Design and Access Statement

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Cenin Renewables

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Contents

Glossary

Term	Definition
Environmental Statement	A document reporting the findings of the Environmental Impact Assessment (EIA) and produced in accordance with the EIA Regulations.
Environmental Impact Assessment	EIA is a means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development.
The proposed development	Manmoel Wind Farm development
Manmoel site boundary	The full extent of the land available for, and being investigated for, potential development.

List of Abbreviations

Abbreviations	Descriptions
AIL	Abnormal Indivisible Load
AMP	Access Management Plan
AMR	Annual Monitoring Report
AOD	Above Ordnance Datum
BBNP	Brecon Beacons National Park
BGCBC	Blaenau Gwent County Borough Council
CAA	Civil Aviation Authority
CCBC	Caerphilly County Borough Council
CfD	Contract-for-difference
DAS	Design and Access Statement
DCfW	Design Commission for Wales
DNS	Development of National Significance
EIA	Environmental Impact Assessment
EIA Regulations	The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017
ES	Environmental Statement
FWPAA	Future Wales Pre-Assessed Area
GW	Gigawatt
HGV	Heavy Goods Vehicles
IEMA	Institute of Environmental Management & Assessment
kWh	Kilowatt hours
LCOE	Levelised Cost of Energy
LDP	Local Development Plan
LGV	Light Goods Vehicles
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment
m	Metre
MW	Megawatt
MWh	Megawatt hours
Natural Power	Natural Power Consultants
NRW	Natural Resources Wales
PAA	Pre-Assessed Areas for Wind Energy
PAC	Pre-Application Application
PEDW	Planning and Environment Decisions Wales
PINS	Planning Inspectorate
PPA	Power Purchase Agreement
PRoW	Public Right of Way
PPW	Planning Policy Wales

Abbreviations	Descriptions
PS	Planning Statement
RVAA	Residential Visual Amenity Assessment
SAC	Special Areas of Conservation
SPA	Special Protection Areas
SSA	Strategic Search Areas
SSSI	Sites of Special Scientific Interest
TAN	Technical Advice Note
WG	Welsh Government

1. Introduction

Cenin Renewables (the Applicant) are seeking consent to development and operate a wind farm at Manmoel in the south Wales. The application is a Development of National Significance (DNS) and as such consent is sought from the Welsh Ministers for consent to develop and operate Manmoel Wind Farm (the proposed development).

This statement has been prepared in accordance with statutory legislation for DNS to be submitted to the Planning and Environment Decisions Wales (PEDW) under Part 5 of the Planning (Wales) Act 2015, which amends the Town and County Planning Act 1990 ('the Act') and the Developments of National Significance (Procedure) (Wales) Order 2016 (as amended) and subsequent Regulations.

The statutory requirement for a Design and Access Statement (DAS) to accompany an application for a DNS is prescribed in Article 14 of '*The Developments of National Significance (Procedure) (Wales) Order 2016*.'

This DAS has been prepared by Natural Power to accompany the application for the proposed development, and includes:

- The procedures used by the Applicant to find a suitable location and design for the proposed development;
- Details of the proposed development;
- The methods proposed by the Applicant to ensure that any residual environmental impacts are avoided/minimised/mitigated;
- Consideration of the proposed development against the relevant policies of the Welsh Ministers; and
- Consideration of the proposed development against the Local Development Plan (LDP) for Blaenau Gwent County Borough Council (BGCBC) and Caerphilly County Borough Council (CCBC), being the administrative areas within which the proposed development is located, and other relevant considerations.

1.1. The Applicant

Cenin Renewables is a renewable integrated infrastructure company committed to powering a greener future. Through Cenin's innovative approach to renewable energy provision, they can unlock hidden green energy potential and utilise the earth's natural resources. They respect the people they work with and the places they live, helping develop quality energy systems for local communities that increase wellbeing and add value for future generations by creating a sustainable world. In 2021, Cenin's work in sustainable development was recognised with them being awarded the Queen's award for enterprise. Cenin's principals have been developing award winning solar and wind projects by utilising the very latest technologies. Their recent projects include Parc Dyffryn, Parc Stormy and Llanwonno.[1]

1.2. Consultants

Natural Power, the lead consultancy on the project, has been providing expertise to the renewable energy industry since the company was formed in 1995 and is one of Wales' and the UK's leading renewable energy consultants. Natural Power currently employs over 420 people working full time providing renewable energy services nationally and internationally, including a dedicated Welsh team who have delivered over 460 MW worth of applications consented, including those that have gone to appeal.

