**: imposes a statutory duty on local authorities to include policies relating to the

[219] IPCC (2018) Special Report: Global Warming of 1.5ºC, https://www.ipcc.ch/sr15/chapter/spm/, accessed 10th August 2020
[220] UK Government (2008) The Climate Act, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5th August 2020
[221] UK Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5th August 2020

mitigation and adaption to climate change in their Local Plans.

Policy and Strategies

- **National Planning Policy Framework (2019):** sets out a requirement for plans to take a proactive approach to climate change mitigation and adaption.
  Paragraph 8 of the NPPF acknowledges climate change adaptation and mitigation as one of the key pillars of sustainable development.
  Paragraph 148 explains that the planning system should help to shape places that contribute to radical greenhouse gas reductions, encourage the reuse of existing resources including existing building conversions and support renewable and low carbon energy and associated infrastructure.
  Paragraph 149 states that Plans should take a proactive approach to mitigating and adapting to climate change, considering the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures or making provision for the possible future relocation of vulnerable development and infrastructure.
- **Clean Growth Strategy (2017):** describes policies and proposals intended to support the UK to meet its Carbon Budgets and decarbonise the UK's economy by 2050. It notes that greater energy efficiency in homes reduces household costs as well as emissions, whilst also offering substantial health benefits. Decarbonising heat poses a particular challenge to meeting carbon targets in both residential and non-residential buildings, the strategy emphasises that it is preferable to avoid new homes needing to be retrofitted later and instead tackling the challenge within the initial development.

Guidance

- **National Planning Policy Guidance Climate Change (2019):** provides advice on how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. It states that planning has an important role in reducing the emissions of greenhouse gases through effective spatial planning, by setting out aims, policies and by impacting on the location, mix and design of development. It provides examples of how Local Plans can mitigate climate change by promoting a reduction in emissions:
  - Reducing the need to travel and providing for sustainable transport;
  - Providing opportunities for renewable and low carbon energy technologies e.g. through district heating networks that include tri-generation (combined cooling, heating and power);
  - Providing opportunities for decentralised energy and heating e.g. maximising summer cooling through natural ventilation in buildings;
  - Promoting low carbon design approaches to reduce energy consumption in buildings, such as passive solar design; and
  - The provision of multi-functional green infrastructure.

  In addition, it provides examples for adaption to climate change:
  - Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime;
  - Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development;
  - Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality; and
  - Promoting adaptation approaches in design policies for developments and the public realm.

  Regarding viability, guidance is provided which states that Section 106 and Community Infrastructure Levy contributions can be used to fund climate change mitigation measures, such as green infrastructure and renewable energy developments. Expected contributions should be realistic, and properly evidenced to increase developer certainty.

Existing Local Planning Context

Climate Change Strategy

Wirral Borough's Climate Change Strategy, Cool 2 (approved in December 2019) builds upon the original climate change strategy, Cool 2014-2019. Wirral Borough Council also declared a climate emergency on the 15th of July 2019.

The aim of Cool2 is to co-ordinate climate change-related action and investment within Wirral. It sets out the local target of reaching 'net zero' pollution as early as possible before 2041 and the need to stay within a Paris Agreement compliant carbon budget which demands rapid decarbonisation. To achieve this, the plans sets out five key targets:

- Leaner use of energy: To reduce the overall demand for energy in Wirral across residential, commercial and industrial sectors including ensuring all homes currently below Energy Performance Certificate (EPC) Band C that can be upgraded are improved to this level or better by around 2030.
- Clean energy: To generate and/or source all our local energy needs from zero carbon and renewable sources by around 2041.
- Clean Travel: A complete transition to fossil fuel free local travel by around 2030.
- Wiser decisions: To use resources – materials, land and food - in a sustainable way so that our collective decisions do not add indirectly to the burden of climate damaging pollution in Wirral or elsewhere – cutting waste, changing land uses and our diets.
- Storing more carbon: To capture more carbon naturally by increasing woodland cover in line with national recommendations and by protecting soils and natural habitats.

Existing Wirral local planning policies

The existing Wirral Unitary Development Plan (UDP) was adopted in 2000 and does not contain any climate change specific polices. However, it does contain the following relevant policies:

- A chapter on renewable energy. This chapter has one policy (REN1) which sets out the high-level principle for renewable energy: *'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 other policies of the plan'.*
- Policy TRT3 refers to minimising noise, visual impact and air pollution, and meeting the needs for cyclists.
- Policy WMT2 is focused on promoting recycling and the re-use of waste materials.

There is therefore an opportunity to develop new policy to facilitate renewable energy in line with local, national and international climate change policy, strategy and legislation.

Wirral Local Plan 2020 - 2035 Issues and Options Consultation

Wirral's Strategic Objective 1 declares that the Council will '*support sustainable approaches to the location, design, construction, operation and impact of new development. This includes reducing carbon emissions in line with national and local targets.'*

Strategic Objective 4 includes the promotion of *'appropriate renewable energy and green technologies.'*

Best Practice

Energy Hierarchy

Many Local Authority Plans include a policy on the 'Energy Hierarchy'. The Hierarchy lists and prioritises the actions policy makers, developers, industry and consumers need to take when considering energy use, in order of most sustainable to least. The use of the Energy Hierarchy in policy is generally consistent with some slight amendments to wording by each local authority to best relate to their local context.

Draft London Plan (anticipated for adoption in 2020): Policy SI2 states that '*major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy: 1) Be lean: use less energy and manage demand during construction and operation. 2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3*

Energy infrastructure. 3) Be green: generate, store and use renewable energy on-site.'

Draft Greater Manchester Spatial Framework (most recent consultation ended 2019): Policy GM-S 2 outlines an expectation that '*new development will: be zero net carbon from 2028 by following the energy hierarchy (with any residual carbon emissions offset), which in order of importance seeks to: i. Minimise energy demand; ii. Maximise energy efficiency; iii. Utilise renewable energy; iv. Utilise low carbon energy; and v. Utilise other energy sources.'*

Energy & Climate Statements

Reading Borough Council Local Plan (adopted 2019): Have a sustainable design SPD which expresses that an Energy Statement should be submitted with all major developments to demonstrate how the proposal meets energy efficiency targets set out in the Local Plan.

Draft Flintshire Council Local Plan (anticipated for adoption 2021): Policy EN12 requires that '*residential development sites of 100 units or more and non-residential developments with a floorspace of 1000 sqm or more, will be required to submit an Energy Assessment to determine the feasibility of incorporating low carbon or renewable energy technology or connecting to nearby renewable or low carbon energy sources and heat networks.'*

Draft London Plan (anticipated for adoption in 2020): Policy SI2 states that '*major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance. As a minimum, energy assessments should include the following details: 1) calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy. 2) proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services 3) proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP). 4) proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies'*

Milton Keynes Council Local Plan (adopted 2019): Policy SC1 requires that *'proposals for more than 11 dwellings and non-residential developments of over 1000sqm an Energy and Climate Statement will be required demonstrating that the proposal achieves a carbon reduction improvement upon the Part L building regulations or higher, provide onsite renewables to further reduce carbon emissions, calculate indoor air quality and overheating risk performance, requires an 'as built' performance for the air quality and overheating proposals including a monitoring scheme for the first five years of a development's occupancy with information provided to the LPA and occupiers.'*

Section 106 & CIL contributions

Hull City Council Local Plan (adopted 2017): Policy 52 outlines that the '*council will support the provision of appropriate new infrastructure, including to mitigate and adapt to climate change, working with partner organisations and the East Riding of Yorkshire Council where necessary, to deliver the priorities of the Local Plan.'* It is outlined that S106/CIL will be used to facilitate this delivery.

Manchester City Council Local Plan (adopted 2012 and currently under review): Policy PA1 states that '*through such obligations as CIL and S106, the Council may seek contributions with priority assessed on a site by site basis for climate change mitigation/adaption.'*

Addressing residual carbon

Draft London Plan (anticipated for adoption in 2020): Policy SI2 states that '*where it is clearly demonstrated that the zero-carbon target for major development cannot be fully achieved on-site, any shortfall should be provided: 1) through a cash in lieu contribution to the relevant borough's carbon offset fund, and/or 2) off-site provided that an alternative proposal is identified and delivery is certain'*. It is outlined that Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver greenhouse gas reductions. The operation of offset funds should be monitored and reported on annually.

