MYNYDD LLUEST Y GRAIG ENERGY PROJECT

South West of Llanerfyl, Powys, mid Wales

Scoping Report

Submitted in respect of a request for a Scoping Direction under Regulation 33 of the The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017

- VATTENFALL WIND POWER LTD -

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1 Introduction

1.1 Context and Background

1.1.1 The Mynydd Lluest y Graig Energy Project proposal (the 'Proposed Development') is located in Powys, mid-Wales, to the west of Welshpool and Newtown and between the A458 and A470, as shown on Figure 1. The site is located approximately 3 miles north-east of Talerddig and 2 miles south-west of the village of Llanerfyl.

1.1.2 The Proposed Development site comprises upland grazing land and commercial forestry at its western end and is currently entirely used for farming and forestry purposes. The altitude of the site ranges from approximately 320m to 425m at its highest points at both its eastern and western ends. The development boundary is presented in Figure 2.

1.1.3 The Proposed Development, as a scheme greater than 10 Megawatts (MW) in capacity, is classed under Part 2, Regulation 4 of *The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016* as a Development of National Significance (DNS). DNS schemes are to be determined by the Welsh Ministers following the introduction of the *Planning (Wales) Act 2015*, which broadened the devolved decision making powers of Welsh Government over a range of new infrastructure projects, such as energy, gas storage and airports.

1.1.4 The proposed development boundary, as shown on Figure 2, lies fully within Pre-Assessed Area 3, which is relevant to Policy 17 of the national development plan, *Future Wales: The National Plan 2040*, adopted in February 2021. Policy 17 on *Renewable and Low Carbon Energy and Associated Infrastructure* states that for schemes within the pre-assessed areas there is a presumption in favour of large-scale wind energy development, subject to conformity with criteria set out in Policy 18. The development boundary was also previously within Strategic Search Area B (SSA B) under Technical Advice Note 8 (TAN8).

1.1.5 The development site has been the subject of three previous wind farm proposals. The first, located on the northern extents of the Site, was known as Mynydd Waun Fawr and was submitted as a planning application with accompanying ES (ES) to Powys County Council (PCC) in 2007 with Supplementary Environmental Information in 2009 – this proposal was withdrawn from the planning system in July 2013. The second, located on the land to the west known as Rhyd Ddu, had only proceeded to Scoping when it was discontinued in 2009.

1.1.6 Subsequently, a scheme combining both Mynydd Waun Fawr and Rhyd Ddu into a single proposal scheme was prepared as a Development Consent Order (DCO) application under the Planning Act 2008. This scheme was discontinued in 2013 following a reversal in UK Government regulatory support for onshore wind energy development and the removal of onshore wind from the DCO process.

1.1.7 A substantial body of evidence and level of understanding of the Site's environmental characteristics exists from prior surveys and assessments. This has been drawn upon to inform this Scoping Report; however, this does not obviate the need for further original baseline surveys specific to the current Proposed Development and based upon a knowledge of the current site conditions, to be undertaken. Seasonal nature conservation surveys have already commenced.

1.2 The Applicant

1.2.1 The Applicant is Vattenfall Wind Power Ltd (Vattenfall). Vattenfall is registered in England (company number 06205750) and forms part of the Vattenfall Group, the ultimate parent company of which is Vattenfall AB, a Swedish public limited liability company owned by the Swedish state. The Vattenfall Group has a significant track record in the development and operation of wind farms in both the onshore and offshore sectors. The company works in all parts of the energy value chain from generation through to distribution and sales, the Vattenfall Group currently operates 545MW of onshore wind capacity and 836MW of offshore wind across northern Europe.

1.2.2 Vattenfall has now been working in the UK for more than ten years, and has grown its wind business from one project in 2008 to 11 today. Vattenfall also continues to grow in the sectors of district heating and power networks, with an intent to make fossil free living possible within one generation. In so doing, Vattenfall acknowledges that many stakeholders often represent varying interests and conflicting needs. Listening to, understanding, and balancing the varied and sometimes conflicting priorities of such stakeholders is seen as a core part of Vattenfall's corporate social responsibility.

1.2.3 Vattenfall has appointed an independent renewable energy specialist consultancy, Dulas Ltd., to advise them on the scope of environmental impact assessment (EIA) work and environmental issues, draw up preliminary conceptualisations of the proposed wind farm layout and wider energy project, and to provide sufficient environmental information to enable the formulation of an Environmental Statement (ES) which will accompany an application for development consent for the Proposed Development. Dulas has been preparing EIAs for three decades and is an accredited assessor through the Institute of

Environmental Management and Assessment (IEMA); Dulas is accordingly a competent EIA provider in the renewable energy sector.

1.3 Purpose of the Scoping Report

1.3.1 This Scoping Report supports a request by the Applicant for a Scoping Direction to the Welsh Ministers via the Planning and Environment Division Wales under Regulation 33 of *The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017*, hereinafter referred to as the 'Regulations'. This Scoping Report presents relevant provisional information which describes the location and nature of the development, and the potential significant environmental issues that may arise from the construction, operation and decommissioning of the proposed energy project. The formulation of this information has been guided by the requirements set out in Part 4, sections 14 and 15 of the Regulations, which require the submission of the following information:

(i) a plan sufficient to identify the land;

(ii) a brief description of the nature and purpose of the development including its location and technical capacity;

(iii) its likely significant effects on the environment; and

(iv) such other information or representations as the person making the request may wish to provide or make.

1.3.2 The purpose of this Scoping Report is to inform the Planning and Environment Division Wales and Statutory Consultees on relevant aspects of the Proposed Development prior to the formulation of a formal Scoping Direction. The information contained herein is indicative only and several iterative alterations to the design and layout of the proposed energy project are likely to be considered before they are finalised prior to completion of the application documentation.

1.3.3 Regard has been made to Appendix 3: Environmental Impact Assessment of the guidance notes for DNS projects (*Guidance on Developments of National Significance – Appendix 3, EIA: PINS Wales March 2016*), which advises in more detail on information to inform a scoping request. The guidance advises that a Scoping Report should contain:

- *an outline of the main alternatives considered and the reasons for selecting a preferred option;*
- *results of desktop and baseline studies where available;*
- *a record of consultation undertaken with relevant bodies (including any public engagement) to date;*
- *referenced plans presented at an appropriate scale to convey clearly the information and all known aspects associated with the proposal;*

- *guidance and best practice to be relied upon, and whether this has been agreed with the relevant bodies (for example the statutory nature conservation bodies or local authorities) together with copies of correspondence to support these agreements;*
- *methods used or proposed to be used to assess impacts and the significance criteria framework used;*
- *any mitigation proposed and the extent to which these are likely to reduce impacts;*
- *where impacts from consequential or cumulative development have been identified, how developers intend to assess these impacts in the ES (for example, a high level assessment of the grid connection where this does not form part of the proposed development for a power station);*
- *an indication of any European designated nature conservation sites that are likely to be significantly affected by the proposed development and the nature of the likely significant impacts on these sites;*
- *key topics covered as part of developers' scoping exercise; and*
- *an outline of the structure of the proposed ES*

1.3.4 Such information has been incorporated into this Scoping Report except where no relevant information is currently available.

1.3.5 It is stressed that this is an early stage in the project development and therefore only brief technical details and a provisional site boundary are provided. This is to allow comment and feedback from consultees, together with information from the environmental assessment, to guide the most appropriate design and layout of an energy project at this location.

1.3.6 The Scoping Direction will inform the scope and focus of the Environmental Impact Assessment for this proposed DNS.

1.4 Content and Structure of this Scoping Report

1.4.1 Based on the information requirements set out in paragraphs 1.3.1 and 1.3.3 above, this Scoping Report presents the following information and data on the site, its environs and potential effects.

1.4.2 Section 2 provides a brief overview of relevant legislation and planning policy at the devolved level, including Future Wales, Planning Policy Wales and the Powys County Council local development plan and associated guidance.

1.4.3 Section 3 provides an overview of the Proposed Development, including a brief description of the nature and purpose of the proposed development. In addition, an outline of the main alternatives considered, and an explanation of preferred options, is presented, where available.

1.4.4 Sections 4 to 15 describe the baseline environment in and around the potential development area and provides an outline of the potential significant effects of the development along with any potential mitigation measures already identified. The principal environmental disciplines that are likely to be addressed are explained, along with proposed methodologies of assessment, relevant guidance and best practice guidelines. This includes how potential cumulative effects will be addressed. Any potential effects to European designated nature conservation sites will be described. Further, any matters that the Applicant believes should be scoped out will be presented, resulting in the definition of the key topics to be addressed as part of an EIA.

1.4.5 Section 16 sets out the proposed structure of the ES.

1.5 EIA Competency

1.5.1 Part 5, Regulation 17 (4) of the EIA Regulations requires that: "*An environmental statement must—(a) be prepared by persons who in the opinion of the relevant planning authority or the Welsh Ministers, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement."* In this respect any developer for a DNS scheme is required under sub-paragraph (b) to include a statement regarding the expertise of the person (company) undertaking the EIA and composing the ES.

1.5.2 The Applicant has engaged Dulas Ltd, a renewable energy consultancy located in Machynlleth, Powys with nearly 40 years' experience of designing, planning and installing renewable energy schemes. Dulas has through its history managed the undertaking of in excess of 45 published ESs for renewable energy schemes throughout the UK and across a variety of different consenting regimes.

1.5.3 For a decade, Dulas has maintained accreditation through the Institute of Environmental Assessment and Management (IEMA). The accreditation is awarded annually subject to meeting a number of commitments, inclusive of reviews of key EIA personnel and ESs in order to ensure they meet the required standards.

1.5.4 Through maintaining the IEMA accreditation, Dulas ensures it has the required competency to conduct and coordinate EIAs, resulting in the production of ESs which are routinely reviewed by IEMA for their quality and accuracy.

2 Planning and Energy Policy Context

2.1 Introduction

2.1.1 This Chapter summarises the context for renewable energy and the relevant planning policy that will be applied in the determination of the MLyG Energy Project DNS application. It also provides a summary of the energy policy background under which the Proposed Development has been brought forward.

2.1.2 There have been significant changes in the approach towards renewable energy development across the United Kingdom in recent years. This Chapter will therefore briefly summarise the main developments in energy legislation and policy at the international, UK, Welsh and Powys levels in the context of the delivery of clean renewable energy projects.

2.2 UK Energy Policy

2.2.1 Clear scientific evidence[1] has established that global warming is driving climate change across the planet and the primary cause is the burning of fossil fuels, whereby the resulting carbon dioxide emissions lead to increases in global temperatures and exacerbation of the greenhouse effect.

2.2.2 The result of such concentrations is that the planet's average surface temperature has risen nearly 2 degrees Fahrenheit since the late 19th century, with six of the warmest years on record taking place since 2010[2]. It has become widely accepted that greenhouse gas emissions (GHG) need to be significantly reduced in order to avoid catastrophic long-term damage to the environment, species and humans. In 2005, the Kyoto Protocol[3] came into effect providing the first ever framework for international action. Under the Protocol, the United Kingdom, together with 37 other industrialised countries (called "Annex I Countries"), committed themselves to reducing greenhouse gas emissions by 5.2% from 1990 levels by the year 2012.

2.2.3 The Climate Change Act 2008[4] committed the UK to reducing its greenhouse gas emissions by 80% by 2050 compared to 1990 levels. It also led to the creation of the independent Committee on Climate Change to provide evidence based advice to the

[1] Intergovernmental Panel on Climate Change (IPCC) Fifth Report on Climate Change. 2014
[2] NASA,2019 Evidence | Facts – Climate Change: Vital Signs of the Planet (nasa.gov)
[3] United Nations Framework Convention on Climate Change (2005) The Kyoto Protocol
[4] The Climate Change Act 2008

Government on the policies needed to deliver this target, including regarding five-year carbon budgets.

2.2.4 The Paris Agreement was signed following an international conference in December 2015 (COP21)[5] and committed all nation signatories to undertake ambitious efforts to combat climate change and adapt to its effects. It commits to holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C above these levels.

2.2.5 The Committee on Climate Change (CCC) published a report in 2019[6] responding to a request from the Government to reassess the UK's long-term emissions targets and recommended a new emissions target for the UK: net zero greenhouse gases by 2050. Chapter 6 of the CCC's report refers to delivering a net zero emissions target for the UK. The chapter sets out a number of actions, including the transition to a net zero emissions economy and what is needed to underpin delivery of net zero emissions in the UK. 'Part b' sets out key near term actions to put the UK on track to achieve net – zero greenhouse gases emissions by 2050 - and recommends that more rapid electrification must be accompanied with greater build rates of low carbon generation capacity, accompanied by measures to enhance the flexibility of the electricity system to accommodate high proportions of inflexible generation. In addition, the report presents that development of new infrastructure will be important in opening new avenues for decarbonisation.

2.2.6 In response to the CCC's report the United Kingdom became the first international state to declare a climate change emergency and legislate long term climate targets (with Wales and Scotland having declared such emergencies in April 2019). The resultant legislation in 2019 amended the Climate Change Act 2008 (c.27) and introduced a legally binding target to achieve 'net zero' by 2050. Paragraph 1 of the Climate Change Act (as amended) sets out the target to 2050 and states that "it is the duty of the Secretary of State to ensure that the net UK carbon account for the year 2050 is at least 100% lower than the 1990 baseline (which means the aggregate amount of net UK emissions of carbon dioxide for that year and net UK emissions of each of the other targeted greenhouse gases for the year that is the base year for that gas)".

2.2.7 In this context, the current situation in Wales on decarbonisation and harnessing clean energy demonstrates there is still much to be done. In Wales in 2019[7] approx. 43% of electricity generation in Wales was from renewables, with much of the rest generated by

[5] United Nations Framework Convention on Climate Change (2015) The Paris Agreement
[6] Climate Change Committee Net Zero – The UK's contribution to stopping global warming, May 2019
[7] Energy Generation in Wales 2020 (Published 2021)

gas fuelled power stations. In terms of electricity consumption in Wales, 51% was delivered from renewable energy sources, with 825MW of current renewable capacity being locally owned. In recent years, renewable energy installation rates have significantly reduced as a result of reductions in regulatory support and electricity network constraints. Accordingly, there remain significant challenges to meeting the target of 70% of Wales's electricity demand from Welsh renewable electricity sources by 2030. This indicates that, despite the progress made to date, a substantial increase in generation capacity is still required.

2.2.8 The latest figures on GHG emissions in Wales were published in July 2020[8]. These show that an overall reduction of 30% has been achieved since 1990 (emissions from energy supply have been reduced by 36% over the same period), and again there is still a considerable way to go to meet the net zero target by 2050.

2.2.9 In April 2019, the Welsh Government accepted the CCC recommendation and set a carbon reduction target of 95% with an ambition to get to net zero by 2050. However, following the CCC's December 2020 report, in February 2021 the Welsh Government made a legal commitment[9] to achieve net zero emissions by 2050, but with a desire to "get there sooner". Wales also has interim targets[10] for 2030 and 2040, and a series of 5-year carbon budgets. Carbon budget 3 for the period 2026-2030 requires Welsh Government to achieve a reduction in emissions of 58% below the baseline.

2.2.10 Powys County Council declared a climate emergency on 24th September 2020. This included an ambition to reduce its carbon emissions to net zero, in line with the Welsh public sector target of 2030.

2.3 Welsh Energy Legislation and Policy

2.3.1 Relevant Welsh legislation on the delivery of renewable energy projects includes:

- The Wellbeing of Future Generations (Wales) Act 2015 - primary legislation requiring all Wales's based public bodies to put long-term sustainability at the forefront of thinking and actions.
- The Environment (Wales) Act 2016 – which sets in place an obligation on Welsh Government to reduce greenhouse gas emissions by 80% against 1990 levels by 2050 (albeit now superseded).

[8] Emissions of Greenhouse Gases by year: https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Greenhouse-Gas/emissionsofgreenhousegases-by-year
[9] The Environment (Wales) Act 2016 (Amendment of 2050 Emissions Target) Regulations 2021
[10] https://gov.wales/climate-change-targets-and-carbon-budgets

- The Planning (Wales) Act 2015 – among the provision of which were the powers given to Ministers to determine strategic energy projects 10 - 50MW.
- The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) (Amendment) Regulations 2016 - amended so that all onshore wind generating stations above 10MW would be determined by Welsh Ministers.
- Wales Act 2017 – further enables Ministers (from 2019) to determine other (non-wind) onshore energy generating projects up to 350MW alongside specified new electricity distribution infrastructure up to 132kV.

2.3.2 Relevant Welsh Government policy includes Prosperity for All: A Low Carbon Wales[11] (June 2019), which seeks to cut emissions and increase efficiency in a way that maximises wider benefits for Wales, ensuring a fairer and healthier society. It sets out a hundred policies and proposals that seek to directly reduce emissions and support the growth of the low carbon economy. They include:

- Policy 26: which expands Welsh Ministers' decision-making remit for DNS from the upper limit of 50MW onshore to 350MW both on and offshore (excluding onshore wind, the consenting for which is already fully devolved).
- Policy 27: which removes battery storage from the DNS process.
- Policy 28: regarding the need for the UK Government to account for the continued operation of Aberthaw coal-fired plant on climate change targets (note this facility was closed in March 2020).
- Policy 29: to address the issue that the phasing out of coal could result in the temporary increase of gas powered generation to balance the Great Britain electricity system.
- Policy 30: to continue being part of the EU Emissions Trading System to the end of Phase III.
- Policy 31: to deliver the 2017 Renewable Energy Targets announced by the Welsh Government.

2.3.3 These policies have subsequently been delivered through other forms of legislation and policy, as summarised in this section.

2.3.4 Further relevant policy aims include a new aspiration for a further 1GW of renewable energy capacity by 2025 under the Ambition Statement of the Net Zero Wales Carbon

[11] Welsh Government (2019) Prosperity for All: A Low Carbon Wales

Budget 212 Significantly, the NZW contained a new aspiration for there to be an additional 1 GW of renewable capacity installed by 2025 and the published mid Wales regional energy strategy published by Welsh Government in 2021 which sets a vision "To achieve a zero-carbon energy system that delivers social and economic benefits, eliminates fuel poverty, better connects Mid Wales to the rest of the UK, and contributes to wider UK decarbonisation."[13]

2.4 Welsh Planning Policy

Future Wales – the National Plan 2040 (February 2021)

2.4.1 This constitutes the highest tier of the development plan against which the Proposed Development will be determined, stating that: "*As set out in legislation, applications for Developments of National Significance must be determined in accordance with Future Wales, which is the national development plan for Wales*."

2.4.2 It sets out a strategy for addressing key national priorities through the planning system, including achieving decarbonisation, climate-resilience and achieving net zero. It acknowledges the climate change emergency is actively changing our environment and directly affecting communities and emphasises its role as "an important lever to deliver the change we need".

2.4.3 The Plan states that:

"Wales can become a world leader in renewable energy technologies. Our wind resources and our support for both large and community scaled projects and a commitment to ensuring the planning system provides a strong lead for renewable energy development, ensure we are well placed to support this sector".

2.4.4 Future Wales restates the following ambitious targets for the generation of renewable energy:

- For 70% of electricity consumption to be generated from renewable energy by 2030.
- For one gigawatt of renewable energy capacity to be locally owned by 2030.
- For new energy projects to have at least an element of local ownership from 2020.

2.4.5 Relevant policies in the Plan include:

- Policy 17: which states that the Welsh Government strongly supports the principle of developing renewable and low carbon energy from all technologies and at all scales to meet future energy needs and to combat the climate emergency.

[12] https://gov.wales/net-zero-wales
[13] https://gov.wales/regional-energy-strategy-mid-wales

The Proposed Development is partially located within a Pre-Assessed Area for Wind Energy, where there is a presumption in favour of large-scale wind energy development, subject to the criteria in Policy 18. The Welsh Government has already determined (through modelling) that the landscape is capable of accommodating wind development in these areas in an acceptable way (an assessment based on 250m tip heights). Applicants are required to demonstrate the net benefits a scheme will bring in terms of social, economic, environmental and cultural improvements to local communities and the visual impact of new grid infrastructure is required to be minimised.

- Policy 18: which states that DNS applications for renewable and low carbon energy projects will be permitted subject to a range of detailed criteria. The Policy states:

  Proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance will be permitted subject to policy 17 and the following criteria:

  1. outside of the Pre-Assessed Areas for wind developments and everywhere for all other technologies, the proposal does not have an unacceptable adverse impact on the surrounding landscape (particularly on the setting of National Parks and Areas of Outstanding Natural Beauty);

  2. there are no unacceptable adverse visual impacts on nearby communities and individual dwellings;

  3. there are no adverse effects on the integrity of Internationally designated sites (including National Site Network sites and Ramsar sites) and the features for which they have been designated (unless there are no alternative solutions, Imperative Reasons of Overriding Public Interest (IROPI) and appropriate compensatory measures have been secured);

  4. there are no unacceptable adverse impacts on national statutory designated sites for nature conservation (and the features for which they have been designated), protected habitats and species;

  5. the proposal includes biodiversity enhancement measures to provide a net benefit for biodiversity;

  6. there are no unacceptable adverse impacts on statutorily protected built heritage assets;

  7. there are no unacceptable adverse impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic disturbance;

8. there are no unacceptable impacts on the operations of defence facilities and operations (including aviation and radar) or the Mid Wales Low Flying Tactical Training Area (TTA7T);

9. there are no unacceptable adverse impacts on the transport network through the transportation of components or source fuels during its construction and/or ongoing operation;

10. the proposal includes consideration of the materials needed or generated by the development to ensure the sustainable use and management of resources;

11. there are acceptable provisions relating to the decommissioning of the development at the end of its lifetime, including the removal of infrastructure and effective restoration.

2.4.6 The cumulative impacts of existing and consented renewable energy schemes should also be considered.

Planning Policy Wales (PPW), 11th edition (February 2021)

2.4.7 PPW 11 establishes the energy hierarchy for Wales and is a material consideration in the decision- making process for the Proposed Development. PPW enshrines the Welsh Government's targets for renewable energy and decarbonisation in planning policy and includes policy to deliver these. It seeks to reduce fossil fuel usage in energy generation but recognises the need for an appropriate mix of energy provision, which maximises benefits to the economy and communities whilst minimising potential environmental and social impacts.

2.5 Local Planning Policy

2.5.1 The policies in the adopted Powys Local Development Plan (LDP) (April 2018)[14] form part of the development plan hierarchy, of which Future Wales is the highest tier. In summary, the LDP provides a supportive context to the development of large-scale renewable energy and recognises that proposals over 10MW will be determined by the Welsh Government. Policy RE1 states that proposals for renewable energy development within or close to Strategic Search Areas (now superseded by the Pre-assessed Areas in Future Wales) will be permitted, subject to certain criteria. In summary the criteria are:

The proposals shall comply with all other relevant policies in the LDP (either on their own, cumulatively, or in-combination with existing, approved or proposed development);

[14] Powys County Council (2018) Powys Local Development Plan

Satisfactory mitigation shall be in place to reduce the impact of the proposal. Provision should also be made for the restoration and after-care of the land for its beneficial re-use;

Where necessary, additional compensatory benefits will be sought by agreement with applicants.

2.5.2 In April 2019, Powys County Council adopted Supplementary Planning Guidance (SPG)[15] on Renewable Energy to be read alongside the LDP policies. The SPG restates a commitment to renewables as a major policy objective and there is recognition that onshore wind will continue to offer the greatest potential to contribute a significant proportion of electricity generation to meet this aspiration. The spatial elements of the Development Plan and any SPG that is associated with it are required to be in accord with Future Wales as the latest expression of national planning policy on these matters.

2.5.3 The SPG includes advice on how LDP Policy RE1 should be applied, together with a section on the criteria for determining renewable energy schemes. It states that the planning considerations will vary relative to the scale of a proposal and the area characteristics, but it identifies the type of information that is likely to be requested by the Council.

2.5.4 Other considerations identified in the SPG include the need for conditions relating to the decommissioning and restoration of developments, opportunities for energy storage; and the need for a planning obligation to ensure operators achieve site restoration and any additional compensatory benefits.

2.5.5 In April 2019 Powys County Council published a Landscape SPG to supplement the LDP. This includes detailed guidance on the landscape considerations for development proposals and what needs to be submitted with applications to help with the determination process. It provides step-by-step processes for implementing Policy DM4 (Landscape) for development proposals outside of settlements. It emphasises that proposals should avoid sensitive landscapes and views, maintain distinctiveness/ sense of place and make a positive contribution to the locality. It also includes detailed guidance on how an LVIA for an EIA development should be undertaken, together with a schedule of the types of issues to be considered for wind energy proposals.

2.5.6 Two further SPGs[16] were adopted by the Council in July 2021 on archaeology and the historic environment. The archaeology SPG is aimed at all stakeholders involved in development proposals that may affect Scheduled Monuments or other archaeological

[15] Powys County Council (2019) Supplementary Planning Guidance on Renewable Energy

[16] Powys County Council 2021 https://en.powys.gov.uk/article/4907/LDP-Supplementary-Planning-Guidance-SPG

remains and sets out guidance on how archaeology should be considered when designing developments and when making planning decisions. The historic envrionment SPG is again aimed at stakeholders and Council Officers who are involved in development proposals that may affect Registered Historic Landscapes, Registered Historic Parks and Gardens or Listed Buildings, or sites or features contained on the Historic Environment Record.

3 Description of Proposal

3.1 Site Location

3.1.1 The Mynydd Lluest y Graig Energy Project is located in Powys, mid-Wales, to the west of Welshpool and Newtown and between the A458 and A470, as shown on Figure 1.

3.1.2 The Proposed Development is largely comprised of upland grazing land with commercial forestry at its south-western end. The altitude of the site ranges from approximately 320m to 425m at its most elevated points (at both the eastern and western ends). The upland landscape comprises a mix of areas of open moorland, mixed and mono crop coniferous forestry, marshy grassland, wet modified bog and improved agricultural grazing land. Figure 2, Site Boundary, shows the energy project boundary outlined in red, and an additional area of land hatched in orange, which is land which is likely to be used for access track and cabling to connect the two areas of the wider development boundary.

3.1.3 The closest large towns to the Proposed Development are Welshpool, approximately 16km to the east, Newtown, approximately 15km to the south-east and Machynlleth approximately 18km to the west.

3.1.4 The closest villages to the Proposed Development are Llanerfyl and Talerdigg, both approximately 5km from the site centre to the south-west and north east respectively. Numerous other villages and hamlets lie within 10km of the proposed development boundary, mostly located along and around the A458 and A470.

3.1.5 In terms of human settlement, the area immediately around the proposed development boundary is characterised by isolated dwellings and farmhouses located on, or accessed from, the minor C class road network, the primary spine of which is the C2031 running between Llanerfyl and Talerdigg.

3.1.6 As with the land within the proposed development boundary (Figure 2), the land within 10km of this is largely given over to grazing land and commercial forestry, the latter owned both privately and by Natural Resources Wales.

3.2 Nature and Purpose of the Proposed Development

3.2.1 The proposed energy project would generate renewable electricity from, principally, wind power alongside other energy generation and storage options under consideration, such as ground-mounted solar, energy storage, and hydrogen generation and storage. These forms of power, in contrast to many other conventional forms of electricity generation, do not produce waste, emissions to air, or contribute to global environmental

problems, and have the potential to reduce greenhouse gas emissions (GHGs) through the displacement of fossil fuel derived generation.

3.2.2 The potential energy project, if installed, would provide benefits in respect of:

- bringing about reductions in greenhouse gases associated with conventional power plant;
- contributing to renewable energy targets;
- installing a diverse energy generation plant which supports the security of UK embedded power production;
- allowing a useful income stream to the landowners thereby diversifying the activities on the farms; and
- providing regional and local economic and community benefits.

3.3 Site Identification

3.3.1 As described above, the Mynydd Lluest y Graig Energy Project has been formed by the amalgamation of two earlier wind farm proposals. The Applicant identified the application site through a previous site selection process undertaken by Nuon UK Ltd (later acquired by Vattenfall), which sought to identify development sites which are technically, environmentally and economically viable that also avoid areas of high environmental sensitivity.

3.3.2 Detailed desktop studies informed the initial understanding of technical and environmental constraints that were then examined further in a series of site visits and meetings with landowners and a range of interested stakeholders to inform preliminary wind farm designs for Mynydd Waun Fawr. In 2007 Nuon UK Ltd began assessing neighbouring land at Rhyd Ddu for wind farm suitability adopting the same methodology and both sites were taken forward into development as separate sites, and thereafter subsequently as a single scheme but which did not go forward to planning.

3.3.3 The Site also fell within the boundary of Strategic Search Area B (SSA B), identified within TAN8 in 2005 (now discontinued) and within the revised SSA B boundary identified by Arup on behalf of Powys County Council in 2008. As such the development site has strongly accorded with national spatial planning policy for wind power in Wales in the past two decades, which has influenced the site selection process.

3.3.4 The more recent delineation of the Proposed Development site as a pre-assessed area under Policy 17 of Future Wales is further testimony to the appropriateness of this area for wind energy development.

3.4 Design Approach

3.4.1 During the development phase of an energy project, the Applicant works within the framework of a Design Process. This process ensures that information relating to the site, such as environmental or technical constraints, are taken into account when finalising the project for design freeze, prior to an ES being drafted. This Design Process will be applied in the development stage through balancing consideration of the Applicant's commercial viability needs, the environmental conditions of the Proposed Development site and surroundings, and following the procedures recommended in guidance document *Design and Access Statements in Wales*, published by Welsh Government April 2017.

3.4.2 The Design Process necessitates that information is gathered from the relevant experts, such as civil and electrical engineering, wind resource, GIS, financial, aviation, generation, communications and health and safety. In addition, experts from other fields will contribute information relating to the site conditions and potential impacts. These experts would include, but may not be limited to, the disciplines of ecology, ornithology, hydrology, cultural heritage, noise and landscape and visual.

3.4.3 In addition to the internal Design Process inputs outlined above there will be ongoing dialogue with external stakeholders whose considerations may also influence some aspects of the project design and be accounted for as part the Design Process.

3.4.4 During the Design Process there may be several iterative steps that enable the information collected on the project to influence the design decisions. Initially, constraints will be collected in a GIS database and a preliminary desktop design and a site layout will be generated. Subsequently, EIA baseline survey work will be conducted and, at a suitable point, design workshops will be convened until such time as an initial Design Freeze is reached prior to the statutory pre-application consultation phase.

3.5 Transport Access to Proposal Site

3.5.1 For a project of this nature, many components and civils requirements will be transported to Site via standard articulated and heavy goods vehicles along the established highway network. Wind turbine generators, which are classed as abnormal loads, require detailed investigations of the feasibility of delivery to their destination due to the scale, length and weight of components prior to confirming whether the wind farm element of the energy project is technically viable.

3.5.2 It is anticipated that proposed wind turbine components would be delivered using specialist delivery vehicles from a port at either Ellesmere or Liverpool in the north of

England, which are proven turbine delivery points, and thereafter transported to the Site via the M53, A55, A483, A5, and A483. Currently, alternative transport access options for abnormal loads and construction traffic are under investigation.

3.5.3 Following confirmation of the likely preferred access routes, further detailed consultations with the Welsh Trunk Roads Agency and Powys Highways Authority will be conducted to identify critical access issues and reporting requirements for the EIA.

3.5.4 It is anticipated that a Construction Transport Management Plan (CTMP) will be prepared and submitted as part of the DNS application documentation.

3.6 Energy Project Infrastructure

Wind Energy

3.6.1 The Applicant expects to power the Site with three bladed horizontal axis wind turbines each with a power rating of up to 7.5MW. The wind farm element will comprise up to 16 turbines, resulting in a total installed capacity of up to 120MW. The turbine parameters to be used for the purposes of the assessment assume a hub height in the region of 114m and a rotor diameter of up to 175m; an overall blade tip height envelope of up to 200m is assumed.

3.6.2 Other infrastructure items which are expected to be included in the development proposal include:

- creation of new transport access entry point to the development site;
- turbine foundations;
- crane hard-standing areas at each turbine location and turning heads;
- associated low to medium voltage transformers at each turbine base;
- a series of on-site access tracks linking site infrastructure;
- a network of buried electrical cables (likely to follow the route of on-site tracks);
- a sub-station compound containing a control building and outdoor equipment, including high voltage transformer and switchgear, located on a levelled foundation platform;
- an energy storage facility comprising containerised battery units on a levelled foundation platform;
- ground-mount solar photovoltaic (PV) arrays in suitable locations across the site;
- potential hydrogen production and storage facility on a levelled foundation platform;
- 2 free-standing meteorological masts;
- borrow pits (for the extraction of stone on site); and

- temporary construction compounds.

3.6.3 Turbine foundations will be formed in excavations of approximately 4m depth, depending upon localised ground conditions and the depth to suitable load bearing ground. the preferred foundation design is gravity-based, but this will be subject to detailed design considerations following geotechnical investigations of each of the turbine bases, should the project secure consent.

3.6.4 The foundations will be steel reinforced octagonal tapered concrete foundations up to 26m diameter. Larger working areas around the foundations, dependent on localised ground conditions, will be required for construction purposes. Prior to excavation, topsoil (and in particular peat, where this is present) and existing vegetation will be lifted and carefully stored. After completion of the foundation works, they will be backfilled with excavated material and vegetation will be reinstated.

3.6.5 It is likely that the concrete for turbine foundations and other site infrastructure will be brought in from off-site being sourced as locally as possible; on-site concrete batching will be considered.

3.6.6 Crane hardstandings are required to provide a stable bearing surface for the mobile cranes required for turbine erection. Two cranes are typically used and the hardstanding specifications vary between turbine manufacturers; however they will typically require an area of approximately 75m by 45m and are formed by excavating and infilling with compacted stone.

3.6.7 Existing tracks within the proposed development boundary will be utilised wherever reasonably practicable for construction and on-going turbine access and servicing after commissioning. New and upgraded tracks will provide the required access between the site entrance, turbines and the other infrastructure. They will typically have a running width of 5m, widening at bends, and will have turning heads and passing places where required. Track verges will be reinstated after construction.

3.6.8 Transformers are required to increase the voltage at which the turbines generate (typically 690V) to 33kV in order to prevent excessive losses in the on-site cabling. The transformers will be located externally in cabins at the base of each turbine.

3.6.9 The turbines will be connected to the site sub-station by means of 33kV on-site cabling. These cables will be laid underground in trenches, in most cases running adjacent to the site tracks; in the same manner as the foundations these trenches will be backfilled with excavated material and have the original vegetation reinstated.

3.6.10 The 33kV electrical cabling will terminate at the site sub-station compound, comprising switchgear and transformers to increase the voltage to 132kV for export on the electricity network owned by the Distribution Network Operator (DNO).

3.6.11 The area required for the onsite sub-station will be approximately 75m x 75m and will accommodate a control building and basic welfare facilities. Typically, the control building will be approximately 30m x 15m x 7m high and finished in an appropriate vernacular design.

3.6.12 The 2 free-standing meteorological mast(s) will be of a steel lattice construction and will accommodate anemometers and wind direction vanes at various heights up to and including the turbine hub height.