Testimony to Natural Power's experience and ongoing commitment to competency and continual improvement, its Planning and Environment Departments are accredited by the Institute of Environmental Management and Assessment (IEMA) and registered to IEMA's EIA Quality Mark scheme[2] . In addition, Natural Power also operates

[1] Cenin, (2022). [Online]. Available from https://cenin.co.uk/renewables/ [Accessed 13/02/2023]

[2] IEMA website, *EIA Quality Mark*, (2023). [Online]. Available from https://www.iema.net/corporate-programmes/eia-quality-mark [Accessed 13/02/2023]

in formally accredited health and safety (ISO 45001), environmental (14001) and quality (9001) management systems. As well as development and EIA services, Natural Power also provides expert advice and due diligence consultancy, site construction management and site operation and maintenance. Thus, Natural Power is a competent, experienced consultant to co-ordinate and undertake EIA and to prepare the Environmental Statement (ES).

2. Environmental Statement

The Environmental Statement (ES) has been prepared in accordance with The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (EIA Regulations). The ES reports the findings made in the Environmental Impact Assessment (EIA) of the proposed development. The scope of the EIA was the subject of a formal scoping opinion the Planning Inspectorate (PINS (now PEDW)), which included input from the relevant Local Planning Authorities (BGCBC and CCBC), and from other consultees including Natural Resources Wales (NRW). Further consultations, and responses to consultation comments, are detailed in each relevant topic chapter of the ES.

During the EIA process, site visits and desktop assessments, in line with relevant guidance, were carried out to ascertain the potential impacts, and mitigation measures to be made. A review of planning and other relevant policies was also made to inform the assessment process and ensure the proposed development adequately considered local and national policy.

3. Design and Access

The Applicant has provided a detailed written statement about the design principles and concepts that were applied to the proposed development before submission in Chapter 4: Site Selection and Design Evolution of the ES, as well as within individual environmental topic chapters. Access issues have also been addressed in the ES, in particular:

- Chapter 4: Site Selection and Design Evolution of the ES details the design process and the rationale for location and the design of the proposed development;
- Chapter 5: Project Description describes the arrangements for access in and around the site during construction and operational phases; and
- Chapter 11: Traffic and Transport deals with access primarily of larger components to the site during the construction phase (including Appendix A11 and associated figures).

It is therefore considered that this DAS, in combination with the ES, fulfils the planning requirement for a statement on design and access.

4. Overview of the proposed development

The proposed development is located on Manmoel Common, east of Manmoel Road, Ebbw Vale, Blaenau Gwent. The majority of the proposed development site boundary is located is within the BGCBC area, although its south-western corner lies within the CCBC Local Planning Authority boundary. The site centre grid reference is 316626, 206851.

The proposed development is located approximately 3 km away from the Brecon Beacons National Park Authority Boundary (BBNP) at its closest point. The site is surrounded by settlements with Ebbw Vale approximately 200 m to the east and Tredegar approximately 500 m to the west. The village of Manmoel is situated approximately 2 km to the south. In terms of surrounding designations, Cwm Merddog Woodlands and Blaenavon Coity Mountain are

located approximately 1.7 km and 3.5 km to the east of the proposed development. Sirhowy Hill Woodland and Cardiff Pond are approximately 1.3 km to the north and Parc Bryn Bach approximately 2.4 km to the northwest.

The proposed development site boundary is located along the northern section of Cefn Manmoel, an elevated ridge situated between the Sirhowy Valley and Ebbw Vale. The ridge is approximately 504 m Above Ordnance Datum (AOD) at its highest point.