Swindon Local Plan (adopted 2015): Policy DE2 states that '*allowable solutions funding can be made*

where on-site provision of renewable technology is not appropriate. Funds gathered will be used for wider energy efficiency and energy generation initiatives.'

Limitations or Restrictions

In addition to the measures included above, it is noted that net-zero carbon transport, green infrastructure, flood risk adaptation and nature-based carbon off-setting also play an important role in the journey towards net-zero carbon development. The best practice on these topics have been presented as part of the Wirral Local Plan Climate Change and Renewable Energy Study Report to support wider work on developing Policy in these areas.

Potential Local Planning Policies

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to measure performance
Net zero	It is recommended that an overarching strategic policy be put in place to set out the need for net zero carbon development. Best practice guidance advocates local authorities adopt a target to have all new developments be net zero carbon emissions in operation by 2030 at the latest. It is recommended that this is supported by a requirement on applicants to submit an 'Energy and Climate Statement' to be submitted with all applications for developments.	*All development should consider and take measures to address climate change implications. This should include reducing carbon emissions associated with the construction, operation and decommissioning of developments, as well as designing in climate change adaptation measures to address the effects of a warming climate. As part of this, new development should be net zero carbon, requiring all new development to reduce its net carbon emissions from construction and operation to zero (with any residual carbon emissions addressed through compensation or carbon removal measures), demonstrated through*	International and national climate change legislation and policy set out the requirement to radically reduce Greenhouse gases to limit global warming. The Cool 2 Strategy sets the target to reach 'net zero' pollution as early as possible before 2041. Central to this is the requirement for all new development to achieve net zero carbon. The need for all development proposals to have fully taken into consideration the potential to address climate change is a fundamental requirement in meeting Council's overarching ambition to address the climate emergency. This policy will enable the Council to gain a better understanding of the energy demands and interventions to address climate change impacts of new developments due to come forward within the local authority area, and provide data upon which the Council can use to inform future decisions in regard to energy and climate infrastructure. An Energy Strategy should support all applications and include a projection of	Viability is a consideration as the policy needs to be proportionate to the size of development. As such, it is considered that the level of detail required to satisfy the policy, e.g. in Energy & Climate Statements, may commensurate with the scale of development to ensure a proportionate approach, but not that there will be a lesser standard to achieve. The development of a Supplementary Planning Document. could be required to guide applicants as to how they can demonstrate meeting net zero to overcome viability issues and maximise the contribution each development can make to meeting climate change targets.	• Production of a satisfactory Energy and Climate statement as part of an application. • Number of developments meeting net zero carbon emissions.

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to measure performance
		the submission of an Energy and Climate Statement, to demonstrate how the development will achieve net zero carbon, including consideration of the energy hierarchy and how monitoring and reporting on performance will be delivered.	the development's annual energy demand and a feasibility study demonstrating how the development's energy-based emissions can be reduced through a combination of energy efficiency measures and renewable energy implementation. The Statement will help to ensure that the energy use and energy-based emissions associated with new developments is considered carefully throughout the planning process. A Supplementary Planning Document will be prepared to provide guidance on the production and consideration of Energy & Climate Statements. As a minimum the Energy & Climate Statement should include: i. A calculation of energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions of any other part of the development, including construction, operation and decommissioning. ii. The proposed measures to reduce carbon emissions through the design and proposed delivery of the development.		

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to measure performance
			iii. Demonstrating how the use of decentralised energy and generation of onsite renewables has been considered, including demonstrating how the energy hierarchy has been followed. iv. The proposed measures included within the design to adapt to climate change impacts for the lifetime of the development (for example, extreme temperatures and weather events). v. Demonstration of compensation or carbon removal measures to address to achieve net-zero carbon. vi. Setting out the monitoring scheme to ensure delivery of emissions reductions identified in the statement.		
Energy Hierarchy	It is recommended that Wirral Borough Council consider adoption of a specific policy focused on an 'energy hierarchy'. To develop this further, it is encouraged that work is undertaken	*Development should be delivered in accordance with the energy hierarchy, which in order of importance should:* *i. Minimise energy demand (using less energy and managing energy demand during construction and operation);*	The use of an energy hierarchy is a well-established tool to address energy use from the inception of development. It avoids 'locking in' to carbon intensive developments, which add to the requirements for retrofit to meet climate change commitments. Its principles are embedded throughout the plan how it is addressed is a requirement of the Energy and Climate Statement.	• Potential additional cost implications to meet net zero carbon requirements. • Potential that availability of required technologies and skills to meet net zero carbon requirements. • Cost and availability of suitable measures to address residual carbon may present a challenge, particularly as demand	• Number of developments meeting net zero carbon emissions. • Production of a statement of net carbon emissions for each new development, which should

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to measure performance
	to embed the priorities of the 'energy hierarchy' in to development in Wirral, which could form supplementary guidance should a policy be adopted.	*ii. Maximise energy efficiency (include measures in the development to use energy efficiently);* *iii. Utilise renewable energy (maximise the use of building mounted and local sources of renewable energy);* *iv. Utilise low carbon energy (where renewable energy is not an option); and* *v. Utilise other energy sources (where low carbon and renewable energy is not an option).* *vi. Compensate for or deliver carbon removal measures to address residual carbon emissions on-site* *vii. Compensate for or deliver carbon removal measures to address residual carbon emissions off-site.*		increases. However, high costs associated with measures to address residual carbon are likely to have a positive influence on driving delivery of wider energy hierarchy measures, maximising the use of more beneficial interventions.	demonstrate the net carbon emissions at zero (including any carbon emission offsetting demonstrated to be secured). See policy requirement below.

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to measure performance
		The accompanying Energy and Climate Statement should fully address how the development is proposed to conform with the hierarchy.			
Section 106/CIL	It is recommended that Wirral Borough Council consider a policy to outline how they can support the delivery of climate change mitigation/adaptation though the use of Council funding mechanisms to be clear who pays for measures.	*Wirral Borough Council will support the provision of measures to mitigate and adapt to climate change to deliver the priorities of the Local Plan. This includes through obligations such as CIL and S106, seeking contributions, assessed on a case by case basis, towards measures to mitigate and adapt to climate change.*	The policy is In line with best practice and provides an established mechanism to support delivery of climate change mitigation and adaptation. Planning obligations are used to make otherwise unacceptable development acceptable in planning terms, by requiring developers to contribute to schemes that will address negative aspects of development. This could include climate mitigation methods within the Borough.	• Legal advice should be sought prior to adoption of such a policy to confirm it is in line with any Section 106/CIL allocation restrictions.	• Number of CIL/S106
Residual Carbon	It is recommended that Wirral Borough Council consider mechanisms to address residual	*Where a development cannot demonstrate net zero carbon can be met on-site, applicants should demonstrate how*	The policy provides a funding mechanism for the Council to use when in viability discussions with developers. While on-site net zero carbon developments are preferable, the	• Policies such as these are primarily, initially being proposed by regional authorities, who may have more resource to co-	• Tonnes of residual carbon addressed

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to measure performance
	carbon including considering if they would be able to facilitate the operation of a fund that developers could pay into to address residual carbon.	*allowable solutions to residual carbon emissions can be addressed through carbon removal measures, secured through a S106 agreement.*	Council recognises that this is not always feasible and will provide a mechanism to address any carbon 'shortfall'. It can also provide greater confidence that planning policy is supporting the delivery of climate targets. It is anticipated that this policy could be supported with a Supplementary Planning Document to provide guidance on the consideration of residual carbon, with further detail on potential offsetting schemes and the process for a S106 agreement.	ordinate such a fund. This measure could be considered as part of a collaborative approach at a regional level with the Liverpool City Region Combined Authority. • A Fund would need to be set up and administered by the Council, including legal advice on the nature of projects that fund can invest in. • Council may find it beneficial to set a carbon 'price per tonne' and maintain under review (as the price of addressing residual carbon is likely to rise over time, e.g. rising land purchase prices for woodland planting as demand increases). • Would need to consider the powers of the Council to set up a fund and set rates for a price per tonne of residual carbon.	

Policy Development Paper

Renewable Energy

Introduction

This Policy Direction Paper provides background context for the development of renewable energy focused policy, as part of embedding climate change action within the Wirral Local Plan 2020-2035.

This Paper forms part of a suite of Policy Development Papers, which also include Papers on 'Net Zero Carbon Development' and 'Sustainable Building Design' recommending policies to address climate change in the Local Plan.