3.6.13 Borrow Pits will be required to provide stone for various purposes, but primarily track and hardstanding construction. The number and size of borrow pits will be determined through site investigation and, within the constraints of acceptable environmental impact and available stone quality, the Applicant will endeavour to source adequate stone for construction purposes from within the proposed development boundary.

3.6.14 Temporary construction compounds will be required to house temporary portacabins to be used for site offices and welfare facilities; store fuels, tools, small parts and materials required during construction; provide parking space for cars and construction vehicles and a receiving area for incoming vehicles; and refuel construction vehicles. The largest of these will be up to approximately 75m x 50m, although the majority will be smaller than this.

Ground-Mounted Solar

3.6.15 Opportunities for the deployment of ground-mounted solar photovoltaics (PV) will also be explored across the development site on land that has both a low environmental and agricultural value. The solar arrays would also be expected to be located out with the shadow zone of the wind turbines in order to reduce any losses associated with loss of solar irradiance through blade sweep.

3.6.16 Where viable and acceptable locations for solar arrays exist, these will be incorporated in the details of the Proposed Development set out in the DNS application and will be subject to EIA.

Energy Storage

3.6.17 Energy storage, often in the form of large scale battery units, is emerging as an important complementary medium to wind and solar generation. Storage can be used both to store energy generation in times of excess production relative to grid availability, and also to

act as a grid balancing measure that enables storage of power from the grid for release at a required period, thereby providing a 'security buffer' to cope with supply and demand events.

3.6.18 Typically, the energy storage facility is located adjacent to the on-site substation compound and houses battery storage components contained in sealed units, similar to shipping containers, alongside air conditioning systems and an electrical and maintenance room. Storage facilities would be sited on concrete upstands although the area required for the on-site energy storage facility is not yet determined. The storage facilities would require safety fencing to ensure the protection of stock and the public.

3.6.19 Details of the energy storage element of the Proposed Development will be set out in the DNS application and will be addressed within the EIA and included in the pre-application consultation. Vattenfall currently operates the Pen y Cymoedd Wind Farm and Battery Storage project in south Wales, where a similar arrangement is in operation. The project utilises lithium-ion batteries housed in shipping container units and the wind farm and the battery storage facility share grid infrastructure so that the batteries can either be powered by the wind farm, or directly from the grid. Following is an illustration of the battery units at the wind farm project:

Plate 1: Battery storage units at Pen y Cymoedd

Green Hydrogen

3.6.20 The Applicant is investigating the potential to provide facilities within the Proposed Development site for green hydrogen production and storage. Hydrogen generation through an off-take arrangement with the energy project at times of high production or grid curtailment, or through drawing from the grid when the wind is low, is now technically viable and offers opportunities for more balanced power provision to the grid

and an alternative fuel source for heating and transport. It is assumed that a sufficient source of water would have to be available for this option to be taken up, whether extracted on-site or transported in. Such potential requirements will be assessed in the relevant scopes of work within relevant EIA chapters.

3.6.21 Through electrolysers, electricity is used to split water into hydrogen and oxygen. This technology is well developed and available commercially, and systems that can efficiently use renewable power—for example, wind and solar—are being developed and deployed across the world. Thereafter the hydrogen is stored and supplied as a potential transport fuel or heating source with local end users.

3.6.22 Typically, the hydrogen facility will be installed on a solid foundation and would comprise several containerised electrolysers, a water treatment centre and storage tanks, along with an electrical connection to the on-site substation. Vehicle manoeuvring areas are also required within the fenced facility for incoming and outcoming specialised containerised transporter vehicles to convey the hydrogen, in pressurised from, to the end-users. For this scale of development, hydrogen production facilities in the range of 10 – 30MW are increasingly viable. An illustration of a typical hydrogen production and storage facility is shown below:

Plate 2: Illustration of Hydrogen Production and Storage Facility

3.6.23 The principal emission from an operational hydrogen production facility is oxygen, which can be harnessed and stored for other commercial purposes. There are no other operational emissions. Environment permitting and hazardous substances consent – to ensure the environmental protection and safety aspects of hydrogen facilities – are additional regulatory requirements the Applicant will be required to secure prior to commencement of the operation of the facility.

3.6.24 Preferred areas for the siting of hydrogen facilities, if included in the development proposal at the time of submission, will be identified on plans, and the process of production and storage will be described and assessed within the EIA. In addition, the transport movements associated with the operational phase of the project, inclusive of transporters for the hydrogen fuel, will be assessed within the transport assessment (see Section 10).

3.7 Detailed Plans and Programme

3.7.1 The location of all generation and storage infrastructure will be clearly identified for the development application in the form of suitably detailed plans with grid coordinates for each element, and unless particular environmental or technical constraints dictate otherwise, a micro-siting tolerance of up to 50m will be sought for all energy infrastructure.

3.7.2 Prior to commencement of the Proposed Development, it is expected that details of the compliance requirements stipulated by planning condition, such as construction methods, transport access, and environmental management details, will be agreed with relevant stakeholders. Any modifications to the detailed plans will be agreed with Powys CC prior to commencement.

3.7.3 The construction period is likely to be up to 30 months, including time required for tree felling and for ground clearance and preparation. The principal construction activities (in likely order of works) will include, but not be limited to, the following:

- Highway improvement works;
- Felling;
- Site entrance construction;
- Construction of temporary construction compound(s);
- Existing track upgrades and new track construction;
- Construction of turbine foundations and associated hardstandings;
- Construction of onsite substation and associated control building;
- Construction of meteorological mast(s);

- Cable laying;
- Delivery and erection of wind turbines;
- Delivery and installation of additional energy infrastructure;
- Connection of electrical cables;
- Commissioning of site equipment; and
- Site demobilisation and restoration.

3.7.4 Some activities will be carried out concurrently in order to reduce the construction time period where possible, and restoration will be carried out as early as the construction process allows.

3.7.5 A clear indication of the overall construction period, and that of the component activities outlined above, will be provided in the ES.

3.8 Consideration of Alternatives

3.8.1 The Applicant is pursuing development of a portfolio of renewable energy and energy storage projects across the United Kingdom, both on- and off-shore. Mynydd Lluest y Graig is one such development site that was, as explained above, identified as two separate schemes in about 2008. Following the spatial guidance under Technical Advice Note 8 in 2008 theses schemes were located within SSA B, and the applicability of the development site for large scale renewables has been proven more recently through its inclusion with the Pre-Assessed Area[17] 4 in Future Wales. For these reasons, the selection of this development site is shown to be an appropriate location for large-scale wind energy generation, and evidence of a more detailed site selection procedures should not be necessary in the EIA.

3.8.2 Details of the alternative designs considered for this development scheme, including the location and scale of energy infrastructure, alongside a description of the evolution of the design in response to site-specific, environmental and amenity factors, will be presented in detail in the ES.

3.9 Mitigation and Net Gain

3.9.1 The mitigation of potentially adverse effects arising from the Proposed Development will, in the first instance, be inherent in the iterative design process followed during the Environmental Impact Assessment. Historic data from the previous proposals and new baseline data will provide constraints to, and opportunities for, the location of all energy

[17] Areas where there is a presumption in favour of large-scale onshore wind energy development and the associated landscape change subject to the criteria in Future Wales Policy 18.

project infrastructure. This, along with the technical constraints and requirements of the wind turbines and other energy requirements, will be used to position each of the energy project infrastructure elements to reduce environmental impacts as required. The relative importance of each environmental constraint will be balanced with other salient issues, such as the ability to develop designs which can be constructed safely, and detailed proposals discussed with the relevant consultees in order to arrive at a final design which minimises environmental impacts as far as is reasonably possible.

3.9.2 Where significant environmental impacts are still predicted to occur, site specific mitigation techniques, consistent with industry best practice will be developed in order to mitigate these.

3.9.3 Pertinent environmental enhancement programmes, such as with biodiversity, peat or archaeology, will be developed in conjunction with consultees that will seek to provide a net environmental benefit to the assets within the proposed development boundary in line with Criteria 5 of Policy 18 of Future Wales.

3.10 Cumulative Assessment

3.10.1 The location of the Proposed Development within mid Wales will mean it is situated in a landscape with other wind farms, both within the planning system, consented and operational, with which potentially significant cumulative effects could reasonably be expected to occur. Relevant developments will be identified with the relevant advisors at PCC and NRW for the purposes of the relevant topic-specific assessments, and at an advanced stage of the EIAs the cumulative baseline will be confirmed with these stakeholders.

3.10.2 There is a complex cumulative wind farm landscape in planning and EIA terms which will evolve during the development and EIA stages of the Mynydd Lluest y Graig Energy Project proposal prior to application for consent. Accordingly, the Applicant and EIA team will stay abreast of all relevant energy and wind farm development within Powys, Ceredigion and Gwynedd and reflect an up-to-date cumulative situation accurately within the final DNS submission.

3.10.3 In order to be able to do this effectively the Applicant will seek to agree with the relevant consultees a cut-off date beyond which no further developments (e.g. revision to layouts, refusal, granting of consent, etc.) amongst other wind farms will be taken into account within the cumulative assessments of the various relevant chapters of the ES.

3.10.4 The way in which cumulative assessment will be dealt within each ES chapter is described in the relevant topics below.

3.11 Grid Connection

3.11.1 The grid connection infrastructure will not be included within the application for planning permission for the MLyG Energy Project. Separate consents under the Electricity Act 1989 (for transmission) and the Developments of National Significance (Wales) Order 2016 (for distribution sub-132kV) will be required for connection of the scheme to the electricity network.

3.11.2 Currently, there is some uncertainty over the future of national transmission upgrades in the mid-Wales area that will enable the connection of energy projects in the pre-assessed area and beyond. As such, sufficient details to inform a detailed environmental impact assessment are not available, and as such any attempt at assessment would be inaccurate and of limited applicability to the decision-making process. Accordingly, the Applicant proposes to include indicative information on the grid routing and likely infrastructure, along with a high level evaluation of effects, both in isolation and cumulatively with other wind farm and grid connection infrastructure in the region.

3.11.3 Planning consent for the grid connection will be the responsibility of the relevant Distribution Network Operator, Scottish Power Energy Networks (SPEN), and National Grid Electricity Transmission (NGET). Assurance will be provided of the environmental impacts of the grid connection infrastructure through the NGET / SPEN planning applications for electrical connection under consenting regimes relevant to the scale of the connection.

4 Environmental Baseline and Potential Significant Environmental Effects

4.1 Introduction

4.1.1 In the following sections overview details of the general environmental characteristics of the site and its surrounds are described. Such baseline details are drawn from the previous studies into the site. Arising from the identification of the baseline factors, the principal environmental disciplinary matters are identified that have the potential to be significantly affected by the proposed development. A description of the methods to be employed in the assessment of potential significant effects is presented, along with details of any salient guidance or best practice in addressing and mitigating such effects.

4.1.2 Each topic section is also structured to present the general approach to surveys to establish the environmental baseline for the site area, the typical impacts associated with this form of development (during the construction, operation and decommissioning phases of the Proposed Development) and how predictions of effect are to be undertaken. Information is also provided on initial features or sensitivities that may be relevant to each environmental discipline e.g. landscape, ecology etc. It is proposed that the methodologies of assessment to be applied would follow those typically used for wind energy schemes, details of which are presented under each heading.

4.1.3 Each ES assessment chapter will identify the potential impacts of the Proposed Development during the construction, operation and decommissioning phases and will identify robust mitigation for such potential impacts as and when appropriate. As well as identifying likely significant impacts, each will set out whether those impacts are positive or adverse, and explain how these conclusions are arrived at.

5 Landscape and Visual Amenity

5.1 Introduction

5.1.1 A Landscape and Visual Impact Assessment (LVIA) of the Mynydd Lluest y Graig Energy Project will be conducted by an accredited landscape architect with energy project experience.

5.1.2 The landscape and visual assessment will define the existing landscape and visual baseline environments; assess their sensitivity to change; describe the key landscape and visual related aspects of the proposed development; inform the design of the energy project proposal; describe the nature of the anticipated change upon both the landscape and visual environments; and assess the magnitude and significance of the changes for the construction, operational and decommissioning stages.

5.1.3 A study area of 35km radius from the site boundary is proposed, as agreed previously with PCC and NRW following consultation on previous proposals for the site in 2014/15 and informed by a zone of theoretical visibility (ZTV) for the proposed energy project (see Figure 3). A cumulative search area will be agreed with the statutory consultees.

5.2 Policy and Relevant Guidance

Legislation and Policy

5.2.1 Under the *European Landscape Convention*[18], the importance of all landscapes is identified and greater attention to the care and planning in all landscapes is supported to manage change and ensure a forward-looking approach to management. The Convention identifies that every landscape forms the setting for the lives of local people, and the quality of those landscapes can affect everyone's lives.

5.2.2 The Convention does not advocate the same measures and policies for all landscapes. Instead, it encourages approaches that are adaptable to particular landscape types and which respond to their unique characteristics. The United Kingdom is a signatory to the Convention, signed originally in 2006 and UK guidance on conducting landscape and visual studies has been informed and guided by it.

5.2.3 Welsh Government published the NDF for Wales, titled *'Future Wales: The National Plan 2040'*, at the end of February 2021. This is the highest level of development plan within Wales and sets out the key policy direction for the future

[18] https://www.coe.int/en/web/landscape

5.2.4 The key policies of the NDF in relation to large scale wind energy proposals (over 10 MW) are policies 17 and 18, which are described in Section 3 of this Report. The intent of these policies is to support of renewable energy projects and in particular large scale projects which are determined by the DNS process. Particularly, there is a presumption in favour of large scale wind energy development in the 'Pre Assessed Areas [PAAs) for wind developments', subject to the provisions of policy 18. This proposed Development is located entirely within Pre-assessed Area 4 for wind energy. For development within the PAAs there is an implicit acknowledgement that 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. There is a presumption in favour of large-scale wind energy development (including repowering) in these areas, subject to the criteria in policy 18*."

5.2.5 *Planning Policy Wales* (PPW) sets out the land use planning policies of the Welsh Government and is supported by a number of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters. These documents together form the national planning policy framework for Wales and are a material planning consideration in the planning process. PPW aims to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales.

5.2.6 The *Powys Local Development Plan* (LDP) 2011-2026 was adopted in April 2018 is supported by Supplementary Planning Guidance (SPG): Landscape (adopted April 2019) and SPG: Renewable Energy (adopted April 2019). Details of these policies are presented in Section 2.

Guidance and Best Practice

5.2.7 The LVIA will follow recognised best practice including:

- Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment (3rd Edition) (GLVIA3);
- Scottish Natural Heritage (2017) Visual Representation of Windfarms: Guidance (Version 2.2);
- Scottish Natural Heritage (2012), Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments;
- Scottish Natural Heritage (2017) Siting and Designing Windfarms in the Landscape (Version 3a);

- Landscape Institute (2019) Technical Guidance Note 06/19: Visual Representation of Development Proposals;
- Landscape Institute (2021) Technical Guidance Note 02/21: Assessing landscape value outside national designations;
- Landscape Institute (21019) Technical Guidance Note 02/2019: Residential Visual amenity assessment (although mainly relevant to section 4.3 below);
- Natural Resources Wales (2021) Using LANDMAP in Landscape and Visual Impact Assessments GN46; and
- Natural England (2014) An Approach to Landscape Character Assessment.

5.2.8 Section 2 of this Scoping Report sets out the planning policy framework that is considered of relevance to undertaking the EIA for the proposed Mynydd Lluest y Graig energy project. The LVIA will, among other things, reference those topic specific policy or advice notes of relevance to this technical discipline of the EIA.

5.3 Assessment Methodology and Significance Criteria

5.3.1 The Applicant will seek to agree the detailed assessment methodology with PCC and NRW, building on the level of agreement reached on many aspects of the methodology following consultation on previous proposals for the site in 2014/15. In summary the methodology will follow the following stages:

- Consultation with relevant parties including PCC and NRW to reconfirm agreement to the assessment methodology, the scope of the assessment, the extent of the study and cumulative search areas and relevant schemes to include, the number and location of both specific and representative viewpoints to be utilised within the assessment, and the scope of the cumulative assessment. The 36 viewpoints and study area previously agreed (see Annex 1) in connection with the NSIP scheme would form the starting point in terms of re-starting consultation with PCC and NRW on applicable, representative viewpoints. It should be noted that the previously agreed list of viewpoints included several that are clustered and therefore duplicate similar views from similar locations, which the applicant will seek to renegotiate post Scoping;
- Consideration of those planning policies from national to local levels pertinent to landscape and visual issues;
- Baseline assessment, site survey, viewpoint photography and identification of the sensitivity of all receptors, both landscape and visual;

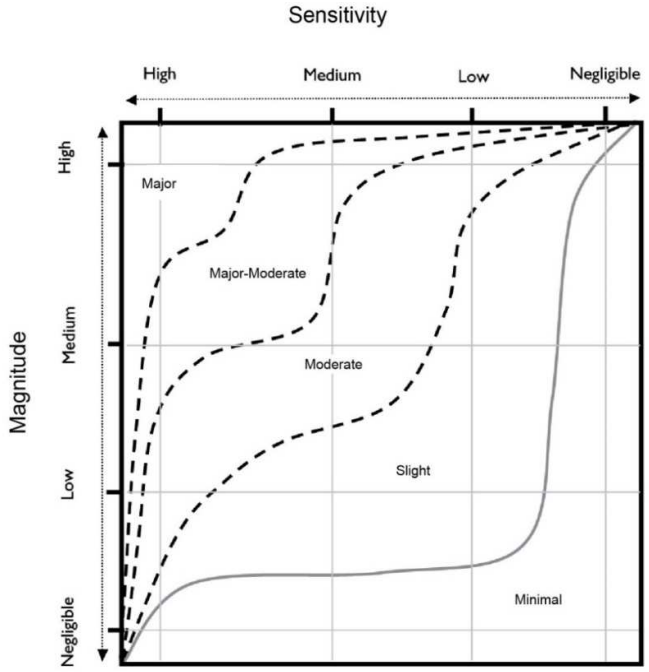
- Design iteration and amendment of scheme to ensure embedded mitigation by design. This will include a consideration of turbine layouts, lighting proposals, associated ancillary equipment, access tracks, areas of hardstanding and substations;
- Assessment of effects upon the landscape character and visual amenity (including in relation to residential properties - see Section 4.3) for the construction, operation and decommissioning stages of the development, including consideration of night-time effects.
- The assessment will:
  - Identify the magnitude and significance of effects upon the landscape character, designated and recreational landscape and the existing visual environment;
  - Determine whether each identified effect is positive, neutral or adverse using an informed professional judgement; and
  - be supported by accompanying plans and graphics.
- Recommendation of further mitigation measures where appropriate;
- Assessment of residual effects; and
- Assessment of all cumulative effects, including cumulative ZTV production and wireframe visualisations as part of the baseline panorama for each viewpoint. This will include discussion with PCC and NRW to reach agreement on the cumulative scope and the identification of which wind developments (e.g. single turbines) can be scoped out of the assessment allowing the cumulative assessment to clearly focus upon potentially significant cumulative effects.

5.3.2 The process of forming a judgement of significance of impact is based upon the assessment of the magnitude of the impact and the sensitivity of the receptor, in order to come to a professional judgement of how important an impact is. The assessment will determine the level (and significance) of landscape and visual effects with reference to the nature of the receptor (commonly referred to as the sensitivity of the receptor), which considers both susceptibility and value, and the nature of the effect (commonly referred to as the magnitude of effect), which considers a combination of judgements including size/scale, geographical extent, duration and reversibility.

5.3.3 Sensitivity is rated within the range of High-Medium-Low-Negligible and is assessed by combining the considerations of susceptibility and value (as defined within GLVIA 3). Magnitude is also rated within the range of High-Medium-Low-Negligible and is assessed by combining the considerations of scale, duration and extent of impacts (as defined within GLVIA3). Full details of the proposed methodology for ascribing sensitivity and

magnitude will be set out and agreed with relevant statutory stakeholders at the commencement of the assessment. A glossary of terminology will be provided within the submitted LVIA ES Chapter.

5.3.4 The judgement of significance is illustrated by the diagram below:



5.3.5 Impacts that are Major-Moderate or Major are considered to be potentially significant. Impacts of Moderate significance or less are *"of lesser concern"* (GLVIA 3, para 3.35). It should also be noted that whilst an effect may be significant, that does not necessarily mean that such an impact would be unacceptable, or should necessarily be regarded as an *"undue consequence"* (GLVIA 3, para 5.40).

5.4 Potentially Significant Effects and Approach to Mitigation

Baseline

5.4.1 The landscape baseline will be established by reference to the LANDMAP database and original fieldwork. All 5 spatial datasets (Geological Landscape, Landscape Habitats, Visual and Sensory, the Historic Landscape and the Cultural Landscape), will be used, with reference to mapped aspect areas, and their published Collector survey records. The visual and sensory description for the aspect area which includes the majority of the site states that the area is: *"An extensive area of upland grazing with a patchwork vegetation cover of rough grazing, heather and bracken, irregular field patterns running with the topography and intermittent small blocks of coniferous and mixed woodland. Exposure*

and wind are dominant features with isolated more intimate areas with small irregular hedged fields in sheltered areas to the edge of the area."

5.4.2 In addition to the NRW LANDMAP database, information regarding Snowdonia National Park will also be referenced.

5.4.3 The visual baseline is influenced by the location of the site within a landscape dominated by upland moorland and forestry plantation in an otherwise featureless upland landscape. Views are generally elevated and open in nature, allowing long panoramic views of the surrounding countryside against the backdrop of the Cambrian mountains. The study area is generally sparsely settled, with the key transport routes through the study area including the A458 and A470.

5.4.4 Visual effects would be assessed for groups of visual receptors within close proximity of each other that are judged to experience similar visual effects arising from the proposed development. These will be referred to as 'visual receptor groups' and would include motorists on local roads, users of rights of way and local residents/visitors to settlements.

5.4.5 There are a number of operational wind farms within the locality of the Site. The closest include:

- Tirgwynt Wind Farm, approximately 1km to the south (12 turbines);
- Mynydd Clogau wind farm approximately 5km southeast (17 turbines);
- Carno A and B wind farm approximately 5km to the southwest (56 turbines);
- Carno Extension wind farm, approximately 5km to the southwest (12 turbines); and
- Mynydd y Cemmaes approximately 8km to the west (18 turbines).

5.4.6 It is further noted that the Llanbrynmair Wind Farm was approved in January 2021.

5.4.7 These will be considered as part of the baseline environment in accordance with best practice, with schemes under construction or approved but not yet constructed considered as future baseline, subject to the date of the planning submission. The final baseline of cumulative sites for assessment purposes will be agreed with PCC.

5.4.8 Snowdonia National Park is located approximately 8.5km to the north west of the site. In addition, the Brecon Beacons National Park is located approximately 24.6km to the south east and the Clwydian Range and Dee Valley AONB is located approximately 33km to the north east. Effects on the Snowdonia National Park will be considered in the LVIA. The ZTV shows very limited visibility from either of the AONBs, so effects on these designations are unlikely to require full assessment.

Design Mitigation

5.4.9 During the design process for the proposed Development, the advice and guidance of the landscape assessor will be drawn upon to inform the overall design and layout of the energy project.

5.4.10 The aim from a landscape and visual perspective will be to avoid or minimise harmful impacts to the landscape and visual receptors, and achieve a consistent scale of scheme that is well-balanced in composition overall. This includes seeking to ensure that no turbine is too dominant or overwhelming in the main view from a property, such that it could result in unacceptable living conditions.

Impact prediction and mitigation

5.4.11 The initial ZTV for the proposed development indicates that visibility would be greatest within approximately 10km of the proposed development, extending to approximately 15km to the north east. Beyond this area, isolated areas of potential visibility are indicated to the north within Snowdonia National Park. To the south east, areas of potential visibility are indicated between the site and the Brecon Beacons National Park. However, many of the existing wind farm developments to the south of the site would already be visible in these views, closer to the areas of potential visibility.

5.4.12 The principal effects to landscape character that could occur as a result of the development are:

- Loss of features such as forestry plantation or open moorland that contribute to the landscape character within the site;
- Introduction of additional features to the landscape such as turbines and access routes;
- A direct change to the landscape character of the site; and
- Indirect change to the characteristics of the surrounding landscape.

5.4.13 The assessment of effects will consider the effects to landscape character based on the approach taken in the 'Using LANDMAP in Landscape and Visual Impact Assessments' guidance note and GLVIA 3 and through the confirmed findings of the fieldwork and reconnaissance. Given the reduction in visibility indicated on the initial ZTV beyond approximately 15km, only those LANDMAP aspect areas within 15km of the Site are included in this assessment, as beyond 15km they will not experience more than Negligible effects on character given the reduction of effects with distance alongside the existing pattern of wind farm development.

5.4.14 The principal visual receptors that could be affected by the proposed development are:

- Scattered private dwellings and farmsteads;
- Walkers on Glyndŵr's Way National Trail;
- Users of local Public Rights of Way (PRoW) and open access land;
- Residents at Llanbrynmair and Llanerfyl;
- Receptors using local minor roads;
- Receptors on the A470 and A 458; and
- Receptors on the Newton to Machynlleth railway line.

5.4.15 Effects on visual receptor groups will be assessed through the use of representative and (where appropriate) specific viewpoint locations. The viewpoints will be agreed with Powys County Council and NRW as part of the detailed post-Scoping consultations.

5.4.16 Effects on the special qualities of Snowdonia National Park will be considered within the LVIA. Given the limited visibility indicated within both the Brecon Beacons National Park and the Clwydian Range and Dee Valley AONB, combined with the location of existing wind farm developments between the Brecon Beacons and the site, it is not considered that any significant effects would be experienced on these designations, and it is not considered that a full assessment of effects will be required.

5.4.17 Site assessment, ZTV analysis, and wireframes will inform the assessment. Photomontages will be used to illustrate the appearance of the proposed windfarm in the landscape and in views. The assessment of effects will take account of the susceptibility and value of receptors, and thus sensitivity, and the magnitude and duration of effects. A judgement on the significance of identified effects will be given.

5.4.18 The scheme design is not yet fixed. The final layout will be informed by consideration in terms of landscape and visual effects and potential effects on residential visual amenity (see Section 4.3), in line with policy as set out by Planning Policy Wales (Edition 11). Given the nature of the development proposals, mitigation by design is important in seeking to reduce any potentially adverse effects upon the landscape and visual resource that might potentially occur.

5.4.19 The assessment will focus on operational effects as these are occur for the longest period of time and will be the most significant in landscape and visual terms. However, some effects may also occur during the construction and decommissioning phase such as the loss of vegetation or movement of construction traffic. Mitigation measures may be suggested and deployed where appropriate to reduce these where possible.

Cumulative Assessment

5.4.20 The cumulative search area will be agreed with PCC and NRW.

5.4.21 In terms of selecting which other wind farm/turbine proposals within the search area should be included, SNH Guidance 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (March 2012) advises that:

"An assessment of cumulative impacts associated with a specific development proposal should encompass the effects of the proposal in combination with:

- *existing development, either built or under construction;*
- *approved development, awaiting implementation; and*
- *proposals awaiting determination within the planning process with design information in the public domain. Proposals and design information may be deemed to be in the public domain once an application has been lodged, and the decision-making authority has formally registered the application."* [para. 26] - note that this category also includes recently refused applications which may yet be appealed.

5.4.22 Schemes which are in scoping will also be noted, but will not be included within the assessment unless they become active applications before the Mynydd Lluest y Graig application is submitted, with the exception of schemes where reliable information is available with respect to the scheme design, and the application is known to be imminent.

5.4.23 The cumulative assessment will examine the same groups of landscape and visual receptors as the assessment for the main scheme. The assessment will be informed by cumulative ZTVs, showing the extent of visual effects of the schemes in different colours to illustrate where visibility of more than one development is likely to arise. Cumulative schemes will be shown as part of the baseline panorama for each viewpoint and will clearly identify each scheme and their planning status.

5.4.24 In addition, the effects on users of routes through the area, from which wind farms may be sequentially visible as one passes through the landscape, will also be considered. This assessment is based on the desk study of ZTVs and aerial photography, and site visits from travelling along the routes being assessed.

5.4.25 Operational, under-construction and permitted wind farms will be treated as being part of the landscape and visual baseline as prescribed by SNH guidance.

5.4.26 The way in which the assessment will be described and presented will be tailored proportionally to convey to the reader the likely significant effects, in line with the SNH and LI/IEMA guidance.

5.4.27 A list of schemes and viewpoints will be agreed with PCC and NRW during and following the scoping process. It is proposed that single turbines of <50m blade tip will be considered where they lie within 3km of the site; and single turbines of <80m blade tip within 5km of the site.

5.5 Residential Visual Amenity

5.5.1 The visual amenity component of residential amenity will be assessed as a separate but related aspect to the LVIA, as recognised by GLVIA3.

Policy and Relevant Guidance

5.5.2 Guidance on the preparation of residential visual amenity assessments (RVAA) is provided in Landscape Institute Technical Guidance Note 02/2019 - Residential Visual amenity assessment (LI TGN 02/19).

Assessment Methodology and Significance Criteria

5.5.3 Energy projects including wind turbines are generally regarded as being a form of development for which it is appropriate to undertake a residential visual amenity assessment, as the scale of development is such that the turbines may lead to effects being perceived as 'overbearing' or 'overwhelming' that could exceed the Residential Visual Amenity Threshold as set out within Residential Visual Amenity Assessment Guidance (LI TGN 02/19). This is defined as where visual effects are *"of such nature and / or magnitude that it potentially affects 'living conditions' or Residential Amenity"*.

5.5.4 A study area of 2km is proposed, subject to agreement with PCC. Each property within the study area will be assessed on site from publicly accessible points, and via a review of aerial photography, so that the orientation of windows and gardens towards the energy project and the degree of screening from intervening buildings and vegetation can be taken into account, along with the extent and nature of fenestration. This will enable a judgement to be formed as to whether the visual amenity will be affected to the degree that the Residential Visual Amenity Threshold is exceeded.

5.5.5 The RAA will, as appropriate, include a detailed ZTV analysis and accompanying plans, including photography, vision splays and identification of key windows, how the dwelling sits in the garden, and its approach. This will aid the assessment, informing the locations within the garden and number of rooms for each residential receptor with potential visibility of the proposed development, as well as the angle of these views.

Potentially Significant Effects and Approach to Mitigation

5.5.6 There are approximately 64 isolated dwellings and farmsteads scattered within the surrounding environment that may have views of the proposed development. See Figure 4 for the location of these properties.

5.5.7 Should there be potential for the proposed Development to result in effects to residential amenity, a Residential Visual Amenity Assessment (RVAA) will be conducted to establish if and where there is potential for the Residential Visual Amenity Threshold to be exceeded. The potential cumulative effect of cumulative schemes will also be considered as part of the RVAA.

6 Ecology and nature conservation

6.1 Introduction

6.1.1 The ecology and nature conservation chapter of this scoping report has been prepared following the Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017). *"Preliminary Ecological Appraisal (PEA) is the term used to describe a rapid assessment of the ecological features present, or potentially present, within a site and its surrounding area (the zones of influence, or ZOI) in relation to a specific project."* In this case, the specific project is the Lluest y Graig Energy Project and the ZOIs are specified for each ecological receptor identified.

6.1.2 To prepare this chapter a series of desk and field tasks were completed that provide a relatively well-defined baseline. This has been used to:

- Identify the likely ecological constraints associated with the energy project;
- Identify any mitigation measures likely to be required, as far as practically possible given the potential for further design evolution of the energy project layout;
- Identify additional surveys that may be required to inform the full EcIA; and
- Identify the opportunities that the project offers to delivery ecological enhancement.
- The Ecological Impact Assessment (EcIA) of the Lluest y Graig Energy Project on flora and fauna will be conducted by an accredited, competent ecological assessor with extensive experience in the wind energy sector. Birds/avian fauna are considered separately under Section 7 Ornithology below.

6.2 Policy and Relevant Guidance

6.2.1 Nature conservation policy in Wales is implemented through a series of areas, habitats and species designated under legislation from international to local level. In relation to the majority of significant habitats and protected species, key legislation and policy relevant to the protection, conservation and enhancement of nature conservation interests associated with the ecological study area is outlined in Table 6.2.

Table 6.2.1: Relevant legislation and planning policy - Ecology

Scale	Legislation/ Planning Policy	Description
International	The Conservation of Habitats and Species Regulations 2017 (as amended) – The Habitats Regulations	This legislation transposed the Habitats Directive (European Directive 92/43/EEC) into Welsh and English law during the period where the UK was a member of the European Union. Following the implementation of Brexit, the legislation is enacted into UK law, ensuring continued protection of all

Scale	Legislation/ Planning Policy	Description
		habitats and species listed on the Annexes of the Habitats Directive. Certain habitats and species will remain protected as per the objectives of the Directive, and will be referred to as such in this Chapter for ease of reference. Species listed on these Annexes are identified as being threatened or of 'community interest'. Annex I lists habitat types regarded as being of European/international importance, including 'priority habitat types'; Annex II lists species of European/international importance; and Annex IV(a) lists animal species of community interest needing strict protection. Species listed on Annex II and Annex IV(a) are commonly referred to as European Protected Species (EPS), and will remain as such following the implementation of Brexit. Under the Habitats Regulations it is an offence to: > Deliberately capture, injure or kill an wild animal of an EPS > Deliberately disturb wild animals of any such species > Deliberately take or destroy the eggs or such an animal, or > Damage or destroy a breeding site or resting place of such an animal. Disturbance of animals includes in particular disturbance which is likely: > to impair their ability to survive, breed or reproduce, or to rear or nurture their young, or > in the case of animals of a hibernating or migratory species, to hibernate or migrate; or to affect significantly the local distribution or abundance of the species to which they belong.
	Natura 2000	Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right. Sites are present across all 27 member states as well as the United Kingdom, owing to the UK's membership of the European Union at the time of inception. Sites comprise a combination of Special Areas of Conservation (SACs) and Special

Scale	Legislation/ Planning Policy	Description
		Protection Areas (SPAs), designated for species or habitats valued at a European level.
National	The Wildlife and Countryside Act 1981 (as amended) (WACA)	This piece of legislation remains the primary UK mechanism for statutory site designations (e.g. Sites of Special Scientific Interest, SSSI) and the protection of individual species listed under Schedules 5 and 8 of the Act, each subject to varying levels of protection.
	Protection of Badgers Act 1992	Affords protection to individual badgers from disturbance, injury or killing, and protects their setts from interference.
Regional	Future Wales – The National Plan 2040	Future Wales is the national development framework, setting the direction for development in Wales to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, 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. Policy 18, Criterion 5 requires that all renewable energy DNS must include enhancement measures to provide a net benefit to biodiversity.
	Planning Policy Wales – Chapter 6: Distinctive and Natural Places (11th ed. 2021)	Chapter 6 of Planning Policy Wales (PPW) sets out the Welsh Government's objectives for Biodiversity and Ecological Networks among other environmental and cultural components of 'Placemaking'. In particular, the Biodiversity and Ecological Networks section puts emphasis on planning authorities to have regard for the State of Natural Resources Report (SoNaRR) and Area Statements published by Natural Resources Wales. In this sense PPW now requires information of ecosystem resilience as well as protected and priority species as outlined by Section 6 and Section 7 of the Environment (Wales) Act 2016.