The site boundary covers an area of approximately 7.5 hectares.

The proposed development comprises the following main elements:

- Up to 5 turbines of up to 180 m maximum tip height and associated crane hardstandings;
- Transformers house adjacent to or in turbines;
- Onsite access tracks plus underground cable runs alongside;
- An onsite sub-station building;
- Construction compound; and
- Access into the site boundary.

The proposed development is located primarily on an area of upland common land which comprises of a mix of grasslands, marsh, heath, bracken and woodland. The proposed development is located primarily on an area of upland common land. Under section 16 (1) of the Commons Act 2006 secondary consent will be required for the removal of approximately 7.1 hectares of existing common to accommodate the turbines, tracks and associated infrastructure. Suitable replacement land contiguous to the common of approximately 10.0 hectares will be secured.

Work will be undertaken to facilitate erection of turbines, and creation of new access tracks and/or upgrades to existing access tracks. Site restoration and landscaping will aim to integrate new infrastructure elements as sympathetically as possible.

Full details of the infrastructure associated with the proposed development is provided in the ES, Volume 1, Chapter 5: Project Description and associated figures in Volume 2.

The proposed development is expected to have an operational life of up to 50 years.

A layout plan is provided at the end of this document (ES, Volume 2, Figure 1.2: Site Layout).

5. Context

The design of the proposed development has been influenced by a range of planning policy considerations, as well as good practice guidance. Full details of the planning policy framework are provided within the Planning Statement (PS) and within Chapter 2: Legal and Policy Context of the ES, which accompany the application.

This section provides an outline and assessment of the design policy framework at both a national and local level that is of relevance to the proposed development.

5.1. Locational Policy and Guidance

5.1.1. Pre-Assessed Areas

As addressed in more detail in the PS, Future Wales: the National Plan 2040 (Future Wales) was adopted in February 2021. Pre-Assessed Areas for Wind Energy (PAAs) were identified in Future Wales where the Welsh Government (WG) has modelled the likely impact on the landscape and has found them to be capable of accommodating development in an acceptable way. , These areas benefit from a presumption in favour of large-scale wind energy development within these areas.

Four out of the five turbines proposed for Manmoel Wind Farm lies within a PPA, known as Future Wales Pre-Assessed Area 10 (FWPAA)[3], with one turbine just located north of the FWPAA 10. This is shown on Figure 5.1.

