BP60: Conwy LAEP: Implications for the RLDP (solar and wind)

Replacement Local Development Plan 2018-2033

Background Paper: Deposit

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CONWY

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Executive Summary

Introduction and context

Arup was commissioned by Conwy County Borough Council (CCBC) to consider how the wind and solar requirement set out within CBBC's Local Area Energy Plan (LAEP) will impact on the next iteration of Conwy's LDP through a geospatial analysis and policy review.

In 2022, CCBC published its first Local Area Energy Plan. This plan used a combination of stakeholder engagement and technical modelling to identify key steps for Conwy to accelerate towards a zero carbon energy system. The plan set out an aspiration to install 690MW additional capacity of onshore wind and solar energy, based on a technical study that provided estimations of the amount of renewable energy required to meet future energy demand in Conwy.

Conwy County Borough Council has begun work on an emerging Replacement Local Development Plan (RLDP) for 2018 to 2033. The LDP was informed by a Renewable Energy Assessment (REA) which identified and mapped key constraints for each technology. This REA (when including grid connection and site constraints in the final assessment) did not identify any suitable areas for wind or ground mounted photovoltaics (PV) in Conwy. This study is not designed to replace the REA, but provides an initial spatial analysis based on the LAEP.

Approach

We undertook a spatial analysis of wind turbine and ground mounted PV potential in Conwy. We defined a set of constraints, which were discussed with representatives of CCBC in a constraints workshop held in January 2023. These constraints were based on 500kW minimum scale development which is smaller than the 5MW minimum used in the REA, and maps were produced showing the potential for wind and PV in Conwy. From these, an estimation of installed capacity potential was made, both for the whole county and also on CCBC assets. We also undertook a review of planning policy options for renewable energy, and considered their suitability for CCBC.

Conclusions and recommendations

The spatial analysis found that there is significant potential for wind and PV generation in Conwy. Even taking into account that fact that only a fraction of the suitable area is likely to eventually develop projects, we estimated that up to 496MW of installed wind capacity and 2,231MW of ground mounted PV generation capacity is available in the County. This far exceeds the County's needs as set out in the LAEP.

CCBC has more control to deliver renewables on its own assets. We found that on these there is estimated potential for 6.6MW wind turbine generation, 16.2MW ground mounted PV generation and 6.5MW rooftop PV generation. This needs to be considered alongside previous analysis conducted by Welsh Government Energy Service (WGES).

We have explored a number of possible planning policy options, and recommend that these are reviewed and the preferred policy or combination of policies be taken forward.

This work identifies opportunities for the potential colocation or coordination of residential and employment site allocations alongside development for renewables, and recommends that the Replacement LDP sets out policy to require developments to maximise the potential for renewable or low carbon energy generation to meet the needs of the proposal and to contribute to the renewable energy targets of Conwy.

We recommend the following next steps:

1. Confirmation of preferred policy approach
2. Further refinement of the spatial areas available for renewable energy
3. Revisiting the potential for renewables on CCBC assets
4. Strategic discussions with SPEN on how the LAEP can inform their future investment and network upgrades.

1. Introduction

1.1 Overview and purpose of report

In 2022 Arup completed a Local Area Energy Plan (LAEP) [1] for CCBC. This plan used a combination of stakeholder engagement and technical modelling to identify key steps for Conwy to accelerate towards a zero carbon energy system. The study also provided estimations of the amount of wind and solar energy required to meet predicted energy demand for Conwy.

Following this, Arup was appointed to consider how the renewable energy requirement set out within the LAEP might impact on the update to CCBC's Local Development Plan (LDP). This report sets out our approach to doing this through spatial analysis, which will look at the theoretical potential for wind turbines and ground mounted photovoltaics in the county, as well as reviewing possible policy options drawing on examples from elsewhere. This work is not designed to repeat the Renewable Energy Assessment that was developed in 2019, rather it seeks to look at the potential that Conwy has for renewables throughout the County and discuss how this could be supported through planning policy. We have also included consideration of generation potential on local authority assets.

The remainder of this report is structured as follow:

- **Section 1** (this section) includes background to the project and an overview of the methodology;
- **Section 2** provides an overview of current policy and legislation;
- **Section 3** describes our methodology for the spatial analysis;
- **Section 4** outlines the results of our spatial analysis;
- **Section 5** provides an outline of policy options for CCBC to consider; and
- **Section 6** sets out our recommendations for CCBC to take forward.

1.2 Background

CCBC is currently undertaking a full review of its adopted LDP [2] and is producing a replacement LDP. Once adopted, the replacement LDP [3] will cover the period 2018 to 2033. The emerging replacement LDP sets out the priority issues and aims for the County. These include:

- actively managing the transition to a low carbon economy.
- securing an appropriate mix of energy provision, which maximises benefits to Conwy's economy and communities whilst minimising potential environmental and social impacts. The approach should recognise the benefits of renewable and low carbon energy as part of the overall commitment to tackle climate change and increase energy security; and
- formulating a renewable energy target for the plan area to reflect the renewable energy resource in Conwy.

The emerging replacement LDP is informed by a Renewable Energy Assessment (REA) (2019) [4], which assesses the potential for renewable generation on Conwy. The REA does not however suggest any suitable sites for wind energy or PV farm development in Conwy.

In May 2019, CCBC declared a Climate Emergency. The Climate Challenge Programme [5] was established to deliver a decarbonisation plan for Conwy. This set out the aim of CCBC becoming net zero carbon and implementing a Local Area Energy Plan (LAEP) by 2030.

CCBC completed work on its LAEP in 2022. The LAEP sets out a vision for what a zero carbon energy system could look like in 2050. It sets out "development of onshore renewables (onshore wind and ground PV) and associated storage" as a priority intervention area. The LAEP technical report [6] sets out:

“Scale up of onshore renewables, particularly ground PV, is an essential component of meeting Conwy’s energy demand. The current LDP supports the development of a 4MW array, and up to 30MW of onshore wind. Whilst these are good steps, this meets less than 10% of the projected optimal level of renewables needed by 2050, not including battery storage. As such, a rapid scale up in the RLDP is likely needed”

The LAEP sets out an ambition for an additional 690MW of onshore renewables by 2050 to deliver a net zero system in a cost effective way.

The targets included in the LAEP need to be considered as part of the emerging policies to be included in the RLDP.

1.3 Summary of methodology

1.3.1 Overview

In order to assess the potential for renewable generation in Conwy and how this could be incorporated into the RLDP, we followed the methodology below. We undertook spatial analysis using constraints agreed with CCBC, and we carried out a review of possible policy options to enable wind and solar to be deployed. The results of both aspects of this work are included in this report and recommendations are made for how CCBC could use these to work towards net zero.

A. Spatial implications and mapping

We conducted spatial analysis to identify the potential for either solar or wind development throughout Conwy as well as to calculate the estimated potential energy generation in these areas. This was done by selecting constraints that would make a site unsuitable for development, then using GIS to highlighted areas outside these constraints. Constraints included designations such as the National Park, as well as physical constraints such as road networks and water courses (a full list is included in section 3). We developed an estimation of installed capacity, both for the whole county and on local authority land. We also undertook analysis as to where allocations in the RLDP for residential and employment could offer opportunities for co-generation.

B. Policy options

A review of national and regional policy context was undertaken, along with policies from other LDPs. This included an analysis of benefits and dis-benefits of potential options for policy approaches that might be taken forward by CCBC to promote development for onshore renewable and low carbon energy generation, such as allocating specifics sites for renewable energy generation, and opportunities for generation in relation to residential and employment allocations in the RLDP.

C. Reporting and recommendations

We consolidated the analysis to compile this report and make recommendations for CCBC to consider."

2. Policy Context

2.1 Overview

This section identifies the key legislation relating to renewable and low carbon energy development as well as relevant policy, strategy and research at a national, regional and local level. Alongside identifying and summarising relevant parts of the policy, strategy and research documents, commentary is provided where there are potential implications for the drafting of policy in the emerging RLDP.

In summary, reviewing the adopted and emerging policy context, strategy and research at a national, regional and local level demonstrates overall support at all levels, from Welsh Government to local authority, for energy generation from renewable and low carbon sources. This review of relevant documents also highlights the policy support for the economic, community and health and wellbeing benefits that can be promoted through renewables developments.

The thrust of planning policy in Wales will help to address both the declared climate emergency and nationally set targets for carbon emissions. National policy requires that LDPs are drafted to support decarbonisation, achieve an appropriate mix of energy provision and ensure that their area's full potential for renewables is maximised to support the meeting of renewable energy targets.
This policy context section covers the following components:

- Key legislation in Wales
- National level policy, strategy and research in both the UK and Wales, this covers both net zero and planning policy, as well as other related topics
- Regional level policy, strategy and research in North Wales
- Local level strategy, plans and evidence, covering energy and related topics
- The development plan, which includes both the national and local plans - Future Wales as the national framework for development in Wales, CCBC's adopted LDP which covered plan period 2007 to 2022, and the emerging CCBC RLDP which covers 2018 to 2033.

2.2 Key legislation

2.2.1 Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations (Wales) Act [7] sits above and influences the three tiers of plan making, at the national, regional and local levels.

The Act places a duty on public bodies to carry out 'sustainable development'. This involves improving the economic, social, environmental and cultural well-being of Wales in accordance with the sustainable development principle, which is to achieve seven overarching well-being goals through five-ways of working. Furthermore, the principle is to be achieved without compromising the ability of future generations to meet their own needs.

Of most relevance to the topics of renewable energy and climate change, the seven well-being goals of the Act include contribution to a resilient Wales and a globally responsible Wales. The Act also requires a consideration of long-term persistent problems, such as poverty and health inequalities, in addition to climate change.

2.2.2 Environment (Wales) Act 2016

The Environment (Wales) Act [8] provides the legislation needed to plan and manage Wales's natural resources in a more proactive, sustainable and joined-up way. The Act aims to make best and most sustainable use of Wales's natural resources while safeguarding and building the resilience of natural systems for the longer term. It places a duty on Welsh Ministers to set targets for reducing greenhouse emissions and also to set carbon budgets. The act did not include the full net zero commitment at the time,

instead setting a target that the net Welsh emissions account for the year 2050 is at least 80% lower than the baseline. and the net zero commitment came afterwards as discussed below.

2.3 National level policy, strategy and research

Both the UK and Welsh governments have declared climate emergencies and set net zero emissions targets for 2050. The target of achieving net zero emissions by 2050 was also informed by advice from the Climate Change Committee, as set out in 'The path to Net Zero and progress on reducing emissions in Wales' report (2020) [9]. The actions identified by the Climate Change Committee would limit warming well below 2°C if comparable actions were adopted by other developed countries and developing countries followed slightly later. These actions include full decarbonisation of the power sector as well as full switchover to electric vehicle sales and installation of low-carbon heating, and decarbonisation of manufacturing.

Policy responses for achieving net zero in Wales

Net Zero Wales: A series of statutory 5-year carbon budgets have been established for Wales to define the pathway to meet the net zero 2050 target. 'Prosperity for All: A Low Carbon Wales' (2019) [10] was the Welsh Government's first of its series of plans to address the carbon budget from 2016-2020.

Current policy relating to the achievement of net zero is set out in the 'Net Zero Wales Carbon Budget 2 (2021-25)' (2021) [11]. The document sets out 123 policies and proposals for meeting Carbon Budget 2 which requires a 37% average reduction with a 0% offset limit. Modelling projects that the targets of Carbon Budget 2 will be met for 2025 and an overall 44% reduction against the 1990 baseline is expected. The approach of Net Zero Wales is informed by the seven well-being goals of the Well-Being of Future Generations (Wales) Act 2015.

Policy 6 of Net Zero Wales requires that, over the course of Carbon Budget 2, Planning Policy Wales (PPW) [12] will facilitate decarbonisation through the planning system. PPW will help to shape development plans, including at a national, regional and local level, to ensure they are maximising opportunities to decarbonise through a place based approach to sustainable development. As such, the emerging Conwy RLDP will need to align with the targets of Net Zero Wales as communicated through the PPW.

Net Zero Strategic Plan: Net Zero Wales also sets an ambition for the Welsh public sector to reach the net zero target by 2030. The strategic milestones for achieving this goal are provided in the Net Zero Carbon Status by 2030 Road Map (2021) [13]. The Public Sector Net Zero Reporting Guide (2023) [14] sits alongside the Road Map to guide consistent measuring and understanding of the Welsh public sector's carbon emissions. It also supports the preparation of decarbonisation action plans for the sector.

The Welsh Government's strategic approach as an important public sector employer, to the declared climate emergency, is also detailed in the Net Zero Strategic Plan (2022) [15]. The aim of achieving net zero by 2030 is central to the plan which includes 54 initiatives to provide the foundation for progress towards this aim. The plan also brings together evidence from across the Welsh Government to outline priority decarbonisation initiatives, of which land use is one.

Given that the Net Zero Strategic Plan is concerned with how the Welsh Government can contribute towards the 2030 ambition the implications for the emerging RLDP are relatively minor. However, in relation to land use, the document states that Welsh Government is exploring how to contribute to hosting renewable generation. The ability for Welsh Government land to facilitate renewable energy schemes may be a consideration when considering the allocation of land as part of the preparation of the RLDP.

Planning Policy Wales

The land use planning policies of the Welsh Government are set out through PPW 11 (2021). All development plans must be prepared in accordance with PPW.

Key Planning Principles: The Key Planning Principles included in PPW provide a guiding vision for all development plans to ensure that land use planning meets the goals and ways of working set out in the Well-being of Future Generations (Wales) Act. The principles require the efficient use of resources and note the important role the planning system has to play in making development resilient to climate change, decarbonising society and developing a circular economy.

The 'Productive and Enterprising' theme: The approach to development for renewable and local carbon energy is addressed in PPW through the Productive and Enterprising theme included in Chapter 3. Key issues which sit under the theme include embracing the challenge of decarbonisation of energy sector and moving towards local, decentralised renewable energy systems. This theme supports the encouragement of policies and proposals which promote low carbon developments and sites for renewable energy.