Scale	Legislation/ Planning Policy	Description
	Technical Advice Note (TAN) 5 - Nature Conservation and Planning (2009)	Technical Advice Note 5 (TAN5) contains a set of principles which includes integrating nature conservation into all planning decisions and for development to provide a net benefit for biodiversity conservation in Wales with no significant loss of habitat or populations of species, locally or nationally.
	The Environment (Wales) Act 2016	The act makes provisions within Wales for the planning and managing of natural resources at national and local level. Section 6 of the act introduces the biodiversity and resilience of ecosystems duty whereby public authorities are required to seek to maintain and enhance biodiversity so far as it is consistent with the proper exercise of those functions. Section 7 of the act introduces a list of living organisms and types of habitat, known as Species or Habitats of Principal Importance, in Wales which are considered of key significance to sustain and improve biodiversity.
	The Countryside and Rights of Way (CROW) Act 2000	This legislation strengthens the provisions of the 1981 Wildlife and Countryside Act, both in respect to statutory sites such as Sites of Special Scientific Interest (SSSI's) and protected species. It also places a statutory obligation on Local Authorities and other public bodies to further the conservation of biodiversity in the exercise of their functions, thus providing a statutory basis to the Biodiversity Action Plan (BAP) process which began in 1994. Section 74 of the Act lists the habitat types and species of principal importance in England.
Local	Powys County Council – Local Development Plan 2011 - 2026	The Powys County Council (PCC) Local Development Plan (LDP) sets out the strategy for meeting the future needs of the county's natural, built and cultural environments. Of particular reference for ecology and nature conservation is Policy DM2 – The Natural Environment. The overarching theme of Policy DM2 is for developments that have an adverse impact on priority species, habitats and features of recognised importance to biodiversity or nature conservation will not be permitted except where it can be demonstrated that impacts can be

Scale	Legislation/ Planning Policy	Description
		satisfactorily mitigated, acceptably minimised or appropriately managed to include net enhancement; or where there are exceptional circumstances where the reasons for the development or land use change clearly outweighs the need to safeguard the biodiversity and nature conservation interests of the site and where alternative habitat provision can be made in order to maintain and enhance local biodiversity.
	The Powys Nature Recovery Action Plan	The national strategy for biodiversity was delivered at a local level via Local Biodiversity Action Plans (LBAP), which has been superseded and transposed into the Powys Nature Recovery Action Plan (PNRAP), by the Powys local nature partnership. The PNRAP contains 17 habitats and 28 species action plans. Habitats and species for which the action plans have been prepared and are considered relevant to the study area are: <u>Habitats</u> — <u>Species</u> Coniferous woodland; — Brown hare; Farmland; — Brown trout; Linear habitats; — Otter; Rivers and streams; — Red kite; and Scrub and ffridd; and — Water vole. Lowland blanket bog The PNRAP places a greater emphasis on ecosystem resilience and improving habitat connectivity between habitats and populations forms the core of the approach and assists in helping to deliver the Environment (Wales) Act Section 6 duty by the LPA. Habitats and species considered in the PNRAP are more extensive and allow for sites to be targeted for recovery and biodiversity net gain for specific needs of the features present.

6.2.2 The key legislation for individual species that are relevant to this EcIA scoping report is summarised in Table 6.2.2.

Table 6.2.2: Species-specific legislation

Species	Legislation
Plants	Section 13 (Schedule 8) of the WACA and Regulations 46-52 (Schedule 5) of the Conservation of Habitats and Species Regulations 2017 (as amended) identify measures for the protection of wild plants. The legislation together protects all plants listed on both Schedules of both pieces of legislation against: > Intentionally picking, collecting, cutting, uprooting or destroying a wild plant; > Selling, offering or exposing for sale, or having in possession or transporting the purpose of sale, any live or dead wild plant included in the Schedules, or any part of, or anything derived from, such a plant; or > Publishing or causing to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things. Enforcement provisions of the WACA were extended by the Countryside Rights of Way Act 2000 (CRoW), Section 81 and Schedule 12. Section 14 of the WACA prohibits the planting in the wild of plants listed in Part 11 or Schedule 9 or otherwise causing them to grow there. This includes (amongst others) Himalayan balsam Impatiens glandulifera and Japanese knotweed Fallopia japonica.
All species of British bat *Chiroptera sp.*	All British species of bat are listed on Schedule 2 'European Protected Species of animals' of the Conservation of Habitats and Species Regulations 2017 (as amended), and as such as known as European Protected Species (EPS). In addition, all British bats are protected under Section 9 (Schedule 5) of the WACA and eight species are listed on Section 7 of the Environment (Wales) Act 2016. In summary, the above legislation collectively prohibits the following: > Deliberate capture, injury or killing of a bat. In court, 'deliberate' is likely to be interpreted as someone who, although not intending to capture/injure or kill a bat, performed the relevant action whilst being sufficiently informed and aware of the consequence their actions will most likely have; > Intentional or reckless disturbance or a bat in its roost or deliberate disturbance of a group of bats; > Damage or destruction of a bat roosting place (even if bats are not occupying the roost at the time); > Possession or advertisement/sale/exchange of a bat (dead or alive) or any part of a bat; or > Intentional or reckless obstruction of access to a bat roost. Licences are issued by Natural Resources Wales (NRW) for any actions that may compromise the protection of an EPS, including bats, under the Conservation of Habitats and Species Regulations 2017 (as

Species	Legislation
	amended). This includes all developments and engineering schemes, regardless of whether or not they require planning permission.
Great crested newt *Triturus cristatus*	Great crested newt (GCN) are an EPS and fully protected under Schedule 5 of the WACA. This makes it an offence to: > Capture, kill, disturb or injure a GCN (deliberately, or by not taking enough care); > damage or destroy a breeding or resting place, both pond and terrestrial (deliberately, or by not taking enough care); > obstruct access to their resting or sheltering places, both pond and terrestrial (deliberately, or by not taking enough care); or > possess, sell, control or transport live or dead GCN, or parts of a GCN. Licences are issued by NRW for any actions that may compromise the protection of an EPS, including GCN, under the Conservation of Habitats and Species Regulations 2017 (as amended). This includes all developments and engineering schemes, regardless of whether or not they require planning permission.
Hazel dormouse *Muscardinus avellanarius*	Dormouse are an EPS and also fully protected under Schedule 5 of WACA. This makes it an offence to: > capture kill, disturb or injure dormouse (on purpose or by not taking enough care). > damage or destroy a breeding or resting place (deliberately or by not taking enough care) > obstruct access to their resting or sheltering places (deliberately or by not taking enough care) > possess, sell, control or transport live or dead dormouse, or parts of dormouse. Licenses are issued by Natural Resources Wales for any actions that may compromise the protection of an EPS including dormouse, under the Habitats Regulations 2017. This includes all developments and engineering schemes, regardless of whether or not they require planning permission
Eurasian badger *Meles meles*	Badgers are subject to legislation contained within the Protection of Badgers Act 1992. This means that it is unlawful to kill, capture, disturb or injure any individual or intentionally damage, destroy or obstruct an area used for breeding, resting or sheltering by badgers.
Water vole *Arvicola amphibious*	The water vole is fully protected under Schedule 5 of the WACA and is a priority conservation species. This makes it an offence to: > Intentionally capture, kill or injure water voles; > damage, destroy or block access to their places of shelter or protection (on purpose or by not taking enough care);

Species	Legislation
	> disturb them in a place of shelter or protection (on purpose or by not taking enough care); or > possess, sell, control or transport live or dead water voles or parts of them (not water voles bred in captivity). Licences are not issued for 'development' under WACA by NRW. However, with the application of sufficient measures to avoid harm and preparation of a working method statement for the construction period, then it is unlikely that incidental offences will occur. This applies to both permitted development and development requiring planning permission.
Otter *Lutra lutra*	Otters are an EPS and also fully protected under Schedule 5 of the WACA. This makes it an offence to: > Capture, kill, disturb or injure otters (on purpose or by not taking enough care); > damage or destroy a breeding or resting place (deliberately or by not taking enough care); > obstruct access to their resting or sheltering places (deliberately or by not taking enough care); or > possess, sell, control or transport live or dead otters, or any part of an otter. Licences are issued by Natural Resources Wales for any actions that may compromise the protection of an EPS including otters, under the Conservation of Habitats and Species Regulations 2017 (as amended). This includes all developments and engineering schemes, regardless of whether or not they require planning permission.

6.3 Study Area and Zone of Influence

6.3.1 Study areas for baseline ecological information gathering and determining the Zone of Influence (ZoI) have been based on the Site Boundary, and have been established in accordance with best practice guidance for individual ecological receptors and historical consultations with NRW. Study areas adopted may be updated over the course of the iterative design process to account for any changes in scheme design and where land access permissions allow.

6.4 Assessment Methodology

Scope

6.4.1 The scope of this report and proposed ecological impact assessment (EcIA) has been informed by previous ecological investigations of the Site and extensive consultations with statutory consultees during the previous consultation. The purpose of the scoping

study is to determine what is required to be taken forward for further assessment in the full ecological assessment.

Scope of full EcIA

6.4.2 The impact assessment presented in the full ecological assessment will be based on current Chartered Institute of Ecological and Environmental Management (CIEEM) guidance (2018). The assessment process will include the following stages:

- determination and evaluation of important ecological features;
- identification and characterisation of impacts;
- outlining mitigation measures to avoid and reduce significant impacts;
- assessment of the significance of any residual effects after such measures;
- identification of appropriate compensation measures to offset significant residual effects; and
- identification of opportunities for enhancement.

6.4.3 The ecological assessment will be supported by Technical Appendices and relevant figures, which will provide full details of desk studies, consultations and field survey results to inform the design and assessment of the proposed Development.

6.4.4 Ecological data deemed sensitive (e.g. relating to the breeding and/or resting places of protected species) will be included within a confidential appendix to the EcIA. This will not be made publicly available but will be issued to Natural Resources Wales (NRW) and other statutory consultees.

6.4.5 It will be ensured that sufficient information is presented within the EcIA to allow an objective and robust assessment of potentially significant adverse impacts upon important ecological features to take place.

Zone of Influence

6.4.6 The extent of the study area for each important ecological feature has been defined as the zone of influence (ZoI). Each ZoI has been determined employing professional judgement through a review of the current baseline ecological conditions relative to the Proposed Development, consideration of the proposed activities and any relevant legislation and policy.

6.4.7 Each ZoI reflects the sensitivity and value of potential important ecological features and is considered to be sufficient to cover the potential zone of influence of the Proposed Development on these features, while providing contextual information to assist with determining and evaluating the baseline.

6.4.8 The field surveys undertaken will inform a full assessment of the Proposed Development area and, where access permits, the surrounding and connected habitats to provide contextual information to further the assessment.

Determining Importance

6.4.9 This scoping study includes an assessment of the impacts upon important ecological features which are likely to be significantly affected by the Proposed Development. A detailed assessment of features that are sufficiently widespread, unthreatened and resilient to impacts realised by the Proposed Development will not be undertaken in the full EcIA report, and a justification provided for such features to be 'scoped out'.

6.4.10 Relevant policy will be referred to when determining importance or sensitivity of an ecological feature, on an international, national and local scale. Additionally, importance will be determined using professional judgement, as well as specialist consultation advice and the results of baseline surveys.

6.4.11 Importance will not necessarily be related solely to the level of legal protection that an ecological feature is afforded, and ecological features may be important for a variety of reasons – such as their connectivity to a designated site, the rarity of the species, or the geographical location of the species relative to their known range.

6.4.12 Consideration will be given to the level of nature conservation value for each ecological receptor that may be affected, to help determine the value of that receptor. In addition, the sensitivity of the ecological receptor will also be considered to help in the decision of taking forward the feature into the EcIA. The value of a receptor will be considered in terms of the population that occupies, or relies on the site, rather than at an individual or legislative level. The approach to assessing the value of ecological receptors is presented in Table 6.4.1.

6.4.13 The full EcIA report will consider the ecological importance of features in greater detail once updated survey data has been gathered.

Table 6.4.1: Definitions of nature conservation value for ecological features

Level of Value	Reference	Examples
Very High	International	Very high importance and rarity, international scale and limited potential for substitution. > An internationally designated site or candidate site SPA, SAC, Ramsar Site, Biogenetic reserve or an area which NRW has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified.

Level of Value	Reference	Examples
		> Internationally significant and viable areas of a habitat type listed in Annex 1 of the Habitats Directive. > Regularly occurring globally threatened species (i.e. International Union for Conservation of Nature Red listed) or species listed on the Annex 1 of the Bern Convention. > Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status. > A regularly occurring nationally significant population/number of any internationally important species.
High	National / Regional (Wales)	High importance and rarity, national scale and limited potential for substitution. > A nationally designated site, e.g. SSSI, National Nature Reserve (NNR) or a discrete area which meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether it has yet to be notified. > A viable area of a Section 7 Environment Act Habitat of Principal Importance or of smaller areas of such habitat that is essential to maintain the viability of a larger whole, this could include a network of ancient species-rich hedges or even small groups of ancient trees. > A regularly occurring significant population/number of any nationally important species i.e. listed on the Wildlife and Countryside Act 1981 (as amended). > Any regularly occurring population of a nationally important species that is threatened or rare in the county or region.
Medium	County (Powys)	High or medium importance and rarity, regional scale, limited potential for substitution. > Regional/county significant and viable areas of key habitat identified as being of regional value. > Any regularly occurring significant population of a species listed as being nationally scarce, or in the LBAP or relevant Natural Area on account of its regional rarity or localisation. > Significant populations of a regionally/county important species. > Sites such as Sites of Importance for Nature Conservation (SINC) selected on Regional/County criteria. > Any regularly occurring significant population that is listed in a Local Red Data (RDB) or BAP on account of its rarity or localisation.
Low	Local	Low or medium importance and rarity, local scale. > Areas identified in a LBAP or in the relevant natural area profile. > Sites/features that are scarce within the locality or which appreciably enrich the local area's habitat resource.

Level of Value	Reference	Examples
		> A diverse and/or ecologically important valuable hedgerow network. > Diverse and/or ecologically valuable grassland. > A significant population of a local important species i.e. listed on a LBAP. > Species populations of local importance.
Negligible	-	Very low importance and rarity, local scale. > Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or Neighbourhood. > An occasional occurrence or small population of a locally scarce species.

Characterising Potential Impacts

6.4.14 Identification and characterisation of both positive and negative impacts on important ecological features will be undertaken in accordance with the CIEEM guidelines (2018).

6.4.15 Impacts will be considered for the construction, operational and decommissioning phases and will be assessed on the basis that a clearly defined range of avoidance and standard good practice measures are implemented.

Magnitude of Potential Effects

6.4.16 Effects are judged in terms of magnitude over the area and timeframe in which they occur. This will be assessed using five levels as detailed in Table 6.4.2 and Table 6.4.3.

6.4.17 The magnitude of the effect is independent of the value of the receptor. Effects can be positive or negative, of particular or varying timescales, direct or indirect, reversible and can be cumulative.

Table 6.4.2: General criteria to describe the magnitude / character of potential effects

Magnitude of Impact		Typical criteria
Major	Adverse	Complete or near-complete loss of resource, population / productivity and/or quality and integrity of the receptor, through mortality, displacement or disturbance. Severe damage to key characteristic features or elements. Quantified as approximately >80% of resource lost.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality. Quantified as approximately a >80% net gain for the resource, in comparison with the baseline.

Magnitude of Impact		Typical criteria
Intermediate	Adverse	Significant effect on the resource or status of the population / productivity due to mortality, displacement or disturbance, but not adversely affecting the integrity. Partial loss of/damage to key characteristics, features or elements. Quantified as 21-80% of resource lost.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality. Quantified as approximately a 21-80% net gain for the resource, in comparison with the baseline.
Minor	Adverse	Some measurable change / partial reduction in the status of the population / productivity of its attributes, via mortality, displacement or disturbance. Minor loss of or alteration to, one (or maybe more) key characteristics, features or elements of the resource. Quantified as 1-20% of resource lost.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial effect on attribute or a reduced risk of negative effect occurring. Quantified as an approximate 1-20% net gain for the resource in comparison with the baseline.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements. Quantified as <1% of the resource lost.
	Beneficial	Very minor improvement of the status of the population / productivity or quality of the resource. Quantified as a <1% net gain for the resource. No loss or alteration of characteristics, features or elements; no observable effect in either direction
No change	Neutral	No loss or alteration of characteristics, features or elements; no observable effect either adversely or beneficially. Can also be considered a continuation of the baseline.

Table 6.4.3: Temporal magnitude / timeframe of potential impacts

Temporal Magnitude	**Definition**
Permanent	Impact continues beyond the span of lifetime of the development (>30 years)
Long-term	Between 15 and 30 years
Medium term	Between 5 and 15 years
Short term	6 months and up to 5 years
Negligible	Less than 6 months

Determining Significant Effects

6.4.18 CIEEM (2018) define a significant effect as an effect that either supports or undermines biodiversity conservation objectives for important ecological features or for biodiversity in general, i.e. the feature could be positively or negatively significantly affected.

6.4.19 CIEEM (2018) notes that 'A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects can be lawfully permitted following EIA procedures as long as the mitigation hierarchy has been applied effectively as part of the decision-making process'.

6.4.20 Potential significant effects identified will be expressed with reference to an appropriate geographic scale.

6.4.21 In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect will be assumed as a precautionary approach. Where uncertainty exists, this will be acknowledged in the full EcIA report.

6.4.22 Table 6.4.4 below provides the matrix that will be used to assist in determination of the significance of ecological effects in this scoping report. However, in accordance with CIEEM guidelines, the matrix will be a tool only in making predictions. In some cases, the significance is shown as being one of two alternatives. This allows for the application of professional value-based judgement in appraising significance between individual receptors, which may not have equal significance within their context.

6.4.23 Effects defined in Table 6.4.4 as moderate, large or very large are considered significant. Where effects are defined as slight or neutral these are considered not significant.

6.4.24 The full EcIA report will consider the magnitude of potential impacts in greater detail once updated survey data has been gathered.

Table 6.4.4: Matrix for assisting in the determination of significant ecological effects

Ecological value	Character / magnitude of impact				
	Major	**Intermediate**	**Minor**	**Negligible**	**No change**
Very high	Very Large	Large or Very Large	Moderate or Large	Slight	Neutral
High	Large or Very Large	Moderate or Large	Slight or Moderate	Slight	Neutral
Medium	Moderate or Large	Moderate	Slight	Neutral or Slight	Neutral
Low	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight	Neutral
Negligible	Slight	Neutral or Slight	Neutral or Slight	Neutral	Neutral

Cumulative Effects

6.4.25 The potential for cumulative effects on important ecological features as a result of other wind farm proposals will be assessed in line with the CIEEM (2018) guidelines. This scoping report undertook an initial assessment which will be built upon in the full EcIA to encompass the effects of the Proposed Development in combination with existing developments, either built or under construction; approved developments; awaiting implementation; and proposals awaiting determination within the planning process with design information in the public domain.

Avoidance and Mitigation

6.4.26 The adoption of embedded mitigation measures to avoid or minimise adverse effects upon important ecological features will be part of the iterative design process for the Proposed Development.

6.4.27 Measures to avoid or otherwise minimise potentially adverse effects during scheme design have been identified in this scoping study, and the following will be included in the full EcIA:

- Land-take: the Proposed Development's infrastructure will be designed to minimise the requirement for land-take and the number of watercourse crossing points and woodland felling;
- Watercourse crossing points: existing crossing points will be utilised where possible, with reinforcement and redesign works conducted to allow them to permit exceptional loads. Reinforcement works and new crossing points, where required, will be designed and executed in accordance with best practice and enable the free passage of fish and other wildlife;
- Watercourse buffers: a minimum of a 50m buffer will be applied around all watercourses, in so far as possible having regard to other ecological and non-ecological features;
- Natural linear features buffers: a minimum of a 50m buffer from the blade tip will be applied to all natural linear features, woodland edges, wooded watercourses etc.;
- Bat roost buffer: a minimum of a 50m buffer from the blade tip will be applied to all recorded bat roosts; and
- Construction Environmental Management Plan (CEMP): a CEMP (or similar) will be prepared and in place during the construction, operation and decommissioning phases of the development. The CEMP will include all good practice construction

measures, pollution prevention controls and monitoring methodologies and protocol to be implemented over the course of the development in line with current guidance.

6.4.28 Full details of embedded mitigation measures in relation to ecology will be detailed in the full EcIA.

Residual Effects

6.4.29 An assessment to determine the significance of residual ecological effects, which remain after mitigation measures have been applied, will be undertaken in the full EcIA.

Compensation

6.4.30 Where significant residual effects still remain, compensation will be provided in the full EcIA. This could include replacement habitat, or habitat improvements which would offset potentially significant residual effects.

Enhancement

6.4.31 Suitable principles for ecological enhancement to be delivered as part of the Proposed Development will be outlined within the full EcIA. The appropriateness and feasibility of principles will be discussed with NRW and other relevant statutory consultees over the course of the process, with a view to prescriptive enhancement measures being detailed post-consent within a full Habitat Management Plan (HMP). The objective of this Plan will be to deliver an overall net benefit to biodiversity overall relative to current baseline conditions over the lifetime of the energy project. It may be necessary to prepare an Outline HMP to provide an overview of measures proposed, which may be presented either as an individual Technical Appendix to the EcIA or as an addendum.

6.5 Baseline Conditions

6.5.1 The proposed energy project at Mynydd Lluest y Graig comprises two historical proposals, Rhyd Ddu (data collected 2005-2008) and Mynydd Waun Fawr (2008-2012). Historical survey results comprise both faunal and floral survey data.

6.5.2 Since that time, additional survey effort has been undertaken by the Environmental Dimension Partnership Ltd (EDP) in 2014, and Environment Systems Ltd (EnvSys) between 2017-2018, and are ongoing in 2022.

6.5.3 A brief summary of historical survey data and its key findings is provided in Table 6.5.4.

6.5.4 Results from the 2021 desk study and field surveys are also provided. Where surveys are either ongoing or have not yet commenced (and thus data is not yet available) a description of the methods is provided.

Desk Study

6.5.5 A desk study was undertaken in 2018 and was updated in 2021. This was conducted to inform the proposed approach to baseline information gathering, including the scope for the baseline ecological surveys and to form appropriate zones of influence.

6.5.6 Aerial imaging, the Ancient Woodland Inventory (NRW), the MAGIC map service and all previous survey results to date were consulted.

6.5.7 Data requested from the Biodiversity Information Service for Powys and the Brecon Beacons National Park (BIS) were as follows:

- sites holding international statutory designations: 30km;
- sites holding national statutory designations: 10km;
- sites holding non-statutory designations: 2km;
- protected and priority species: 10km; and
- non-mobile notable and floral species: 2km.

6.5.8 Previous scoping reports suggested that surveys were conducted for the following ecological receptors:

- red squirrel;
- pine marten;
- brown hare;
- reptile;
- white-clawed crayfish;
- invertebrate; and
- fish;

6.5.9 However, following the results of the desk study in 2021, it was judged that such surveys are not necessary as part of the 2021 and 2022 survey effort. This was also agreed when NRW were consulted.

6.5.10 A brief summary of findings from the desk study completed to date is provided below.

Sites holding Statutory Designations for Nature Conservation

6.5.11 No sites holding Statutory Designations for their nature conservation interest are situated within the Site.

6.5.12 There are 14 sites holding International statutory designations within a ZoI of 30km (Table 6.5.1). These are considered important at the International level, with a Very High ecological value. Where it has been possible based on the data available, these sites have

been either scoped in or out of further assessment in the full EcIA, with rationale provided.

Table 6.5.1: Sites with International statutory designations for nature conservation within 30km of the study area. Bolded text within the table indicates the feature has been scoped in

SAC	Distance from Study Area	Qualifying features	Scoped in/out	Rationale
Afon Eden – Cors Goch Trawsfynydd	28.8km NW	Active raised bogs Floating water-plantain Otter Freshwater pearl mussel Atlantic salmon	Out	Qualifying habitat features have no Ecological Pathway to the Site, with their catchments being completely separate. Qualifying faunal features (otter, Atlantic salmon) are not considered to be at significant risk on account of the distance between the Site and this SAC (28.8 km), and the lack of physical link between the Site and the SAC watercourses.
Berwyn a Mynyddoedd De Clwyd / Berwyn and South Clwyd Mountains	7km N	Blanket bogs Base-rich scree Plants in crevices in base-rich rocks Dry heaths Dry grasslands and scrublands on chalk or limestone Very wet mires often identified as 'quaking'	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate. The SPA designation for this site is considered in Section 7.5 Ornithology.
Cadair Idris	21.5km NW	Blanket bog Calcium-rich springwater-fed fens Plants in crevices in base-rich rocks Marsh fritillary butterfly Tall herb communities Purple moor-grass meadows Wet heathland with cross-leaved heath Western acidic oak woodland Clear-water lakes or lochs with aquatic vegetation and poor-moderate nutrient levels Plants in crevices on acid rocks Acidic scree Slender green feather-moss	Out	Qualifying habitat features have no Ecological Pathway to the Site, with their catchments being completely separate. Joyce & Pullin (2003) suggest that the colonisation range of the marsh fritillary butterfly, one of the SAC qualifying features can be up to 20km. The Site is situated 21.5km from this SAC.
Coed Cwm Einion	26.4km SW	Mixed woodland on base-rich soils with associated rocky slopes	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate.
Coedydd a Cheunant	29.9km SW	Western acidic oak woodland	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site

SAC	Distance from Study Area	Qualifying features	Scoped in/out	Rationale
Rheidol / Rheidol Woods and Gorge				with their catchments being completely separate.
Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionydd Oakwoods and Bat Sites	22.6km NW	Alder woodlands on floodplains Bog woodland Western acidic oak woodland Lesser horseshoe bat Rivers with floating vegetation, often dominated by water-crowfoot Mixed woodland on base-rich soils associated with rocky slopes Dry heaths Wet heathland with cross-leaved heath	Out	Qualifying habitat features have no Ecological Pathway to the Site, with their catchments being completely separate. Qualifying faunal features (lesser horseshoe bat) tend not to forage further than 5km from their roosts (Bontadina, Schofield & Naef-Daenzer, 2001). Tournant *et al.* (2013) indicated that they do not generally travel more than 600m from their roosts. The SAC is located 22.6km from the Site, with lesser horseshoe being a low collision-risk species on account of its morphology and foraging technique (SNH, 2019).
Coedydd Llawr-y-Glyn	11.7km SW	Western acidic oak woodland	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate.
Elenydd	28.6km SW	Blanket bog Grasslands on soils rich in heavy metals Dry heaths Floating water-plantain Clear-water lakes or lochs with aquatic vegetation and poor-moderate nutrient levels	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate.
Granllyn	18.4km E	Great crested newt	Out	English Nature (2001) state that great crested newts are highly unlikely to cover distances greater than 1.3km from ponds. This SAC is located 18.4km from the Site.
Migneint-Arenig-Dduallt	23km NW	Blanket bog Dry heaths Acid peat-stained lakes and ponds Wet heathland with cross-leaved heath Western acidic oak woodland Clear-water lakes or lochs with aquatic vegetation and poor-moderate nutrient levels	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate.

SAC	Distance from Study Area	Qualifying features	Scoped in/out	Rationale
Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau	27.9km NW	Lagoons Atlantic salt meadows Estuaries Grey seal Shallow inlets and bays Otter Intertidal mudflats and sandflats Reefs Glasswort and other annuals colonising mud and sand Subtidal sandbanks Sea caves Bottlenose dolphin	In	Catchment of the SAC extends to the western extent of Site. Previous consultations with NRW indicate indirect effects are most likely to occur on certain qualifying features (grey seal, otter, bottlenose dolphin, along with habitats on ecotones/edges between terrestrial and marine ecosystems). As part of this consultation, it was agreed that no development will take place within the edge of the catchment that falls within the Site. Effects will still be considered as part of the full EcIA report.
River Dee and Bala Lake / Afon Dyrdwy a Llyn Tegid (Wales)	25km NW	Bullhead River lamprey Brook lamprey Floating water-plantain Otter Sea lamprey Atlantic salmon Rivers with floating vegetation often dominated by water-crowfoot	Out	Qualifying habitat features have no Ecological Pathway to the Site, with their catchments being completely separate. Qualifying faunal features (otter, Atlantic salmon) are not considered to be at significant risk on account of the distance between the Site and this SAC (28.8 km), and the lack of physical link between the Site and the SAC watercourses..
River Wye / Afon Gwy (Wales)	21.6km SW	Allis shad Twaite shad White-clawed crayfish Bullhead River lamprey Brook lamprey Otter Sea lamprey Atlantic salmon Very wet mires with a quaking surface Rivers with floating vegetation often dominated by water-crowfoot	Out	Qualifying habitat features have no Ecological Pathway to the Site, with their catchments being completely separate. Qualifying faunal features (otter, Atlantic salmon, etc.) are not considered to be at significant risk on account of the distance between the Site and this SAC (28.8 km), and the lack of physical link between the Site and the SAC watercourses.
Tanat and Vyrnwy Bat Sites / Safleoedd Ystlumod Tanat ac Efyrnwy	15.5km NE	Lesser horseshoe bat	Out	Qualifying faunal features (lesser horseshoe bat) tend not to forage further than 5km from their roosts (Bontadina, Schofield & Naef-Daenzer, 2001). Tournant *et al.* (2013) indicated that they do not generally travel more than 600m from their roosts. The SAC is located 15.5 km from the Site, with lesser horseshoe being a low collision-risk species on account of its morphology and foraging technique (SNH, 2019).

6.5.13 There are 24 sites holding National statutory designations within their ZoI of 10km from the Site (Table 6.5.2). These are considered important at the National level, and of High ecological value (Table 6.5.3). Where it has been possible based on the data available, these sites have been either scoped in or out of further assessment in the full EcIA report, with rationale provided.

Table 6.5.2: Sites holding National statutory designations for nature conservation within 10km. Bolded text within the table indicates that the notification has been scoped in

Site	Distance from Study Area	Notifications	Scoped in/out	Rationale
Berwyn (also NNR)	7.1km N	Varied blanket bog and moorland vegetation, supporting breeding birds.	Out	Qualifying habitat features have no Ecological Pathway to the Site, with their catchments being completely separate.
Bryn Coch	380m to N	Lowland fens, lowland dry acid grassland, lowland meadows.	In	Situated between the Nant Meniol and Afon Gam, both of which originate from catchments on Site. The SSSI is notified for its Priority habitats (lowland fens, lowland dry acid grassland, lowland meadow) the former of which has potential to be a GWDTE.
Coed Copi'r Graig	5km N	Northern woodland type close to its southernmost edge of its range in Britain.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Coed y Lawnt a Coed Oli	3km NE	Wet, deciduous hillside woodland, with birch, alder and wet moss carpet ground layer.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Cors Lawnt	2.4km N	Valley mire merging into poor-fen.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Cors Llanllugan	4.9km SE	Undisturbed basin mire.	In	Situated between two branches of the Afon Rhiw, which originates on Site. The SSSI is notified for its nature as an undisturbed basin mire which has potential to be a GWDTE.
Cors Llyn Coethlyn	4.6km NW	Valley mire system supporting three vegetation types of outstanding interest.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Cors Ty-Gwyn	6.5km NE	Natural succession from basin mire to woodland.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to

Site	Distance from Study Area	Notifications	Scoped in/out	Rationale
				the Site with their catchments being completely separate
Corsydd Llanbrynmair	4.2km NW	Three notable and intact remnants of blanket bog.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Fachwen Isaf	5.8km N	Fen-meadow and species-rich acid grassland.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Ffridd Mathrafal Track Section	7.5km E	Geological	Out	Qualifying features are geological, with no biological pathways to the site.
Gregynog (also NNR)	9.4km SE	Wood-pasture/parkland habitat and associated epiphytic lichens and invertebrates associated with ancient trees.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gwaun Efail Wig	5.5km NE	Mosaic of wet and dry grassland with swamp plant communities.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gwaun Llan	6.2km W	Unimproved damp mesotrophic pasture	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gwaun Wern-y-Wig	4.5km NE	Damp unimproved pasture on the upland fringe.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gweunydd Ceunant	7.4km NE	Supports largest known population of the greater butterfly-orchid in Montgomeryshire.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gweunydd Dolwen	Adjacent to Site boundary	Acid and neutral dry grassland.	In	Proximity to Site (adjacent to Site boundary).
Gweunydd Dyfnant	7km N	Unimproved acid pasture, intermediate in character between the more intensively managed lowland grassland and the unenclosed uplands.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate

Site	Distance from Study Area	Notifications	Scoped in/out	Rationale
Gweunydd ger Fronhaul	5.7km E	Unimproved lowland dry grassland and associated stands of rush pasture and woodland/scrub.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gweunydd Llechwedd-Newydd	5.2km N	Neutral and acid grassland, with associated patches of marshy grassland and acidic boggy patches.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Gweunydd Pen-y-Coed	6.5km N	Unimproved acid wet pasture on a peaty substrate.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Llyn Mawr	6.2km S	Moderately oligotrophic upland lake in a catchment only partially modified by agricultural improvement.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Mawnog Gwaunynog	3.7km NE	Carr woodland developed on deep peat in a well-defined basin.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate
Waun Cwm Calch	7km SW	Mire and swamp vegetation types and small sedge-dominated flushes.	Out	Qualifying features are all habitats in nature, they have no Ecological Pathway to the Site with their catchments being completely separate

6.5.14 There are five sites holding Non-Statutory designations within their ZoI of 2km from the Site (Table 6.5.3). These are considered important at the Regional (Powys) level, and of Medium ecological value. Where it has been possible based on the data available, these sites have been either scoped in or out of further assessment in the full EcIA, with rationale provided.

Table 6.5.3: Sites holding Non-Statutory designations for nature conservation within 2km. Bolded text is indicative that the feature has been scoped in

Site	Distance from Study Area	Reason for Designation	Scoped in/out	Rationale
Hafod y Beudy SINC / LWS	Within site boundary	Semi-improved marshy grassland pasture	In	Proximity to Site and potential GWDTE status of designated habitat.,

Llyn Hir SINC / LWS	Directly adjacent to site boundary	Low nutrient upland lake	In	Proximity to Site and potential GWDTE status of designated habitat.
Llyn Gogor SINC / LWS	1.35km E	Upland site with valuable blanket bog communities	In	Relationship of catchment with habitats on Site and potential GWDTE status of designated habitat.
Moel Bentyrch SINC / LWS	1.87km NE	None provided, appears to be acid grassland and heath-covered hill.	Out	Designated site has no ecological pathways connecting it with habitats and influences on Site.
Rhyd RVNR	1.6km S	None provided, RVNR within localised area of broadleaved woodland.	Out	RVNR support road verges with interesting/uncommon species assemblages in a localised environment. Designated site has no ecological pathways connecting it with habitats and influences on Site.

Field Surveys

6.5.15 The following surveys have been completed or are ongoing to establish baseline ecological conditions and potentially important ecological features within the Site and surrounding area, which may be impacted by the Proposed Development.