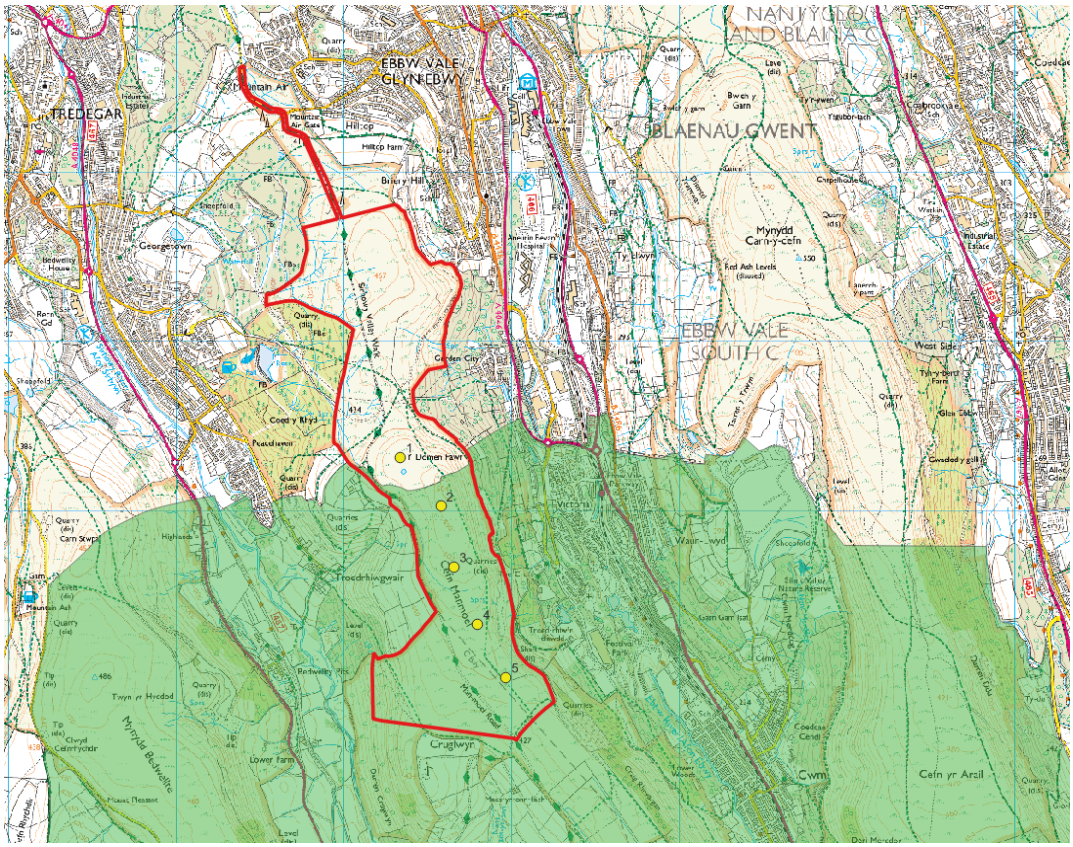

Figure 5.1: Pre-Assessed Area

Key: PAA shaded green; Site boundary outlined red; Turbine layout yellow dots

5.1.2. LANDMAP: Visual and Sensory

LANDMAP is identified as an important information resource to inform planning for the sustainable management of natural resources. The Visual and Sensory aspect in particular is instructive as to the likely sensitivity of receiving landscapes and visual receptors. Aspect areas with a high or outstanding visual and sensory evaluation may be more sensitive to change from development. The whole of the proposed turbines lie within areas of only moderate visual and sensory evaluation (see Figure 5.2).

[3] Welsh Government (2021) Available from: https://gov.wales/future-wales-national-plan-2040-0 [Accessed 13/02/2023]