Renewable energy targets: The Welsh Government's renewable energy targets are embedded in PPW (paragraph 5.7.14). These include the generation of 70% of Wales's electricity consumption from renewable energy sources by 2030; for one Gigawatt of renewable energy capacity in Wales to be locally owned by 2030; and for new energy projects to have at least an element of local ownership. PPW is clear that the planning system has an active role to play in ensuring the delivery of these targets. Further detail on local ownership are provided in the policy statement Local Ownership of Energy Generation in Wales [16]., which includes discussion on different ownership models and the development process, as well as definitions of what is considered local ownership

Policy approach to supporting renewable energy generation: Paragraph 5.7.10 of PPW specifically requires that local authorities should facilitate grid infrastructure required to support the renewable and low carbon energy potential for the area. Paragraph 5.7.13 sets out the energy hierarchy for planning with reducing energy demand and using energy efficiently sitting at the top of hierarchy above renewable energy generation.

Local authorities should facilitate all forms of renewable and low carbon energy development and should seek cross-department co-operation to achieve this. This is set out in PPW paragraph 5.9.1 which also states that renewable energy should be maximised by linking the development plan with other local authority strategies, including Local Well-being Plans and Economic/Regeneration strategies.

Paragraphs 5.9.1 of PPW states that to support the achievement of energy and decarbonisation targets, local and regional authorities must take an active, leadership approach by setting out their vision for decarbonisation and energy for their areas. As part of the support for achieving energy and decarbonisation targets, PPW introduces the use of Local Area Energy Planning, as a means to inform, shape and enable key aspects of the transition to a low carbon energy system. As identified in paragraph 5.9.5 of PPW, the LAEP or other development plan evidence, should be used by local authorities to identify targets for renewable energy in local development plans. The target should be expressed as an absolute energy installed capacity figure so that is measurable and can be monitored. As part of developing a renewable energy target, PPW (paragraph 5.9.6) states that local authorities should consider the renewable energy resource available to them as well as an appropriate evidence base, and use the full range of policy options available.

Plan policies are required by paragraph 5.9.10 of PPW to be supportive of renewable and low carbon energy development in all parts of Wales and should direct developments to the right locations. Furthermore, policies should clearly set out local criteria against which proposals will be evaluated.

PPW (paragraph 5.9.14) is clear that planning authorities should establish spatial policies in development plans which identify the appropriate locations for development of energy developments below 10MW. From this point there should be a presumption in favour of development in identified areas. This will include an acceptance of landscape change, and clear criteria-based policies should be set to detail the locational issues to be considered at the planning application stage. Beyond these identified areas, planning applications for renewable and low carbon energy developments should be determined based on the merits of the individual proposal. As part of the approach to ensuring that their area's renewable and low carbon energy potential is achieved, the PPW (paragraph 5.9.15) states that local authorities should have policies with the criteria against which planning applications outside of identified areas will be determined.

PPW (paragraph 5.9.17) highlights that Future Wales [17] includes policy for renewable energy schemes for 10MW and larger and identifies Pre-Assessed Areas for large scale wind. It is clear that authorities should not seek to amend the Pre-Assessed Areas but may define areas within the Pre-Assessed Areas for other land uses (including renewable development sites of below 10MW). However, local policy should not adversely affect the ability of large scale wind developments coming forward in the Pre-Assessed Areas.

Paragraphs 3.58 and 3.59 of PPW outlines national policy towards safeguarding Wales's Best and Most Versatile (BMV) agricultural land. Development plan policies and development management decisions should give considerable weight to protecting BMV land. In March 2022 the Minister for Climate Change

issued a guidance letter [18] to local planning authorities to clarify planning policy regarding BMV and solar PV arrays. The letter confirmed that where BMV land is identified within a proposed solar PV array development, considerable weight should be given to protecting that land from development and permission should be refused unless other significant material considerations indicate otherwise.

Key to the inclusion of policy in the RLDP is to consider the following:

- Supporting development that is higher up the energy hierarchy.
- Linking to other local authority strategies to support the promotion of energy from renewable and low carbon sources where possible.
- Reflecting the findings of the LAEP through policies that set the target for energy installed capacity from renewables.
- Locational policies that set out the preferred areas for renewables under 10MW and criteria based policy for the assessment of proposals in other areas.
- Avoiding harmful impacts of large scale wind developments coming forward in the Pre-Assessed Areas.
- Protect BMV land, and include criteria to prevent unacceptable impacts through renewable and low carbon energy generation.

Other relevant national strategy documents

Recommendations for scaling up renewable energy in Wales are identified in Welsh Government's Renewable Energy Deep Dive exercise (2021) [19]. The recommendations set out an overarching strategy and vision for renewables generation in Wales where energy needs are met at least from this source, and any surplus is utilised to tackle nature and climate emergencies. Furthermore, it makes recommendations that local energy plans are to be scaled up to create a national energy plan by 2024, to map out future energy demand and supply for all of Wales.

In this Deep Dive exercise, recommendations relating to renewable generation are included across the following areas of focus:

- Grid – including engaging with Ofgem to set out Wales's investment need.
- Consenting, licensing and supporting advisory arrangements – including a review of current processes to ensure that they are timely and proportionate.
- Finance – working with experts to explore ways of securing investment in renewable energy generation and reviewing options for the acceleration of renewable energy generation in Wales to maximise local economic and social value.
- Opportunities to scale up Community and Local Energy in Wales – including scaling up resources to support community and local renewable energy and improving access to the public estate for the community energy sector.
- Opportunities to maximise economic and social value in Wales – including working with the UK Government to bring new investment to ports in Wales and scoping a programme of work to maximise the installation of renewables, flexibility and storage on business and industrial sites.
- Innovation – including working with Ofgem to develop a Welsh regulatory derogation to enable energy business model innovation.

The Welsh Government has set out its pathway for sustainable economic growth in the Prosperity for All: economic action plan (2019) [20]. As part of the Economic Contract of the action plan that is set out to frame the reciprocal relationship between Government and business, Government investment is required to contribute to progressing towards reducing the country's carbon footprint. Moving to a low carbon, circular economy and reducing the country's carbon emissions, is framed as involving the Welsh Government working with developers, regulators and energy infrastructure providers to accelerate the deployment of low carbon energy generation.

The development of relevant policy in the emerging Conwy Replacement Local Development Plan (RLDP) should seek to align with the findings of the Local Areas Energy Plan (LAEP) (which is discussed later in this chapter) as well as building on specific opportunities to maximise energy generation from renewables. Policy should provide support for investment in renewables and economic growth in this area. This may include work to identify suitable and viable areas that could support development for renewable energy generation.

2.4 Regional level policy, strategy and research

Future Wales, the national development plan, sets out that **Strategic Development Plans (SDPs)** should be prepared for the four regions of Wales. Conwy lies within the North Wales Region alongside five other local authorities. It is expected that the SDP for the North Wales region will be prepared by constituent Local Planning Authorities and other stakeholders. However, an early version of the plan is yet to be drafted.

SDPs will influence the content (and length) of future LDPs. It is proposed that SDPs will allow '*larger than local issues … which cuts across a number of LPA areas to be considered and planned for in an integrated and comprehensive way*'. The Development Plans Community Guide [21] produced by Welsh Government in collaboration with Planning Aid Wales outlines how SDPs will consider the following strategic issues relevant to the region they cover which is expected to include issues such as:

- The scale and location of housing and employment growth.
- Strategic housing and employment development sites and their placemaking principles.
- Strategic Green Infrastructure routes.
- Transport infrastructure.
- A co-ordinated approach to environmental designations, energy, minerals and waste.
- Individual LPA spatial strategies to provide the framework for and enable the preparation of Local Development Plan Lites (LDPLs) once the SDP is adopted.

Local planning policy prepared under an adopted SDP would be more focussed in nature, dealing with local issues and policies and site-specific allocations, effectively comprising a LDPL. The LDPL is envisaged by Welsh Government, as a relatively simple, short and focussed development plan that is in general conformity with the adopted SDP. For example, the preparation of the LDPL will generally not require the reassessment of the spatial strategy and scale and location of housing and employment growth, given that this information will be set out in the adopted SDP.

Dependent upon the direction of travel for the SDP for the North Wales Region and what matters are considered to be of importance for consideration at the regional level, it may be that areas identified as being suitable for renewables development might be set out at the regional level. The SDP provides the opportunity to better coordinate and standardise the approach to energy generation across the region. The Council will be able to influence the identification of these areas and the relevant regional policy approach through its working with the other Local Authorities of the region and other stakeholders as part of the preparation of the SDP.

North Wales Energy Strategy: The North Wales Energy Strategy (2021) [22] sets out a strategic pathway and key interventions to deliver the region's ambitions for decarbonising its energy system. The strategy also seeks to secure economic, social, ecological and wellbeing benefits from the transition. To contribute to meeting Welsh Government targets for net zero by 2050, the strategy includes the target of reducing emissions from North Wales's energy systems by 55% by 2035. Emissions from domestic heat and power and emissions from commercial and industrial will need to fall by 57% and 54%, respectively, so that the overall reduction of 55% can be achieved. The strategy includes scenarios modelled to set out a potential route to decarbonisation and towards the achievement of a net zero energy system by 2050.

Policy included in the Replacement LDP should be drafted to support the achievement of targets for reducing emissions from North Wales's energy systems.

North Wales Growth Deal: The North Wales Growth Deal [23] is a partnership between the private and the public sectors including the six local authorities of North Wales. The aims of the Growth Deal include building a more vibrant, sustainable and resilient economy in North Wales in line with the Wellbeing of Future Generations (Wales) Act 2015. Its programme includes low carbon energy generation and a number of investment projects have been identified to bring low-carbon growth and development to the region. The Growth Deal's low carbon energy programme is set out to generate up to £530 million net additional GVA and enable carbon savings of at least 2,723,000 tonnes.

The drafting of policies for the Replacement LDP will need to be informed by investment projects relating to renewable and low carbon energy generation within the region. Related policies should be drafted to support the achievement of projects where they would not result in unacceptable impacts on the existing environment.

2.5 Local level strategy, plans and evidence

2.5.1 Conwy County Borough Council Local Area Energy Plan

In May 2019, CCBC declared a Climate Emergency. The Climate Challenge Programme was established to deliver a decarbonisation plan for Conwy. This set out the aim of CCBC becoming net zero carbon and implementing a Local Area Energy Plan (LAEP) by 2030.

The Borough Council completed work on their LAEP in 2022. The LAEP sets out a vision for what zero-carbon energy system could look like in 2050. This included targets of 40MW of additional onshore renewables by 2028 and 690MW of additional onshore renewables by 2050.

The targets included in the LAEP will need to be considered as part of the emerging policies and renewable energy targets to be included in the RLDP. It will be necessary to identify an adequate number of locations at which renewable and low carbon energy development can be accommodated to meet the targets of the LAEP.

2.5.2 Other relevant local strategy documents

Further support for reducing the carbon footprint of the County is set out in **the Local Well-being Plan (2018)** [24]. Prepared by the Conwy and Denbighshire Public Services Board, which covers both authority areas, the Wellbeing Plan seeks to ensure that people of all ages can enjoy good mental wellbeing. Achieving the improvement of energy efficiency of buildings is supported as a short term aim of the plan (1-5 years). The plan also seeks to help ensure that the plan area is viewed as a leader in the development of community-led renewable energy schemes in the medium term (1-15 years).

Conwy County's Economic Growth Strategy (2017) [25] sets out the five ambitions to grow the County's economy from 2017 to 2027. These ambitions are set out to secure the goals of increasing the proportion of full-time jobs from 59% to 70% and increasing the average salary to 95% of the UK average.

Promoting renewable energy projects across the County forms one of the key ambitions of the strategy which notes that energy is a major growth sector for the North Wales Region as a whole. The encouragement of solar farms to assist diversification and provide both economic and community benefits is included in the Strategy as an area in which short to medium term opportunities exist. The strategy identifies how the County Borough Council can help to support its success and this includes a review of its planning policy to support the ambitious approach for the use and development of land and assets.

The emerging policies of the Replacement LDP provide the opportunity to link with the strategy of the Local Well-being Plan and Economic Growth Strategy. Policy related to renewable and low carbon energy generation should highlight the associated health and economic benefits of this type of development.

2.6 The Development Plan

The development plan for Conwy comprises the national development plan (Future Wales) at the national level and the Conwy Local Development Plan 2007-2022 at the local level. The emerging development plan consists of the Emerging Conwy County Council Replacement Local Development Plan 2018-2033.

2.6.1 Future Wales: the national plan 2040

Future Wales (2021) provides the framework for planning change and development in Wales up to 2040. The plan sets out the approach for the planning system to address a number of key national priorities, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.

Future Wales Outcomes: The plan includes 11 Future Wales Outcomes that together provide a vision for what the country will look like at the end of the plan period. The policies of the plan area are set out to contribute the achievement of these Outcomes. Outcome 11 supports the creation of places that are decarbonised and climate-resilient and notes that the planning system must help Wales lead the way in promoting and delivering a competitive, sustainable decarbonised society. This Outcome also states that decarbonisation commitments and renewable energy targets will be used as opportunities to achieve a number of additional benefits. These include the creation of a more resilient and equitable low-carbon economy, developing clean and efficient transport infrastructure, improving public health and generating skilled jobs in new sectors.

Policy 17: Renewable and Low Carbon Energy and Associated Infrastructure: The plan's approach to renewable and low carbon energy is set out through Policy 17. The policy provides strong support for the principle of developing renewable and low carbon energy from all technologies and at all scales. Planning decisions are required to be informed by Wales's international commitments and the target to generate 70% of consumed electricity by renewable means by 2030.

The policy also highlights the Pre-Assessed Areas for Wind Energy in Wales, within which Welsh Government has already modelled the likely impact on the landscape and has found them to be capable of accommodating development in an acceptable way. However, within and outside of Pre-Assessed Areas communities should be protected from significant cumulative impacts such as where smaller settlements could be potentially surrounded by large wind schemes. The policy is cross-referenced to Policy 18: Renewable and Low Carbon Energy Developments of National Significance which sets out the approach for renewable and low carbon energy developments of National Significance.

Policy 18: Renewable and Low Carbon Energy Developments of National Significance: Policy 18 sets the plan's approach for renewable and low carbon energy projects (including repowering) which qualify as Developments of National Significance. The policy sets out a number of criteria against which Developments of National Significance of this type should be considered.