Table 6.5.4: Historical and Current survey summary

Receptor	Methodologies followed	Periods of Data Collection	Key findings
Extended Phase 1	JNCC (2010)	2005, 2006, 2008, 2014, 2018, 2021 (ongoing) Access road & track of Rydd Ddu 2009-2011, 2014.	Botanically important acid grassland and blanket bog habitats. Peat estimated to occupy 96 ha.
National Vegetation Classification (NVC)	Rodwell (1991& 1992) Rodwell (2006)	2008, 2015, 2014, 2018, 2021 (ongoing)	Variety of mire and both wet and dry heath communities identified, along with various acid grassland and rush-pasture communities.
Automated survey at ground level (bats)	Bat Conservation Trust (2007) Hundt (2012) SNH (2021)	2014, 2018, 2021 (ongoing)	Survey effort in 2018 identified peaks in activity during June, July and August, with 87% of passes from high collision risk, medium population risk species (*Pipistrellus spp*). 2.5% of passes recorded from high collision risk, high population risk (*Nyctalus spp.*), highest in July and August. Low numbers of passes recorded from species at edge of their range (Leisler's, Nathusius' pipistrelle) which are high collision-risk, high population vulnerability.

Receptor	Methodologies followed	Periods of Data Collection	Key findings
Bat activity transects	Hundt (2012)	2008, 2009, 2014, 2018	Bat activity found to generally be highest around linear features and woodland edge. Some activity noted over the lowland central area where cattle pasture and rushy/marshy grassland present.
Bat roost surveys	Bat Conservation Trust (2007) Hundt (2012)	2008, 2009, 2014, 2018	*Myotis sp.* confirmed to be roosting within ruin at Mynydd Carreg-y-big ford. Roosts for low numbers of bats observed in various trees across the site.
Great crested newt HSI and/or eDNA	Oldham *et al.* (1990) Oldham *et al.* (2000) ARG UK Advice Note 5 (2010) Biggs *et al.* (2014)	2006, 2007, 2014, 2018	Early HSI surveys found majority of ponds unsuitable, however eDNA surveys on 19 waterbodies in 2014 returned positive results in four ponds.
Great crested newt population size class assessment	English Nature (2001)	2015, 2018, 2021	GCN are present on site. The 2021 survey effort resulted in three distinct populations identified across four ponds, all classed as Low in size class.
Hazel dormouse HSA	Bright *et al.* (2006)	2015, 2018, 2021 (ongoing)	Discrete areas of High and Medium suitability located on the northern boundary, and within the Ffridd Rhyd-Ddu forestry. Areas of Low suitability in the centre of the site.
Hazel dormouse nest tube search	Bright *et al.* (2006)	2015, 2018	No evidence of dormouse occupation of tubes.
Badger	Harris, Cresswell & Jefferies (1989)	2006, 2008, 2014, 2018, 2021 (ongoing)	Four active setts identified in 2014. Setts remained active in 2018.
Otter	Ward, Holmes & Jose (1994)	2006, 2008, 2009, 2014, 2018, 2021 (ongoing)	Low number of spraints around streams within Site boundary. No evidence of resting sites.
Water vole	Strachan & Moorhouse (2006)	2006, 2008, 2009, 2014, 2018, 2021 (ongoing)	No evidence recorded.
Red squirrel	Gurnell *et al.* (2001)	2008	No evidence recorded
Peat depth analysis		Access road & track of Rydd Ddu 2009-2011	Five areas of deep peat occupying c. 123 ha

Receptors Considered to be Important Ecological Features (IEFs)

6.5.16 Sites holding International Statutory Designations that will be assessed as IEFs include:

- Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC.

6.5.17 Sites holding National Statutory Designations that will be assessed as IEFs include:

- Bryn Coch SSSI;
- Cors Llanllugan SSSI;
- Gweunydd Dolwen SSSI.

6.5.18 Sites holding Non-Statutory Designations that will be assessed as IEFs include:

- Hafod y Beudy SINC / LWS;
- Llyn Hir SINC / LWS;
- Llyn Gogor SINC / LWS.

6.5.19 Habitats that will be assessed as IEFs include:

- Annex I habitats;
- Habitats of Principal Importance;
- Habitats listed on the Powys LBAP / PNRAP;
- GWDTE.

6.5.20 Fauna that will be assessed as IEFs include:

- Bats;
- GCN;
- Badger;
- Otter;
- Water vole;
- Hazel dormouse;
- Reptiles.

6.5.21 In the event that the 2021-2022 survey effort identifies other features of ecological value that can be considered an IEF, these will be considered for conclusion within the assessment.

Further Survey

6.5.22 Surveys are and will be conducted in the areas where the provisional energy project infrastructure is proposed, which may not match where all or the final Proposed Development infrastructure is to be located due to the nature of iterative design. Updated NVC survey may be required once the more detailed development design is available, should sensitive areas such as Annex I habitats or potential GWDTE habitat be present. These surveys will be conducted following the same guidelines as previous surveys unless new guidance is published in the meantime, and will aid in the input into the design of the Proposed Development, ensuring that effects on vegetation are understood and assessed in the full EcIA report.

6.5.23 Historic peat depth surveys have been conducted in the forested areas and will be refreshed should they be required by PCC/NRW in order to ascertain the depth of peat across the site. However, once the final layout has been decided following the iterative design process, the survey can be highly targeted to assist in any micro-siting of turbines and other infrastructure. Ideally, the survey would target the centre of the proposed track and then 5m and 10m either side. Peat depth readings need not be conducted if the track is shown to be on mineral soils. The same must be conducted at the turbine locations, crane pads, blade laydowns etc. Refer to Section 12 on Peat for further details of the surveys.

6.5.24 The proposed transport access and grid connection routes are yet to be determined. In both cases, when the routes are finalised, they will also need to be subject to standard ecological surveys and assessments to determine the ecological baseline and identify any significant effects likely to arise from proposed impacts that require mitigation.

6.6 Potentially Significant Effects and Approach to Mitigation

6.6.1 Potential adverse impacts and effects upon ecological features will be assessed within the full EcIA to highlight activity which could arise during the construction, operational and decommissioning phases of the Proposed Development. These are summarised below.

6.6.2 Impacts will be assessed and informed on the basis of baseline study findings and through consultation with relevant specialist groups as required.

6.6.3 Significant effects have been assessed at this scoping stage, where possible, on account of the large volume of data already available. Conclusions using available data are outlined below. For the full EcIA, these will be reviewed further in light of any new evidence.

Table 6.6: Potential significant effects resulting from the Proposed Development

Activity	Potential Effects
Construction Phase	
Designated sites	Majority of designated sites, including International, National and Non-Statutory are situated some distance away although are connected via water catchments, with only indirect effects considered to be possible. Indirect effects such as adverse impacts to notified features that are GWDTE, such as hydrological change or introduction of pollution from inadequate pollution prevention measures during construction. Features may also be faunal, with any hydrological change potentially impacting these qualifying features of the SAC.

	An exception to this is Gweunydd Dolwen SSSI is positioned directly adjacent to the Site boundary. Effects to this site may therefore be direct, such as direct although inadvertent realisation of Potentially Damaging Operations (PDO).
Habitats	Direct loss to ecologically important habitats as well as those protected by various legislation. Indirect impacts to GWDTE via hydrological change from direct loss of ecologically important habitats.
Faunal species	Direct impacts Killing and injury to some protected and priority species via construction activities, either resulting in loss to individuals or loss of entire populations. Displacement of protected and priority species through construction activity. Loss of sheltering places for protected and priority species through habitat loss. Loss of habitat connectivity for protected and priority species through habitat loss. Indirect impacts Long-term fragmentation / genetic bottlenecking of populations of protected and priority species through habitat loss and therefore connectivity. Reduction in prey availability via adverse impacts to habitat quality or water quality.
Operational Phase	
Designated sites	No notable or discernible impacts to any sites holding any designations.
Habitats	No direct impacts anticipated. Indirect impacts may arise through drying of peat-based habitats.
Faunal species	Direct impacts include mortality via: – road collisions at known crossing points or water course crossing points (terrestrial fauna excluding bats); – collision with turbines (bats only). Indirect effects include potential reduction in population sizes at a variety of geographical scales.

Decommissioning Effects

6.6.4 Effects from decommissioning have the potential to be similar to those during the construction phase, although are more likely to occur over a shorter time period.

6.6.5 Species most likely to be disturbed and displaced from the Site during decommissioning are those that breed, roost or forage within it at the time.

6.6.6 It is acceptable to expect potential for legislative change in the period between the EcIA report production and the decommissioning of the Development, as well as changes in the local populations of ecological receptors on site and local area across the lifespan of

the Development. These may be driven by climatic change, other similar developments within the local area and wider community, increased effectiveness / policing of wildlife protection or a change in the legislative protection on account of the EU Exit by the UK, the natural oscillation of species' populations across the wider landscape, domestic development in the local area, increased or decreased production of the local farms or diversification of local farms, amongst other factors.

6.6.7 Confident or robust predictions are therefore not possible over a minimum of a 35-year period, particularly given the rate of change in number and distribution of many protected species over the past 35 years. Effects from decommissioning on ecological receptors on the Site at the time of decommissioning itself will be best addressed through up-to-date survey data and an Construction Environmental Management Plan (CEMP) or similar.

6.6.8 Full consideration of decommissioning effects will be made in the full EcIA.

Approaches to Mitigation and Biodiversity Benefits

6.6.1 The full EcIA report will provide sufficient information to allow the competent authority to undertake a Habitats Regulations Assessment of the potential effects of Proposed Development, in relation to sites holding International statutory designations, if appropriate and required.

6.6.2 At this stage, mitigation is likely to include the production of a Construction Ecological Management Plan (CEMP) which will include, but not be limited to:

- Design of features of infrastructure to be considerate and sensitive of IEFs;
- Micro-siting of infrastructure to avoid negative effects to IEFS;
- Protection of habitats and other features important to protected or priority species during construction activities, either through complete avoidance or via pollution prevention measures;
- Where avoidance is not possible, the conducting works sensitively, at appropriate times of year and under appropriate licences and with supervision from an Ecological Clerk of Works (ECoW);
- Creation or restoration of IEF habitats lost;
- Creation of a long-term habitat management plan, to include a scheme of monitoring as well as thresholds at which certain intervention or remedial works will be triggered;
- With respect to bats: implementation of a scheme of monitoring to include acoustic monitoring of bat activity and a methodological carcass search for a set time period. Following this, if necessary a curtailment programme (or appropriate alternative

mitigation) will be tailored to optimise both bat mortality reduction and energy production ensuring the maintenance of their conservation status at a range of geographical scales.

6.6.3 Pertinent environmental enhancement programmes, such as with biodiversity, peat or archaeology, will be developed in conjunction with consultees that will seek to provide a net environmental benefit to the assets within the proposed development boundary in line with Criteria 5 of Policy 18 of Future Wales.

6.7 Residual Effects

6.7.1 Effects on IEFs will be assessed in the full ecological assessment report following proposed mitigation measures, taking into account the species' population, range and distribution.

6.8 Cumulative Assessment

6.8.1 Cumulative effects of all relevant factors of the Proposed Development in each phase (construction, operation, decommissioning) will be assessed alongside other wind farm projects subject to the EIA process, and the effects these have on a relevant reference population. In the full EcIA report, this assessment will also include potential effects on the qualifying features of sites holding International statutory designations.

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7 Ornithology

7.1 Introduction

7.1.1 This ornithology chapter of this scoping report has been prepared following the Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017). *"Preliminary Ecological Appraisal (PEA) is the term used to describe a rapid assessment of the ecological features present, or potentially present, within a site and its surrounding area (the zones of influence, or ZOI) in relation to a specific project."* In this case, the specific project is the Lluest y Graig Energy Project and the ZOIs are specified for each ecological receptor identified.

7.1.2 To prepare this chapter a series of desk and field tasks were completed that provide a relatively well-defined baseline. This has been used to:

- identify the likely ornithological constraints associated with the Energy Project;
- identify any mitigation measures likely to be required, as far as practically possible given the potential for further design evolution of the energy project layout;
- identify additional surveys that may be required to inform the full OIA (Ornithological Impact Assessment); and
- identify the opportunities that the project offers to deliver ornithological enhancement.

7.1.3 The full OIA of the Mynydd Lluest y Graig Energy project on birds will be conducted by a specialist avian and ornithological assessor with extensive experience in the renewable energy sector.

7.2 Policy and Relevant Guidance

7.2.1 Policy for birds and their associated habitats in Wales is implemented through a series of areas and species designated under legislation from an international to local level. In relation to the majority of significant bird species, key legislation and policy relevant to the protection, conservation and enhancement of bird interest associated with the ornithological study area is outlined in Table 7.2.1.

Table 7.2.1: Relevant legislation and planning policy - Ornithology

Scale	Legislation / Policy	Description
International	EC Birds Directive (2009/147/EC)	Annex 1 of the EC Birds Directive lists rare and vulnerable species of wild birds that are subject to special conservation measures. The Directive also provides for the designation of SPAs, which form part of the Natura 2000 network of sites protected by European wildlife legislation.

Scale	Legislation / Policy	Description
	The Conservation of Habitats and Species Regulations 2017 (as amended) – The Habitats Regulations	This legislation transposed the Habitats Directive (European Directive 92/43/EEC) into Welsh and English law during the period where the UK was a member of the European Union. Following the implementation of Brexit, the legislation is enacted into UK law, ensuring continued protection of all habitats and species listed on the Annexes of the Habitats Directive. Certain habitats and species will remain protected as per the objectives of the Directive, and will be referred to as such in this Chapter for ease of reference. Species listed on these Annexes are identified as being threatened or of 'community interest'. Annex I lists habitat types regarded as being of European/international importance, including 'priority habitat types'; Annex II lists species of European/international importance; and Annex IV(a) lists animal species of community interest needing strict protection. Species listed on Annex II and Annex IV(a) are commonly referred to as European Protected Species (EPS), and will remain as such following the implementation of Brexit. Under this legislation it is an offence to: > Deliberately capture, injure or kill any wild animal of an EPS; > Deliberately disturb wild animals of any such species; > Deliberately take or destroy the eggs of such an animal; or > Damage or destroy a breeding site or resting place of such an animal. Disturbance of animals includes in particular disturbance which is likely: To impair their ability – > to survive, to breed or reproduce, or to rear or nurture their young, or > in the case of animals of a hibernating or migratory species, to hibernate or migrate; or > to affect significantly the local distribution or abundance of the species to which they belong.
National	The Wildlife and Countryside Act 1981 (as amended)	This legislation effectively prevents any kind of activity occurring that might have a detrimental effect on nesting birds. Schedule 1 of the Act also lists a number of species which are protected by special penalties at all times. Nesting periods vary between species, from year to year and in relation to latitude and altitude, however as a general rule, the breeding season for most species occurs between March and the end of July.
	The Countryside and Rights of Way (CROW) Act 2000	This legislation strengthens the provisions of the 1981 Wildlife and Countryside Act, both in respect to statutory sites such as Sites of Special Scientific Interest (SSSI's) and protected species. It also places a statutory obligation on Local Authorities and other public bodies to further the conservation of biodiversity in the exercise of

Scale	Legislation / Policy	Description
		their functions, thus providing a statutory basis to the Biodiversity Action Plan (BAP) process which began in 1994. Section 74 of the Act lists the habitat types and species of principal importance in England.
	RSPB Birds of Conservation Concern (BoCC)	'Red' and 'Amber' lists for Wales have been prepared by the RSPB of species populations and their known breeding population. Red List species are those whose breeding population or range is rapidly declining (50% or more in the last 25 years), recently or historically, and those of global conservation concern. Amber List species are those whose breeding population is in moderate decline (25 – 49% in the last 25 years), rare breeders, internationally important and localised species and those of unfavourable conservation status in Europe. Species included on a third, "Green" list are not considered threatened or to be in significant decline. These lists confer no legal status; however, they are useful when assessing the significance of predicted impacts and determining the level of mitigation that may be required when birds are affected by development or any other activity
Regional	Environment (Wales) Act 2016	This act makes provision in respect of biodiversity, pesticides harmful to wildlife, protection of birds and invasive non-native species in Wales. Section 7 of this act includes a duty on public bodies to have regard to the purpose of conserving biodiversity in the exercise of their functions. The list of species included in Section 7 defines the birds that are of principal importance in Wales and should be considered when public bodies exercise their duty.
	Planning Policy Wales – Chapter 6: Distinctive and Natural Places (11th ed., 2021)	Chapter 6 of Planning Policy Wales (PPW) sets out the Welsh Government's objectives for Biodiversity and Ecological Networks among other environmental and cultural components of 'Placemaking'. In particular, the Biodiversity and Ecological Networks section puts emphasis on planning authorities to have regard for the State of Natural Resources Report (SoNaRR) and Area Statements published by Natural Resources Wales. In this sense PPW now requires information of ecosystem resilience as well as protected and priority species as outlined by Section 6 and Section 7 of the Environment (Wales) Act 2016.
	Future Wales: The National Plan 2040	This development plan recognises the necessity for resilient ecosystems within Wales within Policy 9 of the document. Developments should deliver net biodiversity benefits whilst maximising the provision of green infrastructure, in alignment with Policies 17 and 18.
	Technical Advice Note 5	Technical Advice Note 5 (TAN5) outlines how the land use planning system in Wales should contribute to protecting and enhancing biodiversity and geological conservation. TAN5 details that when considering polices and proposals in planning applications at a local level the principles and material considerations are taken into account.

Scale	Legislation / Policy	Description
Local	Powys Local Development Plan	The Powys Local Development Plan (LDP) includes Policy DM02 – The Natural Environment which require development proposals to demonstrate how they protect, positively manage and enhance biodiversity and geodiversity interests including improving the resilience of biodiversity through the enhanced connectivity of habitats within, and beyond the site.
	Powys Nature Recovery Action Plan (PNRAP)	The national strategy for biodiversity was delivered at a local level via Local Biodiversity Action Plans (LBAP), which has been superseded and transposed into the Powys Nature Recovery Action Plan (PNRAP), by the Powys local nature partnership. The PNRAP contains 17 habitats and 28 species action plans. Species for which the action plans have been prepared and are considered relevant to the study area are: Curlew *Numenius arquata* Red kite *Milvus milvus* Tree sparrow *Passer montanus* Nightjar *Caprimulgus europaeus* The PNRAP places a greater emphasis on ecosystem resilience and improving habitat connectivity between habitats and populations forms the core of the approach and assists in helping to deliver the Environment (Wales) Act Section 6 duty by the LPA. Habitats and species considered in the PNRAP are more extensive and allow for sites to be targeted for recovery and biodiversity net gain for specific needs of the features present.

Study Area and Zones of Influence

7.2.2 Study areas for baseline information gathering and determining each Zone of Influence (ZoI) were based on the Site Boundary, extended to record flight activity, nest, roost and display sites for target species in accordance with guidance (Scottish Natural Heritage, 2018). Study areas and ZoI adopted may be updated over the course of the iterative design process to account for any changes in scheme design and where land access permissions allow.

7.3 Assessment Methodology

Scope

7.3.1 The scope of this report and the proposed ornithological impact assessment (OIA) has been informed by previous ornithological investigations of the Site, along with extensive consultations with statutory consultees during the previous application. The purpose of

this scoping study is to determine what is required to be taken forward for further assessment in the full OIA report.

Scope of the full OIA

7.3.2 The impact assessment presented within the full OIA report will be undertaken in accordance with Scottish Natural Heritage guidance (SNH, 2018) and based on CIEEM (2018) guidelines.

7.3.3 The assessment process will include the following stages:

- determination and evaluation of important ornithological features;
- identification and characterisation of impacts;
- outlining mitigation measures to avoid and reduce significant impacts;
- assessment of the significance of any residual effects after such measures;
- identification of appropriate compensation measures to offset significant residual effects; and
- identification of opportunities for ornithological enhancement.

7.3.4 The impact assessment will take account of existing guidance and published scientific literature in relation to birds and wind farms, together with professional judgement and experience of energy project OIA.

7.3.5 The OIA report will provide a detailed description of existing baseline ornithological features of the study area, along with the assessment of the potential effects of the Proposed Development on the identified important ornithological features. It will be ensured that sufficient information is presented within the OIA to allow an objective and robust assessment of potentially significant adverse impacts upon important ornithological features to take place

7.3.6 Ornithological data deemed sensitive (e.g. relating to nest sites) will be included within a confidential appendix to the OIA. This will not be made publicly available but will be issued to Natural Resources Wales (NRW) and other statutory consultees.

Zone of Influence

7.3.7 Areas which are affected by environmental changes caused by the project can be referred to as the 'ecological zone of influence' (ZoI) (CIEEM, 2018). Birds are highly mobile and capable of travelling large distances as part of their behaviour. Different species can be considered to have differing ZoIs depending on their life cycle and environmental factors. As such impacts have been assessed with a zone of influence appropriate for each

receptor with search areas for historic data and surveys taking place over a larger area for target and key species.

7.3.8 A 30km ZoI for birds is used in this assessment, and is considered to be precautionary with reference to industry guidance for assessing the impacts of proposed energy developments on birds (SNH, 2017).

Determining Importance

7.3.9 The full OIA report will assess, in detail, impacts upon important ornithological features which are likely to be significantly affected by the Proposed Development. A detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts will not be undertaken and justification provided for 'scoping out'.

7.3.10 Relevant policy will be referred to when determining importance or sensitivity of an ornithological feature, on an international, national and local scale. Additionally, importance will be determined using professional judgement, as well as specialist consultation advice and the results of baseline surveys.

7.3.11 Importance will not necessarily relate solely to the level of legal protection that an ornithological feature is afforded, and ornithological features may be important for a variety of reasons – such as their connectivity to a designated site, the rarity of the species, or the geographical location of the species relative to their known range.

7.3.12 Consideration is given to the level of nature conservation value for each ornithological receptor that may be affected, to help determine the value of that receptor. In addition, the sensitivity of the ornithological receptor is also considered to help in the decision of taking forward the receptor into the full OIA. The value of a receptor is considered in terms of the population that occupies, or relies on the site, rather than at an individual or legislative level. The approach to assessing the value of ornithological receptors that will be utilised in the full OIA report is presented in Table 7.3.1.

Table 7.3.1: Definition of nature conservation value for bird interest at Mynydd Lluest y Graig

Sensitivity	Definitions
Very High	Qualifying species of an internationally designated site (i.e. SPA or Ramsar) Species present in internationally important numbers (>1% of UK population).
High	Species that contribute to the integrity of a SPA or Site of Special Scientific Interest (SSSI) but which are not cited as species for which the site is designated (SPAs) or notified (SSSIs).

Sensitivity	Definitions
	Ecologically sensitive species such as rare birds (<300 breeding pairs in the UK). Species present in nationally important numbers (>1% Welsh population). Species listed on Annex I of the EC Birds Directive or breeding species listed on Schedule 1 of the Wildlife and Countryside Act. Regularly occurring relevant migratory species, which are either rare or vulnerable, or warrant special consideration (i.e. Schedule 1 of the Wildlife and Countryside Act and Section 7 of the Environment Act) on account of the proximity of migration routes, breeding, wintering and staging areas in relation to the Development.
Medium	Species present in regionally (i.e. mid-Wales) important numbers (>1% regional population) Species occurring within SPAs and SSSIs but not crucial to the integrity of the site. Species of Principal Importance as defined in Section 7 of the Environment Act. Regularly occurring relevant migratory species, which are either rare or vulnerable, or warrant special consideration (i.e. BoCC Wales Red List) on account of the proximity of migration routes, breeding, wintering and staging areas in relation to the Development.
Low	Regularly occurring relevant migratory species, which are either rare or vulnerable, or warrant special consideration (i.e. BoCC Wales Amber List) on account of the proximity of migration routes, breeding, wintering and staging areas in relation to the Development. Any other species of local conservation interest such as those listed in the LBAP or PNRAP.

Characterising Potential Impacts

7.3.13 Importance will not necessarily relate solely to the level of legal protection that an ornithological feature is afforded, and ornithological features may be important for a variety of reasons – such as their connectivity to a designated site, the rarity of the species, or the geographical location of the species relative to their known range.

7.3.14 Identification and characterisation of both positive and negative impacts on important ornithological features will be undertaken in accordance with the CIEEM guidelines (2018).

7.3.15 Impacts will be considered during the construction, operational and decommissioning phases and will be assessed on the basis that a clearly defined range of avoidance and standard good practice measures are implemented.

Magnitude of Potential Effects

7.3.16 Effects are judged in terms of magnitude over the area and timeframe in which they occur. This will be assessed using five levels as detailed in Table 6.4.2 and Table 6.4.3 in Section 6.4 Ecology.

7.3.17 The magnitude of the effect is independent of the value of the receptor. Effects can be positive or negative, of particular or varying timescales, direct or indirect, reversible and can be cumulative.

Determining Significant Effects

7.3.18 Please refer to Paragraph 6.4.18 in the Section **Error! Reference source not found.** Ecology and Nature Conservation chapter of this report for the approach that will be used to determine likely significant ornithological effects.

7.3.19 In addition, with sole respect to important ornithological features (IOF) an assessment of collision risk will be made using the Band *et al.* (2007) model. This is known as collision risk modelling (CRM) and uses turbine specification measurements and ornithological biometrics of individual avian species to determine likelihood of collision with a turbine.

7.3.20 Flight behaviour of key species observed during the ornithological survey effort in proximity to the proposed turbines will be analysed to further inform the collision risk assessment. Possible disturbance effects will be assessed by determining the bird populations of importance within the energy project area and its surrounds (based on the field surveys and any additional information available), and by reference to the current literature on bird-wind farm interactions. The assessment methodology will follow that initially developed by SNH (2000) for assessing the effects of wind farms on ornithological interests. This method first identifies the sensitivity (conservation importance; as defined in Table 7.3.1) of the receptors present in the study area, then determines the magnitude of the possible effect on those receptors (as described in Table 6.4.2 in Section **Error! Reference source not found.** Ecology).

Cumulative Effects

7.3.21 The potential for cumulative effects on important ornithological features as a result of other wind farm proposals will be assessed in line with the CIEEM (2018) guidelines. The assessment will encompass the effects of the Proposed Development in combination with existing developments, either built or under construction; approved developments; awaiting implementation; and, proposals awaiting determination within the planning process with design information in the public domain.

Avoidance and Mitigation

7.3.22 The adoption of embedded mitigation measures to avoid or minimise adverse effects upon important ornithological features will be part of the iterative design process for the Proposed Development.

7.3.23 Full details of embedded mitigation measures in relation to ecology will be detailed in the full OIA report.

Residual Effects

7.3.24 An assessment to determine the significance of residual ornithological effects, which remain after mitigation measures have been applied, will be undertaken.

Compensation

7.3.25 Where significant residual effects still remain, compensation will be provided. This could include replacement habitat, or habitat improvements which would offset potentially significant residual effects.

Enhancement

7.3.26 Suitable principles for ornithological enhancement to be delivered as part of the Proposed Development will be outlined within the full OIA report. The appropriateness and feasibility of principles will be discussed with NRW and other relevant statutory consultees over the course of the process, with a view to prescriptive enhancement measures being detailed post-consent within a full Habitat Management Plan (HMP). It may be necessary to prepare an Outline HMP to provide an overview of measures proposed, which may be presented either as an individual Technical Appendix to the OIA or as an addendum.

7.4 Baseline Conditions

7.4.1 The proposed energy project at Mynydd Lluest y Graig comprises two historical wind farm proposals, Rhyd Ddu (2005-2008) and Mynydd Waun Fawr (2008-2012). Ecological survey data was collected during the respective years given in parentheses.

7.4.2 Since that time, additional survey effort has been undertaken by the Environmental Dimension Partnership Ltd (EDP) in 2014, and Environment Systems Ltd (EnvSys) between 2017-2018. Surveys have been completed in 2021 and are ongoing in 2022.

7.4.3 A brief summary of findings from the desk study and field surveys completed to date is provided below.

Desk Study

7.4.4 A desk study was undertaken in 2018 and was updated in 2021. This was conducted to inform the proposed approach to baseline information gathering, including the scope for the baseline ornithological surveys.

7.4.5 Records were requested from the relevant biodiversity records centre, the Biodiversity Information Service for Powys and the Brecon Beacons National Park (BIS). The following ornithological receptors and corresponding buffer zones from the study area are provided:

- Sites holding International statutory designations: 30km;
  - Ramsar: Wetlands of International Importance;
  - SPA: Special Protection Area;
- Sites holding National statutory designations: 10km;
  - SSSI: Sites of Special Scientific Interest
  - NNR: National Nature Reserve
- Protected and Priority Species & Species of Principal Importance: 10km;
- Birds of Conservation Concern: 10km; and
- All raptors and their nest sites: 10km.

7.4.6 A brief summary of findings from the desk study and field surveys completed to date is provided below.

Sites holding International statutory designations for nature conservation

7.4.7 Sites holding International statutory designations located within 30km of the Site are summarised in Table 7.4.1, with those scoped into further assessment shown in bold.

Table 7.4.1: Sites holding International statutory designations within 30km. Bolded text within the table indicates the feature has been scoped in

Site	Distance from Study Area	Qualifying features	Scoped in / out	Rationale
Llyn Tegid Ramsar	25.2km to N	Aquatic vegetation Whitefish *Coregonus lavaretus* Grayling *Thymallus thymallus* Mesotrophic lake	Out	Qualifying features have no ecological pathway to the Site.
Cors Fochno and Dyfi Ramsar Dyfi Estuary SPA	**25.3km to W**	**Wintering Greenland white-fronted goose (average count 1985-90 was 110) Wintering wigeon (average count 1985-90 was 4040) Notable also are wintering shelduck, teal, red-breasted**	**In**	**One qualifying feature and at least two notable species are listed on the target species for this scoping report and full OIA.**

Site	Distance from Study Area	Qualifying features	Scoped in / out	Rationale
		merganser, curlew and various raptors. Large numbers of red-throated divers and great crested grebes occur in winter off the mouth of the Dyfi.		
Berwyn SPA	7km to N	Nationally important breeding populations of four Annex 1 species: > 2-3 pairs of red kite (>1% British population) > 14 pairs hen harrier (>2% British population) > 14 pairs merlin (>2% British population) > 18 pairs peregrine falcon (>1.5% British population) Notable also are two other Annex I species: ~5 pairs golden plover, and up to 10 pairs short-eared owl. Both species are at the western and southern edge of their British breeding range. Present also are breeding curlew, dunlin, raven, ring ouzel, snipe and teal.	In	Proximity to Site (<10km) Four qualifying features and at least two notable species are listed on the target species for this scoping report and full OIA, as well as three species noted for their presence in the SPA.
Elenydd-Mallaen SPA	28.6km to S	Internationally or nationally important breeding populations of two Annex I species: > 34 pairs red kite (34% British population and 0.3% global population) > ~7 pairs merlin (>1% British population). Notable also are three other Annex I species: up to two pairs chough, >10 pairs peregrine falcon and ~50 pairs golden plover, the latter of which are on the southern and western edge	In	Two qualifying features are listed on the target species for this scoping report and full OIA.

Site	Distance from Study Area	Qualifying features	Scoped in / out	Rationale
		of their breeding range in Britain. **Present also are 50 pairs raven, breeding teal, red grouse, dunlin, snipe, curlew and ring ouzel.**		
Migneint-Arenig-Dduallt SPA	**23.1km to NW**	**Nationally important breeding populations of three Annex I species:** **> 10-12 pairs hen harrier (2% British population)** **> 9-12 pairs merlin (0.7-0.9% British population)** **> 12 pairs peregrine falcon (1% British population)** **Notable also are breeding golden plover, dunlin, red grouse, chough, red kite, curlew and an important population of black grouse.**	**In**	**Proximity to Berwyn SPA (6km) which is also scoped into this assessment and full OIA.** **Three qualifying features and at least four notable species are listed on the target species for this scoping report and full OIA.**

Sites holding National statutory designations for nature conservation

7.4.8 There are no sites holding National statutory designations with ornithological qualifying interests within the Site nor the 10km study area.

Sites holding Non-Statutory designations for nature conservation

7.4.9 There are no sites holding non-statutory designations with ornithological qualifying interests within the Site nor the 2km study area.

Field Surveys

7.4.10 In accordance with the SNH (2017) guidelines, two years of ornithological surveys are required unless it can be demonstrated that a reduced survey effort is appropriate.

7.4.11 Target species will be limited to those which are afforded a higher level of legislative protection (SNH, 2017) such as those listed on:

- Annex 1 of the EC Birds Directive;
- Schedule 1 of the Wildlife & Countryside Act 1981 (as amended); and
- Red-listed Birds of Conservation Concern.

7.4.12 Consideration must also be given to species identified locally as being of conservation concern within the Powys LBAP / PNRAP, although is best restricted to those likely to be affected by wind farms.

7.4.13 Other local circumstances may indicate that survey information should also be acquired on other species, especially those of regional conservation concern – these are named as Secondary Species.

7.4.14 Passerine species are not generally considered to be significantly impacted by wind farms, although loss of habitat may impact those listed on the above legislation. Any populations identified on Site during the ornithological survey effort that are assessed to be of importance will also be considered in the full OIA.

7.4.15 Target species:

Species	**Scoped in / out**	**Rationale**
Barn owl *Tyto alba*	In	Known to be roosting within the 500m of the Site. A total of 202 records of the species were returned from the Desk study.
Black grouse *Tetrao tetrix*	Out	Based on the extant survey data (from both the former site proposals and adjacent wind farm proposals) and records received during the course of the desk study. Will be scoped back into the assessment as new information is collated during the 2022 surveys
Brent goose *Branta bernicla*	Out	Based on the extant survey data (from both the former site proposals and adjacent wind farm proposals) and records received during the course of the desk study. Will be scoped back into the assessment as new information is collated during the 2022 surveys. No records were returned from the desk-based study
Black-headed gull *Chroicocephalus ridibundus*	In	Black-headed gull was observed in 2014 and 2018. Several observations of territorial vocal utterances were noted during March and June 2018, this could perhaps classify the species as a rare breeder for the site. Eighteen records of this species were returned from the desk-based study
Common crossbill *Loxia curvirostra*	In	Eleven records of the species being present within 10km were returned from the desk-based survey. Two records of common crossbill were recorded in winter 2018.
Curlew *Numenius arquata*	In	Seventy-three records were returned from the desk-based study. Curlew have been recorded on and near to Site throughout the extant and current survey effort
Golden plover *Pluvialis apricaria*	In	Seven records of this species were returned from the desk-based study. During the previous surveys of the Site, golden plover were recorded in all three winter survey periods. 50 pairs golden plover have also been recorded at the Elenydd Mallaen SPA, located 28.6 km to the south, this is the southern and western edge of their breeding range in Britain.