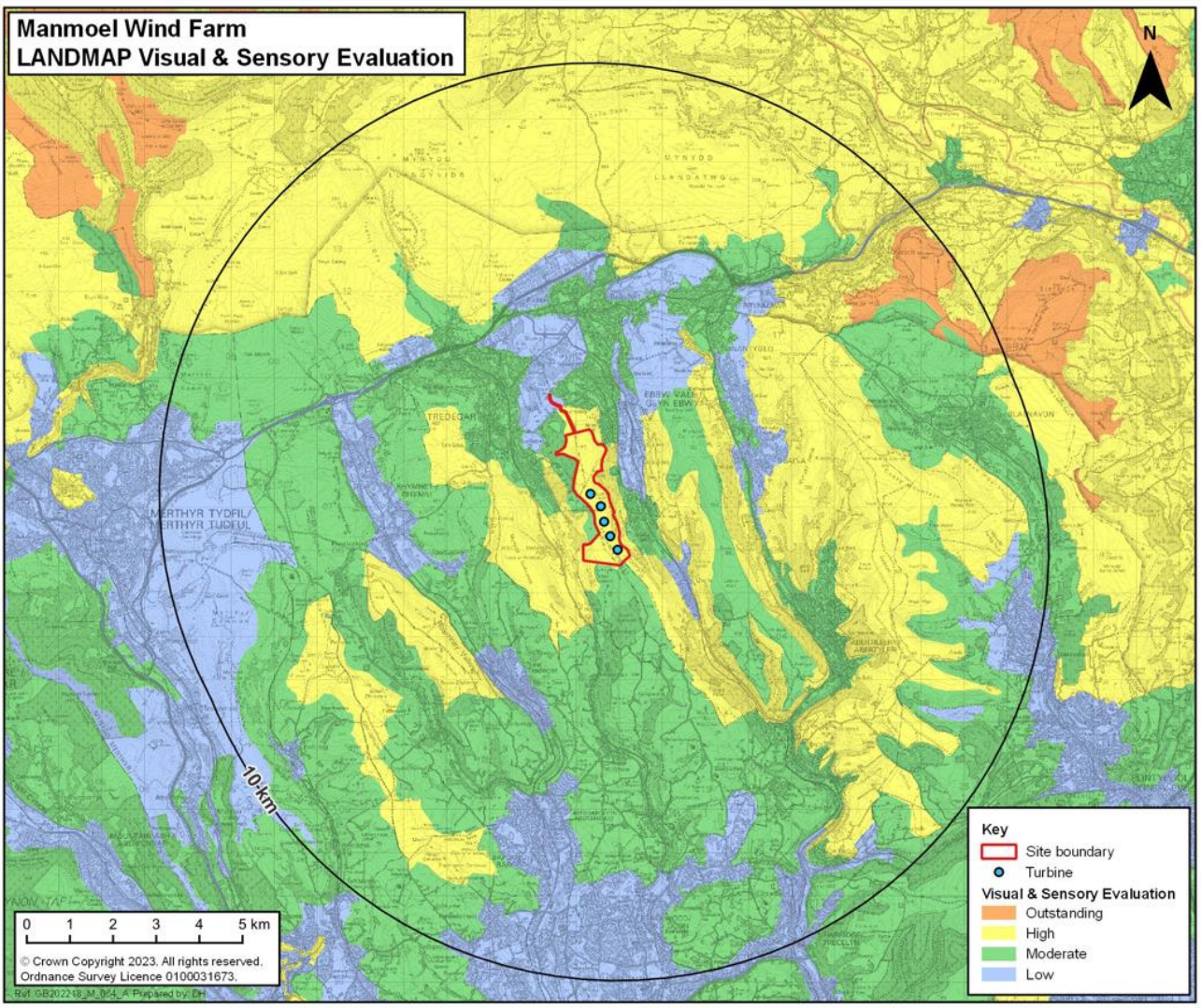

Figure 5.2 LANDMAP Visual and Sensory Evaluation

5.2. National Planning Policy on Design

5.2.1. Planning Policy Wales 11th Edition, Welsh Government (February 2021)

Planning Policy Wales (PPW) 11th Edition[4] states that meeting the objectives of good design should be the aim of those involved in the development process and applied to all development proposals. These objectives can be categorised into 5 key aspects of good design, shown as follows:

- Access;
- Character;
- Community Safety;
- Environmental Sustainability; and
- Movement.

These and their associated explanations are presented in Figure 5.3 of this statement.

[4] Planning Policy Wales 11th Edition. Available from: https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf [Accessed 13/02/2023]

PPW states in paragraph 3.17 that '*in preparing design and access statements, applicants should take an integrated and inclusive approach to sustainable design, proportionate to the scale and type of development proposal. They should be 'living' documents dealing with all relevant aspects of design throughout the process and the life of the development*.'

Figure 5.3: Good Design

Source: PPW 11th Edition (2021)

5.2.2. Future Wales: The National Plan 2040

Outcome 11 of Future Wales[5] is to create '*A Wales where people live…in places which are decarbonised and climate resilient*'. It expands on this to say, '*The challenges of the climate emergency demand urgent action on carbon emissions and the planning system must help Wales lead the way in promoting and delivering a competitive, sustainable decarbonised society. Decarbonisation commitments and renewable energy targets will be treated as opportunities to build a more resilient and equitable low-carbon economy, develop clean and efficient transport infrastructure, improve public health and generate skilled jobs in new sectors*.'

The key policies contained in Future Wales relevant to the proposed development are policies 17 and 18. They are set out as follows:

Policy 17: Renewable and Low Carbon Energy and Associated Infrastructure

"The Welsh Government strongly supports the principle of developing renewable and low carbon energy from all technologies and at all scales to meet our future energy needs.

In determining planning applications for renewable and low carbon energy development, decision makers must give significant weight to the need to meet Wales' international commitments and our target to generate 70% of consumed electricity by renewable means by 2030 in order to combat the climate emergency.