Policy 21: Regional Growth Area – North Wales Coastal Settlements: Four regions for Wales are identified in the section 5 of the plan. Conwy lies in the North region and contains part of the North Wales Coastal Settlements Regional Growth Area which the plan states will grow, develop and offer a variety of public and commercial services at a regional scale. Strategic Development Plans are required to be prepared for all four regions to consider strategic regional issues including future growth areas, housing demand, economic development, transport and green infrastructure. Strategic Development Plans will also plan for the growth of Regional Growth Areas.

Policy 21 of Future Wales sets out the approach for the growth of the North Wales Coastal Settlements Regional Growth Area. The plan states that the area should play its role in decarbonising society and supporting the realisation of renewable energy and notes its strong potential for wind, marine and solar energy generation. Conwy also includes part of two Pre-Assessed Areas for Wind Energy within which there is a presumption in favour of large-scale wind energy development.

The emerging policies of the Replacement LDP should support the national target for 70% of energy to be generated from renewables by 2030. The policy approach taken forward will be required to ensure that development for large scale wind in the Pre-Assessed Areas for Wind Energy is not prejudiced by other types of development (including smaller scale renewables).

2.6.2 Adopted Conwy Local Development Plan 2007-2022

The Conwy LDP 2007-2022 (2013) provides the framework for the control of development and use of land within the boundaries of the County.

Vision, Objectives and Spatial Strategy: The LDP sets the Vision, Objectives and the Spatial Strategy for Conwy over the plan period 2007 to 2022. The LDP's Vision states that by 2022 the communities of Conwy

will be more sustainable, offer a higher quality of life and be supported by a more balanced age structure. The Vision also states that energy generation will be promoted, but is silent in relation to addressing climate change and energy generation from renewable and low carbon sources.

Spatial Objective 11 of the LDP promotes renewable energy developments where they have prospects of being economically attractive and environmentally and socially acceptable. The Spatial Strategy seeks to focus growth at priority accessible urban strategic hub locations and in areas of decline and in need of regeneration, while also ensuring that rural communities are fostered through the provision of sustainable levels of jobs and services. In all 6,520 homes with a 10% contingency level of up to 7,170 homes are planned for during the period 2007 to 2022.

Policy NTE/6: Energy Efficiency and Renewable Technologies in New Development: The LDP sets out its overarching support for the increased use of renewable resources through Policy NTE/6. The policy states that the Council will promote renewable energy sources within development proposals which support energy generation from biomass, marine, waste, solar and wind sources, including micro generation. Developments of this type are required to be acceptable, in terms of impact on quality of life, amenity, landscape, viability and biodiversity.

Policy NTE/7: Onshore Wind Turbine Development: Specific policy to address onshore wind turbine development is provided through Policy NTE/7. Very large-scale (over 25MW) wind farms are to be directed towards Clocaenog SSA, which lies partly within Conwy, with medium-scale wind farms over 5MW and below 25MW considered acceptable in areas outside of this location in exceptional circumstances only. Micro and small scale wind turbine development (5MW and less) are to be supported where they are sympathetic to landscape character and local amenity but should not compromise the ability of the SSA to achieve its anticipated target of energy production.

2.6.3 Emerging Conwy County Council Replacement Local Development Plan 2018-2033

CCBC is undertaking a full review of its adopted LDP. Once adopted the Replacement LDP will cover the period 2018 to 2033. CCBC consulted on the Preferred Strategy version (2019) of the LDP from summer 2019.

Priority Issues and Aims: The RLDP sets out the Priority Issues and Aims for the County. These include:

- actively managing the transition to a low carbon economy;
- securing an appropriate mix of energy provision, which maximises benefits to Conwy's economy and communities whilst minimising potential environmental and social impacts. The approach should recognise the benefits of renewable and low carbon energy as part of the overall commitment to tackle climate change and increase energy security; and
- formulating a renewable energy target for the plan area to reflect the renewable energy resource in Conwy.

RLDP Vision: The Replacement LDP sets out the expected manner in which the County will develop, change or be conversed up to 2033. This includes encouragement for inward investment, infrastructure and active travel provision to support sustainable development where compatible with the need to mitigate against the causes and effects of climate change.

Policy 32 (SP/32): Energy: Policy 32 (SP/32) of the Replacement LDP is set out to promote a mix of energy generation sources, energy storage and building design to deliver clean growth and contribute to the decarbonisation of energy. The support text clarifies that the draft policy approach relating to energy generation supports additional capacity for up to an additional 30MW within the Clocaenog Strategic Search Area (SSA)[1]. Furthermore, support is also included for identified opportunities for district heating, local renewable and low carbon energy generation schemes to help contribute to meeting the national aim of one gigawatt of renewable energy capacity in Wales to be owned locally by 2030.

[1] It should be noted that the regime of SSAs has effectively been replaced by Pre-Assessed Areas for Wind Energy with the adoption of the Future Wales: the national plan 2040 and the publication of PPW 11 in February 2021. The new Pre-Assessed Areas overlap somewhat with the previous SSAs but cover a greater total area and are part of the approach to provide greater support for renewable energy projects in Wales. Technical Advice Note 8 (TAN 8): Renewable Energy (1996) was revoked with the adoption of PPW 11.

The supporting text also highlights that the Replacement LDP is informed by a Renewable Energy Assessment (REA) (2019) [4]. The REA comprises a high-level strategic assessment of the potential for different scales of renewable and low and zero carbon energy generation in different locations. The REA does not however suggest any suitable sites for wind energy or PV farm development in Conwy. The Replacement LDP does not include any additional specific areas that might be allocated for renewable energy development, beyond a 4MW PV scheme on Council owned land at Gofer.

However, the supporting text for Policy 32 states that evidence from the REA is to be used to work up spatial policies to identify the most appropriate locations for renewable and low carbon energy development. For these identified areas, the Replacement LDP will set out a presumption in favour of development as well criteria-based policies to identify the detailed locational issues against which developments will be considered.

The emerging policies of the Replacement LDP presents an opportunity to frame a more positive policy approach to renewables than that which is included in the adopted plan. Importantly, the Preferred Strategy document includes reference to the transition to a low carbon economy, securing an appropriate energy mix and setting an energy target for the plan area among its priority issues and aims. However, these positive measures are not explicitly followed through to the vision for the plan area. Reference might be included in the vision to supporting development for renewables and moving towards securing an appropriate mix of energy provision by the end of the plan period. The emerging Replacement LDP should continue to develop the approach of setting out appropriate locations for renewable and low carbon energy development as well as criteria to consider development of this type within and outside of areas identified as being suitable. The policy approach should seek to ensure that development within areas identified as most appropriate for large scale on-shore wind by Welsh Government (Pre-Assessed Areas for Wind Energy), would not prejudice development of this type.

Relevant draft policies in the RLDP include:

EN/1 Renewable Energy and Achieving Net Zero in New Development

EN/2 Achieving Net Zero Carbon Buildings- Development Management

EN/3 Energy efficient buildings

EN/4 Zero or Low Carbon Energy Sources and Zero Carbon Ready Technology

EN/5 Unregulated carbon emissions and embodied carbon in buildings

EN/6 GHG emissions assessment for new development

EN/7 Carbon Offsetting

EN/8 Grid Connection and RE storage

EN/9 Local Energy Generation

EN/10 Smart Grid and District Heating and Cooling Networks

EN/11 Onshore wind and solar development

EN/12 Onshore infrastructure linked to offshore renewables

3. Approach to spatial analysis

3.1 Summary of spatial analysis

We carried out spatial analysis to identify potentially appropriate areas for either solar or wind development throughout Conwy. Drawing on methodologies used for similar analysis in Future Wales and the REA, we chose a number of constraints to identify areas unlikely to be suitable for development of wind or ground mounted PV development. We held a constraints workshop on 26th January 2023 where these constraints were discussed with representatives of CCBC . A write up of this workshop is included in Appendix C. These constraints were used to undertake spatial analysis. From this analysis, we estimated potential installed capacity for wind and PV, both for the whole county, and for where land potentially suitable for wind or PV development was on land owned by CCBC. Maps showing these outputs are provided in Appendix A.

3.2 A note on selection of size of development explored

The REA focussed on developments of 5MW or more for wind and solar farms**.** Developments of national significance are >10MW. For the purpose of this analysis, we have chosen to assess opportunities for schemes of 500kW and above. There are a wind turbines on the market at this size [26].

For the purposes of the constraints analysis, the wind turbine dimensions have been assumed to be 40m tower height and 20m blade radius (similar in dimensions to the Vestas V39), giving an overall tip height of 60m. The PV has been given a constraint of a total area of at least 5000m², which is approximately the minimum size of a 500kW ground mounted development.

3.3 Selection of constraints

We explored a number of environmental, planning and technical constraints for onshore renewables. These with CCBC at a constraints workshop held on 26th January 2023. These were mostly based on the constraints used in the Future Wales analysis [27], which were based on engagement with government, regulators and industry, and was undertaken more recently then the Toolkit for Planners [28] that the methodology used in the Renewable Energy Assessment was based on. A review of the complaints used Renewable Energy Assessment was also undertaken and compared with the constraints in this exercise.

The constraints used for the wind turbine spatial analysis are listed in Table 1, and for the PV analysis in Table 2. In light of the lack of suitable areas found by the previous Renewable Energy Assessment (REA), this exercise took a broader approach and a number of constraints used in REA were not included. A discussion of the limitations of some of these constraints is included in Appendix C, along with a comparison with the REA constraints.

Table 1: Wind turbine constraints

Constraint (wind)	Buffer
Special Protection Areas (SPA)	No buffer
Special Areas of Conservation (SAC)	No buffer

Constraint (wind)	Buffer
Candidate Special Areas of Conservation (cSAC)	No buffer
Ramsar sites	No buffer
Scheduled Ancient Monuments (SAM)	No buffer
Areas of Outstanding Natural Beauty (AONB)	No buffer
National Parks	No buffer
Ancient woodland	No buffer
World Heritage Sites (WHS)	No buffer
Conservation areas	No buffer
Major transport infrastructure	110m (tip height plus 50m)
Minor transport infrastructure	66m (tip height plus 10%)
Urban regions	No buffer
Watercourses	No buffer

Table 2: PV constraints

Constraint (PV)	Buffer
Special Protection Areas (SPA)	No buffer
Special Areas of Conservation (SAC)	No buffer
Candidate Special Areas of Conservation (cSAC)	No buffer
Ramsar sites	No buffer
Scheduled Ancient Monuments (SAM)	No buffer
Areas of Outstanding Natural Beauty (AONB)	No buffer
National Parks	No buffer
Ancient woodland	No buffer

Constraint (PV)	Buffer
World Heritage Sites (WHS)	No buffer
Conservation areas	No buffer
Major transport infrastructure	No buffer
Minor transport infrastructure	No buffer
Urban regions	No buffer
Watercourses	No buffer
Agricultural Land quality grade 1, 2 & 3a	No buffer
Areas below 5000m^2	n/a

Using the constraints listed above, we carried out spatial analysis to identify areas that would be unsuitable for wind or solar development throughout Conwy. Maps showing the constraints for PV and wind are provided in Appendix A.

From this analysis, we identified areas potentially suitable for wind or solar development. Areas suitable for both types of generation were also highlighted as having potential for co-generation. Areas suitable for development were also overlayed with land owned by CCBC, as well as allocations in the RLDP for residential and employment. These results were presented on maps which are included in Appendix A.

3.4 Estimation of installed capacity

The approach to estimating potential installed capacity for wind and ground mounted PV is provided below, along with estimates of wind, ground mounted PV and rooftop PV on CCBC assets. We recognise that this analysis does not include consideration of grid constraints or other commercial and deliverability factors that would be picked up by a developer.

In practice, renewable energy would not be installed at every location in Conwy with theoretical potential due to a number of issues, such as cumulative impact , competing uses for land and practical limitations to grid connection capacity. We therefore based the final figures on an assumption that renewable generation of wind and PV is installed on 10% of theoretically suitable areas in Conwy.

The results suggest that there is potential for Conwy to meet and exceed the targets for renewable energy generation set out in the LAEP even if only a small proportion of poetically suitable land is developed for renewables.

3.4.1 Calculating wind capacity

The results are shown in table 3 and a description of how potential wind capacity was calculated is included in Appendix C.

Table 3: Maximum potential wind turbine capacity

	Number of wind turbines (based on >50% of ellipse in a suitable area)	Estimated installed capacity (MW)	Average annual Generation (Capacity factor 0.27) MWh p/a
Whole County	9920	496	1,173,139
Freehold land owned by CCBC	132	6.6	15,610

3.4.2 Calculating ground mounted PV capacity

An estimate of installed capacity and generation across the county and on CCBC assets is shown below[2]. A capacity factor of 0.1 was used, the same value that was used in the REA.

Table 4 Potential ground mounted PV capacity

	Total Area (m^2)	Estimated Installed Capacity (MW)	Annual Generation (Capacity factor 0.1) MWh p/a
Whole County	535,381,900	2,231	1,941,444
Freehold land owned by CCBC	3,887,125	16.2	14,188

3.4.3 Calculating rooftop PV capacity on council assets

To identify the rooftop PV potential on buildings in the CCBC area, the dataset provided by CCBC was filtered down to sites with a Gross Internal Area value in in freehold regions. To avoid duplication of site area data, the excel was filtered down to only have unique building codes, site easting and site northing values. The information provided by CCBC was the total site area, rather than the area of the roof itself. To provide an estimated roof area, the site area (m^2) was divided by two. This accounts for both some buildings having more then one floor, as well as some roofs not being suitable for installation. The results are shown in the table below. [3]

Table 5 Potential Rooftop PV Capacity on CCBC Assets

Total site area (m^2)	Roof estimate - 50% of building gross internal area (m^2)	Effective PV area (m^2)	Capacity (MW)	Average Generation (Capacity factor 0.1)
189,904	94,942	32,284	6.5	5,656

[2] To calculate the PV potential across Conwy, and installed capacity density of 1MW per 24,000m2, was used, which is the same value used in Future Wales. When choosing constraints, the minimum parcel size used as a constraint was 5000m2 on the basis that this is approximately the theoretical minimum size for a 500kW scheme, which would give a much higher capacity density of 1MW per 10,000m2. However, whilst some sites of this size could fit approximately 500kW of panels, this level of installed capacity density is not suitable for estimating the capacity for larger areas.