Species	Scoped in / out	Rationale
Goshawk *Accipiter gentilis*	In	Nests are located within 1 km of the Site. Goshawk was recorded in all three historic winter survey periods at the Site. Four records of the species were returned from the Desk Study.
Great black-backed gull *Larus marinus*	In	Historic surveys and current surveys in association with the Site have recorded this species flying over in each winter survey period (2015 and 2018, with time spent at collision risk height). Due to the nature of the flight pattern of this species, it is deemed necessary to scope into the assessment.
Greenland white-fronted goose *Anser albifrons subsp. Flavirostris*	In	Dyfi Estuary SPA, located approximately 27 km west of the Site, has been designated for its international importance as a traditional wintering area for Greenland White-fronted Goose.
Hen harrier *Circus cyaneus*	In	Berwyn SPA, located approximately 7km to the north, is an internationally important breeding site for populations of Hen Harrier. The need for a Habitat Regulations Assessment (Appropriate Assessment) will be screened on the basis of the baseline ornithology data. Ten historic records, some as recently as 2019, with the nearest record being 0.8 km from the site boundary.
Herring gull *Larus argentatus*	Out	Eleven records were returned from the desk study within 10 km of Site. Herring gull was only observed during the 2014-15 survey winter period and on only two occasions. This is likely to remain the same in another survey period and undertaking collision risk modelling on such low numbers is almost certain to return an insignificant effect (i.e. it would be a negligible impact on the local populations in full OIA). Herring gull was observed flying over the site for approximately two minutes in summer 2014 on one occasion. No observations were made in 2015 and none in 2018, with none to date in the 2021-2022 surveys. Detailed analysis in collision risk modelling is likely to return a negligible impact.
Hobby *Falco subbuteo*	In	Three records recorded in the Tirgwynt Windfarm Post Construction Ecological Monitoring Report, most recent record 2019. A single hobby flight was recorded during October 2017. Hobby was observed in 2014 and 2015. One observation was recorded in July 2018. Hobby is not considered to have bred on or in close proximity to site in 2014, 2015, 2018 or 2021.
Kestrel *Falco tinnuculus*	In	Seventy observations of Kestrel have been recorded at the Site during the 2021 VP surveys.

Species	Scoped in / out	Rationale
Lapwing *Vanellus vanellus*	In	Winter observations of lapwing were made in 2014-15 and 2017-18. The 2014, 2015 and 2018 surveys found two probable nests of Lapwing.
Merlin *Falco columbarius*	In	Berwyn SPA, located approximately 7km to the north, is an internationally important breeding site for populations of Merlin. The need for an Habitat Regulations Assessment (Appropriate Assessment) will be screened on the basis of the baseline ornithology data.
Nightjar *Caprimulgus europaeus*	In	Previously recorded within the Site, the 2014 and 2015 nightjar survey confirmed a territory at Mynydd Pantyceiliagwydd and this was confirmed again in 2018.
Peregrine *Falco peregrinus*	In	Berwyn SPA, located approximately 7km to the north, is an internationally important breeding site for populations of Peregrine. The need for an Habitat Regulations Assessment (Appropriate Assessment) will be screened on the basis of the baseline ornithology data.
Osprey *Pandion haliaetus*	Out	A single bird record at Lyn Hir adjacent to the Site's eastern boundary in 1995. No observations were recorded during extant survey data, no records were returned during the desk based study. Will be scoped back into the assessment should new information be collated during the 2022 surveys
Red grouse *Lagopus lagopus*	Out	Based on the extant survey data (from both the former site proposals and adjacent wind farm proposals) and records received during the course of the desk study. Will be scoped back into the assessment should new information be collated during the 2022 surveys
Red Kite *Milvus milvus*	In	Berwyn SPA, located approximately 7km to the north, is an internationally important breeding site for populations of Red Kite. In addition, the Elenydd Mallaen SPA is located approximately 28.6 km to the south, and contains 34% of the British population. Red kite have been recorded across the site during all surveys undertaken over the years.
Redshank *Tringa tetanus*	Out	Based on the extant survey data (from both the former site proposals and adjacent wind farm proposals) and records received during the course of the desk study. Will be scoped back into the assessment should new information be collated during the 2022 surveys
Short-eared owl *Asio flammeus*	Out	No records were returned from the desk-based study. Three records of short-eared owl were recorded during the 2017-2018 winter walkover. They are not considered to be breeding within the Site. No observations of short eared owl have been recorded

Species	Scoped in / out	Rationale
		during the 2021 and 2022 survey effort so far. Species will be scoped back into the assessment should new information be collated during the 2022 surveys
Snipe *Gallinago gallinago*	In	Snipe was recorded in the extant survey effort, no records were returned from the desk based study. Snipe territories are known to be present with the Site.
Starling *Sturnus vulgaris*	In	Numerous starling murmuration's were recorded during winter 2017-18 with over 1.5 hours of time in flight and approximately 15,500 birds recorded.
Teal *Anas crecca*	Out	Based on the extant survey data (from both the former site proposals and adjacent wind farm proposals) and records received during the course of the desk study. Will be scoped back into the assessment should new information be collated during the 2022 surveys
Whooper swan *Cygnus cygnus*	Out	Whooper swans were recorded on Llyn Hir in late November/early December 2013, none were recorded in the winter survey seasons in 2014-2015/ 2017/2018. Whooper swan will be scoped back into the assessment should new information be collated during the 2022 surveys

7.4.16 Secondary species:

- Buzzard *Buteo buteo*
- Raven *Corvus corax*
- All other waders and wildfowl not listed as target species.

Table 7.4.2: Survey details 2017-18

Survey	Timeframe	Details
Vantage Point (winter)	October - March	Surveys were commissioned late in October '17. This resulted in VP watches spanning between 26/10/17 to 06/11/18. This meant that all surveys were completed late in the October migratory period just as the weather was changing into winter and as such potential change in distribution and number of birds may have been under-recorded. However, the results of the surveys are comparable to the previous winter survey periods and do not appear to be a significant limitation to impact assessment.
Winter walkover	October – March	As above but all surveys completed by 03/11/18. Results provided positive sightings and appear representative of the time of year. Visit 2 was completed at least ten days after first visit. Not seen as constraint to the survey results.

Survey	Timeframe	Details
Waterbody survey (WeBS)	November – September	Each lake visited and peak count of each species noted. Largely limited activity. No limitations noted. Visits on monthly basis to waterbodies included in winter walkovers and breeding bird survey results.
Vantage Point (summer)	April – September	No limitations on survey effort and timings observed. Flights tend to be limited with typically half a dozen per VP watch, some watches with no flights at all, and others up to a dozen flights. A lot depends on the weather conditions, especially when the cloud base brings the pressure down. Higher pressure tends to result in fewer flights, so a long period of dry weather in summer 2018 was particularly uneventful. In terms of future collision risk assessment, the number of flights is limited and the numbers for some species are likely to be too small for effective calculations.
Breeding bird survey (BBS)	April – September	Common Bird Census survey modified with Brown & Shepherd (1993) and Calladine *et al.* (2009) methodologies. One visit each month with two visits in June 2018. Surveys in July- September targeted at demonstrating any seasonal changes. Specific searches for Curlew up to 800m from the site boundary where access permitted; targeted forestry surveys for raptor nests; nightjar surveys of recent clear fell (presence of churring males) and walkover of open ground. No limitations on survey effort and timings noted.
Nightjar survey	June – July	Presence/ likely absence of churring males in suitable forest coupes (i.e. those that are up to approximately 15 years old and have suitable ground cover with scrub etc). Gilbert *et al.* (1998) method followed.
Curlew survey	March - August	Surveys for curlew are typically between March and June. Curlew are known to lay second broods or replacement clutches (Grant *et al.* 1999; Currie *et al.* 2001; Valkama & Currie, 1999) and therefore the survey period for curlew is augmented to end in August. The curlew search was incorporated within the Breeding Bird Survey for the site itself but have extended up to 800m from the site boundary for habitats that are most suitable for breeding curlew. Historic curlew sites checked and areas up to 800m where access allows visited to check habitat suitability.
Raptor nest (forestry) survey	April - September	Surveys in the forested areas were intended to identify and monitor raptor nests. Where a nest was identified it was monitored for ongoing activity but without directly accessing the nest to avoid undue disturbance. Notes on passerines such as common crossbill using the forestry were also noted.

7.4.17 Survey effort for the 2021-2022 period has commenced and is ongoing. Surveys were commissioned in late April 2021 and in regard to the summer VP watches, for the BBS

and the curlew survey, the survey effort will continue into April 2022 to account for the late start in the 2021 season. No limitations to summer or winter survey efforts are therefore anticipated.

7.4.18 Nightjar survey effort in 2021 has yielded at least one confirmed nightjar territory.

7.4.19 Full survey results, analysis and interpretation will be made in the full OIA report. Survey effort, both proposed and ongoing for the 2021-2022 period is summarised in Table 7.4.3.

7.4.20 Collision risk modelling will be undertaken on those target species with sufficient data to provide a robust assessment.

Table 7.4.3: Survey details 2021-2022

Survey	Timeframe	Additional information
Vantage Point (winter)	October – March	Surveys completed.
Winter walkover	October– March	As above.
Waterbody survey (WeBS)	April - March	Each water body has been visited and peak count of each species noted.
Vantage Point (summer)	April – September	Surveys completed to date: May 2021 - August 2022 April 2022 – June 2022
Breeding bird survey (BBS)	April – September	Common Bird Census survey modified with Brown & Shepherd (1993) and Calladine *et al.* (2009) methodologies. One visit each month with two visits in June. Surveys in July- September targeted at demonstrating any seasonal changes. Specific searches for Curlew up to 800m from the site boundary where access permitted; targeted forestry surveys for raptor nests; nightjar surveys of recent clear fell (presence of churring males) and walkover of open ground.
Nightjar survey	June – July	Presence/ likely absence of churring males in suitable forest coupes (i.e. those that are up to approximately 15 years old and have suitable ground cover with scrub etc). Gilbert *et al.* (1998) method followed, using transect routes.
Curlew survey	March - August	Surveys for curlew are typically between March and June. However previous discussion on nearby wind farm projects with Natural Resources Wales over the past decade have resulted in requests for ongoing curlew surveys to identify second broods into July and August. The curlew search therefore will be incorporated within the Breeding Bird Survey for the site itself but will be extended up to 800m from the site boundary for habitats that are most suitable for breeding curlew. Historic curlew sites will be checked and areas up to 800m where access allows will be visited to check habitat suitability. An indicative territory map will be prepared.

Survey	Timeframe	Additional information
Raptor nest (forestry) survey	April - September	Surveys in the forested areas are intended to identify and monitor raptor nests. Where a nest has been identified it is being and will continue to be monitored for ongoing activity but without directly accessing the nest to avoid und-due disturbance. Notes on passerines such as common crossbill using the forestry will also be noted.

7.5 Potentially Significant Effects and Approach to Mitigation

7.5.1 Potential adverse impacts and effects upon ornithological features to be assessed within the full OIA to highlight activity which could arise during the construction, operational and decommissioning phases of the Proposed Development are summarised below.

7.5.2 Impacts will be assessed and informed on the basis of baseline study findings and through consultation with relevant specialist groups as required.

Table 7.4.3: Survey details 2021-2022

Activity	Potential Effects
Construction Phase	
Designated sites	Direct impacts Unlikely by virtue of physical distances between them and the Site. Indirect Impacts No meaningful impacts anticipated, as disturbance from construction is anticipated to be temporary in nature. Construction would also not take place over the entirety of the Site, rather, within defined working units and phased over smaller areas.
Avian species	Direct impacts Displacement of populations of IOF, primarily ground-nesting species. Loss of nesting habitat. Destruction of nests whilst active. Indirect impacts Fragmentation of or change in habitat/feature connectivity. Disturbance to and then loss of nest sites, eggs and/or dependant young.
Operational Phase	
Designated sites	Potential changes in population sizes resulting from bird mortality caused by collision with turbines.
Avian species	Direct impacts include mortality via collision with turbines Indirect effects include potential reduction in population sizes at a variety of geographical scales.

Decommissioning Effects

7.5.3 Effects from decommissioning have the potential to be similar to those during the construction phase, although are more likely to occur over a shorter time period.

7.5.4 Species most likely to be disturbed and displaced from the Site during decommissioning are those that breed, roost or forage within it at the time.

7.6 Residual Effects

7.6.1 Effects on target species will be assessed, taking into account the species' population, range and distribution. Principally, the target species of concern are red kite, kestrel and golden plover, as the species are reliably active on site and have been recorded consistently through the history of the site.

7.6.2 As a result, a detailed CRM will be carried out to provide an accurate estimate of any impact from the Proposed Development. This CRM will be required to be run on every iteration of the turbine layout to generate a clear picture of which layout creates the most and least risk for the species.

7.6.3 All species recorded on site which are considered target species will be assessed during CRM although it appears that their abundance is not great enough to warrant major concern.

7.7 Cumulative Assessment

7.7.1 Cumulative effects of all relevant factors of the Proposed Development in each phase (construction, operation, decommissioning) will be assessed alongside other wind farm projects subject to the EIA process, and the effects these have on a relevant reference population.

7.7.2 This assessment will also include potential effects on the qualifying features of sites holding International statutory designations.

7.8 References

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SNH (2000) Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action. SNH Guidance Note. Available at http://www.snh.gov.uk/docs/C205425.pdf 4

SNH (2010) Use of avoidance rates in the SNH wind farm collision risk model. SNH Guidance Note.

SNH (2016) Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. SNH Guidance Note, October 2016.

SNH (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms, March 2

Valkama, J., & Currie, D. (1999). *Low productivity of Curlews Numenius arquata on farmland in southern Finland: Causes and consequences*. Ornis Fennica, *76*(2), 65-70.

Whitfield, D.P. & Madders, M. (2006b) Deriving collision avoidance rates for red kites Milvus milvus. Natural Research Information Note 3. Natural Research Ltd, Banchory, UK. Available at http://www.natural-research.org/documents/NRIN_3_whitfield_madders.pdf

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8 Archaeology and Cultural Heritage

8.1 Introduction

8.1.1 An Archaeological and Cultural Heritage Assessment of the Mynydd Lluest y Graig Energy project will be conducted by AOC Archaeology Group. AOC Archaeology Group is a Registered Archaeological Organisation of the Chartered Institute for Archaeologists (CIfA).

8.1.2 This section of the Scoping Report is supported by the following:

- Heritage Figure 1: Superficial Deposits within the Site (BGS, 2021)
- Heritage Figure 2: Location of historic peat survey within the Site
- Heritage Figures 3-7: Heritage assets within the Site;
- Heritage Figures 8-12: Heritage assets within 1km of the Site
- Heritage Figure 13: Designated heritage assets within 5km of the Site
- Heritage Figure 14: Designated heritage assets within 10km of the Site and Clwedog Valley
- Heritage Appendix 1: Site Gazetteer.

8.2 Policy and Relevant Guidance

8.2.1 The statutory framework for heritage in Wales is outlined in the Ancient Monuments and Archaeological Areas Act 1979, Planning (Listed Buildings and Conservation Areas) Act 1990 and the Historic Environment (Wales) Act 2016. Registration of Historic Parks and Gardens is required by law and the statutory register, including c. 400 historic parks and gardens is due in 2021.

8.2.2 The implications of these Acts with regard to government planning policy are described within:

- Planning Policy Wales (PPW) (2021) - Chapter 6: Distinctive and Natural Places-The Historic Environment
- Technical Advice Note (TAN) 24: The Historic Environment (2017)

8.2.3 Local planning policy is contained within:

- The Powys Local Development Plan (2011-2026) adopted in 2018
    - Theme 3: Guardianship of natural, Built and Historic Assets
    - LDP 13 ii. The Historic Environment
    - Strategic Policy (SP) 7- Safeguarding of Strategic Resources and Assets
- Supplementary guidance on heritage and archaeology, adopted in 2019.

8.2.4 The following guidance documents would be relevant to any development proposal on the Site:

- Guide to Good Practice on Using the Register of Landscapes of Historic Interest in Wales in the Planning and Development Process Revised 2nd Edition (Cadw, 2007)
- Conservation Principles for the sustainable management of the historic environment in Wales (Cadw, 2011)
- Historic Environment Records in Wales: Compilation and Use (Cadw, 2017a)
- Managing Change to Listed Buildings in Wales (Cadw 2017b)
- Managing Change to Registered Parks and Gardens in Wales (Cadw, 2017c)
- Managing Conservation Areas in Wales (Cadw, 2017d)
- Managing Historic Character in Wales (Cadw, 2017e)
- Setting of Historic Assets in Wales (Cadw, 2017f)
- Managing Scheduled Monuments in Wales (Cadw, 2018a)
- Understanding Listing in Wales (Cadw, 2018b)
- Understanding Scheduling in Wales (Cadw, 2019)

8.3 Assessment Methodology and Significance Criteria

Data Sources

8.3.1 This Scoping Report has identified all heritage assets within 1km of the Site; all designated heritage assets within 5km of the Site; and all nationally important heritage assets within 10km of the Site. In addition, the Historic Landscape Area (HLA) of Clywedog which extents to c. 10.9km south-west of the Site has been identified.

8.3.2 The following data sources were consulted during preparation of this scoping report:

- Cadw and Historic Wales (https://historic-wales-rcahmw.hub.arcgis.com/): For designated asset data.
- National Map Library (National Library of Scotland, Causewayside, Edinburgh) (NLS): For online old Ordnance Survey maps (1st & 2nd Edition, small- and large-scale) and pre-Ordnance Survey historical maps.
- The Clwyd-Powys Archaeological Trust (CPAT) and Archwillo (https://www.archwilio.org.uk/arch/): For Historic Environment Record (HER) data (HER reference E6658- which was order based on Version 2 of the Site boundary); records of previous archaeological investigations (Events); Historic Landscape Characterisation (HLC); and the location of Ancient Woodland.

- Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW): via Coflein (https://coflein.gov.uk/en/) for non-designated heritage asset data and for online accessible historic aerial photographs and reference aerial photographs available for copying.
- Archaeology and Cultural Heritage Chapter from a former Environmental Impact Assessment in the vicinity of the Site (CgMs, 2014).
- British Geological Survey (BGS).
- For bedrock and superficial deposit data and historic boreholes information.
- LANDMAP (https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/landmap-the-welsh-landscape-baseline/?lang=en): For historic landscape characterisation and modern landscape information.
- Natural Resources Wales (http://lle.gov.wales/Catalogue/Item/LidarCompositeDataset/?lang=en): For 2m composite LiDAR data from 2016

8.3.3 The data sources and study areas listed above will also be used to inform the Archaeological and Cultural Heritage Assessment and will be used in the creation of an archaeological and cultural heritage baseline. In addition, aerial photography held by RCAHMW will be consulted once the full details of the development layout are confirmed. If available point Lidar Data at a higher resolution (1m or 0.5m scale) will also be consulted for the Archaeological and Cultural Heritage Assessment.

8.3.4 A review of the available archival material at Powys Archives has been undertaken as part of this assessment but a visit to the archive has not been undertaken. Archival material will be consulted for the Archaeological and Cultural Heritage Assessment and included where relevant.

8.3.5 The Site has previously been subject to thorough walkover surveys for both research and commercial purposes. The Archaeological and Cultural Heritage Assessment will be informed by these previous surveys as well as a walkover survey, which will focus on the footprint of the proposed development. The walkover survey will include all access tracks, turbine locations and any other infrastructure within the Site boundary and will be undertaken by two people, equipped with a GPS enabled hand held device which uses ArcMap Collector capable of recording features to within 3m accuracy. The walkover survey will also assess the location and condition of any previously recorded heritage assets within the footprint of the proposed development.

8.3.6 Consultation will be undertaken with Cadw, the RCAHMW and CPAT as the relevant planning authorities regarding mitigation for direct and settings impacts.

8.3.7 The Archaeological and Cultural Heritage Assessment will be informed by a Zone of Theoretical Visibility (ZTV). Site visits to designated heritage assets within 10km of the Site within the ZTV will be undertaken to assess potential impacts on their settings. An assessment of the potential for impact on the Registered Historic Landscape of Clywedog Valley (Site 125) and the setting of any other heritage assets identified by consultation with Cadw, the RCAHMW and CAPT will also be undertaken.

8.3.8 It is not intended at this stage to undertake an ASIDOHL 2 assessment in relation to the impact on the Registered Historic Landscapes to the south of the Site. If necessary the need for an ASIDOHL 2 assessment will be discussed with the relevant planning authorities; Cadw, RCAHMW, and CPAT; following the production of further design information about the proposed development.

Assessment of Likely Effect Significance

8.3.9 The Archaeological and Cultural Heritage Assessment will distinguish between the terms 'impact' and 'effect'. An impact is defined as a physical change to a heritage asset or its setting, whereas an effect refers to the significance of this impact. The first stage of the assessment will involve establishing the significance and importance of the heritage assets and assessing the sensitivity of those assets to change (impact). Using the proposed design for the proposed development, an assessment of the impact magnitude is made and a judgement regarding the level and significance of effect will be arrived at.

8.3.10 The definition of cultural significance is readily accepted by heritage professionals both in the UK and internationally and was first fully outlined in the Burra Charter, which states in article one that 'cultural significance' or 'cultural heritage value' means aesthetic, historic, scientific, social or spiritual value for past, present or future generations (ICOMOS 2013, Article 1.2). This definition has since been adopted by heritage organisations around the world, including Cadw. The Conservation Principles (Cadw, 2011, 10) notes that "*the significance an historic asset embraces all of the cultural heritage values that people associate with it to which prompt them to respond to it*." In order to assess the cultural "*significance of an historic asset four components need to be considered: Evidential, Historical, Aesthetic and Communal value*" (Cadw, 2011: 10).

8.3.11 The Historic Environment is described as a "*finite, non-renewable and shared resource*" which contributes to "*economic vitality, culture, civic pride, local distinctiveness and the quality of life in Wales*" (Welsh Government, 2021: 126).

8.3.12 All heritage assets have significance; however, some heritage assets are judged to be more important than others. The level of that importance or value is determined by the aspect of worth or importance given by people to historic assets. This level of importance is based on the four heritage values (Cadw, 2011: Glossary). In the case of many heritage assets their importance has already been established through their statutory protection or inclusion on formal registers (i.e. Listed Buildings, Scheduled Monuments, Historic Landscapes) (Welsh Government, 2021:125).

8.3.13 The rating of importance of heritage assets will first and foremost be made in reference to their designation. For non-designated assets importance will be assigned based on professional judgement and guided by the criteria presented in Table 8.3.1, which itself relates to the criteria for designations as set out in Cadw's Conservation Principles (2011), Planning Policy Wales (2021), TAN: 24 (Welsh Government, 2017), Understanding Scheduling in Wales (Cadw, 2019) and Understanding Listing in Wales (Cadw, 2018b).

Table 8.3.1: Criteria for Establishing Importance of Heritage Assets

Importance	Receptors
Very High	World Heritage Sites (as protected by UNESCO and Welsh Ministers-PPW, Welsh Government 2021, TAN: 24, Welsh Government 2017, Cadw, 2017g); Other designated or non-designated assets with demonstrable Outstanding Universal Value.
High	Scheduled Monuments (as protected by the Ancient Monuments and Archaeological Areas Act 1979 (the "1979 Act"); Grade I and Grade II* Listed Buildings of exceptional interest (as protected by the Planning (Listed Buildings and Conservation Areas) Act 1990) (the "1990 Act") (Cadw, 2018b); Grade I Historic Parks and Gardens (required to be complied and registered by the Historic Environment (Wales) Act, 2016. Cadw, 2017c); The Inventory of Historic Battlefields in Wales (Historic Environment (Wales) Act, 2017); Exceptional examples of some architectural and historic interest; Non-designated assets considered to meet the criteria for the designations as set out above.
Medium	Grade II Listed Buildings (as protected by the 1990 Act); Conservation Areas (as protected by the 1990 Act); Registered Historic Landscapes;

Importance	Receptors
	Grade II* and Grade II Historic Parks and Gardens (required to be complied and registered by the Historic Environment (Wales) Act, 2016. Cadw, 2017c); Special examples of some architectural and historic interest; or Non-designated assets considered to meet the criteria for the designations as set out above.
Low	Historic Assets of Special Local Interest; Examples of any period, style or type which contribute to our understanding of the historic environment at the local level.
Negligible	Relatively numerous types of assets; Findspots of artefacts that have no definite archaeological remains known in their context.

8.3.14 Planning Policy Wales (PPW) (2021) includes the setting of the heritage asset with its physical remains, and both PPW (2021) and TAN 24 (2017) note that the setting of a heritage asset is as important as the physical remains. Setting is noted as extending beyond property boundaries and intangible as well as physical factors can be important to the understanding of a historic asset (Cadw, 2017f). While PPW does not differentiate between the importance of the asset itself and the importance of the asset's setting, Cadw (2017f) Setting of Historic Assets states that the settings of heritage assets is not fixed and changes.

8.3.15 The importance of an asset is not the same as its sensitivity to changes to its setting. Elements of setting may make a positive, neutral, or negative contribution to the significance of an asset (Cadw, 2017f). Thus, in determining the nature and level of effects upon assets and their settings by the proposed development, the contribution that setting makes to an asset's significance and thus its sensitivity to changes to setting will be considered.

8.3.16 This approach recognises that setting is key to the understanding and appreciation of some, but by no means all, assets. Indeed, assets of High or Very High importance do not necessarily have high sensitivity to changes to their settings (e.g. do not necessarily have a high relative sensitivity). An asset's relative sensitivity to alterations to its setting refers to its capacity to retain its ability to contribute to our understanding and appreciation of the past in the face of changes to its setting. The ability of an asset's setting to contribute to an understanding, appreciation and experience of it and its significance also has a

bearing on the sensitivity of that asset to changes to its setting. While heritage assets of High or Very High importance are likely to be sensitive to direct effects, not all will have a similar sensitivity to effects on their setting; this would be true where setting does not appreciably contribute to their significance. Assets with Very High or High relative sensitivity to settings effects may be vulnerable to any changes that affect their settings, and even slight changes may erode their key characteristics or the ability of their settings to contribute to the understanding, appreciation and experience of them. Assets whose relative sensitivity to changes to their setting is lower may be able to accommodate greater changes to their settings without having key characteristics eroded.

8.3.17 The criteria that will be used for establishing an asset's relative sensitivity to changes to its setting is detailed in Table 8.3.2. This table has been developed based on AOC's professional judgement and experience in assessing setting effects. It has been developed with reference to the policy and guidance noted above including PPW (Welsh Government, 2021), TAN 24 (Welsh Government, 2017), the Xi'an Declaration (ICOMOS 2005), and Cadw's Conservation Principles (2011) and guidance on the setting of heritage assets (Cadw, 2017f).

Table 8.3.2: Criteria for Establishing Relative Sensitivity of a Heritage Asset to Changes to its Setting

Relative Sensitivity	Criteria
Very High	An asset, the setting of which, is critical to an understanding, appreciation, and experience of it should be thought of as having Very High Sensitivity to changes to its setting. This is particularly relevant for assets whose settings, or elements thereof, make an essential direct contribution to their cultural significance.
High	An asset, the setting, of which, makes a major contribution to an understanding, appreciation, and experience of it should be thought of as having High Sensitivity to changes to its setting. This is particularly relevant for assets whose settings, or elements thereof, contribute directly to their cultural significance.
Medium	An asset, the setting of which, makes a moderate contribution to an understanding, appreciation, and experience of it should be thought of as having Medium Sensitivity to changes to its setting. This could be an asset for which setting makes a contribution to significance but whereby its value is derived mainly from its other characteristics.
Low	An asset, the setting of which, makes some contribution to an understanding, appreciation, and experience of it should generally be thought of as having

Relative Sensitivity	Criteria
	Low Sensitivity to changes to its setting. This may be an asset whose significance is predominantly derived from its other characteristics.
Negligible	An asset whose setting makes minimal contribution to an understanding, appreciation, and experience of it should generally be thought of as having Negligible Sensitivity to changes to its setting.

8.3.18 The determination of a heritage asset's relative sensitivity to changes to its setting is first and foremost reliant upon the determination of its setting and the key characteristics of setting which contribute to its cultural significance and an understanding and appreciation of that cultural significance. This aligns with Stage 2 of the Cadw guidance on setting (Cadw, 2017f). The criteria set out in Table 2 are intended as a guide. Assessment of individual heritage assets will be informed by knowledge of the asset itself; of the asset type if applicable and by site visits to establish the current setting of the assets. This will allow for the use of professional judgement and each asset will be assessed on an individual basis.

Criteria for Assessing Magnitude of Impact

8.3.19 Potential impacts, that is the physical change to known heritage assets, and unknown buried archaeological remains, or changes to asset settings, in the case of the proposed development relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during the construction phase or the placement of new features within their setting during the operational phase.

8.3.20 The magnitude of the impacts upon heritage assets caused by the proposed development will be rated using the classifications and criteria outlined in Table 8.8.3.

Table 8.8.3: Criteria for Classifying Magnitude of Impact

Impact Magnitude	Criteria
High	Substantial loss of information content resulting from total or large-scale removal of deposits from an asset; Major alteration of an asset's baseline setting, which materially compromises the ability to understand, appreciate and experience the contribution that setting makes to the significance of the asset and erodes the key characteristics of the setting.
Medium	Loss of information content resulting from material alteration of the baseline conditions by removal of part of an asset;

Impact Magnitude	Criteria
	Alteration of an asset's baseline setting that effects the ability to understand, appreciate and experience the contribution that setting makes to the significance of the asset to a degree but whereby the cultural significance of the monument in its current setting remains legible. The key characteristics of the setting are not eroded.
Low	Detectable impacts leading to minor loss of information content; Alterations to the asset's baseline setting, which do not affect the observer's ability to understand, appreciate and experience the contribution that setting makes to the asset's overall significance.
Negligible	Loss of a small percentage of the area of an asset's peripheral deposits; A reversible alteration to the fabric of the asset; A marginal alteration to the asset's baseline setting.
None	No effect predicted.

Criteria for Assessing Level of Effect

8.3.21 The predicted level of effect on each heritage asset will be determined by considering the asset's importance and/or relative sensitivity in conjunction with the predicted magnitude of the impact. The method of deriving the level of effect is provided in Table 8.3.4.

Table 8.3.4: Level of Effect based on Inter-Relationship between the Importance and/or Sensitivity of a Heritage Asset and/or its setting and the Magnitude of Impact

Magnitude of Impact	Importance and/or Sensitivity				
	Negligible	**Low**	**Medium**	**High**	**Very High**
High	Minor	Moderate	Moderate	Major	Major
Medium	Negligible /Neutral	Minor	Moderate	Moderate	Major
Low	Negligible /Neutral	Negligible/ Neutral	Minor	Minor	Moderate
Negligible	Negligible /Neutral	Negligible /Neutral	Negligible/ Neutral	Minor	Minor

8.3.22 The level of effect is judged to be the interaction of the asset's importance and/or relative sensitivity (Tables 8.3.1 and/or 8.3.2) and the magnitude of the impact (Table 8.3.3). In order to provide a level of consistency, the assessment of importance and relative

sensitivity, the magnitude of impact and the assessment of level of effect will be guided by pre-defined criteria. However, a qualitative descriptive narrative will also be provided for each asset to summarise and explain each of the professional value judgements that have been made.

8.3.23 Using professional judgment and with reference to the Guidelines for Environmental Impact Assessment (as updated) (IEMA 2017), the assessment will consider moderate and greater effects to be significant (shaded grey in Table 8.3.4), while minor and lesser effects will be considered not significant.

Cumulative Effect Assessment

8.3.24 The assessment of cumulative effects will consider whether there would be an increased impact, either additive or synergistic, upon the setting of heritage assets as a result of adding the proposed development to a baseline, which may include operational, under construction, consented or proposed developments as agreed with the local planning authority. The cumulative assessment will have regard to the guidance on cumulative effects upon heritage assets as set out in Environmental Impact Assessment Handbook V5 (SNH & HES 2018) and will utilise the criteria used in determining effects from the Proposed development as outlined in Tables 8.3.1 to 8.3.4 above. Only those assets which are judged to have the potential to be subject to significant cumulative effects will be included in the detailed cumulative assessment.

8.3.25 In determining the degree to which a cumulative effect may occur as a result of the addition of the proposed development into the cumulative baseline a number of factors will be taken into consideration including:

- the distance between developments;
- the interrelationship between their Zones of Theoretical Visibility (ZTV);
- the overall character of the asset and its sensitivity to the development
- the siting, scale and design of the developments themselves;
- the way in which the asset is experienced;
- the placing of the cumulative developments in relation to both the individual proposal being assessed and the heritage asset under consideration; and
- the contribution of the cumulative baseline schemes to the significance of the effect, excluding the individual proposal being assessed, upon the setting of the heritage asset under consideration.

8.3.26 Cumulative developments will be identified as part of the assessment.

8.4 Potentially Significant Effects and Approach to Mitigation

Baseline

8.4.1 A detailed archaeological and historic background is detailed in Appendix 8.2.

8.4.2 This assessment has identified the following heritage assets within the Site (Figure 3-7):

- The Scheduled Monument known as Root Store at Bon-y-Maen 800m NW of Blaen y Cwm (Site 5) is located within the south-western area of the Site, c. 375m north-east of the Turbine 15; and
- 115 non-designated heritage assets within the Site. These non-designated heritage assets are largely composed of post-medieval assets including quarries, buildings, farmsteads, peat cuttings, trackways and dams. There are also several medieval assets including long houses and field systems and five Bronze Age assets (Sites 285, 289, 378, 380 & 509) recorded in the eastern portion of the Site between Llyn Hir in the north and Lluest in the south.

8.4.3 The high number of known heritage assets within the Site is likely reflective of previous intensive walkover surveys undertaken for previous proposals (CgMs, 2014) and as part of wider landscape studies (example Sites 503).

8.4.4 No areas of Ancient Woodland are recorded within the Site, although a rectangular area of *Plantation on Ancient Woodland Site* has been identified immediately north of the centre northern Site boundary.

8.4.5 Following an assessment of historic maps, LiDAR and the underlying geology there is judged to be a High potential for hitherto unknown buried remains to survive on the Site.

8.4.6 Within the 1km study area (Figures 8-12) there are:

- One Scheduled Monument Moel Ddolwen Camp (Site 7), a prehistoric hillfort c. 530m to the north of the Site;
- 317 non-designated heritage assets which date from the prehistoric period, although the majority of assets can be characterised as post-medieval agricultural and settlement remains; and
- 25 previous archaeological investigations (events) recorded by CPAT.

8.4.7 Within the 5km study area (Figure 13) there are:

- 20 Scheduled Monuments (Sites 6, 8, 9, 14, 16, 20, 22, 23, 33, 38, 39, 44, 45, 53, 54 57-59);
- Two Grade II* Listed Buildings; Church of St Mary (Site 60) and Gwernfya (Site 66); and
- 56 Grade II Listed Buildings of medieval to modern date.

8.4.8 Between 5km and 10km from the Site (Figure 14) there are:

- 40 Scheduled Monuments largely of prehistoric and medieval date;
- Eight Grade II* Listed Buildings (Sites 61-65, 67, 68 & 586) dating to the medieval and post-medieval period to the east, south and west of the Site;
- One Historic Park and Garden, Gregynog (Site 125), c. 9.6km south-east of the Site; and:
- One Registered Historic Landscape, Caerws Basin (Site 126), c. 7.7km south-east of the Site.