[5] Future Wales: The National Plan 2040. Available from: https://gov.wales/future-wales-national-plan-2040 [Accessed 13/02/2023]

In Pre-Assessed Areas for Wind Energy the 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.

Applications for large scale wind and solar will not be permitted in National Parks and Areas of Outstanding Natural Beauty and all proposals should demonstrate that they will not have an unacceptable adverse impact on the environment.

Proposals should describe the net benefits the scheme will bring in terms of social, economic, environmental and cultural improvements to local communities.

New strategic grid infrastructure for the transmission and distribution of energy should be designed to minimise visual impact on nearby communities. The Welsh Government will work with stakeholders, including National Grid and Distribution Network Operators, to transition to a multi vector grid network and reduce the barriers to the implementation of new grid infrastructure."

Policy 18: Renewable and Low Carbon Energy Developments of National Significance

"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 (TTA-7T);

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.

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

5.2.3. Technical Advice Note (TAN) 12: Design – Welsh Assembly Government (2009)

TAN 12: Design[6] is the principal source of design guidance for Wales and provides a broad framework with which to steer design standards and principles at the local level. It fully advocates those aspects of good design identified in PPW and presents a series of design guidelines to deliver these elements.

Appendix 1 of TAN 12 includes further detail regarding the content and form of a DAS and has informed the structure of this document. In relation to design, TAN 12 states that a DAS must explain the following:

- Access;
- Character;
- Community Safety;
- Environmental Sustainability; and
- Movement to, from and within the development.

One aspect highlighted as being of particular importance within the guidance are the contributory elements that define the character of the proposal, as set-out in PPW, namely the principles of 'amount', 'layout', 'scale', 'appearance' and 'landscaping' and how these have been addressed within the development proposal.

5.3. Local Planning Policy on Design

The following text sets out the policies which are relevant to design, contained in the LDPs. It is noted that the LDPs of both Local Planning Authorities have reached the end of their plan period. They are considered to be the determining LDPs until they are replaced by the new LDPs currently under preparation, they should be considered superseded in parts by more up-to-date Welsh national planning policy.

5.3.1. Blaenau Gwent County Borough Council Local Development Plan

BGCBC's Local Development Plan up to 2021 (Blaenau Gwent LDP) was adopted in November 2012. It sets out a number of challenges including Challenge 13; Sustainable design and development.[7] This highlights that Blaenau Gwent area has the potential to generate much more of its own energy by sustainable means that reduce carbon emissions. BGCBC seeks to achieve the potential for reducing greenhouses and the impacts of climate change.

Policy DM4; Low and Zero Carbon Energy.[9] T of the LDP states that BGCBC will encourage major development proposals to incorporate schemes which generate energy from renewable and low/zero carbon technologies. The technologies to be utilised are mentioned and include onshore wind.

In order to ensure that the development plan is up to date, Local Planning Authorities are required to undertake a full review of their LDPs, 4 years from the date of adoption. The Blaenau Gwent LDP triggered a review in November 2016.BGCBC's Annual Monitoring Report (AMR) published was in 2022.

Policy SP7of the BGCBC AMR addresses the action need to tackle climate change. Policy SP7 (a), aims to ensure that more of the County Borough's electricity and heat requirements are generated by renewable and low/zero carbon energy.[8] Policy SP7 (b), seeks to ensure the efficient use of land. The monitoring AIM SP7 (a) is on-going, being met or exceeded.

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[6] TAN 12 – Design. Available from https://gov.wales/technical-advice-note-tan-12-design [Accessed 13/02/2023]

[7] Blaenau Gwent County Borough Council (2012) *Local Development Plan up to 2021*. Available from: https://www.blaenau-gwent.gov.uk/media/afeljh2u/written_statement__without_appendices_.pdf [Accessed 26/09/2022]

[8] Blaenau Gwent County Borough Council (2022) *Annual Monitoring Report*. Available from: https://www.blaenau-gwent.gov.uk/media/l0dnmyqg/annual-monitoring-report-2022.pdf [Accessed 15/02/2023]