[3] To estimate the rooftop PV potential from this total area figure, the same methodology was used as for the rooftop PV calculations in the LAEP. This assumed an effective PV to building area ratio (i.e., how much of the roof is expected to take PV in relation to the site footprint) of 0.34, and a capacity density per covered area of 0.2kW/m2 . Further work is needed to determine the suitability of individual buildings and to understand the implications of grid capacity constraints.

4. Spatial analysis: results

4.1 Overview

There is significant potential for renewables across Conwy. Our analysis has taken account of the maximum amount of generation that could be delivered on areas with none of the constraints outlines above. We have not explicitly accounted for co-generation with electricity storage. All maps showing the results of the spatial analysis are provided in Appendix A.

4.2 Wind potential

Based on the constraints outlined in section 3, suitable areas for wind turbine development are shown in Figure 3. The estimated total potential capacity that could be installed in Conwy is approximately 496MW.

As exercise is a broad estimate, there will be locations within the area highlighted that will not be suitable in practice for a number of reasons.

The are a number of existing windfarm schemes in Conwy, and whilst existing schemes were recommended as a constraint in the workshop, data showing the full extent of these schemes was not available. A grid reference for each site is listed on the renewable energy planning database, and whilst this is not sufficient to provide an exclusion zone the point has been marked on the map on figure 3. Whilst cumulative impacts will need to be reviewed in more detail if nearby sites are being considered, existing windfarms can also present an opportunity; wind turbine technology has advanced considerably in the last two decades, and there is often scope for older wind farms to be repowered with more modern, larger machines.

4.3 PV potential

Suitable areas for ground mounted PV development in Conwy are shown in figure 4. The estimated total potential capacity that could be installed in these areas is approximately 2,231MW. Again, there will be locations within the area highlighted that will not be suitable in practice for a number of reasons. Further work is needed to refine these to inform the RLDP.

4.4 Co-generation

Co-generation is where more than one renewable energy technology is installed on the same site. This has a particular advantage when grid connection capacity is limited, as different technologies (for example wind and PV) are rarely operating at their full capacity at the same time, so the total installed capacity of the combined technologies can be greater than the grid connection capacity, with curtailment only happening occasionally. This approach can also reduce capital costs by sharing infrastructure. For the purposes of this study, we have considered co-generation of wind and PV. It would also be appropriate to consider opportunities for storage.

Figure 5 shows where suitable areas for wind and PV have been identified in the same location, which indicates the potential for co-generation in Conwy. An assessment of co-generation has not been considered in any depth, for example separation distance of wind turbine and PV panels (often taken to be tip height) is not taken into account in figure 5. The map has been included to demonstrate how wind and solar development are not mutually exclusive, even when the grid connection is limited. The potential for co-generation could be included in follow up work if this opportunity is to be explored further, and it is recommended that this option is considered on any site specific assessments CCBC undertake.

4.5 Colocation allocations

The RLDP contains allocations for housing and employment. These have been overlayed on map against suitable locations for wind and solar in figure 7 and has highlighted a number of possible opportunities.

The 5 strategic sites proposed for inclusion in the Replacement LDP were also considered, and all are partially in areas suitable for wind and solar development. These sites and their proposed uses (subject to change/RLDP adoption) are listed below.

- Llanfairfechan – approx. 200 homes & primary school

- Llanrhos – approx. 200 homes
- Old Colwyn – approx. 300 homes
- Abergele – employment, retail and primary school
- Llanrwst – approx. 200 homes

Ways that renewable energy can be supported in allocations for employment and housing is discussed in section 5.2.

4.6 Potential on local authority owned land

An estimation of the potential for rooftop PV on buildings owned by CCBC using the methodology outlined in section 3. The potential estimated capacity was estimated to be 6.5MW, although each building would need a site specific survey to confirm suitability and generation capacity. Further work is needed to take this forward.

We also considered the potential for wind turbines and ground mounted PV on land under freehold by CCBC. The available areas for these are shown in figure 6. For these the same constraints as those used for the broader exercise were applied, suggesting an estimated potential capacity of ground mounted PV of 16.2MW, and for wind turbines of 6.6MW.

The scope of this work did not include investigating specific sites. However, Welsh Government Energy Service (WGES) has already undertaken a review of potential for renewable energy development on Conwy assets. This is summarised below[4]. This data has not been used explicitly to inform our analysis in this report but provides useful context for the potential capacity estimated through this study.

The high-level review did not go into any great detail on planning implications or grid connections.

A meeting with SPEN in January 2023 suggested that future grid offers could include curtailed connections, which could help overcome grid issues. Some of these sites may therefore have potential, and it is worth revisiting them in discussion with SPEN.

Whilst there is some land owned by CCBC that may have potential for renewable energy, there scope for development is relatively small compared to what could be delivered elsewhere in the County. A critical part of delivering the LAEP is therefore encouraging and facilitating developments delivered by others.

[4] This information was provided by Rhys Horan from Welsh Government Energy Service (WGES) on 10th November 2022.

Table 6 CCBC land previously assessed for renewables

Site Name	Address	Estimated area available (acres)	Technology	Potential capacity (MW)	Outcome (WGES initial review)
Cwm Howard	LL30 1GD	7.5	Solar PV	1.5	Unviable - requires private wire option with hospital + shading concerns
Dolgarrog	LL32 8QD	36	Solar PV	6	Unsuitable - planning
Tan Y Lan Nursery	LL29 8UW	40	Solar PV	5	Under review
Gofer. (YES)	LL22 9LG	41	Solar PV	7	Unviable - grid
Tir Llwyd	LL18 5JH		Solar PV	tbc	Under review - unlikely to be viable unless private wire.
Cerrigydrudion	LL21 9SP	7	Wind/Solar	tbc	
Plas Bela Farm, Llanfair TH	https://goo.gl/maps/3kmh3GWGE2f83xTm8	133	Wind/Solar	tbc	Unviable - planning and grid
Bron Haul Farm, Henllan	https://goo.gl/maps/f2CQr2XGmbSUm9yV6	115	Wind/Solar	tbc	Unviable - planning and grid
Groes Fawr Farm, Groes	https://goo.gl/maps/87EZ7uLzzZ4sbzGr7	70	Wind/Solar	tbc	Unviable - planning and grid
Afon Llanfairfechan	LL33 0ER		Hydro	0.3	Unviable - planning and grid

5. Policy review and options

5.1 Overview

This section presents an analysis of benefits and dis-benefits of potential options for planning policy approaches that might be taken forward by CCBC to promote development of onshore renewable and low carbon energy generation. The options presented have been considered in light of the relevant policy context set out in Section 2 of this report. Examples of how each of the policy options might be implemented as part of the planning policy approach for Conwy, are provided in the table below by highlighting local planning policy in Wales that include each policy option type. Further detail about each of these examples is provided in Appendix B.

Options for local policy that are not considered reasonable, for example where they are contrary to the national policy approach or would effectively duplicate the policy approach at that level have not been included in the table of policy options below.

5.2 Analysis of the policy options

Options presented in the table below have been considered in relation to their relative benefits and dis-benefits through a number of lenses. These lenses include:

- How quickly the option might be implemented, and the resources required to put the option in place.
- The resources required to ensure the long-term implementation of the option.
- The expected effectiveness of option.

The analysis does not come to a judgement about which option or combination of options might be most appropriate for CCBC to take forward. The benefits and dis-benefits will need to be considered alongside each other as part of CCBC's decision making and policy development, and alongside draft policies developed to date.

Table 7 Analysis of benefits and dis-benefits of planning policy options for onshore renewables

Policy option	Description	Benefits	Dis-benefits
Supportive strategic policy in LDP	A high-level policy that supports the principle of development for onshore renewables and the aim of contributing to lowering national carbon emissions. Policy should reflect national targets for energy generation from renewables as well the findings of the LAEP when setting the target for energy installed capacity from renewables.	Sets out the County's support for renewable energy within the LDP without the need for the potentially more resource intensive assessment of individual sites for potential allocation for this type of development. Sets the overall target for energy generation from renewables to align with national targets. Can be linked to more detailed policies relating to specific locations for onshore renewables development, types of onshore renewables development and criteria developments are expected to meet.	High-level policy provides developers with less certainty on specific locations that are considered most acceptable, and the criteria development will need to be met without including additional policies that address these issues.
	See example: Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (2017)		

Policy option	Description	Benefits	Dis-benefits
Specific policy in LDP (criteria-based approach)	Criteria-based policy that clearly sets out the criteria that need to be met in order for differing types of onshore renewables to be considered acceptable in planning terms. As per PPW requirements, the policy approach should ensure that development proposals do not prejudice the ability for large scale wind developments to come forward in the Pre-Assessed Areas for Wind Energy in Conwy.	Provides developers with increased certainty in relation to what will be considered acceptable in the County. This approach would help to support specific types of onshore renewables development where specific criteria are met where they might otherwise not be considered acceptable. Limits the need for more resource intensive assessment of individual sites for potential allocation for onshore renewables. Less likely to result in development for onshore renewables outside of any allocated sites or areas of search being perceived as entirely unacceptable.	Criteria should be tested for viability to ensure they are not overly onerous which will require resources. Criteria will lack the spatial specificity of the approach of allocating sites or identifying areas of search for development.
	See example: Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (2017) and Vale of Glamorgan Local Development Plan 2011-2026 (2017)		
Site allocation policies in LDP	Specific sites identified as areas for development for onshore renewables development. Potentially supported by a call for sites.	Provides greater certainty for all stakeholders about what sites will come forward for development during the plan period. If undertaking a call for sites would provide the opportunity for developers to input into the selection of allocated sites. Process needs to consider viability and deliverability of sites. Allows for the incorporation of site specific policies to identify constraints and opportunities appropriate and proportionate mitigation and enhancement as part of the preparation of the policy in the LDP. Alternatively sites can be allocated and an overarching policy setting out move general criteria that proposals are required to meet could be included	Requires resources to assess site options considered for allocation as part of the preparation of the LDP. Given their specificity, if site specific criteria are included as part of the policy or policies allocating site, they may be seen to be less flexible to changing circumstances. Can result in the perception that sites outside of those allocated are excluded from development.
	See example: Pembrokeshire County Council Local Development Plan 2 (LDP 2) 2017 -2033 (Deposit stage) (2020)		
Search areas in LDP	Wider areas identified, to be used in combination with criteria-based policy during determination. National policy is clear that while local authorities should not seek to amend the boundaries of Pre-Assessed Areas for Wind Energy, they may define parts of these areas for other land uses (including renewable development sites	Provides slightly more flexibility than the approach of allocating sites for development. Allows developers greater freedom for decision making about land to promote. Less impact on value of land than through allocation approach. The County already includes part of a Pre-Assessed Area for	Can result in the perception that sites outside of the search areas are excluded from development. While a Pre-Assessed Area for Wind Energy is set out at large scale onshore wind at national level, no search areas have been identified within which other types of onshore renewables is preferred. If a similar approach is to be taken

Policy option	Description	Benefits	Dis-benefits
	below 10MW). However, any policy approach that results in an area of search for other land uses being identified within a Pre-Assessed Area will need to ensure that the ability of large scale wind developments to come forward within that Pre-Assessed Area is not adversely affected. The policy approach could be to set out that certain areas have been identified as being suitable for the development of renewables (for example wind and solar of various scales). The policy could then be clear that at other locations these types of developments will be permitted subject to meeting the criteria of renewables policy and other relevant policies in the LDP.	Wind Energy. The approach of the adopted LDP and emerging Replacement LDP (Preferred Strategy) reflects the old regime of SSAs which has now been replaced by Pre-Assessed Areas for Wind Energy with the adoption of Future Wales and the publication of PPW 11. The approach of the adopted LDP and the emerging Replacement LDP is for the large or very large wind farms to be supported within the Clocaenog SSA. Welsh Government has undertaken an assessment to identify the Pre-Assessed Areas for Wind Energy where, in principle, developments would be acceptable. In these areas there is a presumption in favour of large-scale onshore wind energy development and the associated landscape change subject to the criteria in the landscape policy (18) of Future Wales. Adopting an approach which identifies Pre-Assessed Areas for Wind Energy as the focus for large scale wind would align with national policy.	forward for other typologies, work would be needed to identify suitable areas.
	See example: Flintshire Local Development Plan 2015 – 2030 (2023) and Emerging Replacement Bridgend County Borough Local Development Plan 2018-2033 (Deposit stage) (2021)		
Sequential test approach in LDP	Policy that identifies a location or land type within which development of certain types of onshore renewables is preferred. Where an applicant is applying for development outside of the location or land type identified, they would need to confirm why their site is better than those in the location or on the land type identified and/or show how efforts have been made to identify sites within the location or on the land type and the reasons why this was not viable.	Provides options to promote a range of sites, whilst maintaining preference for those of greatest opportunity.	Onerous application and determination process where sites come forward outside of locations or land types identified through the policy.
	See example: Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (2017)		
New Supplementary Planning Guidance (SPG)	Supporting document to provide detailed advice and guidance on how policies in the LDP should be implemented.	Helpful for policy areas which require technical expertise. Increased level of advice available provides developers with greater certainty about types of application that will be most likely to be considered acceptable. Provides development managers with increased	Not subject to examination but will still require considerable additional resource to be drafted. Would effectively comprise a piece of follow on work once the Replacement LDP is adopted, extending the timeline of having the necessary

Policy option	Description	Benefits	Dis-benefits
		guidance for the determination of applications.	guidance in place for onshore renewables development.
	See example: Pembrokeshire Coast National Park Authority Renewable Energy SPG (2021)		
Policy promoting the incorporation of renewables alongside other types of development	Policy that promotes the incorporation of renewable technologies at larger development schemes and requires that developments do not preclude the ability to deliver renewables technologies in the future.	Potentially provides additional energy sources to meet the needs of new development as it is delivered. Where renewables cannot be delivered as part of new development, the policy approach safeguards areas which are suitable for renewables generation.	Policy approach will be most applicable for larger proposals and will be subject to viability testing.
	See example: Flintshire Local Development Plan 2015 – 2030 (2023)		

Considering energy related policy approaches in adopted and emerging local planning policy in Wales

The review demonstrates that an approach that combines various policy option types is often preferred. Strategic policy can be included to support the principle of development for onshore renewables thereby supporting the County's required contribution towards achieving net zero targets. This is often supplemented by the inclusion of criteria-based policy and search areas to help limit the potential for development coming forward at locations where there is little chance of mitigating adverse effects.