This Policy Direction Paper sets out:

- relevant national legislation, policies and guidance that should be considered when developing renewable energy focused policies,
- an overview of the local context for Wirral and linking to the climate change strategy for Wirral (Cool & Cool2),
- highlights best practice learning from other local authorities that have taken steps to embed climate change within their local planning policies,
- provides recommendations for potential policies for the Local Plan.

Context

Ambitious carbon reduction commitments have been agreed at an international level to secure the increase in the global average temperature to below 1.5ºC to avoid the worst impacts of climate change[222]. To enable this, action is needed to reduce global Greenhouse Gas emissions by over half of their 1990 levels in just over a decade (by 2030).

The Climate Change Act (2008) introduced a statutory target for the UK to reduce Greenhouse Gas emissions by 80% by 2050[223]. In June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order was passed to introduce a statutory target of a 100% reduction (or net zero) of Greenhouse Gas emissions by 2050[224].

Action needs to be taken now to embed these ambitious targets within policy, to deliver necessary emissions reductions, as well as to protect against the effects of climate change which will occur. The planning system plays an important role in the transition to net zero, ensuring that new development is adaptable and resilient to these challenges and decarbonisation measures are facilitated through the planning system where appropriate.

Local Plan documents set out the long-term strategic priorities for development of an area. As such, they are an important tool for guiding how local action will be taken to align with these national and regional priorities such as climate action. Facilitating the development and use of renewable energy technologies within Wirral will be a key step towards addressing climate change.

Key Legislation, Policy and Guidance

Legislation

- **Climate Change Act (2008):** introduced statutory Greenhouse Gas emission reduction targets and 5-yearly carbon budgets in the UK.

[222] IPCC (2018) Special Report: Global Warming of 1.5ºC, https://www.ipcc.ch/sr15/chapter/spm/, accessed 10th August 2020

[223] UK Government (2008) The Climate Act, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5th August 2020

[224] UK Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5th August 2020

- **The Planning and Compulsory Purchase Act (2004)**: imposes a statutory duty on local authorities to include policies relating to the mitigation and adaption to climate change in their Local Plans.
- **The Planning and Energy Act (2008):** sets out powers for local authorities to have development plan policies which impose reasonable requirements for a proportion of energy used to development in their area to be energy from renewable sources and/or to be low carbon energy from sources in the locality of the development.
- **Energy Act (2011):** provides a framework for enabling energy efficiency measures in properties by encouraging low carbon energy supplies, fairer energy markets and improved energy security.

Policy and Strategies

- **National Planning Policy Framework (2019):** sets out a requirement for plans to take a proactive approach to climate change mitigation and adaption. Paragraph 151 states that to enable renewable and low carbon energy development, plans should provide a strategy that maximises the potential for sustainable energy sources, including the identification of opportunities for development to draw from sustainable energy sources and locating potential areas that could support renewable and low carbon development. Paragraph 152 states that local authorities should support community-led initiatives for renewable and low carbon energy development.
- The **National Policy Statements for Energy (2011) and Renewable Energy (2011)** outline guidance for decision making in relation to Nationally Significant Infrastructure Projects (NSIP) for renewable energy developments.
- **Clean Growth Strategy (2017):** describes policies and proposals intended to support the UK to meet its Carbon Budgets and decarbonise the UK's economy by 2050 with a focus on homes, business and industry, transport and natural resources. It notes that greater energy efficiency in homes reduces household costs as well as emissions, whilst also offering substantial health benefits. Decarbonising heat poses a particular challenge to meeting carbon targets in both residential and non-residential buildings, the strategy emphasises that it is preferable to avoid new homes needing to be retrofitted later and instead tackling the challenge within the initial development.
- **Community Energy Strategy (2014):** focuses on creating a supportive environment for community energy and removing specific barriers to growth. It supports communities to produce, reduce use of, manage and purchase energy.

Guidance

- **National Planning Policy Guidance Climate Change (2019):** provides advice on how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. With regards to renewable energy, the guidance outlines that the following are important:
  - Providing opportunities for renewable and low carbon energy technologies e.g. through district heating networks that include tri-generation (combined cooling, heating and power);
  - Providing opportunities for decentralised energy and heating e.g. maximising summer cooling through natural ventilation in buildings;
  - Promoting low carbon design approaches to reduce energy consumption in buildings, such as passive solar design.

Existing Local Planning Context

Climate Change Strategy

Wirral Borough's Climate Change Strategy, Cool 2 (approved in December 2019) builds upon the original climate change strategy, Cool 2014-2019. Wirral Borough Council also declared a climate emergency on the 15th of July 2019.

The aim of Cool2 is to co-ordinate climate change-related action and investment within

Wirral. It sets out the local target of reaching 'net zero' pollution as early as possible before 2041 and highlights the need to stay within a Paris Agreement compliant carbon budget which demands rapid decarbonisation. In relation to renewable energy the plan sets out the following key target: '*To generate and/or source all our local energy needs from zero carbon and renewable sources by around 2041*'.

Existing Wirral local planning policies

The existing Wirral Unitary Development Plan (UDP) was adopted in 2000 and has a chapter on renewable energy. This chapter has one policy (REN1) which sets out the high-level principle for renewable energy:

'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 other policies of the plan'.

There is therefore an opportunity to develop new policy to facilitate renewable energy in line with local, national and international climate change policy, strategy and legislation.

Wirral Local Plan 2020 - 2035 Issues and Options Consultation

Wirral's Strategic Objective 1 declares that the Council will '*support sustainable approaches to the location, design, construction, operation and impact of new development. This includes reducing carbon emissions in line with national and local targets.'*

Strategic Objective 4 includes the promotion of *'appropriate renewable energy and green technologies.'*

Best Practice

Renewable Energy

Manchester City Council Local Plan (adopted in 2012 and currently under review): Policy EN4 requires that '*wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies'*. EN5 of the plan sets out strategic areas for low and zero carbon decentralised energy infrastructure stating '*Within Manchester it is considered that the following strategic areas (indicated on the policies map) will have a major role to play in achieving an increase in the level of decentralised, low and zero carbon energy supplies available:*

- *The Regional Centre*
- *District Centres and associated major development sites*
- *Airport Strategic site,*
- *Strategic housing locations*
- *Strategic employment locations*

Within these areas' new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. The Council will work with all relevant stakeholders, which may include developers, landowners, residents, community groups, private sector partners, utilities companies, neighbouring authorities and other public sector bodies, as appropriate, to bring forward such plans. Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO2 reduction funded by contributions.'

Milton Keynes Local Plan (adopted 2019): Policy SC1 K requires that ' *Development proposals for 11 or more dwellings and non-residential development with a floor space of 1000 sq. m or more will be required to submit an Energy and Climate Statement that demonstrates how the proposal will achieve the applicable requirements* including:
1.*Achieve a 19% carbon reduction improvement upon the requirements within Building Regulations Approved Document Part L 2013, or achieve any higher standard than this that is required under new national planning policy or Building Regulations.*
2. Provide on-site renewable energy generation, or connection to a renewable or low carbon community energy scheme, that contributes to a

further 20% reduction in the residual carbon emissions subsequent to 1) above.'

Energy Networks

Reading Borough Council Local Plan (adopted 2019): Policy CC4 required '*any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq. m shall consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.'*

Draft Greater Manchester Spatial Framework (most recent consultation ended 2019): Policy GM-S 3 outlines that the '*delivery of renewable and low carbon energy schemes will be supported with particular emphasis on the use of decentralised energy networks in areas identified as "Heat and Energy Network Opportunity Areas"*. These areas are highlighted on the policies map.

Draft Swindon Local Plan (anticipated for adoption in 2020): Policy IN4 states that '*any heat produced as part of a renewable energy or CHP installation should be productively used on-site or linked to a district energy network.*'

Milton Keynes Local Plan (adopted 2019): Policy SC2 states that '*all new developments in proximity of an existing or proposed combined heat and power (CHP), combined cooling, heat and power (CCHP) station or local energy network will be expected to connect to the network unless it can be demonstrated that:*

- *a better alternative for reducing carbon emissions from the development can be achieved; or*
- *heating and/or cooling loads of the scheme do not justify a CHP connection; or*
- *the cost of achieving this would make the proposed development unviable.'*

Community Energy

Draft Swindon Local Plan (anticipated for adoption in 2020): Policy IN4 states that '*appropriate renewable and low carbon energy infrastructure which has benefits for local communities and the local economy will be encouraged and supported'.* Within this policy community energy schemes will be encouraged and supported in principle, with the policy stating, '*Energy efficiency and low carbon energy generation schemes brought forward by communities, or with major community benefits, will be encouraged and supported in principle*.'