BGCBC's AMR, SA Objective 22 states the aim to increase efficiency and generation and use of renewable energy across the County Borough. BGCBC are progressing on the adoption of an Energy Opportunities Plan.[9] It is stated that '*The plan is moving in the right direction and having a positive impact*'.[7]

BGCBC state that their ultimate ambition is to become an area which generates sufficient energy through renewable sources to meet the power demands of the County Borough.[8]

5.3.2. Caerphilly County Borough Council Local Development Plan

The CCBC's LDP up to 2021 (Caerphilly LDP) was adopted in November 2010. The Caerphilly LDP states that the council shall promote environmentally acceptable renewable energy to maintain a cleaner environment and help reduce the County's impact on climate change.[10] the Caerphilly LDP Review Report, Appendix 2; contains the findings of the 2019 AMR Report.[11] In Section 5 it states the aim of improving energy, and the promotion of environmentally acceptable renewable energy in order to maintain a cleaner environment and help reduce the County Borough's impact on climate change.

The Caerphilly LDP Review Report sates the aim of maximising renewable and low carbon energy generation.[10]

CCBC state in their Decarbonisation Strategy document that they will focus on constructing buildings without fossil fuelled heating systems and existing buildings will be improved so that they embrace energy efficiency initiatives and utilise renewable energy sources where possible.[12]

CCBC also state, in the Decarbonisation Strategy, their ambition to make the radical carbon reductions that are needed. CCBC is in the process of reviewing their area land assets, in collaboration with the WG Energy Service.[12]

5.4. Other Design Guidance

5.4.1. Design and Access Statements in Wales: Why, What and How, Design Commission for Wales (Updated 2014)

The *'Design and Access Statements in Wales: Why, What and How Guidance13,*' (Design Commission for Wales (DCfW), 2014) highlights that '*early consideration of design issues is essential and central to good development. It is a formal record illustrating the design process, allowing a co-ordinated and effective consultation process to take place*.'

5.4.2. Designing Wind Farms in Wales, Design Commission for Wales (Updated 2014)

The '*Designing Wind Farms in Wales'* Guidance (DCfW, 2014)[14] is a non-statutory document for large-scale wind farms, although it states that it is compliant and builds upon the requirements included within PPW and TAN 12.

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[9] Blaenau Gwent County Borough Council (ND) *Energy Generation Opportunities*. Available from: https://democracy.blaenau-gwent.gov.uk/documents/s4321/Appendix%201.pdf?LLL=0 [Accessed 26/09/2022]

[10] Caerphilly County Borough Council. Local Development Plan up to 2021. Available from: https://www.caerphilly.gov.uk/CaerphillyDocs/LDP/written-statement.aspx [Accessed 26/09/2022]

[11] Caerphilly County Borough Council (2021) *Review Report*. Available from: https://www.caerphilly.gov.uk/CaerphillyDocs/LDP/LDP_draft_review_report.aspx [Accessed 26/09/2022]

[12] Caerphilly County Borough Council (2020*) Decarbonisation Strategy: Reduce-Produce-Offset-Buy*. Available from: https://www.caerphilly.gov.uk/CaerphillyDocs/Council-and-democracy/DecarbonisationStrategy/DecarbonStrategy2020_eng.aspx [Accessed 26/09/2022]

[13] Design and Access Statements in Wales: Why, What and How Guidance. Available from: https://gov.wales/sites/default/files/publications/2018-09/design-and-access-statements.pdf [Accessed 30/05/2022]

[14] Designing Wind Farms in Wales. Available from: http://dcfw.org/designing-wind-farms-in-wales-2/ [Accessed 30/05/2022]

5.4.3. Siting and Designing Wind Farms in the Landscape – Version 3a, NatureScot (Updated 2017)

NatureScot has produced guidance entitled 'Siting and Designing Wind Farms in the Landscape', Version 3a, August 2017. Good design principles for wind farms are becoming established following approximately two decades of wind farm development in Scotland and with around 300 wind farms constructed and operating. NatureScot believes that good siting and design of wind farms is important for all parties involved, helping to produce development which is appropriate to a landscape whilst delivering the Government's renewable energy targets.