Some authorities also identify local search areas which are considered suitable for accommodating solar PV development. There are few examples of local authorities allocating specific sites for onshore renewables development. This approach may become more prevalent as authorities seek to meet the PPW requirement for the planning system to play an active role in ensuring Welsh Government renewable energy targets are met.

Considering policy to promote renewables development as part of allocations for other types of development

The emerging RLDP presents an opportunity to support renewables development which might be delivered alongside other types of development (for example employment or residential) in Conwy. Policy as set out in the current draft RLDP will require developments to maximise the potential for renewable or low carbon energy generation to meet the needs of the proposal and to contribute to the renewable energy targets of the County.

This might be achieved through site specific site allocations or a general policy addressing the principle of providing new development in the context of renewable energy generation in Conwy. Where a general, non-site-specific policy is included, the policy could require larger developments (with the threshold to be determined based on viability testing and other considerations) to be supported by an Energy Assessment to determine the potential feasibility of incorporating low carbon or renewable energy generation.

Where the incorporation of renewable energy generation is determined not to be feasible, development should be designed in a manner which would not preclude the future incorporation of infrastructure to support generation from such sources.

Atkins, in their draft technical note, make specific suggestions for development which could be applied to allocations for other types of development, for example in their report CCBC Buildings Technical Notes v3.0 180123 [29] 4.2.1 part 3 they suggest: developments should incorporate or utilise zero or low carbon energy sources. This involves:

a) Maximising renewable energy sources within the development (especially solar PV).

b) Mandating the use of a minimum 40% of rooftop space for solar PV.

c) Considering the potential to utilise offsite large scale offsite renewable or low carbon energy sources such as heat networks or local large-scale renewable energy generation sources, through a direct connection to the development.

And in Appendix A.2 of the same technical note, they refer specifically to allocations, suggesting that linking renewable generation to other allocations would be attractive to investors.

The continued and accelerated large scale roll out is partly attributed to investment from large corporations who wish to procure green energy directly as they address the agenda to decarbonise. For these reasons, it is considered likely that a solar farm at or within proximity to the site allocations could readily secure external funding.

6. Conclusions and recommendations

6.1 Spatial analysis

The spatial analysis identified that there is significant potential for wind and PV generation in Conwy, with estimates of 496MW for wind turbines and 2,231MW for ground mounted PV. Suitable land is typically in the East of Conwy, due to most of the Western half being within Snowdonia National Park (and therefore out of CCBC control as a planning authority). A greater number of suitable areas have been highlighted then the Renewable Energy Assessment, and this exercise shows that there is potential for Conwy to meet and exceed the targets for renewable energy generation set out in the LAEP.

This work was based on planning constraints and the estimate does not take into account broader factors such as grid limitations, the proportion of different renewable technologies that can be integrated into the energy system, cumulative impact or competing land uses.

This spatial analysis exercise does not look into specific sites, and the non-inclusion of a location in a suitable area for wind and/or PV does not mean that it is not suitable in practice. Brownfield sites in particular may be suitable but are not highlighted by this analysis. An application outside of suitable areas should still be considered on its own merits. Likewise, the inclusion of a site within a suitable area for renewable energy development does not autonomically that development will be appropriate, and the site would need to be considered in more detail. This is a broad exercise and there will be many site-specific reasons who a scheme is not suited to a particular location.

The potential for generation on CCBC assets was considered, and the analysis suggests an estimated potential capacity of ground mounted PV of 16.2MW, and for wind turbines of 6.6MW. The potential for rooftop PV generation on CCBC buildings was 6.5MW. Whilst there is some land owned by the CCBC that may have potential for renewable energy, there scope for development is relatively small compared to what could be delivered elsewhere in the County. A critical part of meeting net zero targets is therefore encouraging and facilitating developments delivered by others.

6.2 Policy review and options

The policy review undertaken highlights the need for policy in the emerging CCBC Replacement LDP to align with the Welsh Government's targets of the Net Zero Wales. Targets for renewable energy identified in the LAEP or other evidence based documents should also be set in the local or regional plan.

We have identified opportunities for the potential colocation or coordination of residential and employment site allocations alongside development for renewables.

A range of high-level policy options are available to CCBC as part of its approach to promoting renewable energy generation and contributing to decarbonising Wales alongside achieving other forms of sustainable development. The various options explored are not exclusive and a combination of those considered might be taken forward by CCBC through the emerging Replacement LDP. The options considered range from the inclusion of supportive strategic policy in the LDP to the drafting of a new SPG addressing the development for renewables in Conwy.

6.3 Recommendations and next steps

Delivering the renewable energy capacity set out in the LAEP will be challenging, but CBBC has an exciting opportunity to deliver this based on the spatial analysis that we carried out. Change is needed to the whole system and CCBC won't deliver this alone.

- The area where CCBC has most control to deliver is on its own sites, and we recommend that it revisits council owned sites previously assessed by WGES, and other council owned land, particularly looking at where grid constraints can now be overcome by the curtailed connections SPEN is offering. The potential for co-generation on these sites could be considered to reduce grid connection constraints and increase viability.

- New developments offer an opportunity for incorporating renewables into the design, and we recommend that the potential for generation near allocations for other types of development is considered, for example the strategic site at Abergele is allocated for employment, retail and primary school, and is partially in areas potentially suitable for wind and PV development. Guidance related to renewables could be issued for developers looking at these sites.
- Based on the policy options set out in this report, we recommend that Conwy confirms its preferred policy approach.
- In order to refine the areas identified as suitable for renewables further, we recommend that a more detailed spatial analysis exercise is undertaken with a tighter of constraints, including commercial factors, to identify more specific areas that could be allocated in policy for renewable energy development. This could include different allocations for different scales of development.
- A review of case law and decisions on best and most versatile agricultural land would be useful to consider how much weight to put on this in decision on ground mounted PV.
- Strategic engagement with SPEN would increase the likelihood that enhancements they plan to the network tie in with where generation is most likely to be installed.

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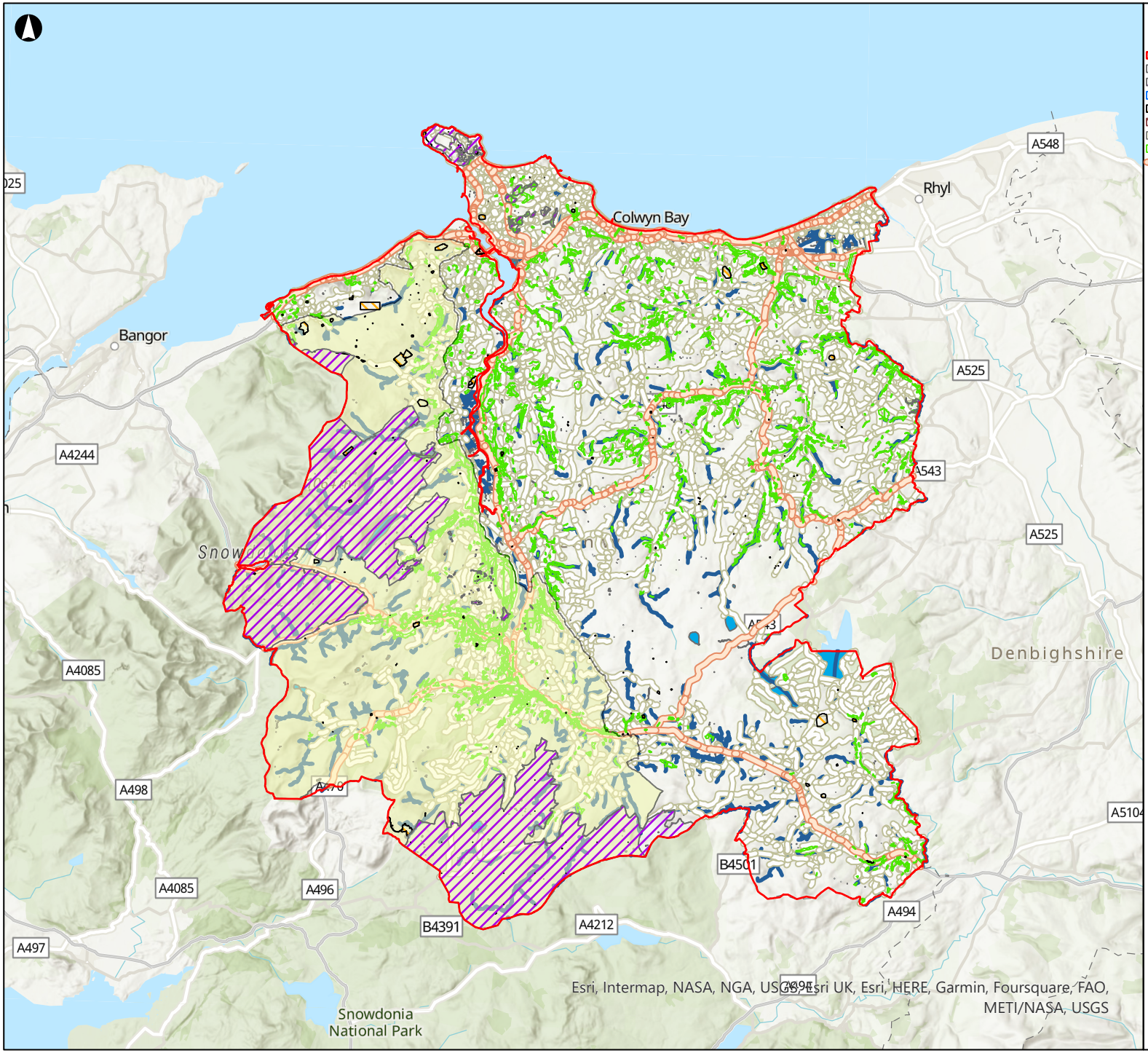
Appendix A

Spatial analysis outputs

A.1 Maps



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- Conwy Boundary
- Special Protection Area (SPA)
- Special Areas of Conservation (SAC)
- Ramsar sites
- Scheduled Ancient Monuments (SAM)
- Areas of Outstanding Natural Beauty (AONB)
- National Park
- Ancient Woodland Inventory 2021
- Major Road
- Major road 110m buffer
- Minor Road
- Minor road 66m buffer
- Built Up Areas
- Watercourses
- Water Region
- World Heritage Sites Essential Setting
- Conservation Area

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Project Name

Conwy LAEP: Implications for the LDP

Drawing Title

Figure 1 – Wind Constraints
Map showing the constraints used for the wind turbine spatial analysis

Scale at A4

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Role

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Suitability

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Project Number	Rev
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Drawing Name

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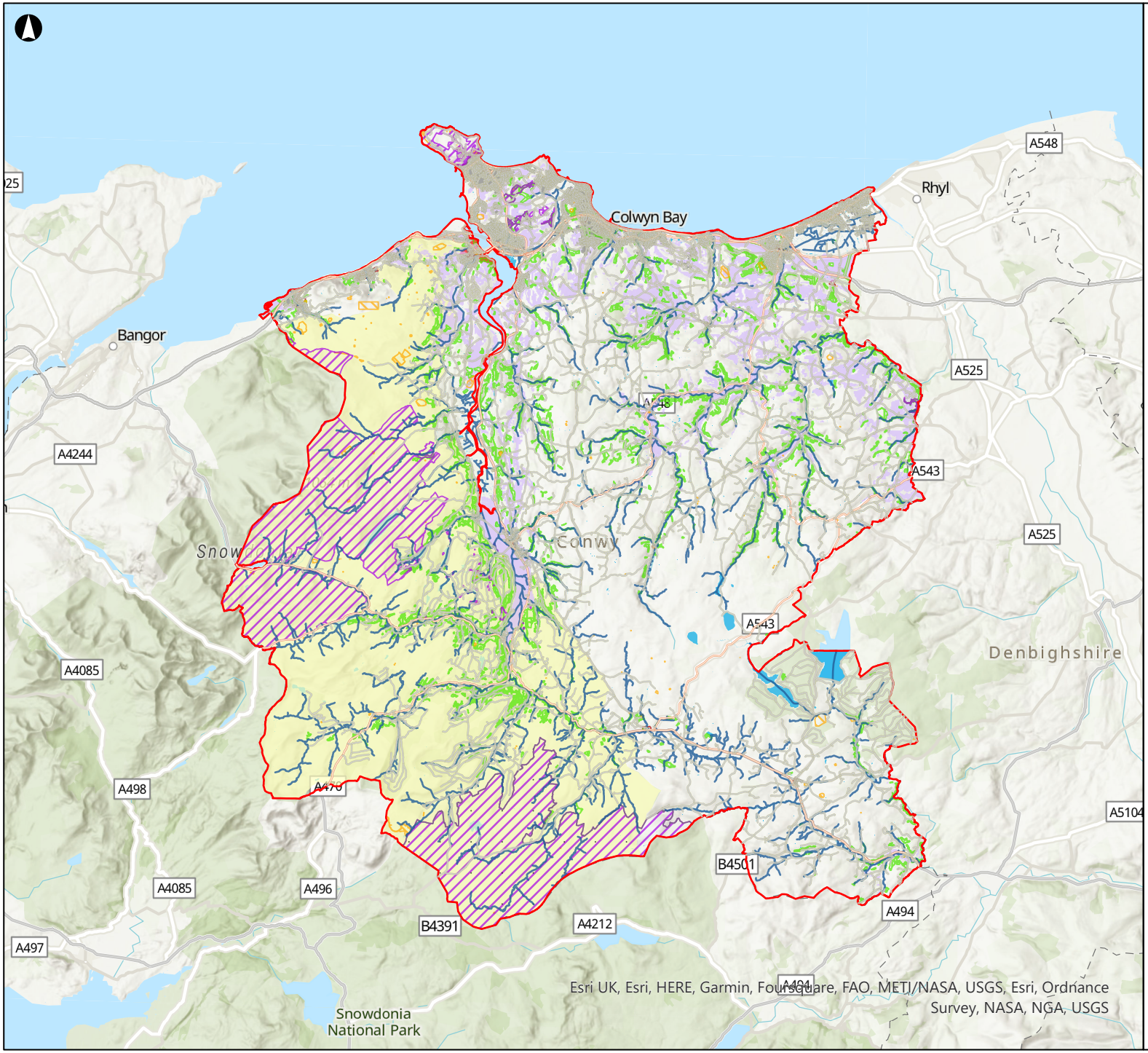