The plan also sets out site specific policies requiring community wide renewable energy, for example Policy NC1 for a new community in Wichelstowe the policy states '*The development at Wichelstowe shall provide a community wide approach to renewable energy, preferably with a district heating system'*.

Welsh Government: the policy Statement on Local Ownership of Energy Generation in Wales sets a target for sustainable energy that *'[focus] not only on new capacity but on how the transition benefits Wales'*. The targets being: '*Wales to generate electricity equal to 70 per cent of its consumption from renewable sources by 2030; 1 gigawatt (GW) of renewable energy capacity in Wales to be locally owned by 2030; [and,] New renewable energy projects to have at least an element of local ownership from 2020*'.

Cornwall's Renewable Energy Planning Advice sets out, on community ownership of renewable energy developments, that: *'The Council believes that this model of renewable energy deployment should receive particular support when considering the merits of renewable energy development at the planning decision stage.'*

Specific Renewable Energy Technologies

Draft Flintshire Council Local Plan (anticipated for adoption 2021): Policy EN13 states that '*renewable or low carbon energy generation development may be permitted for; For large scale solar PV farms (5 MW and above) within Solar Indicative Local Search Areas (specific solar PV land allocations given in proposals map) and/or For small scale and/or community based proposals (less than 5MW) for wind, solar, biomass, energy from waste, anaerobic digestion and hydropower in appropriate locations.'*

In addition, many Local Authorities set out a policy for wind turbines which outlines the criteria required for a wind turbine to be considered acceptable. In the Hull Local Plan

(adopted 2017) Policy 18 states that '*all allocated employment sites (except employment allocations 44 and 45), designated employment areas and the Port Area, as shown on the Policies Map, are potentially suitable for wind turbines. Areas of open space potentially suitable for wind turbines are shown as such on the Policies Map*.' The policy outlines that applications for wind turbines will needs to demonstrate its acceptability against a long list of criteria set out in the policy e.g. no negative impact to local amenity, biodiversity, historic environment, telecommunications and birds.

Manchester City Council Local Plan (adopted in 2012 and currently under review): Policy EN7 outlines the parameters around sourcing, processing and transporting biofuels. It states that *'Biofuels should be obtained from sustainable sources and processes and in a way that minimises transport impacts, following a sequential approach in order to minimise CO_2 emissions – firstly prioritising local and regional sources, followed by national, European and international. Consideration should be given to biofuel delivery by rail and waterways where possible. Where large-scale fuel or feedstock delivery is required by road the energy centre must be located in or adjacent to light industrial, industrial or leisure uses with any impact on local residential amenity minimised.'*

Limitations or Restrictions

There are a number of technical, environmental and legislative constraints associated with the implementation of renewable energy technologies and their associated infrastructure. A full list of the identified constraints is presented in the Wirral Clean Energy Opportunities and Implications Study.

Policy recommendations in this Paper are informed by a review of existing policy, best practice and the constraints-based approach applied in the Wirral Clean Energy Opportunity and Implications Study. Detailed feasibility studies, Environmental Impact Assessments and appropriate Due Diligence will be required to further progress/facilitate renewable energy infrastructure.

Potential Local Planning Policies

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
Onsite Renewable and Low Carbon Energy	With consideration to the best practice review, it is recommended that Wirral Borough Council consider a policy to maximise the opportunities for the use of renewable and low carbon energy sources, particularly the use of onsite generation to reduce emissions.	*Development should be designed in a manner that maximises the use of renewable and low carbon energy supplies. How this is to be achieved should be fully explored in the Energy and Climate Statement. Unless it is demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision, it must be demonstrated how:* *i. the use of onsite renewables to reduce carbon emissions has been maximised* *ii. new developments in proximity of an existing or proposed heat network or district energy network will connect to the network.* *iii. where a development is not to be connected to a heat network, it should be demonstrated how the design makes the development 'district*	Cool2, the Climate Strategy for Wirral, sets out the scale of the challenge to address climate change. Renewable and low carbon energy generation is one of the key tools available to reduce carbon emissions. This is further supported by the Wirral Clean Energy Opportunities and Implications Study, which also identifies significant constraints for stand-alone schemes, indicating that maximising onsite renewable solutions will be needed to meet Wirral's climate ambitions. The Energy and Climate Change Statement should address how onsite renewables and local carbon energy have been fully taken into consideration in accordance with the requirements of the policy, or in cases where such provision is not suitable, feasible or viable, what measures have been taken to maximise the potential of renewable and low carbon energy supplies. This is in line with the NPPF. Paragraph 151 stipulates that plans should identify opportunities for	• Capital investment cost / additional development cost. • Operational maintenance and liability • Feasibility issues such as design and installation, grid infrastructure and property ownership/liability may present a challenge. • Potential environmental or wider impacts	• Production of a satisfactory energy and climate statement as part of an application • % of energy demand satisfied through onsite generation.

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
		heating ready' to enable connection at a later date.	development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers. An Energy and Climate Change Statement will identify these opportunities within new development. The results of the Clean Energy Opportunity Study recognise the potential of building-integrated renewable energy technology in meeting Wirral's decarbonisation goals. The Study recommends encouraging developers to integrate build-scale renewable technologies into new developments where feasible and encourages retrofit to existing buildings where possible.		
Stand-alone Renewable and Low Carbon Energy Schemes	With consideration to the best practice review, it is recommended that Wirral Borough Council consider a policy to state support for renewable and low carbon energy schemes, particularly	*Delivery of renewable and low carbon energy schemes will be supported in appropriate locations and where consistent with other relevant policies of the Local Plan.*	Cool2, the Climate Change Strategy for Wirral, sets out the scale of the challenge to address climate change, Delivery of renewable and low carbon energy schemes is one of the tools available to reduce carbon emissions. This is further supported by the Wirral Clean Energy Opportunities and Implications Study, which also identifies grid constraints, indicating	• Sites identified as potentially suitable may also be being considered for other development, giving rise to decisions on priorities. • Developers may not be forthcoming for smaller opportunities.	• Production of a satisfactory statement on carbon savings of the development as part of an application • KW or MW of installed

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
	the use of decentralised energy networks. It is recommended that Wirral Borough Council also consider further support to schemes developed in areas of opportunity, including those identified through the Wirral Clean Energy Opportunities and Implications Study.		that decentralised energy network solutions will be needed to meet Wirral's climate ambitions. Wider constraints that must be taken into account when considering suitable sites include noise and visual impacts and conservation areas. The Clean Energy Opportunities and Implications Study has identified potential for renewable and low carbon areas a number of opportunity areas for ground-mounted solar PV. It is recognised that this policy position should seek to support new types of development as they become commercially viable to enable the zero carbon energy transition. It is recognised that grid constraints may mean that renewables connecting by private wire or decentralised energy networks may be required.	• Feasibility issues such as grid infrastructure and land ownership may present a challenge. • Potential environmental or wider impacts	renewable or low carbon energy capacity on the Wirral. • KW, MW or % of energy demand produced from decentralised energy networks.
Community Renewable and Low Carbon Energy	With consideration to the best practice review it is recommended that Wirral Borough Council consider a policy to state support for	*Community renewable and low carbon energy developments in appropriate locations will be supported, where consistent with other relevant policies of the Local Plan. The development of all renewable*	Community ownership in renewable and low carbon energy schemes provides local benefits to those potentially impacted by a scheme. It can improve buy-in to development of renewable and low carbon energy schemes. It also provides potential	• Capital investment may be a barrier to schemes developed wholly by community groups. • Engagement with developers, including through incentives and	• Production of a satisfactory statement on carbon savings of the development as

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
	community renewable and low carbon energy schemes.	*energy schemes should demonstrate an element of local ownership.*	sources of revenue to local communities, promotes inclusive growth and maximises benefits. Such developments will therefore be supported and encouraged by the Council in their contribution to addressing the climate emergency. Such a proposal builds on government support for community energy developments and best practice seen in other areas of the UK. It is recognised that grid constraints may mean that renewables connecting by private wire or decentralised energy networks may be required.	the enforcement of this policy, would be needed to ensure meaningful community ownership. • Legal mechanisms to facilitate a shared ownership model may need to be developed or guidance provided to secure the desired outcomes. • Potential environmental or wider impacts	part of an application • Number or % of energy schemes under community ownership and the % ownership they have.
Ground-mounted solar PV	It is recommended that Wirral Borough Council consider a policy to facilitate the implementation of ground-mounted solar PV arrays in the key opportunity areas identified in the Wirral Clean Energy Opportunities and Implications Study.	*Development of ground mounted solar PV will be supported in appropriate locations and where consistent with other relevant policies of the Local Plan*.	The Clean Energy Opportunities and Implications Study identified a number of key areas that may be suitable for both ground-mounted and floating Solar PV development. Wider constraints must be taken into account when considering suitable sites, including visual impacts and conservation areas.	• Visual impact (can be managed by measures such as hedgerow planting) • Detailed feasibility study, EIA and due diligence study required prior to implementation (economics, environmental impact etc.). • Floating solar PV installed in the docks would render the docks unusable and	• Production of a satisfactory statement on carbon savings of the development as part of an application • KW or MW of installed capacity on the Wirral.