Potentially Significant Effects / Mitigation

Direct Impacts

8.4.9 Potential impacts on known or unknown buried archaeological remains which may survive within the Site relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during construction works (including excavation, construction and other works) associated with the proposed development.

8.4.10 Depending on the design of the proposed development there is the potential for a High magnitude of impact.

8.4.11 The assessment of direct impacts will be based on Tables 8.3.1 to 8.3.4 detailed above and the final design of the proposed development.

Settings Impact

8.4.12 There is one Scheduled Monument; Root Store at on-y-Maen 800m NW of Blaen y Cwm (Site 5) which extends into the Site boundary from the south. The monument is a building designed with a specific function in mind and was not designed or constructed to be a landscape feature. Depending on the exact location of the proposed development there is the potential for a settings impact on the Root Store (Site 5).

8.4.13 There are an additional 58 Scheduled Monuments within 10km of the Site. The majority of Scheduled Monuments within the 10km study area are funerary and ritual prehistoric monuments. This type of monument is often located in an environment in which it was originally designed to be visible in and as such these monuments can be more sensitive to changes in the landscape. A settings assessment for all Scheduled Monuments within 10km of the Site will be undertaken and informed by a Zone of Theoretical Visibility (ZTV) and, where applicable, site visits.

8.4.14 There are nine Grade II* and 56 Grade II Listed Buildings within the 10km study area which date from the medieval to modern periods. The proposed development has the

potential to have an impact on the settings of these Listed Buildings. An assessment of the impact of the proposed development on the settings of these Listed Buildings will be informed by a ZTV and site visits.

8.4.15 There is one Historic Park and Garden within 10km of the Site, Gregynog (Site 127). The Park and Garden is noted as being one of the most important in Powys and originated in the 1500s. Historic Parks and Gardens can be sensitive to changes beyond their boundaries, especially where the Park and Garden was designed with key external views of approaches. The setting assessment will identify the setting which provides significance to the Historic Park and Garden and will therefore, be informed by a ZTV and site visit to assess the potential impact of the proposed development on its setting.

8.4.16 There is one Registered Historic Landscape, Caersws Basin (Site 126) which extends within the 10km study area and a second Registered Historic Landscape, Clywedog Valley (Site 127) located beyond the 10km study area but previously highlighted as being sensitive to changes in the wider environment. An assessment of the settings of these landscapes will be informed by a ZTV and site visits.

Mitigation

8.4.17 The Proposed Development will, as far as possible, avoid known heritage assets by design. The walkover survey will assess the locations and condition of known heritage assets and identify any areas where micro-siting may be required. Heritage assets which may require fencing, to prevent accidental incursion or damage during construction works will also be identified during the walkover survey.

8.4.18 The Development Control Archaeologist at CPAT has indicated that other non-invasive archaeological mitigation, in the form of targeted geophysical surveys may be appropriate on the Site. It is likely that this form of non-invasive survey will be required to be undertaken prior to any invasive works and would investigate the potential for buried archaeological remains and the extent of remains associated with known heritage assets. The scope and nature of mitigation required will depend on the final design of the proposed development and would be agreed upon in advance with the applicant and CPAT.

8.4.19 Where known heritage assets cannot be avoided by design, an appropriate mitigation strategy, will be proposed. Any on site mitigation will be agreed upon between the Applicant, and CPAT, as the archaeological advisors to the local planning authority on the basis of a Written Scheme of Investigation as a condition to a planning permission. Invasive mitigation may take the form of a watching brief, evaluation or targeted

excavation - any mitigation will be agreed in advance with CPAT. If significant archaeological remains were encountered, then further mitigation works could be required, depending on the impact of the Proposed Development.

Residual Effects

8.4.20 Following the final design and the development of mitigation strategy, an assessment of the residual effects will be undertaken. In the case that all archaeological remains are avoided by design and/or are thoroughly recorded before being directly impacted by the Proposed Development the level of effect is unlikely to reach the significance level outlined in Table 8.3.4.

Cumulative Effects

8.4.21 Cumulative effects relating to cultural heritage are for the most part limited to effects upon the settings of heritage assets. The assessment would consider the potential for the cumulative effects arising from the addition of the Proposed Development to other cumulative developments upon the setting of heritage assets which have the potential to occur during the operational phase. Cumulative effects will only be considered for those assets where the effects upon the setting from the Proposed Development, alone, have been judged to be an effect of Moderate level or greater. The setting of assets which will have an effect of less than Moderate level are unlikely to reach the threshold of significance as defined in Table 8.3.4.

9 Noise Assessment

9.1 Introduction

9.1.1 This section of the Scoping Report summarises the proposed scope for the noise assessment of the potential Mynydd Lluest y Graig Energy Project, inclusive of all generation and storage infrastructure. Whilst the following section pertains principally to the source of noise emissions caused by wind turbine operation, additional details on the proposed methodology for assessing significance of effects arising from potential solar and hydrogen generation alongside energy storage are included herein.

9.1.2 Wind farms are often situated in rural environments where there are few other sources of noise. At residential distances, wind turbine sound can be audible and noise limits are often recommended to protect amenity and prevent sleep disturbance.

9.1.3 Operational noise from wind turbines includes aerodynamic noise from the movement of the blades and mechanical noise from the turbine components, such as the generator and the gearbox. Turbine manufacturers have, over time, been able to control most of the mechanical sources and as such reduce mechanical noise emissions. Wind turbine aerodynamic noise is restricted by control systems which regulate the pitch and rotational speed of the blades.

9.1.4 The continued development of wind turbine aerodynamics has resulted in a significant increase in generating capacity of wind turbines with little increase in source noise levels. Early generation wind turbines (300 – 600kW generating capacity: $L_{WA} \approx 102 – 104$ dB: available in 1996) may now be compared with current turbine generating capacities of 6MW and $L_{WA} \approx 104 – 106$ dB. The increase in generating capacity married to a minimal increase in source noise levels has resulted in a reduction of the potential noise impacts associated with modern wind turbines. Increased height of wind turbines should be expected to result in turbines operating closer to their optimum generation capacity during periods when wind speeds local to sound sensitive receptors may be low and thereby prevailing backgrounds may also be low.

9.1.5 The sound from wind turbines rises quickly from the cut-in wind speeds and then remains at the same level from close to the rated power to the cut out speed. The background noise, such as that from wind blowing through trees and vegetation, is low at low wind speeds and increases steadily with wind speed. Background noise at high wind speeds can therefore mask the sound from wind turbines. Appropriate noise limits can be derived using ETSU-R-97 and the Institute of Acoustics: *A Good Practice Guide to the*

Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. These limits are based on a fixed value during periods of low background sound and a set margin above the background noise level for day-time and night-time periods.

9.1.6 There will be a short-term noise impact from the construction of the wind turbines and associated infrastructure, and from traffic movements associated with the delivery of construction materials and turbine components. However, construction works will generally be carried out during daytime hours only for a short period.

9.2 Legislative Provisions and Published Guidance: Operational Noise

Future Wales: The National Plan to 2040

9.2.1 As described in Chapter 3, Future Wales sets out the strategic vision and framework for development in Wales. Criterion 7 of Policy 18 states that for renewable energy developments of national significance, new proposals must demonstrate that unacceptable impacts by way of noise, among other matters, do not arise, inclusive of cumulative impacts.

Planning Policy Wales 11 February 2021

9.2.2 Planning Policy Wales – Edition 11 (PPW11) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW11 provide the national planning policy framework for Wales.

9.2.3 PPW11, when considering the issue of Development Management and Renewable and Low Carbon Energy, states that:

"*Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:*

- *the need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations;*
- *the impact on the natural and historic environment;*
- *cumulative impact."*

9.2.4 The issue of sound is considered within Section 6.7 Air Quality and Soundscape. The guidance suggests the following:

6.7.6 In proposing new development, planning authorities and developers must, therefore:

- *address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- *not create areas of poor air quality or inappropriate soundscape; and*
- *seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.*

9.2.5 New energy development is considered in paragraph 6.7.15 where it is stated that:

Location of Commercial, Industrial and other Potentially Polluting Development

6.7.15 For the purposes of this section, potentially polluting development includes commercial, industrial, energy and agricultural or transport infrastructure. Such development should be located in areas where there is low potential for public exposure, or where its impact can be minimised. Novel or new development types may potentially cause pollution and should be carefully considered, and where appropriate, decisions should be based on the precautionary principle.

9.2.6 The footnote to this section states the following with respect to noise from wind farm developments:

Further guidance on wind turbine noise assessment can be found in ETSU-R-97https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy__Searchable_.pdf and further good practice guidance published by the Institute of Acoustics: https://www.ioa.org.uk/publications/wind-turbine-noise

9.2.7 Section 6.7.16 goes on to outline:

Relevant considerations in making planning decisions for potentially polluting development are likely to include:

- *location, including the reasons for selecting the chosen site itself;*
- *impact on health and amenity …"*

Powys Local Development Plan (2011-2026): Supplementary Planning Guidance: Renewable Energy: Adopted April 2019

9.2.8 This guidance supplements the Renewable Energy related policies of the Powys Local Development Plan (LDP) (2011-2026), which was adopted by Powys County Council on the 17th April 2018, and has been prepared to assist decision-making on planning applications within the Powys LDP area.

9.2.9 LDP Policy DM13 – Design and Resources: 11 states that:

The Amenities enjoyed by the occupants of nearby or proposed properties shall not be unacceptably affected by levels of noise, dust, air pollution, litter, odour, hours of operation, overlooking or any other planning matter.

9.2.10 SPG Section 9: Criteria for Determining Renewable Energy Schemes suggests that information likely to be included within any assessment would include:

- *The potential for pollution, noise, dust, odours, vibration, reflected light and shadow flicker; …*

TAN 11: Noise 1997

9.2.11 Technical Advice Note (TAN) 11 provides technical advice with regard to the assessment of noise. It is stated in paragraph 1 that:

This Technical Advice Note (Wales) (TAN) should be read in conjunction with 'Planning Guidance (Wales): Planning Policy'. Planning Guidance, Technical Advice Notes and circulars should be taken into account by local planning authorities in Wales in the preparation of development plans.

9.2.12 When considering the issue of sound associated with the operation of wind turbines, TAN 11 states within Annex B: The Assessment of Noise from Different Sources when considering the issue of wind turbine sound that:

B19. Detailed guidance on noise from wind turbines is contained in Planning Guidance (Wales), Technical Advice Note (Wales) 8, 'Renewable Energy', Welsh Office, 1996, Annex A, paragraphs A28-A38.

Institute of Acoustics Good Practice Guide

9.2.13 In May 2013, the Institute of Acoustics (IoA) published the ‘Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'. The document was prepared with the purpose of agreeing current good practice in the application of the ETSU-R-97 methodology to wind turbine schemes. The document was prepared by a working group and peer reviewed.

9.2.14 The Welsh Government has formally endorsed the IoA Good Practice Guide (GPG) and the planning advice recommends that it be used for wind turbine noise assessments. Since May 2013, a number of supplementary guidance notes have also been published providing further detail. The IoA GPG and the supplementary guidance notes should be regarded as a refinement of the ETSU-R-97 guidance to ensure consistency and the noise assessment will follow the guidelines stated therein.

9.2.15 The GPG provides general advice on noise monitoring and data processing for noise surveys. It also clarifies a number of issues including the following:

- The background noise survey should be of sufficient duration that no fewer than 200 valid data points are obtained for each of the amenity hours and night-time periods with no fewer than five valid points in any 1 m/s wind speed bin.
- The background noise measurements (and thereby noise limits) should preferably be corrected for wind shear by correlating the background noise measurements with the standardised wind speed at 10 m height. The standardised wind speed is defined as the wind speed at 10 m height which is derived from the hub height wind speed using a logarithmic profile, with a roughness length of 0.05 m.
- That ISO 9613-2 is to be used for wind turbine noise predictions, with defined parameters that reflect noise propagation from wind turbines:
- Consideration of cumulative noise issues including:
    - How noise impacts from existing and consented wind farm schemes must be assessed.
    - The use of directivity corrections for specific situations so that the effect of wind direction on noise propagation can be accounted for. This is important in respect of cumulative noise level as there are some receptor locations which cannot be downwind of all turbines at the same time.

World Health Organisation Environmental Noise Guidelines for the European Region 2018

9.2.16 With respect to the issue of potential adverse effects of wind turbine sound upon the health of neighbours to an energy project, Guidance issued by the WHO sets out what they consider to be a level below which no adverse health effects can be identified.

9.2.17 A recommendation is provided within the guidelines to minimise the adverse effects to health where the following is stated:

For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB L_{den}, as wind turbine noise above this level is associated with adverse health effects.

No recommendation is made for average night noise exposure L_{night} of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation.

To reduce health effects, the GDG conditionally recommends that policy-makers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation of one particular type of intervention over another.

9.2.18 The L_{den} level is the yearly average L_{Aeq} noise level determined for a wind farm with a correction of 5 and 10 dB for evening (4 hr) and night-time (8 hr) periods. The calculation of this level is possible for wind farms on the basis of the known wind speed distribution for a site and a knowledge of the sound characteristics of the turbines. In general, a level of around 40 dB L_{A90} is equivalent to a level of around 45 dB L_{den} for most average wind speed sites in the UK. However, the actual relationship is dependent upon the wind resource which is specific for each site.

9.3 Assessment Methodology

9.3.1 To carry out a noise assessment in accordance with ETSU-R-97 and the IoA Good Practice Guide, the following steps are required:

- Specify the number and locations of the wind turbines;
- Identify the locations of the nearest, or most noise sensitive, receptors in conjunction with the Powys Environmental Health Department;
- Determine the background noise levels from measurements as a function of site wind speed at the nearest properties, or at least at a representative sample of the nearest properties;
- Determine the quiet day time and night-time noise limits from the background noise levels identified at the nearest properties in consultation with Powys Environmental Health Department and following ETSU-R-97 guidance;
- Calculate the noise levels owing to the operation of the wind turbines as a function of site wind speed at the nearest properties;
- Compare the calculated noise immission levels with the derived ETSU-R-97 noise limits and assess in the light of relevant planning requirements;
- Identify potential mitigation measures including changes to layout, turbine type and the use of low noise modes as required;
- Identify any cumulative noise issues associated with other existing, consented and schemes in the planning system and if necessary reconsider mitigation.

9.3.2 Construction noise will be assessed in accordance with BS 5228 set out in Section 9.9 below, and operational noise associated with energy storage and hydrogen generation would be assessed in accordance with BS 4142 as set out in Section 9.10 below.

9.4 Baseline Surveys

9.4.1 Noise monitoring equipment consisting of IEC 61672 Class 1 sound level meters fitted with ½" microphones inside custom double skin wind shields mounted at 1.2 – 1.4m

height will be installed at each of the agreed monitoring locations. These will be configured to log existing noise levels using a variety of measurement indices over successive 10 minute intervals, concurrent with wind speed measurements on the site, over a minimum period of two weeks. Wind speed measurements will preferably be carried out at the intended hub height for the proposed turbines or at two heights less than hub height such that hub height wind speed can be derived from the measured wind shear for each 10 minute period.

9.4.2 Baseline noise data expressed in terms of the L_{A90} measurement index will be plotted against 'standardised' 10m height wind speed (converted from hub height using reference ground roughness), or actual 10 metre height wind speed if this is not available with appropriate corrections as set out within the IoA GPG, for the 'quiet day-time' and 'night-time' hours as defined in ETSU-R-97. A best fit polynomial curve will be plotted through this data to define the 'prevailing' background noise as required by ETSU-R-97. Noise limits will be derived from this according to the requirements of ETSU-R-97 which specifies that noise should not exceed a value of X dBL_{A90} or 5 dB above the 'prevailing' background noise level, whichever is the greater. The value of X is 35-40 during the day, 43 at night and 45 for properties occupied by persons with a financial involvement in the site. A detailed construction and decommissioning noise assessment will also be provided.

9.5 Impact Prediction and Mitigation

9.5.1 Noise predictions will be carried out based on the ISO9613-2 methodology assuming a worst case of downwind propagation over hard ground and warranted source noise levels for a representative turbine type. Predicted noise levels will be derived at each assessment locations represented by the baseline measurements for wind speeds for which source noise data is available, preferably from cut-in to 12m/s as required by ETSU-R-97.

9.6 Residual Effects

9.6.1 Where predicted operational noise levels are found to exceed the derived noise limits appropriate mitigation will be identified to ensure that the final proposed design will meet the required noise criteria.

9.6.2 The final report will cover the assessment and results together with an evaluation of other factors which may be of concern to interested parties such as tonal noise,

amplitude modulation, wind shear and infrasound. The predicted noise levels will be deemed to be not significant where the ETSU-R-97 criteria are met.

9.7 Cumulative Assessment

9.7.1 ETSU-R-97 states that the noise limits that it recommends apply to the cumulative effect of noise from all wind turbines that may affect a location. Therefore, any wind energy developments, either operational, consented or in planning, which may require consideration in the assessment process, will be identified and cumulative assessmments undertaken as required.

9.8 Low Frequency Noise, Infrasound & Vibration

9.8.1 A Government-funded study, published in 2006, by Hayes McKenzie investigated low frequency noise from wind turbines. This study concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines. Further international studies include a large study from Health Canada that concluded that there were no health effects from low frequency noise or infrasound.

9.8.2 Vibration from wind turbines is low nevertheless it has been measured in the past but only by extremely sensitive equipment, for example that at the Eskdalemuir monitoring station for detecting nuclear tests in remote parts of the world, to enforce the nuclear test ban treaty. Measured vibration levels are far below the thresholds for human perception even on the wind farm sites.

9.8.3 These issues were also considered in an article in Acoustics Bulletin which concludes: "*...there is no robust evidence that low frequency noise (including 'infrasound') or ground-borne vibration from wind farms, generally has adverse effects on neighbours*".

9.8.4 It is therefore not considered necessary to carry out specific assessments of low frequency noise, infrasound or perceptible vibration. However, further supporting information on these subjects including summaries of more recent international studies may be provided in the ES.

9.9 Construction Noise

9.9.1 The following legislation and standards are of particular relevance to construction noise:

- The Control of Pollution Act 1974 (CoPA 1974);
- BS 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites.

9.9.2 CoPA 1974 provides local authorities in England and Wales with powers to control noise and vibration from construction sites. Section 60 of the Act enables a Local Authority to serve a notice to a contractor of its requirements for the control of site noise. Section 61 of the Act allows for those carrying out construction work to apply to the Local Authority in advance for consent to carry out the works.

9.9.3 Construction noise can be assessed using British Standard BS 5228 which provides a calculation method and general guidance on controlling noise and vibration from construction sites. This standard:

- Refers to the need for the protection against noise and vibration of persons living and working in the vicinity of and those working on construction sites;
- Recommends procedures for noise and vibration control in respect of construction operations; and
- Stresses the importance of community relations, stating that early establishment and maintenance of these relations throughout the site operations will go some way towards allaying people's fears.

9.9.4 There are no noise limits within the main text of BS 5228 and in fact, the preferred approach is to use best practicable means to reduce noise rather than setting limits. This means that everything practicable should be done to reduce noise. This strategy will be adopted for the assessment.

9.9.5 However, Annex E of the BS 5228-1 gives "*example criteria for the assessment of the significance of noise effects*" e.g. for use in ESs. For quiet areas, where the existing ambient noise levels are low, a significant noise effect is deemed to occur if the construction noise (plus the ambient noise) exceeds the following threshold values:

- 65 dB L_{Aeq} Daytime (07.00-19.00) and Saturdays (07.00-13.00)
- 55 dB L_{Aeq} Evenings and Weekends (19.00-23.00 Weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays
- 45 dB L_{Aeq} Night-time (23.00-07.00)

9.9.6 These values will be used in a preliminary assessment to assess the significance of any construction works.

9.9.7 Noise can also occur during construction from traffic on local roads including the transportation of construction materials and turbine components. Where traffic data is available the increase in noise due to construction traffic can be calculated according to the Government guidance "The calculation of road traffic noise" (CRTN).

9.9.8 The issue of construction noise may be dealt with through appropriate planning conditions related to hours of work and/or through the setting of noise limits at neighbouring properties. In general, most activity associated with energy project construction is similar to farming activities with the exception of piling which is not expected for the proposed site.

9.10 Assessment of Other Storage and Generation Infrastructure

9.10.1 BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound* is a British Standard that describes a method for assessing the impact of a proposed or existing industrial or commercial sound source. It use in the context of this Proposed Development will to assess noise associated with the energy generation and storage infrastructure – principally the additional solar, hydrogen and battery storage components of the proposal.

9.10.2 The BS 4142 assessment will rate noise impact based on a comparison between the noise from the source which is being assessed (the specific noise) and the background noise which would exist in the absence of that source. The specific noise is 'corrected' for 'acoustic features' by adding a decibel penalty for tonal or impulsive content and for any other features which are readily distinctive against the background acoustic environment. The corrected noise level is referred to as the 'rating level' and reflects people's general reaction to noise whereby noise with such features is found to be more annoying than featureless noise at the same level.

9.10.3 Once the specific noise level, as corrected for acoustic features and typical background noise levels relevant to periods of operation of the source have been established, the two are compared and assessed under BS4142 as follows:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

9.10.4 Professional judgement will be appiled by the acoustic consultant in identifying potentially significant impacts, and mitigation measures will be required where there are clear exceedances of acceptable thresholds.

10 Transport and Traffic

10.1 Introduction

10.1.1 Given the scale of the proposed energy scheme there is the possibility of some significant transport effects during construction and decommissioning of the scheme, although it is anticipated that there are likely to be negligible transport effects during operation.

10.1.2 A preferred access route from the port of entry for all wind turbine abnormal loads is currently under review, with four access options under investigation. All other construction traffic is likely to arise within the locality of the scheme, particularly as the Applicant will express a preference for local suppliers in order to increase the benefits of the scheme and to reduce the effects of construction traffic on the wider network. It is anticipated that the preferred construction route will be identified prior to the submission of the application and will be assessed in line with the methodology set out below.

10.1.3 The application will also be accompanied with a framework Construction Transport Management Plan (CTMP) to assist in developing possible mitigation measures, compliance with Health & Safety regulations and to illustrate the more detailed points of network management during construction.

10.2 Published Guidance and Approach

10.2.1 A full review of the relevant transport planning policies, guidance notes and documentation will be undertaken and will include reference to the following:

- Future Wales: The National Plan to 2040 (2020);
- Planning Policy Wales, Edition 11, Welsh Government (2021);
- Strategic Traffic Management Plan for Mid Wales Wind Farms, Renewable UK Cymru (2012);
- Mid Wales Joint Local Transport Plan, Trafnidiaeth Canolbarth Cymru (TraCC) (2015);
- The Marches & Mid Wales Freight Strategy - Trafnidiaeth Canolbarth Cymru (TraCC) (2017); and
- Guidelines for the Environmental Assessment of Road Traffic, IEMA (1993).

10.2.2 Section 2 of this Scoping Report sets out the planning policy framework that is considered of relevance to undertaking the EIA for the proposed Mynydd Lluest y Graig Energy Project. The transport assessment will, among other things, reference those topic specific policy or advice notes of relevance to this technical discipline of the EIA.

10.3 Assessment Methodology

10.3.1 The assessment will consider the potential for likely significant effects on receptors using transport routes resulting from increased vehicle movements associated with the construction, operational and decommissioning phases of the Proposed Development.

10.3.2 The construction phase will generate the greatest volume of traffic. The numerical assessments will therefore focus on this phase of development though consideration will be given to both the operational and decommissioning phases.

10.3.3 Receptors are the users of the roads within the transport and traffic study area and the locations through which those roads pass.

10.3.4 The assessment will involve desk study, site visits, consultation, data processing and analysis and interpretation using swept path assessment software, and professional judgement. It will involve the following key stages:

- identify study area;
- determine baselines;
- review the Proposed Development to identify potential effects;
- evaluate significance;
- identify mitigation; and
- assess residual effects.

10.3.5 The IEMA Guidelines document includes guidance on how the sensitivity of receptors should be assessed. Using that as a base, professional judgement will be used to develop a classification of sensitivity for users based on the characteristics of roads and locations as shown in the table below.

Table 10.3: Assessing Sensitivity of Highway Receptors

Receptor	Sensitivity			
	Negligible	**Low**	**Medium**	**High**
Users of Roads	Where roads have no adjacent settlements. Includes new strategic trunk roads that would be little affected by additional traffic and suitable for	Where the road is Trunk or A-class, constructed to accommodate general and HGV traffic moving between primary destinations. Includes roads with little or no	Where the road is a local A or B class road, capable of regular use by HGV traffic. Includes roads where there is some traffic calming or traffic	Where the road is a minor rural road, not constructed to accommodate frequent use by HGVs. Includes roads with traffic control signals,

Receptor	Sensitivity			
	Negligible	**Low**	**Medium**	**High**
	Abnormal Loads and new strategic trunk road junctions capable of accommodating Abnormal Loads.	traffic calming or traffic management measures.	management measures.	waiting and loading restrictions, traffic calming measures.
Users of Locations	Where a location includes individual dwellings or scattered settlements with no facilities.	Where a location is a small rural settlement, few community or public facilities or services.	Where a location is an intermediate sized rural settlement, containing some community or public facilities and services.	Where a location is a large rural settlement containing a high number of community and public services and facilities.

10.3.6 The following rules, also taken from the IEMA Guidelines, will be used to determine which links within the transport and traffic study area should be fully assessed:

- Rule 1 - include road links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles (HGVs) is predicted to increase by more than 30 %).
- Rule 2 - include any other specifically sensitive areas where traffic flows are predicted to increase by 10 % or more.

10.3.7 The IEMA Guidelines identify the key effects that are most important when assessing the magnitude of traffic impacts from an individual development and the levels of magnitude, these being:

- Severance - changes in traffic movements of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively;
- Driver delay – the likelihood of delays is only considered to be "significant or substantial when the traffic on the network surrounding the development is already at, or close to, the capacity of the system;
- Pedestrian delay - an increase in total traffic of approximately 30% can double the delay experienced by pedestrians attempting to cross a road and would be considered ‘substantial’;

- Pedestrian amenity - a change in the traffic flow of -50% or +100% would produce a 'substantial' change in pedestrian amenity;
- Fear and intimidation - changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively; and
- Accidents and safety - professional judgement is used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

10.3.8 To determine the overall significance of the transport and traffic effects, the results from the receptor sensitivity and effects magnitude assessment will be correlated and classified based on a scale set out in Table 2.4 of Volume 11, Section 2, Part 5 of the Design Manual for Roads and Bridges (DMRB).

10.3.9 In terms of the EIA Regulations, effects would be considered significant where they are assessed to be major, major/moderate or moderate.

10.4 Baseline

10.4.1 The traffic and transport study area is defined as the lengths of public road that would be used to access the Proposed Development and be most impacted during the construction phase. The study area has been identified through a review of the likely routes between suppliers of equipment and materials and the site and is considered should include:

- A483 from Oswestry to Welshpool
- A483 from Newtown and thereafter A470 to Clatter
- A458 from Welshpool to Llanerfyl
- Local C class road (New Road) from Llanfair Caereinion to Cefn Coch

10.4.2 Observed traffic flows on the local road network will be established using traffic data sourced from new traffic surveys undertaken by Automatic Traffic Counters (ATC) located at suitable points agreed with PCC and the Mid Wales Trunk Road Agency within the agreed study area.

10.4.3 The count data will be collected in vehicle classes with vehicle speeds per direction. The new counts may also be supplemented with data obtained from Traffic Wales' Trunk Road Traffic Data Services and/ or the Department for Transport.

10.4.4 It is proposed that 2019 be taken as the year of completion and will be used for the base year of the assessment.

10.4.5 High growth factors from the National Road Traffic Forecast or observed local traffic growth estimates developed from first principles will be applied to the surveyed traffic flows to produce future year traffic for use in the assessment. Discussions with the

relevant road authorities will determine the most appropriate level of traffic growth for use in the assessment.

10.4.6 Traffic flows associated with committed developments within proximity of the site will be included in the assessment as advised by PCC.

10.4.7 Traffic flows associated with the construction, operation and decommissioning phases of the site will be established using a first principle approach of estimating traffic flows from construction volumes.

10.5 Impact Prediction and Mitigation

10.5.1 During the construction period, the following traffic will require access to the to the site:

- Forestry traffic;
- Staff transport, either cars or staff minibuses;
- Construction equipment and materials, deliveries of machinery and supplies such as cement; and
- Abnormal loads consisting of the wind turbine sections and heavy lift cranes.

10.5.2 Estimates will be made of the total traffic movements associated with each element of the construction programme and these will be split into average monthly deliveries according to the construction phasing plan. Estimates will be based on information provided by the Applicant and experience developed from other wind farm projects of a similar scale.

10.5.3 To enable comparison of the estimated base traffic flows with total volumes including predicted construction traffic, the monthly construction flows will be converted to average daily flows for each month of the construction period. The peak daily construction traffic flows will be added to the daily base flows and the percentage uplift in this total traffic against base traffic calculated.

10.5.4 An assessment of percentage uplift on each road link within the study area will be made with reference to Rule 1 and 2 of the IEMA Guidelines. Where required, links will be taken forward to an assessment of the predicted magnitude of the impact from the increase in traffic movements with no mitigation in place. The significance of the effect will then be assessed.

10.5.5 Proposed mitigation against the impacts of general construction traffic and to enable the movements of abnormal loads will be identified and discussed. This will include methods of working that would be introduced through a Construction Traffic Management Plan (CTMP) and a Traffic Management Plan (TMP) relating to the movement of (Abnormal Indivisible Loads) AILs as well as physical measures such as road widening.

10.5.6 A high level assessment of the impact of construction and decommissioning traffic volumes against base flow data will be undertaken to review the likelihood for significant impact and the need for mitigation. In addition, an assessment of impacts to typical daily traffic flows along the local road network will be undertaken in the event that hydrogen production is included within the development proposal.

10.5.7 It is considered likely that the greatest impact will be on the local roads close to the site.

10.6 Residual Effects

10.6.1 For any effects that are found to be significant with no mitigation in place, an evaluation will be undertaken to consider the residual effects after the implementation of the proposed mitigation.

10.7 Cumulative Assessment

10.7.1 The chapter will consider the potential for significant cumulative effects arising from the addition of traffic associated with the Proposed Development to other cumulative developments, which are the subject of a valid planning application at the time of assessment. Under-construction and consented developments will be considered as part of the cumulative baseline. Traffic flows associated with operational developments will be captured in surveys of existing traffic movements and therefore form part of the baseline.

11 Hydrology, Hydrogeology and Geology

11.1 Introduction

11.1.1 Due to the scale and location of the Proposed Development there will be a requirement for the assessment of effects to hydrology, hydrogeology and geology within the site area and for a buffer area around the site boundary. This Section outlines the preliminary hydrology, hydrogeology and geology baseline and scopes the requirements for the ES with regard to the surface and ground water resources.

11.1.2 The assessment is required to meet statutory requirements, understand the hydrological regime relevant to the study area, and, where unacceptable impacts are predicted, ensure minimal effects will arise through embedding avoidance and mitigation measures in the development proposal. Peat is considered in Section 0.

11.2 Policy and Relevant Guidance

11.2.1 The following legislation and guidance will be consulted to provide the basis of this baseline assessment, and will be used as part of a subsequent impact assessment:

- The Water Environment Regulations 2017;
- Planning Policy Wales (Edition 11) 2021 and accompanying Technical Advice Notes (TAN);
- Future Wales: the National Plan 2021;
- Technical Advice Note (TAN) 15: Development, flooding and coastal erosion (applies from Dec 2021);
- TAN15 Development and Flood Risk 2021;
- Flood and Water Management Act 2010;
- Water Act 2014;
- Water Resources Act 1991;
- The Groundwater Directions 2016;
- Groundwater Protection: Principles and Practices 2012;
- Pollution Prevention and Control (England and Wales) Regulations 2000;
- Water Supply (Water Quality) Regulations 2018;
- Private Water Supplies (Wales) Regulations 2017;
- Relevant Guidance for Pollution Prevention (GPP); and

- Woodlands for Wales Woodlands and trees, and Water and Soils Guidelines (Welsh Government, 2018).

11.3 Assessment Methodology and Significance Criteria

11.3.1 A comprehensive desk-based study forms the base of this assessment. A range of publicly available sources of information will be used to assess the conditions of the baseline environment and its subsequent sensitivity to the proposed development. The following baseline conditions will be assessed:

- *Geology, hydrogeology and soils of the application boundary and sub-catchments.*
- *Details of designated and protected areas within the drainage pathways of the application boundary.*
- *Watercourses within the application boundary and within a 300m radius of the Site (as detailed on Ordnance Survey 1:10,000 mapping) will be identified and located, in addition to existing and potential watercourse crossings, artificial and/or natural drainage pathways.*
- *The quality and condition of the watercourse within the application boundary and sub-catchments will be obtained from NRW where available.*
- *Flow characteristics of the catchments draining to/from the application boundary, as any reduction in baseflows or a change in the magnitude and frequency of flood peaks in the watercourses as a result of the proposed energy project are critical issues with regards to flood risk, water supplies and aquatic ecology.*
- *The location and nature of public and private water supply abstractions within the application boundary and sub-catchments, recognised by local authorities and NRW. This information will be tabulated and mapped, including all available information, including accessibility and details of supply. Catchment areas for supplies will be considered relative to infrastructure plans and any possible interactions.*

11.3.2 Table 11.3.1 details the sources of information to be consulted to assess the baseline environment.

Table 11.3.1: Sources of Information used to assess Baseline Environment

Topic	Source of Information
Topography	OS contour mapping
Designated Nature and Conservation Sites	NRW Designated Sites https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/designated-sites/?lang=en
Solid and Superficial Geology	British Geological Survey (BGS) online mapping https://mapapps.bgs.ac.uk/geologyofbritain/home.html
Soils and Peat	UK Soil Observatory Map Viewer http://mapapps2.bgs.ac.uk/ukso/home.html Phase 1 Peat Surveys, carried out for the Site 2014-2015
Flooding	NRW online flood https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en
Water Quality	NRW river basin management plans (https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/river-basin-management-plans-published/?lang=en) NRW water watch wales map gallery (http://waterwatchwales.naturalresourceswales.gov.uk/en/) Cycle 2 Rivers and waterbodies (https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=2176397a06d64731af8b21fd69a143f6)
Water Resources	Data request to Powys County Council for private water supplies
Hydrogeology	British Geological Survey data accessed via DEFRA Magic Maps https://magic.defra.gov.uk/MagicMap.aspx

11.3.3 Once the sensitivity of the baseline environment has been assessed, a hydrological constraints map will be developed to ensure these sensitivities are taken into account in the layout design for the proposed energy project. The assessment of impacts on the surface water and groundwater baseline environment from the final design will then be conducted. The impact assessment will follow a defined assessment of criteria in which the final significance of an effect is a combination of the receptor sensitivity and magnitude of change. In this context,

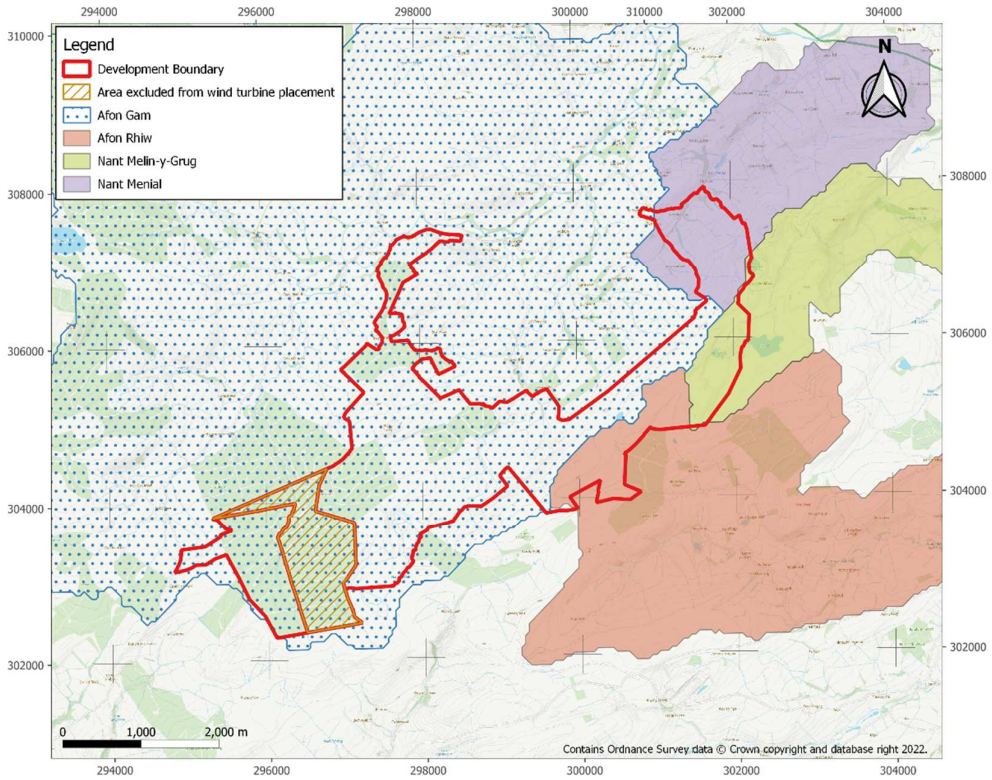
the sensitivity is defined by the presence of a designated status, presence of salmonids or other freshwater ecological interests, the extent of active floodplain and the presence of public/private water supplies etc. The magnitude of change is based upon the level and duration of disturbance.