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Figure 2 – Solar Constraints
Map showing the constraints used for the ground mounted PV spatial analysis

Scale at A4

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Role

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Suitability

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Drawing Name

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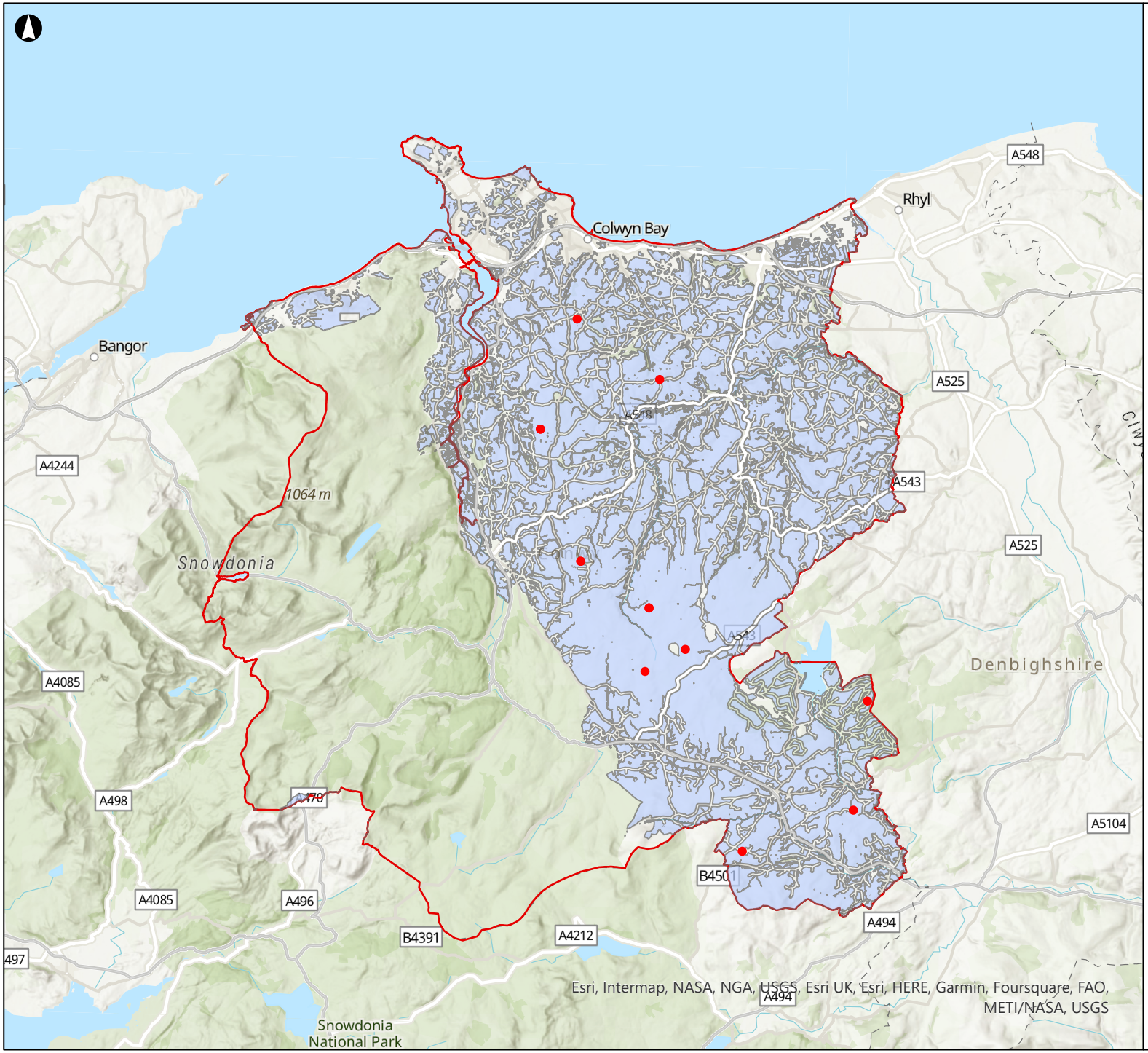

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Figure 3 – Wind Development Areas
Areas found by the analysis to be potentially suitable for development of wind turbines

Scale at A4
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Role
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Suitability
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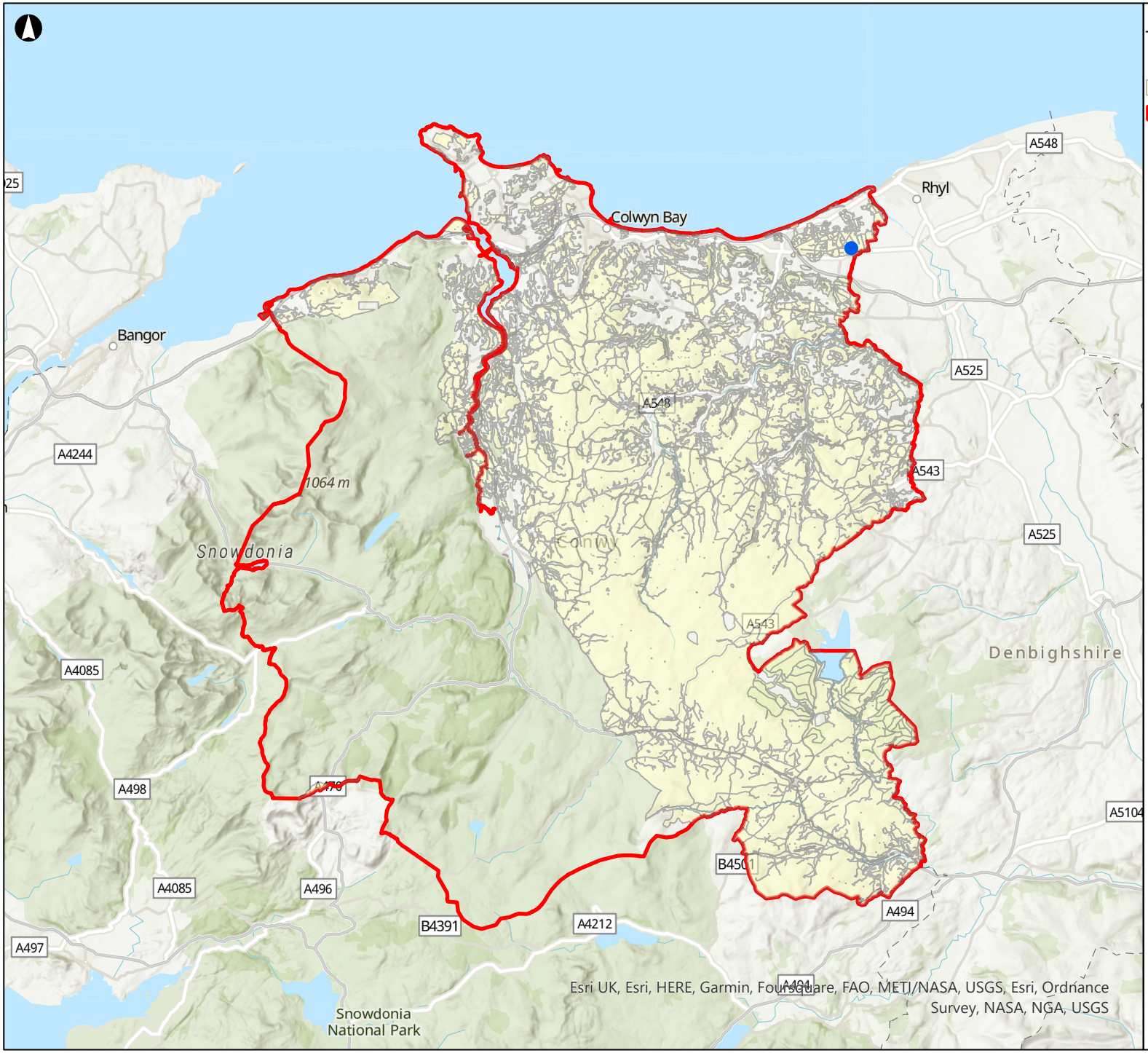

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Figure 4 – Solar Development Areas found by the analysis to be potentially suitable for development of ground mounted PV schemes

Scale at A4

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Role

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Suitability

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Project Number

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Drawing Name

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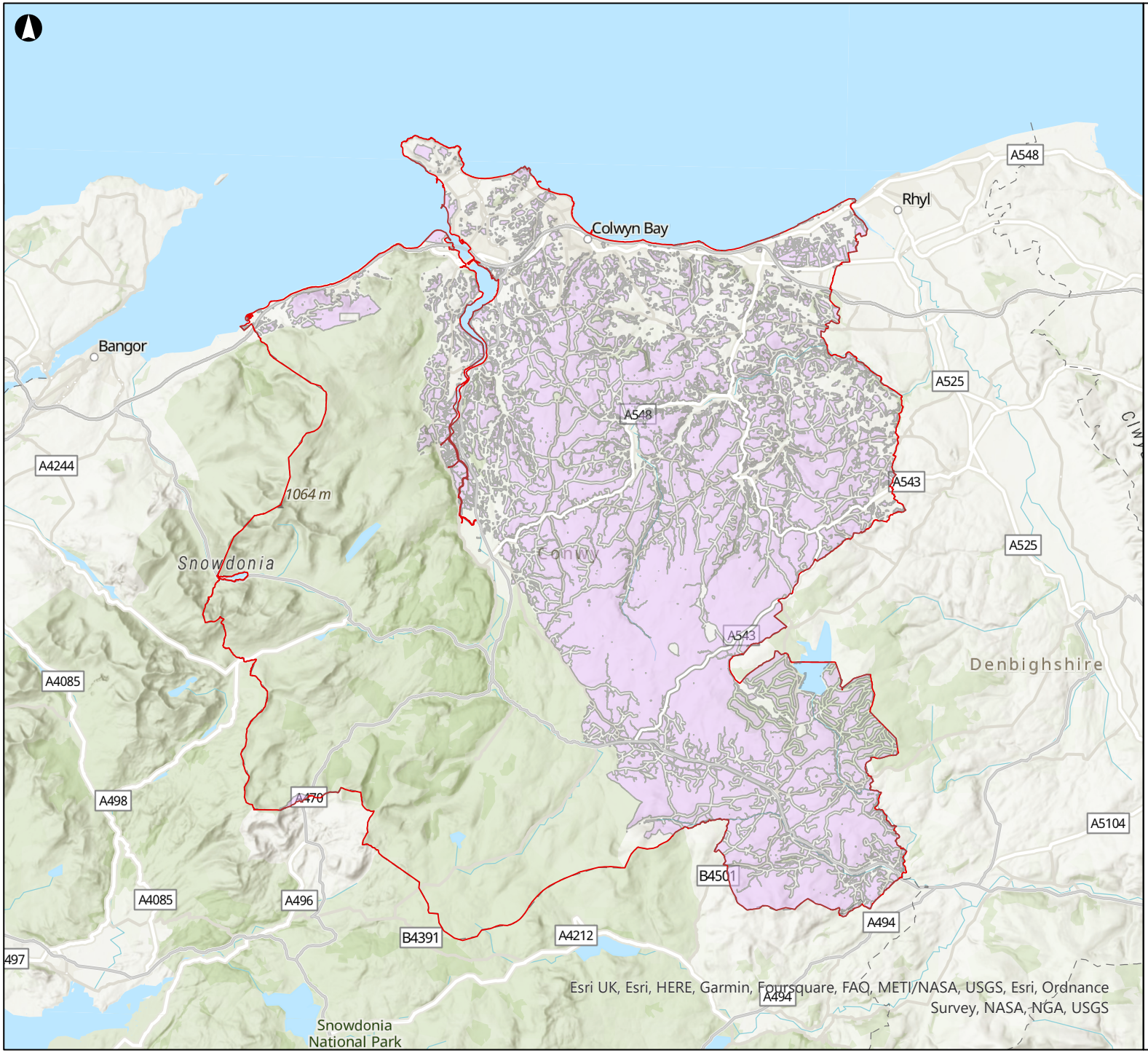

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Figure 5 – Co-generation development Areas that have potential for both wind and ground mounted PV schemes