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
				so should be considered where docks are no longer in use and progressed in collaboration with site owners and other relevant bodies. • Local grid capacity constraints.	
Wind energy	It is recommended that Wirral Borough Council consider a policy enabling community energy groups and other parties to submit proposals for small scale wind turbine arrays or single wind turbine generator installations, as part of the development of the Neighbourhood Plan.	*Development of wind energy installations of* small (indicatively <80m tip height) or medium (indicatively 80-110m tip height) sized turbines *will be supported in appropriate locations and where consistent with other relevant policies of the Local Plan*.	The Wirral Clean Energy Opportunities and Implications Study concluded that large scale wind turbine array installations would not be suitable for implementation in the Wirral Borough. It considers there to be potential for opportunities for small (<80m tip height) or medium (80-110m tip height) sized turbines - considered to be indicatively less than 110m turbine tip height and less than 1.5MW typical capacity. It also considers that these would be single turbine or small array installations. Two key constraints limiting wind farm development in Wirral include, Green Belt and the minimum spacing distance between houses and wind turbines.	• Green Belt utilisation is likely to be required to facilitate wind installations in Wirral. • Visual impact. • Permissions may be required from MOD or nearby airports such as John Lennon. • Detailed feasibility study, EIA and due diligence study required prior to implementation (economics, environmental impact etc.). • Local grid capacity constraints. • (Precedent for wind turbine arrays overcoming	• Production of a satisfactory statement on carbon savings of the development as part of an application • KW or MW of installed capacity on the Wirral.

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
			In the constraints analysis, the minimum distance between a turbine and address was set as 250m for small and medium turbines and 500m for large and very large turbines in line with best practice and ETSU-R-97 Noise Guidelines. The minimum distance is not legislated, therefore if Green Belt land was made available for development and parties within the 250m range of the proposed wind turbine were to agree to the installation, development of a small array or single turbine installation may be possible in some areas. Such installations could be identified on a case-by-case basis by an organisation such as a community energy group through local consultation. Constraints that must be taken into account when considering suitable sites include noise and visual impacts and conservation areas.	the constraints include Frodsham Wind Farm and Peel Mersey Docks).	
Heat networks (connecting developments)	It is recommended that Wirral Borough Council consider a policy stating that new	*All new developments in proximity of an existing or proposed heat network or*	The Clean Energy Opportunities and Implications Study identified key heat opportunity areas for implementation of heat networks. These have the	• Economic viability (heat network cost may be prohibitive to developments and may be	• Production of a satisfactory energy and climate

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
	developments in the heat opportunity areas identified in the Wirral Clean Energy Opportunities and Implications Study are expected to connect to a heat network where technically and financially feasible. It is recommended that the policy states that if the development is not connected to the heat network, it should be made 'District Heating Ready' to enable connection at a later date.	*district energy network will be expected to:* *i. connect to the network unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision; Or,* *ii. where a development is not to be connected to a heat network, it should be demonstrated how the design makes the development 'district heating ready' to enable connection at a later date.*	potential to deliver significant carbon savings to 2050, supporting Wirral's climate change targets. The study also identified that the Wirral has a particular opportunity for Open-loop Ground Source Heat Pumps, which could be integrated with heat network systems to provide a source of low-carbon heating.	more expensive to run by the occupant – individual electric heating in buildings or gas boilers are often cheaper) • Availability and suitability of low-zero carbon heat sources to supply the network. • Consumer buy-in. • Economic viability. • Visual impact associated with energy centre development.	statement as part of an application • % of energy demand satisfied through connection to heat network. kW or MW of installed capacity on the Wirral. • Number of developments connected, or % of developments with connection available that are connected, to heat networks.
Heat network (stations, networks and infrastructure)	It is recommended that the policy states that new heat networks should be designed so that they can be expanded to	*Any developments of heat networks or district energy networks must demonstrate:* *i. a minimum of 85% of the energy supplied is from*	Heat networks powered by renewable and low-carbon heat sources will play an important role in the decarbonisation of heating in Wirral.	• Economic viability • Availability and suitability of low-zero carbon heat sources to supply the network.	• Production of a satisfactory statement on carbon savings of the development as

Topic	Policy recommendation	Potential policy wording	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
	incorporate new developments and additional low-zero carbon heat sources. It is recommended that the policy states that all new heat networks should be designed so that they can be expanded to incorporate new developments and additional low-carbon heat sources, such as waste heat recovery, or renewably powered heat pumps and electric heating. It is recommended that Wirral Borough Council considers a policy stating that a minimum of 85% of heat from new heat networks must be supplied by renewable and low-carbon sources.	*renewable or low-carbon sources.* *ii. how any heat produced will be productively used on-site or linked to a district energy network* *iii. how the design and capacity for future expansion to facilitate incorporation of new development and additional low-carbon technology, such as waste heat recovery, heat pumps and electric heating.*	It is important that the primary heat sources for these networks are renewable or low carbon in nature to support meeting Wirral's climate change targets. Suitable renewable and low-carbon heat sources may include: • Ground source heat pumps • Air source heat pumps • Water source heat pumps • Sewage source heat pumps • Waste heat recovery • Biomass boiler/CHP • Renewably powered electrical heating (resistive, electrode boilers etc). The Clean Energy Opportunities and Implications Study has identified the potential for ground source heat pumps in the Wirral, as well as potential for biomass fuel. The Study identifies a number of district heating priority zones that can feasibly support heat network schemes, with	• Supply security and system resilience (e.g. variation in air temperature, efficiency degradation over time in ground systems) • Visual impact associated with implementing heat pump technologies (e.g. boreholes, air-water heat exchangers) • Potential environmental impacts • Spatial availability • Biomass is not suitable for air quality management areas due to localised emissions.	part of an application • kW or MW of installed capacity on the Wirral. • % of heat from new heat networks supplied by renewable and low-carbon sources.

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			potential to deliver significant carbon savings to 2050. Supplementary or backup generation usually taking the form of gas boilers or electrode boilers will typically be required to enhance the resilience of the system.		

Policy Development Paper

Sustainable Building Design

Introduction

This Policy Direction Paper provides background context for the development of Sustainable Building Design focused policy, as part of embedding climate change action within the Wirral Local Plan 2020-2035.

This Paper forms a suite of Policy Development Papers, which also include Papers on 'Net Zero Carbon Development' and 'Renewable Energy' recommending policies to address climate change in the Local Plan.

This Policy Direction Paper sets out:

- an overview of the local context for Wirral and linking to the climate strategies for Wirral (Cool & Cool2)
- relevant national legislation, policies and guidance that should be considered when developing sustainable building design focused policies.
- highlights best practice learning from other local authorities that have taken steps to embed climate change within their local planning policies
- provides recommendations for potential policies for the Local Plan.

Context

Ambitious carbon reduction commitments have been agreed at an international level to secure the increase in the global average temperature to below 1.5ºC to avoid the worst impacts of climate change[225]. To enable this, action is needed to reduce global Greenhouse Gas emissions by over half of their 1990 levels in just over a decade (by 2030).

The Climate Change Act (2008) introduced a statutory target for the UK to reduce Greenhouse Gas emissions by 80% by 2050[226]. In June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order was passed to introduce a statutory target of a 100% reduction (or net zero) of Greenhouse Gas emissions by 2050[227].

Action needs to be taken now to embed these ambitious targets within policy, to deliver necessary emissions reductions, as well as to protect against the effects of climate change which will occur. The planning system plays an important role in the transition to net zero, ensuring that new development is adaptable and resilient to these challenges and decarbonisation measures are facilitated through the planning system where appropriate.