11.3.4 The potential significant and residual impacts will be identified, differentiating between short term construction and long-term operational impacts. For each potential significant impact, mitigation measures will be derived to avoid, alleviate, minimise or remedy any adverse effects and enhance any positive benefits.

11.4 Baseline

Surface Hydrology, Site Drainage and Flooding

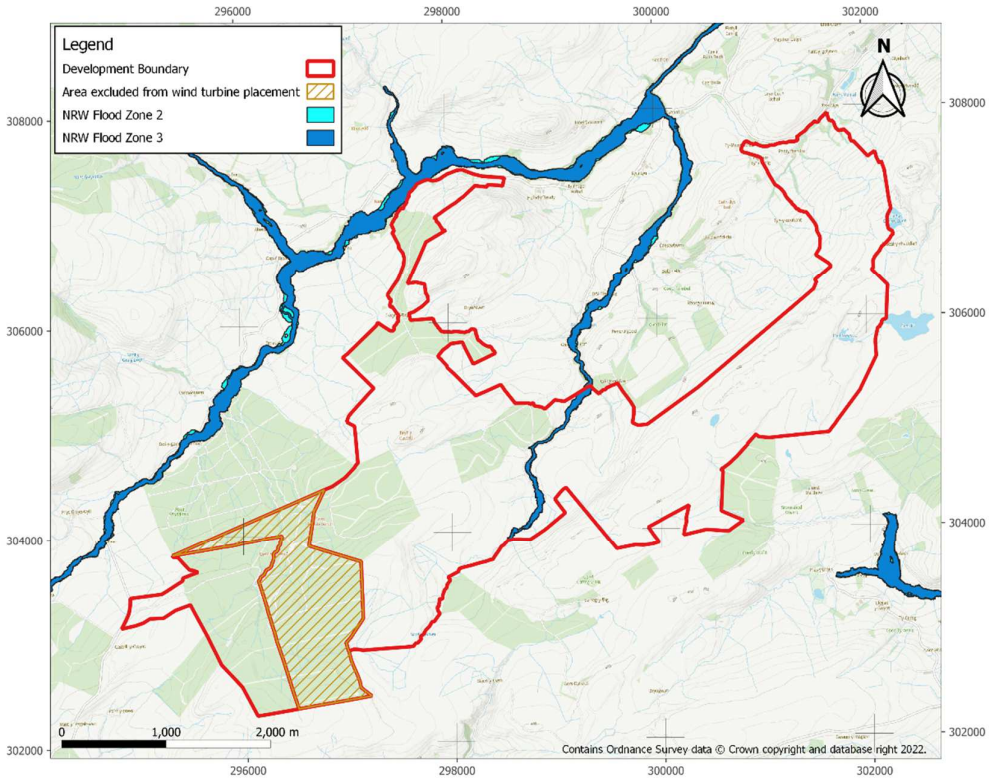
11.4.1 The proposed development area lies within the watershed of the Afon Gam (to the north), Nant Menial and Nant Melin-y-Grug to the north-west (all three draining to the Afon Banwy) and the Afon Rhiw (to the south). All of these watercourses are within the River Severn catchment. The proposed development site drains to the Afon Gam via a number of tributaries including the Nant Wythan and Nant Gelli-Gethin. The site borders the West Wales Catchment to the west, though according to topography, no significant Site area is draining to this catchment. The river catchments can be seen below.



Hydrology Map 1: River Catchment Areas

11.4.2 There are two small lakes within the Site, including the Llyn Newydd and the Llyn y Bugail.

11.4.3 The Environment Agency's Indicative River and Coastal Flood Maps indicate some areas of Nant Wythan and Afon Gam are at risk of flooding. Due to the steep topography of the area however, flood risk is contained close to the channels and is expected to be quickly routed downstream from the Site, therefore the baseline flood risk across the Site is considered to be negligible. NRW flood risk mapping is shown below.

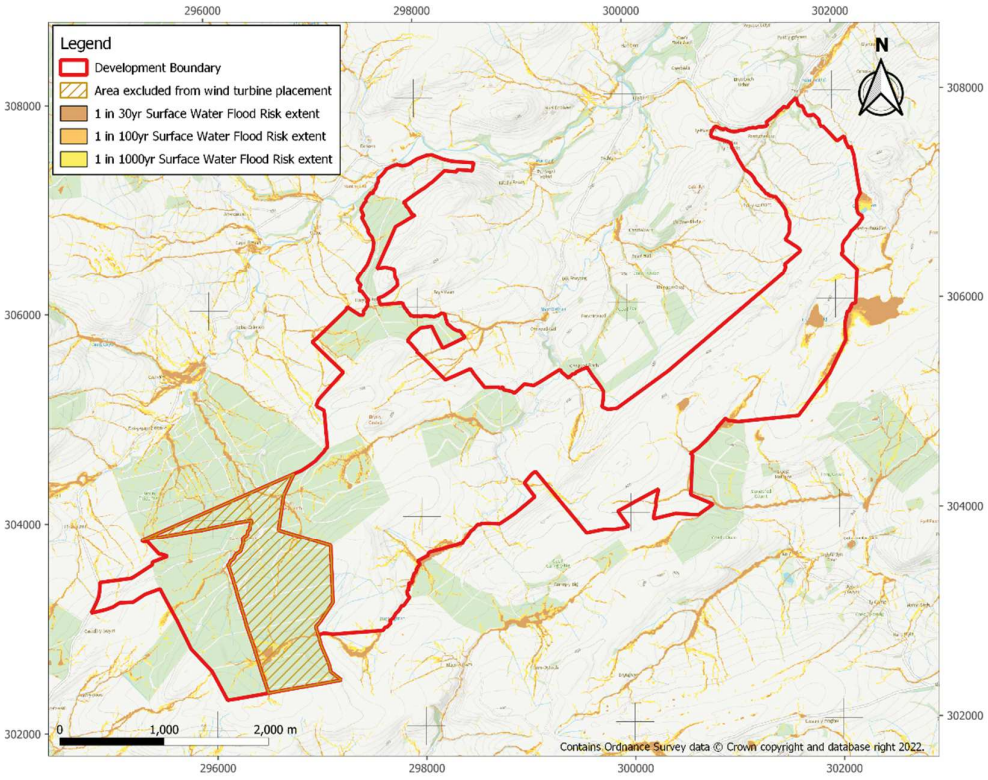


Hydrology Map 2: NRW Flood Risk Mapping

11.4.4 There is no evidence of historic flood risk in the vicinity of the site.

11.4.5 NRW Online mapping indicates a small amount of pluvial flood risk within the site boundary. This flood risk is confined to the numerous tributaries within the site and as such indicates that the flood risk is in fact fluvial in nature. Ponding in these flood maps is also shown within the lake features, such as Llyn y Bugail and Llyn Newydd.

11.4.6 Pluvial flood maps indicated that the surface-water drainage of the area currently flows according to the natural topography and drains into the existing stream network towards the areas of lower topography.



Hydrology Map 3: Surface Water Flood Risk Map

11.4.7 The Site is situated approximately 36km from the coast. Given this distance and the topography of the proposed development site, flood risk from this source has been scoped out of the assessment.

Geology, Hydrogeology and Soils

11.4.8 The Site is underlain primarily by sedimentary sandstone and mudstone of the Penstrowed Grits formation. Mudstone, siltstone and sandstone bedrock of the Nantglyn Flags formation is present in the central extents of the Site. The remainder of the Site is underlain with mudstone and sandstones of the Nant-ysgollon formation, Glanyrafon formation or Dolgau Mudstone formation. The sandstone, mudstone and siltstones are sometimes interbedded and likely to have been formed in deep seas from infrequent slurries of shallow water sediments which were then redeposited as graded beds.

11.4.9 As the Site is underlain entirely by sedimentary rocks, it is likely much of the bedrock is permeable. Additionally, it is likely that the bedrock will harbour groundwater due to the faulted nature of the bedrock. This is confirmed by the 2010 British Geological Survey Aquifer Data, classifying this area as supporting predominately 'Secondary B' and 'Secondary (undifferentiated)' aquifers. A Secondary aquifer includes a wide range of rock layers (or drift

deposits) with an equally wide range of water permeability and storage. Secondary B aquifers comprise predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers. Secondary (undifferentiated) aquifers are assigned where the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

11.4.10 The bedrock is overlain in places by Devensian Till and peat, or is otherwise exposed at, or near the surface. Phase 1 peat depth surveys were conducted in 2014 and 2015 covering the whole site boundary; this is discussed further in Chapter 12.

Land Use and Designated Sites

11.4.11 The Proposed Development site presents a complex topography of undulating hills and steep escarpments. Ordnance Survey mapping indicates the highest elevation is 425m of Mynydd Waun Fawr towards the east of the development area. The site contains some very steep slopes dominated by the north-western slope of Mynydd Lluest-y-Graig.

11.4.12 The land use of the development area is dominated by open rough grassland with forested areas located to the western edge of the site. Surface runoff within the forestry areas is likely to have been modified runoff through uptake and forestry drainage.

11.4.13 The Proposed Development area contains two SSSIs. These are Gweunydd Dolwen, located along the banks of the Afon Gam designated for unimproved acid grassland, and Bryn Coch located to the north of the site designated for Lowland Fen and acid grassland.

Water Quality and Water Use

11.4.14 The Afon Gam (source to conf with Cledan) is currently of good overall status as identified by the River Basin management Plans (RBMP) 2018. The Afon Rhiw (Llyn y Bugail to Dwyrhiew) waterbody is currently classified as having good overall status. The Cledan (source of Afon Gam) is also classed as good overall status, however the Afon Banwy (draining the northern areas of the Site) has poor overall status, as a result of poor ecological classification. The data has been extracted from the WFD mapping published by NRW on the Water Watch Wales website.

11.4.15 Previous requests to PCC made in support of a Private Water Supply Risk Assessment (PWSRA) for the site in 2014, revealed there to be 34 properties with an operational PWS which necessitated inclusion within the PWSRA. PCC will be consulted again to ensure there are no additional properties potentially using a private water supply in the vicinity of the Site since

this assessment. As the consultation with residents was conducted in 2014, residents will also be consulted via letter to confirm the details of their supply are still correct.

11.4.16 A data request for abstraction licences in the vicinity of the Site will be presented as part of the EIA consultation process. A number of discharges were identified within 2km of the proposed site, identified in 2014, the majority of which comprise of private or agricultural effluent waste discharge, this information will be updated where changes have occurred.

11.5 Potentially Significant Effects and Approach to Mitigation

11.5.1 The proposed energy project may induce a series of potential adverse effects upon the baseline hydrology, hydrogeology and geological environment within the vicinity of the proposed works. Impacts may arise during the construction, operation and decommissioning phases.

11.5.2 The potential direct impacts of the proposed energy project on the baseline environment relate to water quality, water resources and flood risk of the surface and groundwater in the draining sub-catchments. These impacts may then have indirect impacts upon the water use and aquatic ecology. The primary short term construction impacts include the potential for reductions in water quality through sedimentation, accidental release of pollutants and changes to in-stream hydrochemistry. The potential water quality impacts through enhanced erosion of disturbed peat will also be considered. The Site will be assessed for flood risk in line with TAN15 within the ES chapter, focusing on potential third party impacts, although it is considered that a full Flood Risk Assessment will not be required.

11.5.3 As the Gweunydd Dolwen and Bryn Coch SSSI sites are located within the drainage pathway of the site, there is potential for the sites to be impacted upon by the proposed development through reduced water quality.

11.5.4 Felling of areas of commercial forestry may also impact upon the hydrology and hydrochemistry of the catchments, and the plantation drainage network may create short residence time pollution pathways.

11.5.5 The potential impacts arising from the operation of the site would primarily be through the accidental release of pollutants. The long-term potential impacts of the infrastructure include an increase in impermeable areas which may impact upon site runoff, and if inappropriately designed, infrastructure may lead to sediment generation from concentrated runoff points.

11.5.6 Such impacts would be avoided as far as possible through the design process, and where this is not possible appropriate mitigation measures would be implemented to ensure potential impacts are minimised. A hierarchy of mitigation strategies will be devised following best practice guidelines including the Pollution Prevention Guidelines, the Water Framework

Directive, and relevant NRW policies. Mitigation measures include appropriate drainage design (an outline drainage plan will be developed for the Site), the use of runoff and sediment control measures where necessary and through the implementation of good working practice. The use of specific mitigation measures will be specified for every potential significant impact identified in the EIA.

11.5.7 The use of appropriate mitigation measures, where deemed necessary, will reduce the potential impacts on the Site from the proposed development. It is anticipated that all potentially significant impacts can be mitigated via such measures to ensure there are no significant residual impacts. The requirement for surface water quality and groundwater baseline, construction and post-construction monitoring will be agreed with NRW.

11.5.8 The ES is required to include a description of the likely significant effects of the proposed development on the environment and furthermore any measures envisaged to avoid and/or reduce the potential effects upon the environment. As such, the EIA will expand upon the hydrological, geological and hydrogeological potential impacts identified within this scoping report to identify what receptors are likely to be affected by the proposed development and other cumulative schemes in the area and to what extent.

11.5.9 The cumulative effects of developments within the local area will be assessed on a catchment basis. The size of the draining catchments and the proximity to current or proposed developments will be assessed to determine the likely cumulative impacts on the local environment.

12 Peat

12.1 Introduction

12.1.1 Peat surveys were carried out in 2014 (Phase 1 Peat Survey) and 2015 (Enhanced Phase 1 peat Survey). The Phase 1 survey consisted of a 100m grid across the entire Site, to ensure coverage within all areas being considered for development. The extent of discrete peat habitats was then identified in the Enhanced Phase 1 Peat Survey, during which peat cores were taken at a range of locations using handheld equipment (e.g. gouge auger) to assess the presence/absence of peat and characterise the peat quality.

12.1.2 These surveys, along with geological mapping of the Site, showed there to be large areas of the Site covered with peat, including localised areas of more than 150cm depth.

12.1.3 With the presence of peat there is potential for significant impacts upon the peat during construction, operation and decommissioning of the proposed wind farm.

12.1.4 The hydrological and carbon balance assessment of peat within the proposed development area will be considered within the Hydrology, Hydrogeology and Geology chapter of the EIA which will include an assessment of the impact upon GWDTEs.

12.2 Policy and Relevant Guidance

12.2.1 The Waste Regulations (2020) set out a requirement relating to waste management to apply a waste hierarchy to ensure waste is managed without endangering human health and harming the environment. In relation to this project the following hierarchy should be considered following published guidance:

A) Prevent peat excavation

B) Reduce volumes of peat excavates

C) Reuse excavated peat in a manner to which it is suited

12.2.2 A considerable body of guidance material has been produced for wind farm construction in the peat uplands of the UK. Relevant guidance documents that will be considered during the ES are drawn from sources throughout the UK, which effectively constitute UK-wide best practice, as follows:

- *CCW, 2010. Guidance Note: Assessing the impact of wind farm developments on peatlands in Wales;*
- *Scottish Renewables, SNH, SEPA, Forestry Commission Scotland (FCS) 2010. Good Practice During Wind Farm Construction;*
- *Natural England, 2010. Investigating the impacts of wind farms on peatlands;*

- *Scottish Renewables and SEPA 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste;*
- *SEPA 2012. Land Use Planning System SEPA Guidance Note 4 Planning guidance on wind farm developments;*
- *Calculating Carbon Savings from Wind Farms on Scottish Peatlands – A new Approach (Nayak et al., 2008; Nayak et al., 2010 and Smith et al., 2011);*
- *SNH, SEPA, Scottish Government and The James Hutton Institute 2011. Guidance Developments on Peatland: Site Surveys;*
- *Joint Nature Conservation Committee 2011. JNCC Report No. 445 Towards an assessment of the state of UK Peatlands; and*
- *Scottish Executive 2006. Peat Hazard Landslide Risk Assessments Best Practice Guide for Proposed Electricity Generation Developments.*

12.3 Assessment Methodology and Significance Criteria

12.3.1 A Phase 1 peat survey has already been conducted across the proposed development area on a 100x100m grid to identify the coverage and depth of the peat. The Extended Phase 1 subsequently identified the extents of discrete peat habitats, using hydrological modelling and increased probe density in identified areas of peat. This will be used to inform the location of the proposed turbines and associated infrastructure to ensure minimal disruption.

12.3.2 Following design freeze, a detailed peat survey will be conducted at the proposed infrastructure locations, consisting of a 10m corridor at 50m intervals along the proposed track and a 10m spacing transects north-south and east-west out to 100m for each proposed turbine base. Peat core samples will also be taken at up to 10 spatially distributed locations to provide a reasonable indication of both horizontal and vertical variability.

12.3.3 The collected peat and hydrological information will be reviewed with reference to the peatland habitats noted in the ecological baseline. This will identify any areas of peatland habitat which would be sensitive to direct or indirect changes as a result of the proposed development. The findings will be cross-referenced with the ecology chapter of the ES.

12.3.4 The peat assessment will form part of the hydrology, hydrogeology and geology chapter.

12.4 Potentially Significant Effects and Approach to Mitigation

12.4.1 Where peat is present, disturbance of deposits may result in instability, drying and oxidation of the peat, together with sedimentation and acidification of the draining watercourses.

12.4.2 Potential impacts also include both direct and indirect effects on the ecology of the peatland through land take and changes in hydro-ecology. The erosion of peat may result in

sedimentation and increased colour downstream resulting in negative impacts upon water resources.

12.4.3 Disturbance of peat may result in carbon losses; therefore, in the absence of any Welsh Government specified calculation tool, the payback period for the proposed energy project development will be assessed using the latest Scottish Government Windfarm Carbon Calculator Web Tool. The tool will be used at the beginning of the development process in order to guide and advise the design process to ensure minimal effects on the existing peat and reduce the carbon payback period and maximise carbon benefits. The proposed development will be designed to minimise, and where possible avoid, soil disturbance when building and maintaining access roads, turbine bases and required infrastructure.

12.4.4 A Draft Peat Management Plan will be developed to mitigate the potential impacts upon peat and peatland habitats (in particular blanket bog if identified). The key aim of this plan is to first minimise peat excavation and disturbance, then to review options for reuse. The minimisation of peat excavation will be considered from the outset of the design informed by the results of the Phase 1 peat surveys. The draft peat management plan will detail the likely volumes of peat that will be generated (including quantification of catotelmic and acrotelmic peat) and the principles of how the peat will be reused or disposed of. The plan should include the following details:

- *A description of the peat conditions on site;*
- *Excavation and reuse volume estimates and reuse requirements;*
- *Classification of excavated material;*
- *Option for use of peat for restoration purposes (e.g. peatland restoration, ditch blocking etc);*
- *The requirement for borrow pit restoration or other specific restoration areas on site;*
- *Specification of the requirements for the handling of excavated materials; and*
- *Construction programme and intended methods of handline and holding of excavated materials.*

12.4.5 The infrastructure layout will be designed to minimise the disturbance of peat within the proposed development boundary. The use of appropriate peat management measures should reduce the potential impacts on site and the surrounding environment of the proposed development. It is anticipated that all potential impacts will be mitigated and will not result in any significant residual environmental effect.

13 Telecommunications, Aviation and Shadow Flicker

13.1 Telecommunications

Introduction

13.1.1 Wind turbines have the potential to impact telecommunication operations and infrastructure. There are many forms of telecommunications infrastructure in the UK. The most relevant aspect in the context of potential restrictions / mitigation requirements for wind developments is the presence of wireless fixed links between radio antennae. Such links broadly fall into two categories. The first is 'microwave links', which provide high-frequency data transfer between antennae and are utilised by mobile phone operators and the emergency services to support their communications network. The second is Ultra High Frequency (UHF) links, which are utilised by operators including utility companies.

13.1.2 A secondary consideration is the impact upon terrestrial television signals which propagate from transmitters to receiving aerials. The aerials are which in turn connected to television receiving equipment.

13.1.3 Wind turbines can cause interference to telecommunications infrastructure and terrestrial television signals in three ways, namely (1) As a physical structure that blocks/weakens the transmitted signal, reducing the strength of the coverage in the shadow zone. Losses in strength due to this mechanism are called 'diffraction losses', (2) The wind turbine blades intermittently 'chop' through the direct coverage path, causing fluctuations in received power, (3) The wind turbines can reflect the signal in an unwanted direction, such that the same signal arrives twice at a receiving aerial with a time delay.

13.1.4 Both fixed telecommunication links and terrestrial television are considered within this section.

Policy and Relevant Guidance

13.1.5 Each stakeholder has their own fixed standoff distances. These is also no set process within any guidance for assessment of telecommunications infrastructure. The assessor will consider the Second Fresnel zone when assessing the effect of a wind turbine upon microwave links and the 0.6th Fresnel zone when assessing UHF links. A buffer zone may then be added (typically 25m) and then the rotor diameter, to produce the exclusion zone. This is based on the Ofcom methodology. Where the link is UHF, reflection calculations in line with the JRC methodology may be completed.

13.1.6 For terrestrial television, there is no set guidance on the assessment process. The methodology proposed to be used is to undertake Carrier to Interference Ratio (CIR) calculations relative to the turbine and an area surrounding the Proposed Development (20km by 20km).

Assessment Methodology and Significance Criteria

13.1.7 With respect to telecommunications infrastructure, there are several stakeholders that might be affected the Development including: Vodafone, Atkins, Ericsson, Arqiva, BT, JRC, Airwave, MBNL and Telefonica (O2). Each of these will be consulted. If a stakeholder raises an objection an assessment of the link or infrastructure will be carried out to determine whether there is an impact and its magnitude. The link data supplied by the stakeholder will be used to model exclusion zones of each link and to calculate the clearance/infringement of the proposed development. A significant impact occurs where the outcome of the analysis confirms the infringement of a link and that mitigation will be necessary. The process for mitigation is to engage with the stakeholder managing the link to discuss a mitigation strategy.

13.1.8 With respect to terrestrial television services, an initial investigation shows that multiple transmitters are expected to serve the 400km2 area. These include Long Mountain and Llangadfan. The transmitters broadcast digital terrestrial television services only. A desk-based study will be undertaken to determine the potential interference of the Proposed Development upon terrestrial television signal considering a 400km2 area centred on the Proposed Development. If adverse effects on television services occurs as a result of the Proposed Development, mitigation measures will be required. The most effective form of mitigation is dependent on the specific impact. The impacts will only by identified once the Proposed Development is operational via complaints received or by carrying out a post construction survey. The requirement for the implementation of such measures will be addressed on a case-by-case basis dependant on the complaint received or the results of the post construction survey. A mitigation strategy would be secured through a planning condition.

Potentially Significant Effects and Approach to Mitigation

13.1.9 For fixed telecommunications infrastructure, it is common practice for wind developers to assess potential impacts and, where necessary, mitigate them. It is extremely uncommon for wind developments to be blocked on the basis of telecommunications issues. This is largely because technical solutions generally exist and are commercially viable. The current details of the infrastructure which cross the Site are unknown. Considering the size of the Site, it is likely

that communications infrastructure will cross it or be present within it. On this basis it is recommended that telecommunications infrastructure is scoped in. However, if the technical and analysis consultation reveals no significant issues requiring mitigation, then telecommunications will be scoped out. A technical assessment will however support the application in either circumstance.

13.1.10 For terrestrial television, it is recommended that a technical assessment is progressed at the earliest opportunity and suitable planning conditions are agreed at the planning stage. Provided this process is followed, it is considered appropriate for television signal impacts to be scoped out.

13.2 Aviation

Introduction

13.2.1 Wind developments have the potential to impact aviation and radar infrastructure in their vicinity. This is predominantly due to three main considerations, namely (1) wind turbines as physical structures that present a collision risk, (2) wind turbines interacting with electromagnetic signals and (3) electromagnetic emissions emitted by the energy project itself. The second category can be further subdivided but essentially this comes down to weakening a radio signal in the shadow of the wind development or reflection of an electromagnetic signals unwanted directions.

Policy and Relevant Guidance

13.2.2 Guidance and policy are dictated primarily by the Civil Aviation Publications (CAP) produced by the Civil Aviation Authority (CAA). There is also further policy provided by the Ministry Of Defence (MOD) and NATS. The most relevant guidance to this project is likely to be those of the CAA found at their Windfarms webpage and the CAPs of CAP 168: Licensing of Aerodromes and CAP 670: Air Traffic Services Safety Requirements, CAP 764: Policy & Guidelines on Wind Turbines. All relevant aviation guidance will be followed.

13.2.3 The relevant safeguarding distance varies depending on the type of infrastructure being considered. Long range radar used for en-route navigation purposes can reasonably be safeguarded against wind turbines at ranges of 100 km or more. Specific aerodromes are typically safeguarded against physical obstructions that present a collision risk within ranges of less than 20 km.

Assessment Methodology and Significance Criteria

13.2.4 The relevant infrastructure in the vicinity of the energy project will be identified, followed by appropriate technical analysis to determine the level of predicted impact and, where required, appropriate mitigation options. Mitigation options will be progressed though consultation with the relevant stakeholder. A significant impact occurs where technical and operational effects upon radar or aviation operations lead to reduced safety as a direct result of the Development.

Potentially Significant Effects and Approach to Mitigation

13.2.5 The key constraints that are to be assessed in the greatest technical detail are NATS' Clee Hill en-route Primary Surveillance Radar (PSR) and the MOD's Shawbury PSR. These radar are approximately 64km and 58km from the Site respectively. A significant effect may occur if the wind turbines are visible and detectable to the radar, and an operational impact is predicted.

13.2.6 There are no licensed aerodromes within safeguarding range which would require consideration. There are no meteorological radar within their safeguarded range. No MOD air defence radar are expected to be affected.

13.2.7 Other aviation issues that will be assessed include military low flying operations and any other radio navigation aids. Formal assessment of such installations is to be completed in accordance with industry standard and best-practice to ensure constraints are comprehensively incorporated.

13.2.8 Aviation lighting will be a requirement due to the proposed height of the turbines. A detailed assessment will inform a lighting scheme in accordance with UK Civil Aviation Authority policy.

13.2.9 Following further technical assessment and consultation with relevant stakeholders, if no potential significant effects are predicted no further assessment will be undertaken and this will be reported in the ES.

14 Forestry

14.1 Introduction

14.1.1 The proposed Mynydd Lluest y Graig Energy Project site contains approximately 603 hectares of forest which is in multiple, private ownership.

14.1.2 The forest areas can be characterised as upland forestry dominated by non-native tree species, the most common of which is Sitka spruce (*Picea sitchensis*). Smaller areas of broadleaved woodland exist within the development boundary as either plantation, Semi-natural or Ancient semi natural type woodland.

14.1.3 Large areas of the forests were established in the 1960's and some of these areas have been harvested and restocked in recent times. Afforestation of bare agricultural land continued into the 1990's and the last new planting took place in 2004.

14.1.4 The woodlands are found at elevations of between 210 and 420 metres above sea level on a range of soils from deep peat to Gleys.

14.1.5 Most of the forest area is actively managed on either a clear felling or a continuous cover system. Smaller areas of broadleaved and coniferous forest have limited or no documented previous management whilst forest management plans are available for the majority of the coniferous areas.

14.1.6 Tree felling will be required within the development site to provide unobstructed locations for energy generation and storage infrastructure such as the turbines, solar arrays and ancillary buildings. New and existing roads and cable routes will also require associated tree felling.

14.2 Policy and Relevant Guidance

14.2.1 The United Kingdom Forest Standard (Forestry Commission 2011) is the primary relevant standard along with its seven supporting guides:

- Forests and Water;
- Forests and People;
- Forests and the Historic Environment;
- Forests and Soil;
- Forests and Climate Change;
- Forests and Biodiversity; and
- Forests and Landscape.

14.2.2 Woodlands for Wales Strategy (WAG, 2009) and its eight supporting policy position papers which will be referred to are:

- Heritage, Landscape and the Cultural Value of Welsh Woodlands and Trees;
- Community Involvement with Welsh Woodlands and Trees;
- Health and Well-being benefits from Welsh Woodlands and Trees;
- Education, Learning and skills benefits from Welsh Woodlands and Trees;
- Welsh Woodlands-their extent, nature and character;
- Water and Soils, Policy position in support of Woodlands for Wales strategy;
- Economic development and enterprise benefits from Welsh Woodlands and Trees; and
- Biodiversity, Policy position in support of Woodlands for Wales strategy.

14.2.3 In spring 2020, Welsh Government announced its commitment to the National Forest for Wales with an ambition to:

- create areas of new woodland
- help to restore and maintain some of our irreplaceable ancient woodlands.

14.2.4 This was followed by a consultation exercise by the Deputy Minister for Climate Change in June 2021 to identify and prioritise new tree planting and remove barriers to new woodland creation.

14.2.5 NRW took on the functions of Forestry Commission Wales under the Natural Resources Body for Wales (Functions) Order 2013 (WG 2013). NRW refers enquirers to many documents published by Forestry Commission UK or Forestry Commission Wales including *Forestry Commission Wales Policy Position on Development Affecting woodlands* (Forestry Commission 2010) and:

- Technical Note: Protecting the Environment during Mechanised Harvesting Operations (Forestry Commission 2005);
- Report: Brash Management on Habitat Restoration Sites (Forestry Commission 2003);
- Report: A Strategic Assessment of the Afforested Peat Resource in Wales (Forestry Commission 2012);
- Practice Note: Managing Brash on Conifer Clearfell sites (Forestry Commission 2006);
- Forestry Practice Guide: Whole Tree Harvesting- A Guide to Good Practice (Forestry Commission 1997); and
- Technical Paper: Designing Forest Edges to Improve Wind Stability (Forestry Commission 1996).

14.2.6 British Standard 5837:2012 (British Standards Institution 2012) Trees in relation to design, demolition and construction will be utilised as required.

14.2.7 The certification status of the forestry is not known at present but it will be incorporated into the baseline.

14.2.8 Whilst felling is not considered to be development requiring consent, if appropriate requirements may be included that secure adherence to ensure that any felling is undertaken in accordance with agreed standards and procedures.

14.2.9 Section 2 of this Scoping Report sets out the planning policy framework that is considered of relevance to undertaking the EIA for the proposed Mynydd Lluest-y-Graig Energy Project. The forestry assessment will, among other things, reference those topic specific policy or advice notes of relevance to this technical discipline of the EIA.

14.3 Assessment Methodology

14.3.1 The study area will extend beyond the proposed development boundary, in particular at the western end of the site area where the largest block of woodland within the proposed boundary is contiguous with woodland outside the boundary and, to a lesser degree, where this occurs with woodland on the central northern boundary. It is considered that these adjoining woodlands should be included particularly in respect of assessment of woodland management issues such as minimisation of windthrow in the forestry study area.

14.3.2 Assessment will use the baseline GIS information (itself based on existing management plans) which will provide information on the location of infrastructure in relation to the forest and other features and:

- An examination and discussion of the baseline existing conditions;
- An assessment of the impacts of any tree felling required in the development area;
- An assessment of the development against best practice guides; and
- An assessment of the development using practical forest management experience.

14.3.3 In determining the significance of an effect, the magnitude of change and the sensitivity of the receptor are combined. For the Mynydd Lluest y Graig Energy Project development the definitions of magnitude will be based on the areas of woodland impacted in relation to the existing conditions. In assessing the sensitivity of the forests and their management, it is considered that their status at International, European, UK or National level will be a key factor. The Impact assessment criteria are shown in the table overleaf.

Table 14.3: Impact Prediction Matrix

Magnitude of Impact (positive or negative)	Definition/Criteria	Example
Major	An impact on one or more International, European, UK or National receptors or a major land use change.	Loss of part of an Ancient Semi-Natural woodland
Moderate	An impact on one or more receptors of Regional value or a partial change or partial loss or gain.	Loss of part of a semi-natural woodland.
Minor	An impact on one or more receptors of county or Unitary authority value or a minor land use change.	Loss of several minor trees from a native woodland.
Negligible	An impact on one or more receptors of local value or a slight land use change	Loss of plantation woodland
Neutral	Results in no measurable impact or change	No change from baseline data.

14.4 Baseline

14.4.1 A forestry baseline in the form of a forest inventory database holding crop information and linked to GIS software is in preparation which will allow an overview of the entire wooded area and analysis of proposed development layouts and their impact on the crops present. The baseline will be informed by the individual management plans in existence for each forest property. Where no information is present it will be gathered through site investigation and forest mensuration. Site investigation will also be used to quality assure, through sampling, data provided from existing sources.

14.4.2 Information gaps may arise from a lack of felling plans and management plans for some smaller areas of woodlands. Where these are not available assumptions will be made about felling dates based on normal forest rotations and best practice guides.

14.5 Impact Prediction and Mitigation

14.5.1 The most significant potential source of impact will be from the preparation of the site prior to the construction of turbines and infrastructure. This will be in the form of tree felling/clearance to create the space required for the development. Tree felling and clearance will be needed for bases and foundations, the upgrading and construction of new access tracks/roads, excavation of quarries, cable routes and the construction of control buildings, meteorological masts, compounds and laydown areas.