Scale at A4

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Role

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Suitability

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Drawing Name

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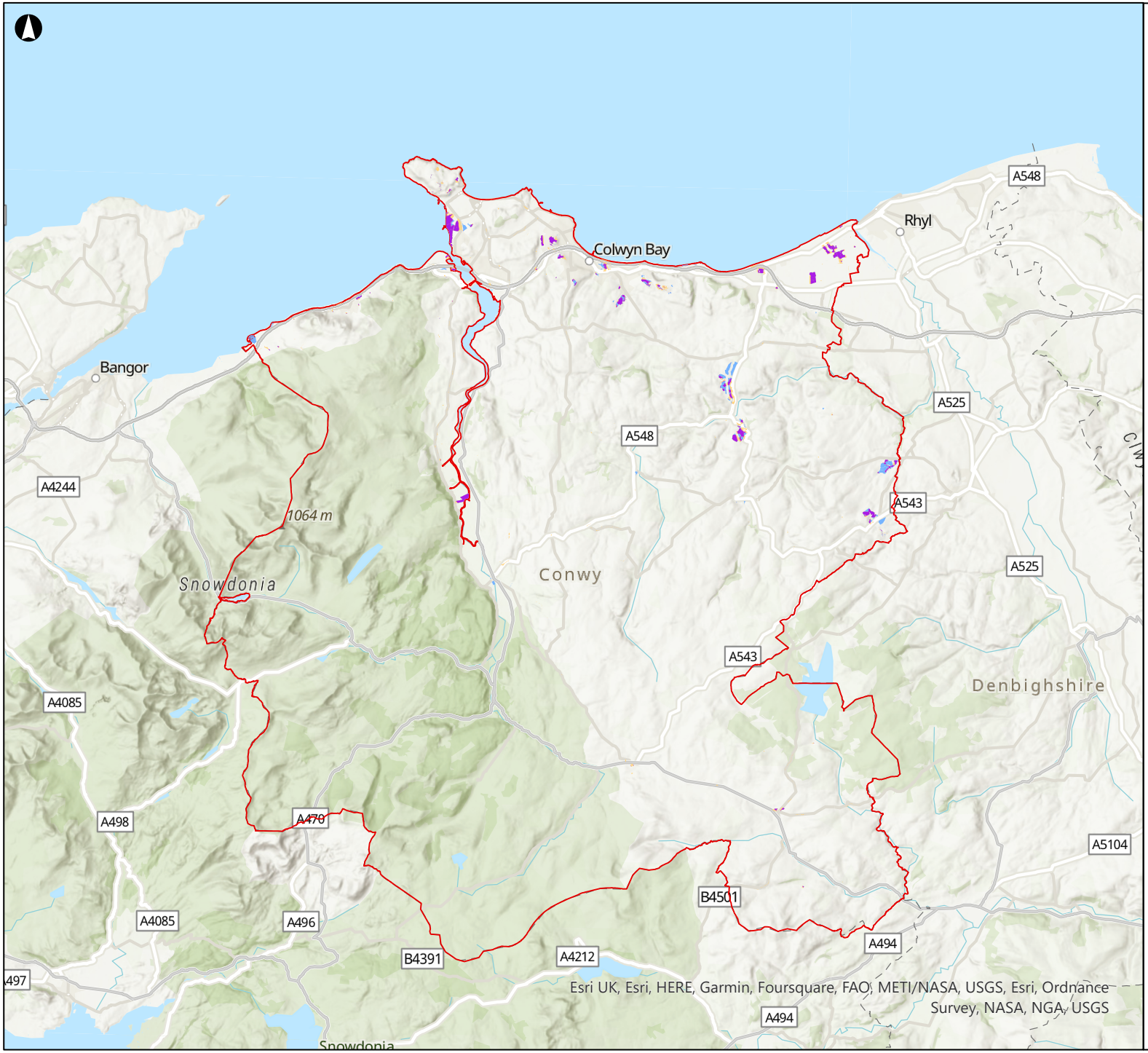

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Freehold Areas Within Solar & Wind Development Areas

Freehold Areas Within Solar Development Areas

Freehold Areas Within Wind Development

Conwy

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Figure 6 – Council owned land
Freehold areas of council owned land within areas potentially suitable for wind turbines or PV schemes

Scale at A4
1:300,000

Role
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Suitability
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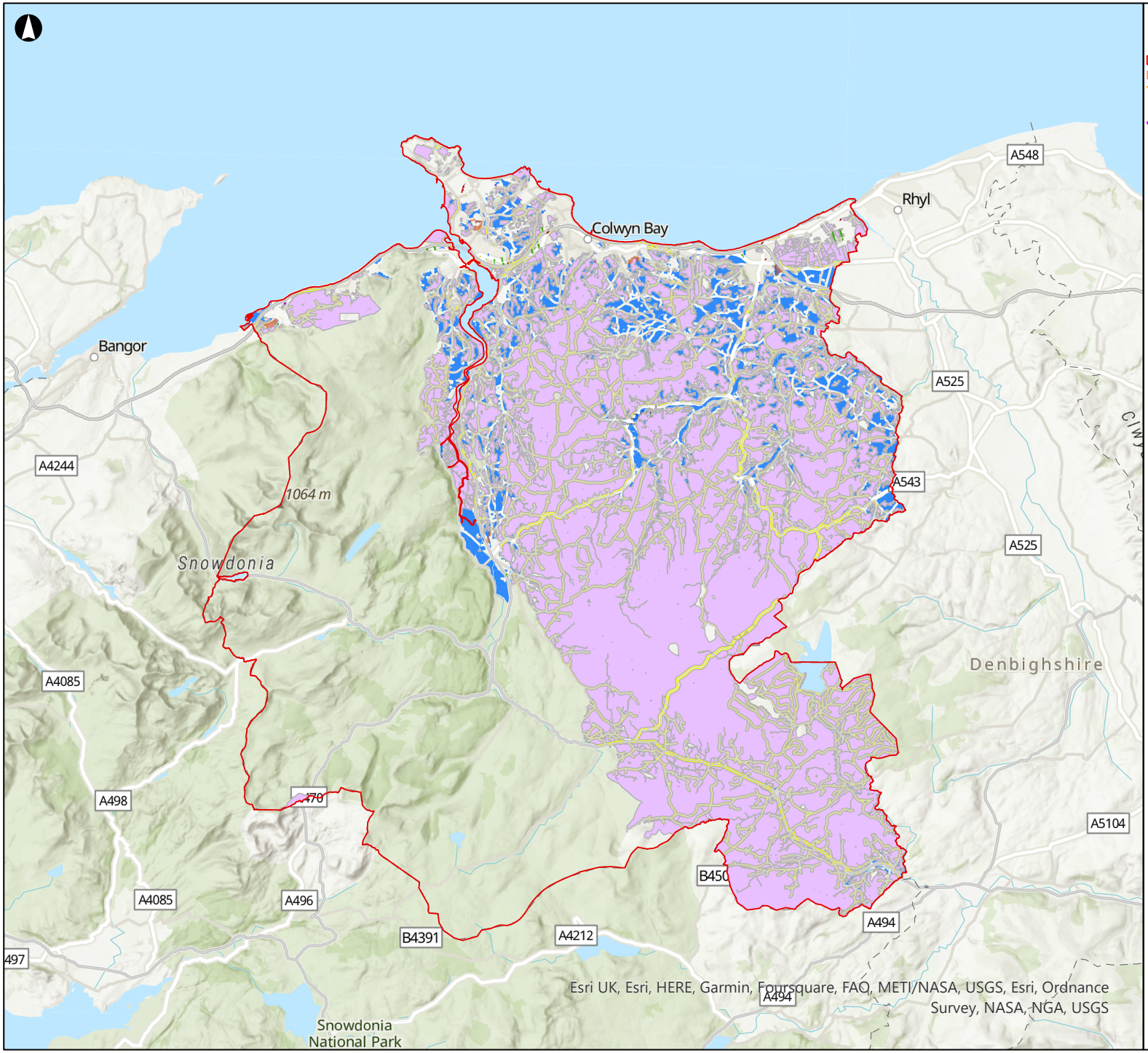

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- Conwy
- Strategic Sites
- Safeguarded Improvment
- Housing Allocation
- Housing Contingency
- Safeguarded Employment
- Safeguarded Employment Site
- Areas Suitable For Wind & Solar Development
- Areas Suitable for Solar Development
- Areas Suitable for Wind Development

Coordinate System: British National Grid

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Drawing Title

Figure 7 – Allocations
Allocations in relation to areas potentially suitable for wind turbines and PV schemes

Scale at A4

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Role

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Suitability

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Project Number

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Drawing Name

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Appendix B

Policy review technical summary

B.1 Liaison with Atkins

Atkins is undertaking work for CCBC and are producing a series of technical notes. The relevant ones (still in draft format were sent to Arup by CCBC 20th January 2020) are considered in the policy review. A meeting was held on 27th October 2022 between Gareth Tucker of Arup and Andrew Lewry of Faithful & Gould (Atkins' contractor) and is summarised below.

- They hadn't done any quantitative work with renewables as part of their scope
- They are in the process of producing a Net Zero Framework Document for CCB
- New building regs in Wales mean domestic new-builds will need an EPC A rating which in his view meant that in practice renewables will required on new builds in Wales, and that this will soon be the case for new non-domestic too.

Relevant policy recommendations made by Atkins in their draft technical notes are provided in the table below.

Atkins Document	Summary
Renewable and Low Carbon Energy Technical Note, Section 3	Proposals for the utilisation, distribution and development of new renewable energy capacity and energy storage, including large-scale ground PV and onshore wind freestanding installations, will be encouraged on land suitable for their development in Conwy. A positive approach to renewable and low carbon energy schemes will be taken, particularly schemes that are led by, or meet the needs of local communities.
Renewable and Low Carbon Energy Technical Note, Section 3	Large-scale wind turbine development with a target capacity of 60MW over the Plan Period will be supported in principle within the Pre-Assessed Areas as shown on the proposal map and in Future Wales.
Renewable and Low Carbon Energy Technical Note, Section 3	• Development of connections to planned offshore wind farms off Conwy's coast and new transmission lines to carry offshore wind power to where it is needed in Conwy will be supported in principle. • In assessing such proposals, the sensitivities of coastal locations, as well as the potential environmental, community and other impacts in neighbouring onshore areas, means that optimum onshore connection points for offshore transmission bringing power from offshore wind farms must be considered as part of the overall offshore transmission network design and in conjunction with the onshore network. Optimum onshore connection locations for offshore transmission are those which must seek to minimise environmental and other impacts both onshore and in the marine environment, including to local communities, and follow good design, avoidance and mitigation principles.
Renewable and Low Carbon Energy Technical Note, Section 3	A 1 GW tidal lagoon generating project proposed in the 2035 North Wales Regional Energy Strategy is supported for the inshore area off Conwy's coast.

Atkins Document	Summary
Renewable and Low Carbon Energy Technical Note, Section 3	· The Council, developers and grid infrastructure providers will enter into a process of early engagement which allows for the planning of an integrated and smart electricity grid in Conwy and ensures technical, financial and management models are developed to overcome barriers. · Where new urban developments look to meet carbon targets through use of offsite renewable energy generation, Council, developers and grid infrastructure will work together to embed these renewable energy generators in the integrated electricity network. · As part of the preparation of the planning application for new urban development, developers must: o enter into an early dialogue with grid infrastructure providers to identify the infrastructure needs arising from new development and ensuring that these are addressed through building design, energy networks and connections in time to serve the proposed development. o demonstrate that there will be adequate grid infrastructure capacity, from first occupation until development completion to ensure that development does not lead to capacity or reliability problems in the surrounding area. o prepare an energy infrastructure phasing and delivery strategy for new urban development sites. This strategy must outline proposals for; § installation of smart meters, § minimising peak energy demand and promoting short-term energy storage § consideration of smart grids and local micro grids where feasible, § what needs to be provided by when and who will fund and deliver it.
Atkins CCBC Carbon Sequestration and Offsetting Technical Note v 3.0	The setting up of a Carbon Offset Fund by CBBC could facilitate carbon offsetting through the use of renewable and low carbon energy (please refer to separate Carbon Offset Fund Technical Note for policy recommendations in this regard).

B.2 Policy review

A review of policy and analysis of options is included in the main report. Examples of how policy options might be implemented are included in the table below

Option	Examples of approach from other planning document(s) and brief overview
Strategic policy in LDP	**Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (2017)** [30] Strategic Policy PS 7: Renewable Energy Technology Sets out the approach to supporting renewable or low carbon energy generation from a range of sources, wherever feasible and viable. The policy is linked to Policy PS 19: Conserving and where appropriate enhancing the natural environment, to help ensure that the objectives of landscape and nature conservation designations are not compromised by development. Policies ADN 1: On-shore wind energy, ADN 2: PV Solar energy and ADN 3: Other Renewable energy and low carbon technologies sit directly below Policy SP 19 setting out the policy approach specific to a variety of renewable energy types. These policies set out criteria against which each type of renewable energy development is to be assessed.

Option	Examples of approach from other planning document(s) and brief overview
Specific policy in LDP (criteria based approach)	**Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (2017)** Policies ADN 1: On-shore wind energy, ADN 2: PV Solar energy and ADN 3: Other Renewable energy and low carbon As described in the cell above, these policies set out the policy approach specific to a variety of renewable energy types. The policies set out criteria against which each type of renewable energy developments is to be assessed. The criteria included in Policies ADN 1 to ADN 3 require developments to adequately mitigate impacts on landscape character, heritage assets and natural resources, prevent unacceptable effects on the amenity of sensitive receptors and prevent significant harm to the residential visual amenities of nearby residents. For wind farms and wind turbines, land typologies and high level locational principles have been included in Policy AND 1 to set out where this type of development is to be considered acceptable. This includes: – Medium-scale developments are only considered acceptable on urban / industrial brownfield sites or for the repowering of existing farms or turbines; – Micro-scale and small-scale developments are only considered acceptable on land outside of the AONB and Special Landscape Areas (SLAs) and where there would be no significant detrimental effect on the setting of the AONB, National Park and World Heritage Site; and – Only domestic-scale developments that are well related to existing settlements / buildings are considered acceptable within the AONB and SLAs or areas that might affect the setting of the AONB, National Park or World Heritage Site.
	Vale of Glamorgan Local Development Plan 2011-2026 (2017) [31] Policy MD19: Low carbon and renewable energy generation Sets out the policy approach by which proposals for the generation of low carbon and renewable energy will be permitted only where no unacceptable impact would result in relation to a number of criteria. These criteria are set out to protect the interests of best and most versatile land, landscape importance, natural and cultural heritage, nature conservation and residential amenity.
Site allocation policies in LDP	The adopted LDPs for the local authorities of Wales do not presently include policies to allocate specific sites for onshore renewable energy development. The preferred approach is to include search areas where onshore renewables is to be considered more favourably. This approach is taken forward by many local authorities as part of its policy relating to development for wind and solar. LDPs in Wales include the allocation of sites for other types of development, most notably housing and employment. For example, **Monmouthshire County Council Adopted Local Development Plan (2014)** [32] includes policies to allocate seven strategic sites as well as a number of 'other housing sites' to meet a substantial part of the need for new housing allocations for the County. These policies allow for the inclusion of site specific criteria that developers will be required to meet to address identified constraints and opportunities for these locations. However, the emerging **Pembrokeshire County Council Local Development Plan 2 (LDP 2) 2017 - 2033 (Deposit stage) (2020)** [33] includes Policy GN 5 Renewable Energy – target and allocations, which sets out three sites for allocation for the delivery of solar PV in the County. These allocations are included to contribute to an additional 9MW per annum renewable energy capacity over the plan period. The policy recognises the role of the LDP in meeting local renewable energy targets. It is stated that developments at these sites should respect environmental, landscape and grid capacity constraints. The LDP is not yet adopted and is to be subject to a 2nd Deposit Plan stage so that changes can be made to reflect updated evidence (including relating to phosphates levels for Riverine SACs in Wales) and changes to national policy and context.
Search areas in LDP	**Flintshire Local Development Plan 2015 – 2030 (2023)** [34] Strategic Policy S15 - Energy Identifies Solar Indicative Local Search Areas (ILSAs) that are suitable to accommodate solar farms of up to 10 MW. These were identified as part of the undertaking of the REA for Flintshire. The policy also sets out a criteria-based approach to enable the assessment of detailed development proposals. The criteria included will allow for the assessment of smaller or community based renewable energy proposals. They can also be used for the assessment of larger schemes that are outside of the ILSAs but