Local Plan documents set out the long-term strategic priorities for development of an area. As such, they are an important tool for guiding how local action will be taken to align with these ambitious international and national statutory emissions targets

Ensuring that buildings throughout Wirral have sustainable design principles embedded at an early stage will be a key step towards reducing Greenhouse Gas emissions. A crucial component to this reduction will also be to retrofit existing buildings.

However, the role of new development in addressing Greenhouse Gas emissions should be considered in context. 80% of the built environment that will exist in 2050 has already

[225] IPCC (2018) Special Report: Global Warming of 1.5ºC, https://www.ipcc.ch/sr15/chapter/spm/, accessed 10th August 2020

[226] UK Government (2008) The Climate Act, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5th August 2020

[227] UK Government (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 5th August 2020

been built today. Therefore, retrofitting existing buildings to reduce emissions through insulation, renewable energy installations and/or connecting to a heat network is crucial to achieve the UK's net-zero ambitions[228]. The role of local planning is more limited with respect to retrofit of existing buildings, as the majority of building retrofit projects would likely be classed as permitted development and therefore not require planning permission. Where planning permission is required, such as in conservation areas and for listed buildings the proposed policies in this paper would apply to retrofitting of buildings.

Key Legislation, Policy and Guidance

Legislation

- **Climate Change Act (2008):** introduced statutory Greenhouse Gas emission reduction targets and 5-yearly carbon budgets in the UK.
- **The Planning and Compulsory Purchase Act (2004)**: imposes a statutory duty on local authorities to include policies relating to the mitigation and adaption to climate change in their Local Plans.
- **The Planning and Energy Act (2008):** sets out powers for local authorities to have development plan policies which impose reasonable requirements for a proportion of energy used to development in their area to be energy from renewable sources and/or to be low carbon energy from sources in the locality of the development.
- **Buildings Regulations (2010) Part L:** states that reasonable provision shall be made for the conservation of fuel and power in buildings, by limiting heat gains and losses, and providing fixed building services that promote efficiency.
  It also includes a four-part guidance document on how to practically achieve Building Regulation requirements in new and existing buildings.
- **Energy Act (2011):** provides a framework for enabling energy efficiency measures in properties by encouraging low carbon energy supplies, fairer energy markets and improved energy security.

Policy and Strategies

- **National Planning Policy Framework (2019):** recognises that good design is a key aspect of sustainable development. Paragraph 125 states that Plans should set out a clear design vision to give applicants as much certainty in development as possible. This can be supported by supplementary planning documents, design guides and codes. Paragraph 131 states that in determining applications, great weight should be given to outstanding or innovative design which promotes high levels of sustainability or help raise the standard of design more generally in an area. Paragraph 150 states that new development can help to reduce Greenhouse Gas emissions through the location, orientation and design. Local requirements for sustainability of buildings should reflect Government policy for national technical standards. Paragraph 153 states that local planning authorities should expect new development to take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.
- **Clean Growth Strategy (2017):** describes policies and proposals intended to support the UK to meet its Carbon Budgets and decarbonise the UK's economy by 2050. It notes that greater energy efficiency in homes reduces household costs as well as emissions, whilst also offering substantial health benefits. Decarbonising heat poses a particular challenge to meeting carbon targets in both residential and non-residential buildings, the strategy emphasises that it is preferable to avoid new homes needing to be retrofitted later and instead tackling the challenge within the initial development.
- **National Design Guide (2019):** provides planning practice guidance for local

[228] UK GBC (2020) Climate Change https://www.ukgbc.org/climate-change/, Accessed 12th August 2020

authorities and developers to achieve well-designed places. This can be achieved through the following measures:

- having a layout, form and mix of uses that reduces their resource requirement, including for land, energy and water;
- being fit for purpose and adaptable over time, reducing the need for redevelopment and unnecessary waste;
- using materials and adopt technologies to minimise their environmental impact.

Guidance

- **National Planning Policy Guidance Climate Change (2019):** provides advice on how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. With regards to sustainable building design, the guidance outlines that the following are important:
  - Promoting low carbon design approaches to reduce energy consumption in buildings, such as passive solar design or maximising summer cooling through natural ventilation;
  - Providing opportunities for decentralised energy and heating.
  - Providing opportunities for renewable and low carbon energy technologies;

  Guidance also states that local planning authorities can:
  - Set energy performance standards for new housing or the adaptation of buildings to provide dwellings, that are higher than the building regulations, but only up to the equivalent of Level 4 of the Code for Sustainable Homes (c20%).
  - Are not restricted or limited in setting energy performance standards above the building regulations for non-housing developments.

  The ability to set local energy efficiency standards is the subject of the recent Future Homes Standard consultation. This could strip the ability of local authorities to set their own standards. At the time of writing, the results of this consultation have not been released.

- **BRE's Building Research Establishment Environmental Assessment Method (BREEAM) & Civil Engineering Environmental Quality (CEEQUAL):** are both methods of assessing the sustainability of buildings and developments, BREEAM is concerned with the lifecycle of master planning, infrastructure and buildings, while CEEQUAL assesses typically larger-scale civil engineering public realm projects. Both methodologies are intended to support the improvement of sustainability performance of buildings and developments. Both are rated out of 6: 'unclassified', 'good', 'pass', 'very good', 'excellent' and 'outstanding'.
- **BRE's Home Quality Mark (HQM):** is measured out of five stars, with a one-star rating meaning a home meets key baselines beyond minimum standards, while a five-star rating signifies outstanding sustainability standards significantly higher than minimum standards.
  HQM focuses on three main aspects of sustainability: living costs; health and wellbeing; and the environmental footprint. While it is not currently as widely adopted as BREEAM or CEEQUAL, its use as a 'preferred option' within Local Plans appears to be growing and could be an additional option for delivery of Greenhouse Gas emissions reductions.

- **Passivhaus standards:** differ to the proceeding standards in that it primarily certifies buildings based on their heating and cooling performance; with very low energy use. The standard is driven by air quality and comfort and requires buildings to achieve thermal comfort solely by post-heating or post-cooling of fresh air flow without the need for additional recirculation. EnerPHit is a separate Passivhaus standard focused on retrofitting. It recognises that it is much more difficult to bring existing buildings up to Passivhaus

standards, as this has not been considered in the initial design. Therefore, to achieve Passivhaus standard, EnerPHit requirements are slightly relaxed.

- **Energiesprong:** has a different approach to housing refurbishment and new build standard. The aim is to create a net-zero energy home with a lifetime cost that is no more than a building regulation compliant house.
  There are three key principles that underpin an Energiesprong home:
  - A focus on performance outcome instead of compliance;
  - Principles supported by a long history of best practice rather than just requirements; and,
  - Technologically agnostic – the approach is not concerned with the method or technology used to create net-zero homes but is only concerned with the performance output.

Existing Local Planning Context

Climate Change Strategy

Wirral Borough's Climate Change Strategy, Cool 2 (approved in December 2019) builds upon the original climate change strategy, Cool 2014-2019. Wirral Borough Council also declared a climate emergency on the 15th of July 2019.

The aim of Cool2 is to co-ordinate climate change-related action and investment within Wirral. It sets out the local target of reaching 'net zero' pollution as early as possible before 2041 and highlights the need to stay within a Paris Agreement compliant carbon budget which demands rapid decarbonisation. In relation to sustainable buildings, the strategy sets out the following targets:

- At least 100,000 homes need upgrading to be more energy efficient over the next 10 years. This is generally considered to be above Band C EPC rating.
- A complete switch over to 'clean -zero carbon' energy sources by 2041.

Wirral Local Plan 2020 - 2035 Issues and Options Consultation

Wirral's Strategic Objective 1 declares that the Council will support sustainable approaches to the location, design, construction, operation and impact of new development. This includes reducing carbon emissions in line with national and local targets.

In order to meet housing needs across the borough, strong emphasis has been placed on the re-use of the quantum of empty homes. This provides additional opportunity to improve energy efficiency in currently vacant homes.

The Emerging Local Plan also discusses the opportunity to 'opt in' to require new properties to be provided at a higher standard under the Building Regulations, where there is clear evidence of local need and where it can be shown to be viable.

Existing Wirral local planning policies

The existing Wirral Unitary Development Plan (UDP) was adopted in 2000. No existing policies on energy efficient buildings requirements are within the existing UDP.