14.5.2 Further impact in the operational phase may arise from maintenance works to tree cover around infrastructure and repowering works. Examples may include removing or cutting trees to maintain tree heights. During decommissioning it may be necessary to remove trees, which have regrown since construction, in order to access the infrastructure.

14.5.3 Potential key impacts include:

- The risk of windthrow in adjacent crops;
- Impacts on approved felling plan;
- Impacts on forest certification;
- Forest fragmentation arising from new infrastructure in the forest;
- Impact on Welsh Government's Woodlands for Wales Strategy;
- The potential loss of designated woodlands; and
- Impacts on compliance with UK Forest Standard guidelines.

14.5.4 While more substantial felling in turbine areas is expected during construction, the majority of the forestry study area will return to the same land use post construction. Input into the design of the location of infrastructure will provide the primary means of mitigation. The redesign of felling coupes to include new infrastructure and windfirm edges will mitigate against the risk of windthrow and forest fragmentation. Woodland that has been designated as Ancient Semi-natural woodland (ASNW) (Ancient Woodland Inventory 2011) lies within the site boundary along with further areas of semi-natural woodland. Design of infrastructure will seek to avoid these areas. Where infrastructure is located near ASNW or other native woodland, British Standard 5837 (British Standards Institute 2012) will be used to mitigate the impact and ensure appropriate tree work is carried out.

14.6 Residual Effects

14.6.1 The residual effects will be assessed with the aid of the GIS baseline but it is considered that they are unlikely to be significant. The felling programme may provide opportunities for forest managers to amend species and management plans at the end of the construction period in order to fully integrate the energy project and the forest. It is anticipated that new energy project access tracks will also allow improved access to forestry vehicles including timber lorries.

14.7 Cumulative Assessment

14.7.1 The forestry impacted by the proposed development is spatially distinct from other afforested land and therefore the risk of cumulative impacts is considered to be low. It is

possible that neighbouring projects could be under development at similar times and there could be a cumulative impact from forestry vehicle movements on local roads.

14.7.2 The ES will quantitatively assess designated native woodlands which appear on the Ancient woodland Inventory for impact from other projects within 20km.

15 Population, Socio-economics and Human Health

15.1 Population

Introduction

15.1.1 The Proposed Development will generate a range of impacts for Powys (and possibly neighbouring Ceredigion given the close proximity to the authority boundary), the rest of Wales and the wider UK. Many of these socio-economic impacts are likely to be positive, though some negative effects may occur, either short term during the development, or more permanently once the site is operational. This section sets out how a comprehensive socio-economic impact assessment will be carried out to consider the extent of these effects of the proposed energy project during construction, operation and decommissioning within the local area (defined below) and the Welsh economy.

15.1.2 The effects on the economy will be considered through various indicators including the numbers of jobs safeguarded and created and the contribution to Gross Value Added. These economic indicators will be complemented with other likely impacts such as those associated with skills development. Where appropriate, social impacts, such as recreational use of the area, will be determined based on the available evidence and likelihood that the development will have effects on activities of local residents. Consideration will also be given to some of the mitigations proposed by the developer and the effects of any potential community benefit fund or shared ownership deployed as part of the energy project.

Policy and Relevant Guidance

15.1.3 The EIA regulations used in the National Policy Framework request that the EIA assess the direct and indirect impacts of a project on human populations and their interaction with the environment. This recognises that social and economic effects are likely to occur which may produce both positive and negative impacts for people both locally to the site, but also in other communities and parts of the country.

15.1.4 Adherence will be made to the best practice and guidance highlighted in the latest Planning Policy Wales (Edition 11) and other relevant policy and legislation as appropriate from government and industry groups. This includes reference to and consideration of the Regional Economic Framework for Mid Wales (published 2021), which identified the potential strengths and opportunities for regional growth in mid Wales as a leading low carbon region.

15.1.5 The support for, and context to, clean energy development in Wales is set out in a range of policies with sustainability often at the centre of Welsh Government policy activity in the past decade to which the EIA will relate. Foremost, The Wales Environment Act (2016), which introduced the legislation needed to ensure that natural resources within Wales are used sustainably and proactively for the future, and complements the recently published Future Wales: The National Plan 2040 which details how Wales will maximise the social and economic opportunities it has in a sustainable manner.

15.1.6 The Wellbeing of Future Generations Act (2015) underpins much of this with its emphasis on ensuring that all elements of future generations are supported with sustainability in several areas including renewable energy development and decarbonisation important for realising this.[19] Decarbonisation projects are capable of reaching all seven pillars set out in the Act and therefore contribute towards the long-term wellbeing goals. The need for sustainable industries together with renewable energy solutions for a greener economy is recently established in the Programme for Government for the 6th Senedd, where the climate and nature emergency is a cross cutting theme.[20]

15.1.7 Prosperity for All: a low carbon Wales (2019) brings together this wider policy through the lens of economic development as part of the ambition of becoming net zero.[21] It sets out how a low carbon economy for Wales can be achieved and its benefits, including clean growth, quality jobs, clean air and water and improved health. The development of new onshore energy generating projects such as Mynydd Lluest y Graig, directly align and contribute to this and other policy areas, by creating high value jobs, improving sustainability and reducing emissions, diversifying the economy and increasing wellbeing.

15.1.8 These impacts are also reflected in Capturing the Potential: a green jobs strategy for Wales (2009) which aims to strengthen the low carbon energy sector in Wales, focusing on the transition Wales needs to undergo to become a low carbon economy in all regards.[22] This includes fostering innovation and technological progression, supporting sustainability in businesses and investing in a more sustainable economy (feeding into later strategies with similar objectives). The development of onshore wind not only aligns to these aims but may also be helped by the attitudes it shapes and subsequent strategies and policy which move to enable more renewable development in Wales. Under the Wales Act (2017) Ministers can

[19] The Wellbeing of Future Generations Act (2015), Welsh Government https://www.futuregenerations.wales/about-us/future-generations-act/
[20] Programme for Government, Welsh Government, June 2021
[21] Prosperity for All: a low carbon Wales a Welsh Government plan, 2019 https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf
[22] Capturing the Potential. A green jobs strategy for Wales, Welsh Government, 2009

determine renewable energy projects of any size greater than 10MW, increasing the opportunities for such developments to come forwards.[23]

15.1.9 At a regional level, the Growing Mid Wales Vision, which feeds into the forthcoming £110m Mid Wales Growth Deal, identifies the opportunities from utilising the renewable energy potential of the region aims to grow the area, create high value employment and added value.[24] Heads of Terms for the Mid Wales Growth Deal were agreed at the end of 2020 with proposals for eight priority areas for intervention, including energy, now expected to be put forward. Should these proposals support the vision to capture more of the benefits from the renewable energy potential of the region then sites like Mynydd Lluest y Graig may have greater local impact.

15.1.10 The Powys Local Development Plan 2011-2026 (Adopted 2018) has sustainability running through it, as well as acknowledging, like the Growing Mid Wales Vision, the opportunities to make the most of the natural resources available for renewable energy.[25] Ambitions to support local growth and community development can be supported by the investment from renewable energy projects while supporting the transition to a low carbon economy which cover several of the LDP objectives.

15.1.11 This assessment will consider the Proposed Development in the context of relevant policy and legislative provisions in order to identify potentially significant effects in accordance with the methodology set up below.

Assessment Methodology and Significance Criteria

15.1.12 To assess the impacts of the Proposed Development on the economy and local communities, a desk based analysis will be carried out exploring the available evidence. This will include information from a review of economic policy and literature of similar developments to identify comparable benchmarks. Recognised metrics for construction impacts will also be used, such as data to convert spend into GVA and jobs created for the sectors involved in the development of an energy project.

15.1.13 The impact assessment will include a review of the socio-economic baseline indicators for either the area proximate to the site or, given availability of data at the local authority level, for Powys. This will support an appraisal of the social and economic policy context at the local, regional and national level. This information will help inform a modelling exercise conducted

[23] Wales Act 2017, Welsh Government, 2017
[24] Vision for Growing Mid Wales, Growing Mid Wales, May 2020
[25] Powys Local Development Plan 2011 – 2026

for the parameters of the Proposed Development to determine the likely scale and scope of any impacts on the GVA and jobs safeguarded and created indicators described above.

15.1.14 There is no published standard for assessing significance of impacts of energy projects development on different receptor groups, though generally, the proximity of the receptor to the site, the level of usage of the site itself and the ease of mitigation all determine sensitivity. As the socio-economic receptors considered have the same level of sensitivity (i.e. one job is considered the same as another) then only magnitude will be considered when determining the significance of an impact. These will be based on the criteria set out in the table below.

Table 15.1: Determining Magnitude of Effect

Magnitude of Impact (positive or negative)	Definition/Criteria
Major	A substantial change to socio-economic loss or gain in the area of impact affecting a large number of people (100+) and/or businesses (30+) to the extent of changing the business and employment structure.
Moderate	A partial change to socio-economic loss or gain in the area of impact affecting a sizeable number of people (20-100) and/or businesses (10-30) to the extent of adjusting business operations and employment.
Minor	A small change to socio-economic loss or gain in the area of impact affecting a group of people (<20) and/or businesses (<10) to the extent of influencing business activities and employment opportunities.
Negligible	No change to socio-economic loss or gain in the area of impact affecting no people and/or businesses permanently and very few people (<10) and/or businesses (<5) temporarily (for less than 1 year).
Neutral	Where there is no positive or negative socio-economic impact.

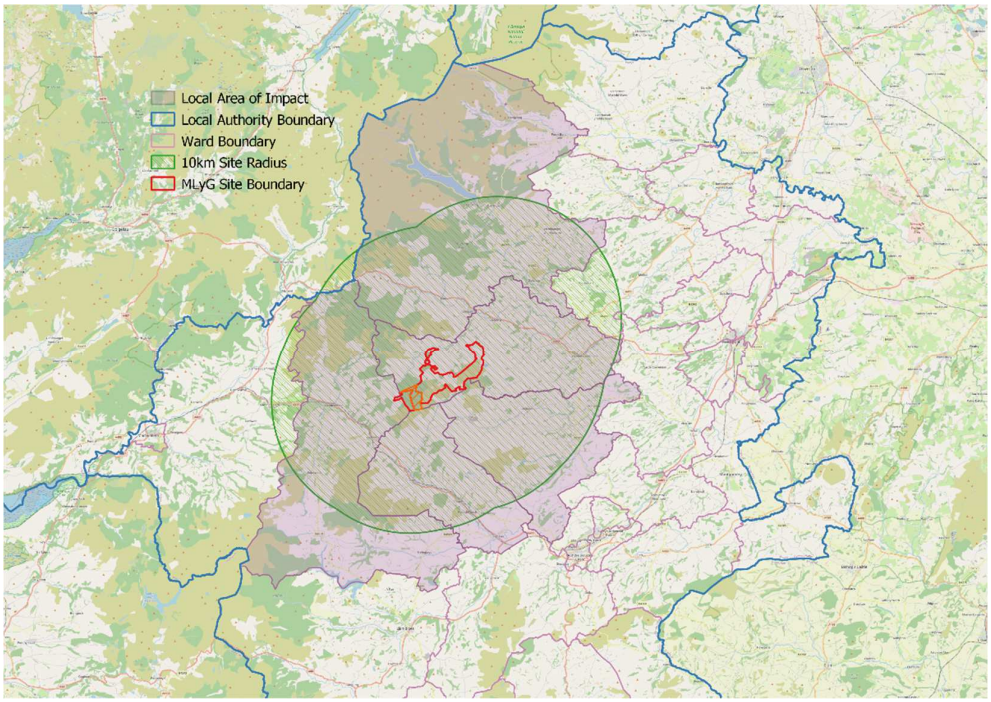
15.1.15 The economic model will assess the impact of the Proposed Development across multiple scenarios to provide a range of different impacts to help demonstrate the potential impacts. This can then be compared with the economic baseline for the area. The judgments and assumptions underpinning these scenarios and assessments will be based on experience of other projects, the insight offered from the economic baseline and the literature evidence available.

15.1.16 The effect on tourism and recreation will also be considered as part of the socio-economic impact assessment and will be based on the potential disruption of existing uses of the site and neighbouring areas. To support this will be evidence of public perceptions of wind farm developments and available data on tourism and visitor numbers to Powys.

Study Area

15.1.17 The socio-economic impacts of the Proposed Development will be determined for three areas. A local study area will be established based on the Wards that fall within 10km of the Proposed Development to consider some of the social effects. This is shown as the local area of impact in the map below.

15.1.18 If possible or notably pertinent, specific impact on small geographies or select businesses may be identified where there may be a direct implication of the energy project.



Socio-economic Figure 1: Study Area

15.1.19 Economic impacts at the local authority level (Powys) and national level (both Wales and the rest of the UK) will also be considered. This will help align the available socio-economic data from the baseline and reflect that the energy project will generate economic benefits such as jobs created and GVA for businesses based outside of the immediate local area and Powys, with supply chains beyond Wales. Sensitivity to the location of contractors and supply chains will be made to also allow for leakage of benefits outside of the UK (for instance parts of the turbine manufacture and supply is likely to be imported from outside of the UK).

Socio-economic Baseline

15.1.20 As outlined in the map above, the primary local study area comprises the wards that sit within 10km of the site in Northern Powys. These are:

- Bawny, Llanfihangel and Llanwyddyn
- Caersws

- Llanbrynmair
- Llanfair Caereinion and Llanerfyl
- Rhiwcynon

15.1.21 The total population across these wards is 9,184, spread across 5,928 households who are likely to be those most directly affected by the Proposed Development. Across Powys the population is 132,447 with the towns of Machynlleth, Welshpool and Newton the largest population centres near to the Proposed Development (though outside of the 10km radius set).[26]

15.1.22 Population density of the local wards is low, with <0.1 through to 0.3 people per hectare reflecting the rural nature of the local landscape. Across the local area of impact the average population density is 0.15 persons per hectare.

15.1.23 Powys has a resident population that is ageing faster than the national average and 56% of the population are of working age (57% in the above wards), compared to 61% in Wales and 62% in the UK. Difficulties in retaining younger residents in the county also impact on this ageing population, with a lack of higher value jobs one of a range of reasons for this.

15.1.24 Unemployment, however, is low with latest estimates at 2.9%, below the Welsh (3.7%) and UK (4.6%) levels, while economic activity is nearly 80%, above both Wales (75.7%) and the UK (79.1%).[27] Much of the employment is with micro (<9 staff) and small (10-49 staff) companies.

15.1.25 Powys residents are also more highly qualified than the Wales average with 41.1% of residents qualified to Level 4 compared to 38.8% in Wales.[28] Across all other qualification levels (1, 2, and 3) a greater proportion of Powys residents hold qualifications than across Wales.

15.1.26 Average earnings are below the Wales average though, with full time workers earning an average of £519 per week compared to £541 in Wales and £587 in the UK.[29]

15.1.27 There is a good availability of jobs in Powys relative to the working age population with a job density of 0.91 (compared to 0.77 in Wales).[30]

15.1.28 Agriculture and forestry is the largest sector in Powys employing 10,000 people or 16.7% of the working population, which is far greater than the Welsh average of 3.2% and representing most of the businesses within the local area of impact to the Proposed Development.[31] Tourism related sectors are also proportionately greater in Powys, with accommodation and food services employing 10% of the working population compared to 9.2% in Wales.

[26] Mid-Year Population Estimates, ONS, 2020
[27] Annual Population Survey, ONS, 2020
[28] Annual Population Survey, ONS, 2020
[29] Annual Survey of Hours and Earnings, ONS, 2020
[30] Job Density, ONS, 2019
[31] Business Register and Employment Survey, ONS, 2020

Manufacturing employs a similar amount to the Welsh average (10% vs 10.7%) and professional, scientific and technical activities are slightly greater (5.8% vs 5%).

15.1.29 This mix of some lower value sectors as well as the lower working population leads to GVA per head in Powys to be £17,025, below the Wales average of £20,738.[32] The largest sector by output is real estate (£344m), followed by Health and Social Work (£306m), Manufacturing (£258m) and Retail (£226m).

15.1.30 Deprivation, assessed through the Welsh Index of Multiple Deprivation for the Lower Super Output Areas (LSOA) that cover the local area of impact, is generally ranked in the lesser deprived or more affluent areas. Llanbrynmair & Banwy rank 882/1909 LSOA areas, while the others are between 1094/1909 and 1304/1909 where 1 is the most deprived area. Access to services (given the remote rural nature of the area) and housing are two of the indicators on which the area is either in the top 10 or 20% of all LSOAs. Income, employment, health, education and community safety are all in the 50% least deprived.

Potentially Significant Effects and Approach to Mitigation

15.1.31 The Mynydd Lluest y Graig Energy Project proposal represents a significant investment that will likely produce substantial economic benefits for the local supply chain, local workforce/ employment, environment, educations, skills and community investment opportunities for local residents and communities. Though there potentially may be some negative impacts arising for some social factors such as recreational use of the land in the vicinity, the presence of existing operational wind farms in the area may have already led to such impacts. There is also little evidence that wind farms have any substantial impact on tourism with only a very small proportion of visitors put off and similarly, recreational activity impacts are likely to be minimal.[33]

15.1.32 Economic benefits will accrue under the development phase with visits to the site from the developer and various consultants supporting local businesses, through the construction phase drawing on local contractors or businesses offering supporting services and through the operation where high value job opportunities and training may support local residents and communities through supplier mapping and brokering supply chain and employment opportunities. Further to the local economic impacts are multiplier effects on the wider economy from the injection of investment while any community benefit fund or shared ownership is also likely to bring economic impacts through spending and support to local businesses and community groups. Overall, the economic impacts are expected to be tens of

[32] Sub-regional Gross Value Added by Welsh NUTS areas, ONS, 2019

[33] The economic impacts of wind farms on Scottish tourism, A report for the Scottish Government, 2008

millions of pounds in additional Gross Value Added, and hundreds of jobs safeguarded or created.

15.1.33 The economic impacts, such as increased employment and contributions to Gross Value Added will be assessed based on expenditure during the development, construction and operation phases of the energy project. This will include assumptions from the literature and evidence on the extent of local content of contracts issued.

Cumulative Impact

15.1.34 With several other wind farms located near to the Proposed Development, cumulative effects across other developments will also be considered. Assessment of whether cumulative effects are beneficial or an enhancement of opportunity will be used to determine implications for the supply chain.

Mitigation

15.1.35 In order to mitigate against any negative socio-economic impacts and deliver direct value to Wales the Proposed Development will include some form of shared ownership or community benefit fund in line with Welsh Government guidelines. This will provide financial resource for the local community to invest in infrastructure and services, supporting both social improvements but also potentially strategic objectives aligned to local authority and Welsh Government plans. For instance, other wind farm funds have been used to deliver superfast broadband to rural areas.

15.1.36 Other mitigation methods will be explored by the developer including the introduction of improved path and bridleway networks and signage at the site to open access for additional recreation. The creation of a habitat enhancement area to offset any ecological considerations may also help mitigate against any potential negative socio-economic effects and will be considered. Further, the developer may also engage with local schools to support education and awareness of renewable energy.

15.2 Human Health

Shadow Flicker

Introduction

15.2.1 Shadow Flicker is described as the effect caused when an operating turbine is located between the sun and a receptor, whereby the shadow of the rotating blades falls over a dwelling causing the internal light intensity to fluctuate. Guidance (such as that in National Policy Statement EN-3) explains that shadow flicker is unlikely to occur at greater than 10 rotor

diameters from a wind turbine and that effects only occur within 130 degrees either side of north relative to the turbine location. Beyond this distance potential impacts associated with shadow flicker are unlikely to be significant.

15.2.2 Following a review of the initial energy project design, there are a small number of residential properties identified within the 10 rotor diameters, based upon a candidate turbine with a 175m rotor, of the nearest proposed turbines and as such a shadow flicker assessment will be required. Should there be any change to these circumstances following turbine siting such a position would be reconsidered.

Policy and Relevant Guidance

15.2.3 Planning Policy in Wales relevant to the Development on this issue is set out in Future Wales and Planning Policy Wales. Under criteria 7 of Policy 18 of the national plan, proposals are required to demonstrate there are no unacceptable adverse impacts to receptors by way of shadow flicker, noise etc. Paragraph 5.9.20 of PPW requires planning authorities to minimise impacts on local communities and safeguard the quality of life of existing and future generations.

15.2.4 These requirements place a duty on the Applicant to set out the methods of assessing shadow flicker and determining, following redesign, the level of significance to receptors. Within the Wales there is no standard for the assessment of shadow flicker and there are no guidelines on what exposures would be acceptable, therefore this assessment seeks to quantify the effect.

15.2.5 Relevant reference documents include:

- Update of UK Shadow Flicker Evidence Base (2011), DECC[34]
- Best Practice Guidance to PPS 18 Renewable Energy (Northern Ireland Department of the Environment, 2009)[i]

15.2.6 In Northern Ireland (where guidance is more developed on this topic) the equivalent planning guidance is the draft Best Practice Guidance to PPS 18 Renewable Energy. The draft PPS 18 states that only properties within 130 degrees either side of north of the turbines can be affected at UK latitudes and the potential for shadow flicker at distances greater than ten rotor diameters from a turbine position is very low. It further recommends "*that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day*." The latter recommendation is based on a European Union sponsored

[34] DECC (2011) Update of UK Shadow Flicker Evidence Base

study undertaken by Predac[35], an organisation that promotes best practice in energy use and supply.

15.2.7 Policy 18 of Future Wales advises that renewable energy projects will be permitted subject a series of policy tests, including Criterion 7 whereby new development should demonstrate that "*… there are no unacceptable impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic interference."* An assessment of potential shadow flicker effects arising from the wind turbines only (no other infrastructure will have moving parts) will be conducted in accordance with the methodology below.

Methodology

15.2.8 Wind turbines are large structures, which can cast long shadows when the sun is low in the sky. Wind turbines can cause 'shadow flicker' under certain circumstances. This happens when the sun passes behind a moving blade and casts a shadow on the window of a neighbouring property. The likelihood of this occurring and the duration of such an effect depends upon the following:

- The direction of the residence relative to the turbine(s);
- The distance from the turbine(s);
- The turbine hub height and rotor diameter;
- The time of year;
- The proportion of daylight hours in which the turbine operates;
- The frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon); and
- The prevailing wind direction.

15.2.9 Research by Clarke[36] demonstrated that shadow flicker only occurs inside buildings when flicker appears through a narrow opening, particularly if the window is the sole source of light. As a general rule of thumb, the residential property must also be within ten rotor diameters of the wind turbine, and in Britain properties must lie within 130 degrees either side of north, relative to the wind turbines.

15.2.10 Potential disturbance from shadow flicker only occurs at frequencies between 2.5Hz and 40Hz. It is also important to note that the proposed wind turbines are variable speed and the

[35] PREDAC (2004) European Actions for Renewable Energies, Spatial Planning of Wind Turbines
[36] Clarke (2001) A case of Shadow Flicker/ Flashing: Assessment and Solution, Open University. Milton Keynes

blades rotate between 13 and 19 rpm, giving blade passing frequency of less than 3Hz, well below the frequencies of 5-30Hz associated with photosensitive epilepsy[37]. No epidemiological effects as a result of operation of the wind turbines are therefore predicted.

15.2.11 Modern turbines turn slower than earlier models making shadow flicker less of an issue, however, shadow flicker can still occur as a result of the sweep of the blades through the rays of sun which could be noticeable to affected properties.

15.2.12 Within the shadow flicker assessment, the following has been undertaken:

- Existing receptors (residential properties) within an identified study area have been described;
- Effects of shadow flicker as a result of the movement of the wind turbine blades on the surrounding receptors have been identified and described;
- Mitigation measures which aim to avoid, reduce or compensate for the identified effects has been presented, if appropriate; and
- A conclusion of the significance of the shadow flicker effect, based up professional judgement informed through conducting many such studies, is given.

15.2.13 A specialised computer package called GH WindFarmer will be used to determine the maximum number of hours in the year when shadows may theoretically be cast from the wind turbines towards dwellings within ten rotor diameters of the site. This is based upon the worst-case conditions of:

- Assuming narrow window openings;
- No screening from buildings or vegetation;
- Full sun from sunrise to sunset (i.e. no cloud cover);
- The rotor plane is always perpendicular to the line from the wind turbine to the sun; and,
- The wind turbine is always operating (i.e. between the operational lower and upper wind speeds with the blades rotating).

15.2.14 The shadow flicker computer model presents a worst-case prediction of potential effects, based on the assumption that direct sunshine unhindered by cloud etc. occurs throughout the year and that the wind turbine rotors are always oriented directly towards each receptor. In practice, shadow flicker effects are likely to occur for considerably less time than the worst-

[37] The National Society for Epilepsy (2002) Epilepsy Action, September 2002.

case predictions as calculated by the shadow flicker model. There are two principal reasons behind this: firstly, in the UK sunshine typically occurs for approximately 30% of daylight hours. At other times, the wind turbines are unlikely to cast shadows sufficiently pronounced to cause shadow flicker effects to occur. Secondly, during those times when wind turbine rotors are not orientated directly towards receptors, i.e. the nacelle and blades are not face on to the receptors, the duration of the shadow flicker effects would be reduced due to the elliptical shape of the shadow cast. Therefore the extent of the shadow cast would range from the thickness of the blade when the blades are in line with the sun and receptor to a width equal to the rotor diameter, at those times when the rotor is perpendicular to the sun and receptor.

15.2.15 Consequently, for the purposes of this assessment the duration of shadow flicker effects will be calculated firstly for worst-case conditions output by the model in which the software assumes that the turbines will be perpendicular to the sun at all times and secondly for a scenario calculated as 30% of the worst-case scenario to reflect the typical sunshine occurring in the UK as described above. In the latter case, the worst case assumption on turbine rotor orientation is retained.

Potentially Significant Effects and Mitigation

15.2.16 The assessment of shadow flicker effects and their significance is determined through interpretation and analysis of the number of hours of shadow that the receptor will experience, including, when and how many days during each year, for how many hours it occurs in each day, and at what time of day. Significance is also determined by whether shadow flicker could cause a human health effect. As noted above, no health effects would be anticipated to occur from shadow flicker at frequencies below 2.5Hz.

15.2.17 For the purposes of the assessment, once the effect of theoretical shadow flicker has been modelled, the approach to establishing the significance of effect is based on professional judgement.

15.2.18 Significance is typically defined as a function of the sensitivity of a receptor with the magnitude of change. In this case the sensitivity of the receptor (an occupied building) is considered to be constant and high and as such significance will be defined largely as a function of the magnitude of change. A methodology for the establishment of the magnitude of change will therefore be derived based on professional experience and the impact prediction table below. Predictions will be based upon the distance of the property from the turbine location along with the number of predicted hours of shadow flicker effect. Effects are rated as being either major (significant) or moderate (potentially significant) where the

magnitude of change is very high/high or medium; or minor or negligible (not significant) where magnitude of change is low/very low, or no change.

Table 15.2: Scoring Methodology for Magnitude of Change

Magnitude of Change	Distance from Turbine	Predicted Shadow Flicker Effect Duration
Very High / High	<500m	>30 minutes per day or >30 hours per year
Medium	500 – 750m	>30 minutes per day or >30 hours per year
Low / Very Low	750 – 1410m	<30 minutes per day or <30 hours per year
No Change	>1410m	No shadow flicker effect predicted

15.2.19 Measures to mitigate potentially harmful effects to residential receptors are likely to entail relocation of wind turbine generators to suitable alternative locations, or reductions in turbine scale / blade length. In extreme cases, turbines may be removed from the scheme altogether.

Residual Effects

15.2.20 Following implementation of any necessary mitigation the assessment will conclude on whether significant effects on human health will arise as a result of the Proposed Development.

15.2.21 Any residual shadow flicker effects will be extant throughout the life of the energy project, and will only occur under certain weather and light conditions.

Ice Throw

15.2.22 Icing of the wind turbine blades is now an unusual occurrence. Typically it can happen when turbine blades are stationary and subject to zero or less than zero temperatures where moisture is in the air.

15.2.23 Modern turbines now have blade sensors incorporated that detect ice on a blade and link to system operator to ensure that, under these climatic conditions, either turbines are shut down when rotating, or prior to turbine start-up blade rotation is kept slow and avoids the 'throw' of ice beyond the radius of the blade itself.

15.2.24 Energy project design will seek to locate turbines a sufficient distance from receptors as to negate any potential impact, including to residences and public rights of way. This design avoidance will be sufficient to avoid potential impacts cause icing to occur, once operation recommences, the operational motion of the turbine blades and the forces of gravity can cause the ice to break off and fall vertically to the ground.

15.2.25 On the basis of the above understanding it is proposed that ice throw will not be assessed in the ES.

Risks to Human Health

15.2.26 Danger to human health (excluding noise impacts, which are addressed in Chapter 9) arising from the construction and operation of wind energy schemes is very rare. Typically, the public is excluded from construction sites, and any visits would be strictly regulated by the developer / installer in accordance with stringent health and safety requirements.

15.2.27 In terms of lightning, conductors are installed on all wind turbine generators that direct lightning strikes to earth, removing any risk to the public caused by the turbines themselves.

15.2.28 Wind-generated electricity is not a completely benign source of energy and at least 80 recorded fatalities[38] involving wind power have been recorded globally since 1975, but these are primarily to the construction workforce prior to operation. The trend has even improved substantially, whereby the mortality rate, despite the operation of many thousands of turbines worldwide, has dropped threefold since the first commercial expansion of the wind sector in the 1980s. On the few occasions where wind turbines have failed during operation, such incidences principally arose during seriously poor weather conditions during which the public is not typically roaming at large and is not, consequently, under threat.

15.2.29 For these reasons it is proposed that potential significant effects to human health are scoped out of the environmental assessment.

[38] Centre for Sustainable Energy, *Concerns about wind power.* June 2017

16 Draft Outline of the Environmental Statement and Other Documents

16.1 Scoped In / Scoped Out

16.1.1 On the basis of the above sections, the following environmental matters are proposed to be Scoped-in to the EIA:

- Landscape and Visual, including Residential Amenity
- Noise
- Ecology
- Ornithology
- Hydrology, hydrogeology and geology
- Peat
- Forestry
- Archaeology and Cultural Heritage
- Telecommunications and Aviation
- Transport Access and Traffic
- Population, Socio-economics and Shadow Flicker

16.1.2 On the basis of the above sections, the following environmental matters are proposed to be Scoped-out of the EIA:

- Human Health

16.2 Environmental Statement (ES)

16.2.1 The ES will comprise a Non-Technical Summary, Written Statement, Appendices and a Figures document. Detailed specialist reports, as required, will be included as separate Technical Appendices forming part of the ES.

16.2.2 The Written Statement will comprise the above mentioned chapters and inclusive of sections on Introduction, EIA Methodology, Consideration of Alternatives and Project Description.

- Landscape and visual assessment;

16.2.3 These chapters will be supported by relevant drawings and photographs within the Figures document.

16.2.4 A confidential annex may be provided which would contain any sensitive, confidential information, e.g. ornithological information. Initial circulation will be restricted to NRW and RSPB, with circulation to other parties subject to agreement by both organisations.

16.3 Other documents

16.3.1 A separate Planning Statement will be prepared in support of the application for consent. The Planning Statement will not be part of the ES. It will discuss the relevant energy, environment and planning policies of relevance and assess the identified impacts against those. The Planning Statement will also set out the wider policy context for renewable energy development at the European and national levels.

16.3.2 In addition, the following supporting DNS application documents will be provided in order to fulfil regulatory requirements:

- Pre-application Consultation Report;
- Statements of Common Ground;
- Outline CEMP;
- Outline Transport Management Plan;
- SAB Sustainable Drainage Statement; and
- Grid Statement.

Annex 1: Previously Agreed Viewpoints for the Landscape and Visual (2014/15)

Viewpoint	Distance and direction from nearest turbine (km)	Visual receptors
VP01 - Carreg-y-big	0.9, south	Road users
VP02 - Bridleway near to Llyn y Grinwydden	0.3, north east	Recreational horse riders and walkers
VP03 - Minor road running between Llangadfan and Tirymynach	1.2, south west	Road users
VP04 - Glyndwr's Way, Neinthirion	1.5, north west	Recreational walkers and road users
VP05 - Glyndwr's Way on Minor Road, Nant yr Eira	1.6, north west	Recreational walkers
VP06 - Glyndwr's Way, Dolwen	1.7, north	Recreational walkers and road users
VP07 - Glyndwr's Way at Eithin-llwyn	2.2, north west	Recreational walkers
VP08 - Minor Road (west), Mynydd yr Hendre	2.2, south	Road users
VP09 - Minor Road (east), Mynydd yr Hendre	2.7, south	Road users
VP10 - Glyndwr's Way, Pen Coed	3.3, north	Recreational walkers
VP11 - Minor road near Waenglapiau	3.9, east	Residents
VP12 - Talerddig	3.8, south west	Road users
VP13 - Llanerfyl	3.1, north east	Residents and road users
VP14 - Glyndwr's Way near Brynderwen	3.4, north	Residents
VP15 - Moel Bentyrch	4.3, north east	Recreational walkers
VP16 - Garreg-hir	5.2, south	Recreational horse riders and walkers
VP17 - A458 at Llangadfan	4.3, north	Residents
VP18 - Minor road Afon Banwy valley	5.0, north east	Road users
VP19 - Minor road near Adfa	6.3, south east	Residents
VP20 - Glyndwr's Way at Penyfford (south)	5.5, north east	Recreational walkers
VP21 - Track near Craig-y-gof	5.8, north east	Recreational horse riders and walkers
VP22 - Glyndwr's Way at Penyfford (north)	6.1, north east	Recreational walkers
VP23 - Glyndwr's Way, Cerrig-y-Tan	3.9, west	Recreational walkers
VP24 - Ann Griffiths Walk, Allt Dolanog	8.1, north east	Recreational walkers
VP25 - Minor road, Gors Goch	9.6, south	Recreational horse riders and walkers
VP26 - Mynydd Clywedog, Snowdonia National Park	10.5, north west	Visitors to the National Park

Viewpoint	Distance and direction from nearest turbine (km)	Visual receptors
VP27 - Lane at Llidiardu	11.6, south east	Road Users
VP28 - Llanfihangel-yng-Ngwynfa	11.9, north east	Residents at Llanfihangel
VP29 - Penycrocbren	13.8, south east	Recreational horse riders and walkers
VP30 - Foel Dinas, Snowdonia National Park	15.3, north west	Visitors to the National Park
VP31 - Llyn Clywedog Reservoir	15.1, south east	Recreational walkers
VP32 - Footpath, Moel y Cerrig Duon	19.2, north west	Recreational walkers
VP33 - Aran Fawddwy, Snowdonia National Park	20.3, north west	Recreational walkers
VP34 - Two Tumps, Kerry Ridgeway	22.6, south east	Recreational walkers
VP35 - Pumlumon fawr	23.2, south west	Recreational walkers
VP36 - Cadair Idris	26.2, north west	Recreational walkers