Option	Examples of approach from other planning document(s) and brief overview
	may still be appropriate subject to assessment against the criteria and the incorporation of suitable mitigation.
	Several local authorities in Wales include SSAs previously identified through TAN 8 at the national level for their potential contribution to energy from wind. The relevant policies of these authorities set out a presumption that large scale wind developments (>25MW) should be located within the SSAs. Local search areas relating to the development of solar farms have also been defined within the adopted LDPs of a number of local authorities including **Powys** [35] (Policy RE1)**, Vale of Glamorgan** (Policy MG30) and **Flintshire** (Policy EN13). These are areas assessed as having the greatest potential for solar energy resource. Within these areas potential constraints to solar energy development have also been mapped. Policy RE1 of the Adopted Powys LDP is clear that proposals within or close to SSAs, for renewable and low carbon energy development other than wind energy greater than 25MW, should not prejudice that type of development within the SSA. Vale of Glamorgan and Flintshire do not include SSAs.
	Emerging Replacement Bridgend County Borough Local Development Plan 2018-2033 (Deposit stage) (2021) [36] Policy SP13: Renewable and Low Carbon Energy Development Sets out Local Search Areas (LSAs), within which proposals for wind and solar energy generation will be permitted subject to a number of criteria. Proposals for other types of development within these areas are only to be permitted where they can demonstrate that they would not unacceptably prejudice the renewable energy generation potential of the LSA or the Future Wales's Pre-Assessed Areas for Wind Energy. The plan identifies that one of the LSAs is located within a Pre-Assessed Area for Wind Energy and as such any proposal in this area will need to ensure that the renewable energy potential of Pre-Assessed Area for Wind Energy is not compromised. The supporting of the policy states that there may be sites found to be suitable for development within other areas assessed as having higher landscape sensitivity.
Sequential test approach in LDP	**Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026 (2017)** Policies ADN 1: On-shore wind energy, ADN 2: PV Solar energy and ADN 3: Other Renewable energy and low carbon In addition to setting out criteria against which different types of renewable energy developments are to be assessed, land typologies and high level locational principles have been included in Policy ADN 1 for wind farms and wind turbines. These land typologies and high level location principles set out where this type of development is to be considered acceptable. This effectively sets out a sequential based approach to development: – Medium-scale developments are only considered acceptable on urban / industrial brownfield sites or for the repowering of existing farms or turbines; – Micro-scale and small-scale developments are only considered acceptable on land outside of the AONB and Special Landscape Areas (SLAs) and where there would be no significant detrimental effect on the setting of the AONB, National Park and World Heritage Site; and – Only domestic-scale developments that are well related to existing settlements / buildings are considered acceptable within the AONB and SLAs or areas that might affect the setting of the AONB, National Park or World Heritage Site.
New Supplementary Planning Guidance (SPG)	**Pembrokeshire Coast National Park Authority Renewable Energy SPG (2021)** [37] Sets out the approach for the implementation of the Pembrokeshire Coast National Park LDP 2 (2020), Policy 33: Renewable and Low Carbon Energy. Policy 33 provides general support for proposals for renewable and low carbon energy development subject to a number of criteria. The SPG provides a definition of what each type of renewable energy comprises and how a suitable site for each type should be chosen. It also sets out key landscape sensitivities and general guidance for siting each renewable energy type. Further detailed information about the landscape sensitivity in different parts of the National Park (divided by Landscape Character Area (LCA)) is provided in relation to solar PV and wind energy developments.
Policy promoting the incorporation of renewables alongside other types of development	**Flintshire Local Development Plan 2015 – 2030 (2023)** Policy EN12: New Development and Renewable and Low Carbon Energy Technology Sets out the policy approach to requiring new development to maximise the potential for renewable or low carbon energy technology to meet the energy needs of the proposal. Larger development proposals

Option	Examples of approach from other planning document(s) and brief overview
	(100 homes or 1,000 sqm of non-residential development) are required to submit an Energy Assessment to determine the feasibility of incorporating low carbon or renewable energy technology and how the proposal can contribute to increased levels of energy generation from these types of sources.

Appendix C

Constraints: detailed approach

C.1 Introduction

Our initial review of the REA identified that the constraints used were more restrictive than was necessary, and there were opportunities for Conwy to revisit these to enable a more proactive approach to the development of renewable energy. The fixed constraints used in the more recent Future Wales methodology were therefore considered when identifying sites, along with the constraints in the REA. Both these assessments were for larger developments then the 500kW being assessed here, and the constraints and buffers were adjusted accordingly to be more appropriate for the smaller scale of scheme.

C.2 Constraints workshop write up

C.2.1 Wind turbine calculations

Wind turbines cannot be sited in too close proximity to each other due to wake interference, where the region immediately downwind of a wind turbine has less power in the wind that can be used by adjacent turbines. A distance between wind turbines is therefore needed, which is often expressed in rotor diameters. When designing windfarms or estimating wind capacity over a large area, a greater number of rotor diameters in the direction of the prevailing wind is typically used. In estimating capacity Future Wales used ellipses a separation distance of 7 * rotor diameter from southwest to northeast, and a separation distance of 5* rotor diameter from northwest to southeast. A similar approach has therefore been taken with this work.

For the purposes of modelling, a 500kW wind turbine with a rotor diameter of 40m was assumed, which equates to an ellipse with a diameter of 280m (7d) by 200m (5d). For estimating capacity of a large continuous area each ellipse would be taken to represent a wind turbine, with the number of ellipses in the area indicating the number of wind turbines of the chosen size that could be installed.

A grid of 280m by 200m ellipses was therefore created for Conwy and overlayed with areas suitable for wind development. These ellipses were then filtered and clipped to the extent of the potential wind development areas. The boundaries of each ellipse were dissolved and grouped based off their unique identifier.

The areas identified through the spatial analysis are however not continuous, and if a wind turbine was counted for every ellipse that had a part within an area suitable for wind would lead to scenarios where adjacent part-ellipses could place wind turbines too close to each other, leading to an over-estimation of capacity. Conversely, taking the total area of all suitable sites for wind turbines and estimating capacity as one continuous area would not account for the spacing between areas, and could lead to an under-estimation.

The resultant output was therefore filtered to only show ellipses which had at least 50% of its area within the potential wind development layer. i.e. the number of wind turbines has been estimated by taking the number of ellipses with a majority of their total area within a suitable wind area. Taking this approach, the potential number of 500kW wind turbines in the County was estimated to be 9920.

From this the total installed capacity was estimated, using 500kW wind turbines the constraints analysis was based on. The capacity factor of a renewable generator is the ratio of the actual energy produced to the energy that would have been produced if the generator had operated continuously at the maximum rated power. A capacity factor of 0.27 was used in this report, the same value that was used in the REA.

To calculate the number of freehold land parcels which intersect an ellipse which falls within the wind development potential area, the unfiltered intersected ellipses were intersected with the freehold polygons. This takes into account portions of ellipses where the total area is less than 50% of the total ellipse area. 59 freehold land parcels intersect an ellipse.

The potential for wind turbines on land owned by CCBC was estimated identifying the number of ellipses that intersected or touched a freehold land parcel. Based on this approach the total number of wind turbines in the freehold areas within the county was estimated to be 132.

This approach did not however consider the type of building where there is a building in or adjacent to freehold land, so a more detailed assessment may preclude many sites.

C.3 Limitations

C.3.1 Constraint selection and analysis

When selecting constraints, commercial factors such as expected yield/income, landowner interest and proximity to grid connection were not taken into account, on the basis that the focus of this spatial analysis was on planning factors, and developers would need to consider commercial aspects themselves – which may change over the life of the LDP.

The spatial analysis was very broad, and each individual site may have constraints or other issues which mean it is unsuitable for development such as ground slope or proximity to individual dwellings. Whilst Urban Areas were included as a constraint, individual buildings were not included as a constraint, as the

occupancy status of these can vary. In particular, if the occupants of a dwelling stand to financially benefit form a renewable energy development, for example a farming family owning a scheme on their land, then the buffers that would be appropriate around a dwelling will be significantly less than those that would be used between a commercial development and an uninvolved property.

As the water courses and road layers were line feature classes, they are not representative of the true width of the features within Conwy which again may preclude development in some areas identified as suitable.

Likewise, there may be sites that have potential for wind or PV which were not identified in a suitable area, for example some brownfield sites could be excluded by using 'urban regions' as a constraint. A site not being highlighted in this analysis is not a reason for it to be refused at planning.

A more detailed list of constraints, including a comparison with Future Wales and the REA, is included in the constraints workshop write up above. Existing or consented wind and PV had originally been considered as a constraint and are included in the workshop write up, however these were not used for the final analysis as insufficient information on the site boundaries were available.

On both the wind and solar maps the currently onshore wind and PV sites are shown as points, rather than the full site boundary, which will impact what developments can go near them. This data was extracted from the Renewable Energy Planning Database in January 2023. However, it is important to note that it only typically shows sites which have a capacity of 150kW or higher, and may not be comprehensive even for larger schemes, therefore other sites may exist within Conwy.

The most suitable data source for each constraint was used to collect the information. For data not provided by the CCBC the information was downloaded at project onset**.** Therefore, the information acquired at the time was the most up to date, however changes could have occurred since. Any limitations found in these public datasets are included in this analysis.

Whilst a map showing theoretical potential for co-generation has been produced, this has not been considered in any depth, for example separation distance of wind turbine and PV panels (often taken to be tip height) is not considered. The potential for co-generation and a capacity estimation could be included in follow up work if this opportunity is to be explored further, and co-generation should be considered when undertaking feasibility work for specific sites.

C.3.2 Capacity estimation

As outlined above there will be local factors which may render a site in an area identified as suitable for wind or solar as inappropriate for development, and there will be some areas not identified here are suitable for development which are well suited to a wind or solar scheme. The estimate does not consider broader factors such as grid limitations, the proportion of different renewable technologies that can be integrated into the energy system, cumulative impact or competing land uses such as use of lower quality land for agriculture. Additional wind and ground mounted PV do not consider sites below the minimum size threshold of 500kW. These figures should not be taken as an accurate prediction the potential that Conwy has for renewable energy generation of, rather than an accurate prediction. Each potential site should be assessed on its own merits.

Ground mounted PV

The capacity density for a ground mounted PV scheme can vary depending on several factors such as total scheme size, panel size, layout, ground slope and shading. calculate the PV potential across Conwy, an installed capacity density of 1MW per 24,000m^2 was used, which is the same value used in Future Wales. When choosing constraints, the minimum parcel size used as a constraint was 5000m^2 on the basis that this is approximately the theoretical minimum size for a 500kW scheme, which would give a much higher capacity density of 1MW per 10,000m^2. However, whilst some sites of this size could fit approximately 500kW of panels, this level of installed capacity density is not suitable for estimating the capacity for the whole county, so the Future Wales value has been used instead.

Wind turbines

An ellipse based model as described in C2.1 was used to estimate capacity as outlined in section 3. However, as the areas identified through the spatial analysis are however not continuous, and if a wind turbine was counted for every ellipse that had a part within an area suitable for wind would lead to scenarios adjacent part-ellipses could place wind turbines too close to each other, leading to an over-estimation of capacity. Conversely, taking the total area of all suitable sites for wind turbines and estimating capacity as one continuous area would not account for the spacing between areas, and could lead to an under-estimation. The resultant output was therefore filtered to only show ellipses which had at least 50% of its area within the potential wind development layer. This approach will however exclude some potentially suitable sites, as well as including in some locations where two wind turbines are too close to both be installed. All ellipses were orientated in the same direction, which does not take into account local topography in siting multiple wind turbines.

In calculating the wind turbine capacity, 500kW wind turbines with a rotor diameter of 40m were assumed. In practice many of the suitable areas identified would be suitable for a wind turbine larger than 500kW. A capacity factor of 0.27 was assumed, which was the value used in the REA and is typical for a wind turbine in Wales however in practice there is a wide range of capacity factors for wind turbines depending on the specific site characteristics.

Rooftop PV

The information provided by CCBC was the total site area, rather than the area of the roof itself. To provide an estimated roof area, the site area (m2) was divided by two – this approximation would vary a lot from site to site. The other assumptions such as an effective PV to building area ratio (i.e. how much of the roof is expected to take PV in relation to the builds footprint) of 0.34, and a capacity density per covered area of 0.2kW/m2 are also very broad, and are to give an indication of potential only, they should not be used for a detailed assessment on specific buildings. Any building being considered for PV should have its own site-specific assessment.

C.4 Best and most versatile agricultural land

Areas with best and most versatile agricultural land (BMVAL grades 1, 2 and 3a) have been selected as a constraint, so the spatial analysis will not highlight any areas of this land quality as suitable for PV.

On 1 March 2022, the Welsh Government Minister for Climate Change issued a letter [38] to Chief Planning Officers clarifying that, where BMVAL is identified within a proposed solar PV array development, considerable weight should be given to protecting such land from development, because of its special importance, and unless other significant material considerations indicate otherwise it will be necessary to refuse permission.

There have been recent decisions that have alluded to this, and the implications of these warrant further investigation in terms of what circumstances a ground mounted PV site on BMV land may be considered or refused. A review of case law and decisions is outside the scope of this project, if further detail is needed this could take place as additional follow-on work.