Best Practice

New Development

Draft Flintshire County Council Local Plan (anticipated for adoption 2021): Policy EN12 states that '*New development will be required to maximize the potential for renewable or low carbon energy technology to meet the energy needs of the proposal. Residential development sites of 100 units or more and non-residential developments with a floorspace of 1000 sqm or more, will be required to submit an Energy Assessment to determine the feasibility of incorporating low carbon or renewable energy technology or connecting to nearby renewable or low carbon energy sources and heat networks.'*.

Regarding low carbon development, Reading Borough Council Local Plan (adopted 2019): Policy H5 states that *'All major new-build residential development should be designed to achieve zero carbon homes. All other new build housing will achieve at a minimum a 19%*

improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations'. Policy CC2 states that '*Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change. To meet these requirements:*

- *All major non-residential developments or conversions to residential are required to meet the most up to date BREEAM 'Excellent' standards, where possible;*
- *All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Very Good' standard as a minimum.'*

Greater Manchester Draft Spatial Framework (most recent consultation ended 2019): Policy GM-S 2 includes an expectation that new development will: *'a. Be zero net carbon from 2028 by following the energy hierarchy (with any residual carbon emissions offset), which in order of importance seeks to:*

i. Minimise energy demand;

ii. Maximise energy efficiency;

iii. Utilise renewable energy;

iv. Utilise low carbon energy; and

v. Utilise other energy sources.

With an interim requirement that all new dwellings should seek a 19% carbon reduction against Part L of the 2013 Building Regulations'
d. Achieve a minimum 20% reduction in carbon emissions (based on the dwelling emission or building emissions rates) through the use of on site or nearby renewable and / or low carbon technologies;
e. Include a carbon assessment to demonstrate how the design and layout of the development sought to maximize reductions in whole life CO2 equivalent carbon emissions.

Milton Keynes Council Local Plan (adopted 2019): Policy SC1 states that *'Development proposals for 11 or more dwellings and non-residential development with a floor space of 1000 sq. m or more will be required to submit an Energy and Climate Statement that demonstrates how the proposal will achieve the applicable requirements below:*

1. Achieve a 19% carbon reduction improvement upon the requirements within Building Regulations Approved Document Part L 2013, or achieve any higher standard than this that is required under new national planning policy or Building Regulations.

2. Provide on-site renewable energy generation, or connection to a renewable or low carbon community energy scheme, that contributes to a further 20% reduction in the residual carbon emissions subsequent to 1) above.'

Camden Borough Local Plan (adopted 2017): Policy CC2 states that *'The Council will promote and measure sustainable design and construction by:*

f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment;
and h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.'

Building Retrofit

Milton Keynes Council Local Plan (adopted 2019): Policy SC1 states that '*Proposals which would result in considerable improvements to the energy efficiency, carbon emissions and/or general suitability, condition and longevity of existing buildings will be supported, with significant weight attributed to those benefits.*

Greater Manchester Draft Spatial Framework (most recent consultation ended 2019): Policy GM-S 2 includes '*Promoting the retrofitting of existing buildings with measures to improve*

energy efficiency and generate renewable and low carbon energy;' The Greater Manchester Spatial Energy Plan also suggested further analysis and spatial mapping to identify priority zones for retrofit within Greater Manchester.

Electric Vehicle Charging Infrastructure Provision

Reading Borough Council Local Plan (adopted 2019): Policy TR5 states that '*Development should provide car parking and cycle parking that is appropriate to the accessibility of locations within the Borough to sustainable transport facilities, particularly public transport.*

Development should make the following provision for electric vehicle charging points:

- *All new houses with dedicated off-street parking should provide charging points;*
- *Within communal car parks for residential or non-residential developments of at least 10 spaces, 10% of spaces should provide an active charging point.'*

Greater Manchester Draft Spatial Framework (most recent consultation ended 2019): Policy GM-S 2 states the expectation that new development will: *'Incorporate adequate electric vehicle charging points to meet likely long-term demand;'.*

Draft London Plan (consultation ended 2018): Policy T6.1 states that '*All residential car parking spaces must provide infrastructure for electric or Ultra-Low Emission vehicles. At least 20 per cent of spaces should have active charging facilities, with passive provision for all remaining spaces'.*

Limitations or Restrictions

Enforcing policies that could be perceived to be onerous to developers could be challenging on the grounds of viability. This is particularly relevant for small-scale development.

Additionally, policy based around retrofitting can be difficult to implement effectively, given that the majority of residential retrofit will be considered permitted development.

Policy recommendations in this Paper are informed by a review of existing policy and best practice. However, sustainable building design can vary widely on a site-by-site basis.

Potential Local Planning Policies

Topic	Policy recommendation	Potential policy wording[229]	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
Residential development	With consideration of the best practice review, it is recommended that Wirral Borough Council consider a policy requiring all residential development to meet a specified emissions reduction target. In setting a 19% reduction on the Dwelling Emission Rate (DER) against the Target Emission Rate (TER), this is equivalent to the energy performance requirements in Code for Sustainable Homes Level 4. It is also recommended that local authorities adopt a target to have all new homes and buildings to be net zero carbon emissions in operation by 2030 at the latest. The policy should also enable the use of empty homes and facilitate retrofit of buildings to net zero where	**Option 1 (net zero now)** *All applications for new residential dwellings should achieve net zero carbon, including all applications for minor residential dwellings, extensions, retrofit or bringing back into use empty homes.* *Where it is demonstrated that the scheme is not suitable, feasible or viable to meet net zero carbon, it should demonstrate the maximum contribution the scheme can make towards these requirements and as a minimum must achieve a minimum a 19% improvement dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.*	Through the Cool 2 Strategy produced by Wirral, the Borough has committed to net zero pollution, including carbon, by 2041 at the latest. All residential development will therefore have to adapt to becoming net zero to meet this target. Where this is not possible, clear evidence should be provided as to why it is not achievable Planning applications for residential based development should meet the highest standards of sustainable development, and this policy seeks to ensure that this is fully addressed in the submission and determination of all applications. It is an essential component of the Council's ambition to address the climate emergency in line with international agreements based on scientific evidence. This policy does however acknowledge that net zero carbon development may not be viable for all residential development, providing a minimum, transition or 'fall back' position of a 19% reduction in Building Regulations Part L specifications where this is the case, or requiring applicants to demonstrate the maximum contribution that can be made if this cannot be achieved.	• Potential for developers to justify no feasibility for net zero carbon development to reduce costs. • Viability issues with smaller-scale residential development. The cost of developers producing small-scale solutions on an individual basis may impact viability. • Majority of residential retrofitting applications will be covered by permitted development and therefore will not need to abide by this policy. • Increased permitted development rights under new Planning White Paper.	• Number of new developments meeting net zero carbon or achieving 19% reduction in Part L standards. • Production of a satisfactory Energy & Climate Statement as part of an application. • Energy Performance Certificate (EPC) rating of buildings in the Borough.

[229] Potential policy wording for Sustainable Building Design is presented as options at this stage for further consideration and decision by Wirral Borough Council.

Topic	Policy recommendation	Potential policy wording[229]	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
	these engage with the planning regime. It is recommended that this is supported by a requirement on applicants to submit an 'Energy and Climate Statement' to be submitted with all applications for residential developments, which should consider whole life carbon impacts.	*The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.* **Option 2 (net zero in future)** *All applications for new residential dwellings should demonstrate the maximum contribution the scheme can make towards net zero carbon and as a minimum must achieve a minimum a 19% improvement dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations, including all applications for minor residential dwellings, extensions, retrofit or bringing back into use empty homes.* *By [date to be confirmed, e.g. 2025, 2030], all applications for new residential dwellings should*	The Energy & Climate Statement will help to ensure that the energy use and energy-based emissions associated with new developments is considered carefully throughout the planning process. The Energy & Climate Statement should include a projection of the development's annual energy demand and a feasibility study demonstrating how the development's energy-based emissions can be reduced through a combination of energy efficiency measures and renewable energy implementation. It is expected that the Statement will be commensurate with the scale of the development and will be further explained in a Supplementary Planning Document. As a minimum the Energy & Climate Statement should include: vii. A calculation of energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions of any other part of the development, including construction, operation and decommissioning. viii. The proposed measures to reduce carbon emissions through the design and proposed delivery of the development. ix. Demonstrating how the use of decentralised energy and generation of		

Topic	Policy recommendation	Potential policy wording[229]	Potential Reasoned Justification	Potential risks / challenges e.g. cost/viability	Potential indicators to monitor performance
		achieve net zero carbon, including all applications for minor residential dwellings, extensions, retrofit or bringing back into use empty homes. *The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.*	onsite renewables has been considered, including demonstrating how the energy hierarchy has been followed. x. The proposed measures included within the design to adapt to climate change impacts for the lifetime of the development (for example, extreme temperatures and weather events). xi. Demonstration of how residual carbon has been addressed to achieve net-zero carbon. xii. Setting out the monitoring scheme to ensure delivery of emissions reductions identified in the statement. The Clean Energy Opportunities and Implications Study recommends encouraging developers to integrate build-scale renewable technologies into new developments where feasible and encourages retrofit to existing buildings where possible.		
Non-residential development	With consideration to the best practice review, it is recommended that Wirral Borough Council consider a policy requiring all non-residential development to meet certain emissions reduction targets. Best practice guidance advocates an approach to	**Option 1 (net zero now)** *All applications for new non-residential development should achieve net zero carbon. This includes all works that require planning permission for retrofit or building extension.*	National Planning Practice Guidance notes that Local Plans can mitigate climate change by promoting low carbon design approaches to reduce energy consumption in buildings. BREEAM and CEEQUAL are standards that take low carbon energy methods into account in their assessment of developments. In considering the scale of the climate challenge, it is considered	• Potential for developers to justify no feasibility for net zero carbon development to reduce costs. • Viability issues with smaller-scale non-residential development.	• Number of new developments meeting net zero carbon or BREEAM/CEEQUAL 'Excellent'. • Production of a satisfactory Energy & Climate Statement

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	'leapfrog' Energy Performance Certificate baseline requirements and aim for higher standards as this will minimise the likely cost of future retrofit. As such, this includes a focus on long term goals such as bringing in alignment with BRE schemes. BREEAM and CEEQUAL 'Excellent' is recommended. It is also recommended that local authorities adopt a target to have all new developments be net zero carbon emissions in operation by 2030 at the latest. It is recommended that this is supported by a requirement on applicants to submit an 'Energy and Climate Statement' to be submitted with all applications for developments.	*Where it is demonstrated that the scheme is not suitable, feasible or viable to meet net zero carbon, it should demonstrate the maximum contribution the scheme can make towards these requirements. At a minimum, all applications for new non-residential developments must achieve BREEAM 'Excellent'. This includes all works that require planning permission for retrofit or building extension. All applications for public realm, and other schemes that are not appropriate to be considered under BREEAM, at a minimum must achieve CEEQUAL 'Excellent'.* *The supporting Energy & Climate Statement should demonstrate how these requirements will be achieved.*	that an 'Excellent' standard for development in Wirral is appropriate. Planning applications for non-residential based development should meet the highest standards of sustainable development, and this policy seeks to ensure that this is fully addressed in the submission and determination of all applications. It is an essential component of the Council's ambition to address the climate emergency. The policy does however acknowledge that net zero carbon development may not be viable for some non-residential development, and provides for a minimum, transition or 'fall back' position of BREEAM/CEEQUAL 'Excellent' where this is the case, or requiring applicants to demonstrate the maximum contribution that can be made if this cannot be achieved. The Energy & Climate Statement will help to ensure that the energy use and energy-based emissions associated with new developments is considered carefully throughout the planning process. An Energy & Climate Statement should include a projection of the development's annual energy demand and a feasibility study demonstrating how the development's energy-based emissions	• Increased permitted development rights as proposed under the new Planning White Paper (August 2020). • Cost of developers producing small-scale solutions on an individual basis impacting viability.	as part of an application. • Energy Performance Certificate (EPC) rating of buildings in the Borough.

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		Option 2 (net zero in future) *All applications for new non-residential development must achieve BREEAM 'Excellent'. This includes all works that require planning permission for retrofit or building extension. All applications for public realm, and other schemes that are not appropriate to be considered under BREEAM, at a minimum must achieve CEEQUAL 'Excellent'.* *By [date to be confirmed, e.g. 2025, 2030], all applications for new non-residential development should achieve net zero carbon. This includes all works that require planning permission for retrofit or building extension.* *The supporting Energy & Climate Statement should*	can be reduced through a combination of energy efficiency measures and renewable energy implementation. It is anticipated that this could be supported with a Supplementary Planning Document to provide guidance on the production and consideration of Energy & Climate Statements. As a minimum the Energy & Climate Statement should include: i. A calculation of energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions of any other part of the development, including construction, operation and decommissioning. ii. The proposed measures to reduce carbon emissions through the design and proposed delivery of the development. iii. Demonstrating how the use of decentralised energy and generation of onsite renewables has been considered, including demonstrating how the energy hierarchy has been followed. iv. The proposed measures included within the design to adapt to climate change impacts for the lifetime of the development (for example, extreme temperatures and weather events).		

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		demonstrate how these requirements will be achieved.	v. Demonstration of how residual carbon has been addressed to achieve net-zero carbon. vi. Setting out the monitoring scheme to ensure delivery of emissions reductions identified in the statement. The Clean Energy Opportunities and Implications Study recommends encouraging developers to integrate build-scale renewable technologies into new developments where feasible and encourages retrofit to existing buildings where possible.		
Electric vehicle charging infrastructure	With consideration to the best practice review, it is recommended that Wirral Borough Council consider a policy requiring all residential and non-residential development to accommodate electric vehicle charging points. Best practice guidance advocates consideration of how rapid and large-scale adoption of electric vehicles could impact the Borough within the plan period.	**Option 1 (25%)** *All applications for residential dwellings with off street parking must accommodate one active Electric Vehicle charging point per dwelling. All applications for non-residential development must include at least 25% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 25% of passive infrastructure to allow for*	Electric Vehicle provision can play a key role in meting Wirral's Cool 2 Strategy targets of 'net zero' pollution before 2041 and fossil fuel free local travel by around 2030. Enabling the growth of electric vehicles by providing for the necessary infrastructure is an essential tool in tackling climate change. It is also central to ensuring suitable car parking provision is enabled now and future proofed with the necessary infrastructure to allow further charging facilities to avoid the need for future retrofit. Consideration should be made for the potential energy demand for electric vehicle charging infrastructure, which	• Viability of providing both active and passive infrastructure on smaller-scale developments. • Potential reliance on developers to convert passive infrastructure into active charging points in the future. • Current low uptake levels of electric vehicles within Wirral but noting the expectation of a	• Number of active EV charging points provided through new development. • Number of potential EV charging points available through passive infrastructure.

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	It is recommended that this includes a requirement for passive charging infrastructure provision to futureproof this policy.	*future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.* **Option 2 (increase to 100%, e.g. by 2030)** *All applications for residential dwellings with off street parking must accommodate one active Electric Vehicle charging point per dwelling. All applications for non-residential development must include at least 25% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 25% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.*	should be fully addressed in the overall scheme design. Addressing on–street parking could be more challenging for schemes, such as town centre regeneration, that may include elements of on–street parking. The potential of utilising new technologies and solutions to providing on-street charging should be considered and implemented where practicable and feasible.	relatively high uptake predicted for the future by Scottish Power Energy Networks (the District Network Operator) • Responsibility for operational maintenance costs. • Feasibility issues such as location, design and installation.	

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		By [date to be confirmed, potentially aligned with 2030 in line with imminent government announcement on petrol diesel ban by 2030] all applications for non-residential development must include 100% of their car parking provision to be served by active electric vehicle charging infrastructure, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes. **Option 3 (increase to 50%, e.g. by 2027 and 100%, e.g. by 2030)** *All applications for residential dwellings with off street parking must accommodate one active Electric Vehicle charging point per dwelling. All applications for non-residential development*			

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		must include at least 25% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 25% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes. *By [date to be confirmed, e.g. 2027 as a central date], all applications for non-residential development must include at least 50% of their car parking provision to be served by active electric vehicle charging infrastructure and a further 50% of passive infrastructure to allow for future capacity, with a minimum of one parking space serviced by electric vehicle charging*			

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		infrastructure for all schemes *By [date to be confirmed, potentially aligned with 2030 in line with imminent government announcement on petrol diesel ban by 2030] all applications for non-residential development must include 100% of their car parking provision to be served by active electric vehicle charging infrastructure, with a minimum of one parking space serviced by electric vehicle charging infrastructure for all schemes.*			