The guidance reflects the advance in understanding of the key landscape and visual issues relevant to wind farm development. It does not refer to wider technical design considerations (such as wind speed, access to grid) or to other natural heritage issues (such as impacts on birds, other wildlife and habitats) which are also of importance in relation to both siting and design. The content of the guidance focuses on Landscape and Visual Impact Assessment (LVIA) of wind farms, wind turbine design and layout, wind farm siting and design, and designing in landscapes with multiple wind farms. Guidance is provided on the appropriate turbine form, size, scale, layout and on the siting and design of wind farms in relation to landscape character, landscape with scenic value, landscape pattern, landform, perspective and focal features. The guidance has informed the content of the DAS, which outlines the site context and proposed design solution for the proposed development.

6. Site Selection and Design

This section considers the steps that were undertaken during the process of site selection and design. This includes details of the iterative design process that has been undertaken to arrive at the final design contained within this application.

Prior to and as part of the EIA process, design iterations were prepared and considered for the turbine locations and onsite ancillary infrastructure. To establish the most appropriate development layout, potential environmental impacts and their effects, physical constraints and project economics were taken into account. Information was collated from desktop information, field surveys, the EIA scoping direction, consultation with statutory and non-statutory consultees, public consultation events, local planning policy, planning conditions and recent case law. This information provided the baseline from which site issues and sensitivities could be identified and highlighted for further detailed assessment and given priority in influencing the layout iterations of the proposed development. The design evolution process is described in detail.

6.1. Site Selection

Natural Power was chosen by the Applicant to progress the application for the proposed development. Both Cenin Renewables and Natural Power have project experience in the area and a comprehensive understanding of the site and local vicinity. The site design has been an iterative process with the evolution of the site design and layout continued through the EIA.

A key aim of the design process has been to limit the overall footprint of the proposed development, whilst maximising the positive renewable energy generation and other benefits and minimising the environmental impacts wherever possible.

A range of design constraints are elaborated on in more detail in Chapter 4: Site Selection and Design Evolution, Volume 4 of the ES, section 4.3.

The following key considerations have been taken into account during the design process of the proposed development:

- Relationship to the surrounding landscape and communities;
- Relationship with cumulative developments; and

- Technical and environmental constraints.

The site lies within registered Commons Land. The proposed development and the wider range are designated as open access land.

Four out of the five turbines proposed for Manmoel Wind Farm lies within a PAA, FWPAA 10[15].

The proposed development is open and exposed common land with public access. The proposed development consists of upland, plateaux landform and steep sides, with sheep grazed grassy moorland. Very little woodland and scrub is presented within the proposed development site boundary. Grassland and marsh within the study area consists of unimproved and semi-improved acid grassland, unimproved and semi-improved neutral grassland, marshy grassland and poor semi-improved grassland.

The proposed development site area does not fall within any nationally designated areas.

From the outset therefore, proximity to residential dwellings was considered an integral part of the design. Development of turbines was not considered within 800 m from residential dwellings.

Potential noise, shadow flicker and visual amenity impacts have been given consideration during the site design iterations to ensure minimised effects on nearby residents. A detailed noise assessment is provided in Chapter 12: Noise. Shadow flicker is considered in Chapter 13: Health and Public Safety and the full Shadow Flicker Report can be found in Appendix A13.1, Volume 3 of the ES. Residential Visual Amenity is considered in Chapter 8: Landscape and Visual Impact Assessment, and the full Assessment can be found in Appendix A8.7: Residential Visual Amenity Assessment (RVAA), Volume 3 of the ES.

A key aim of the design process was to avoid overly complex and visually confusing layouts, and to seek to achieve simplicity and consistency within the proposed wind farm design, whilst reducing its overall impact when viewed from local settlements.

Desk based studies indicated that there were no designated ecological or ornithological constraints such as Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA), Special Areas of Conservation (SAC) or RAMSAR, within the proposed development. Baseline survey work indicated potential suitability for wind energy development, subject to further detailed assessment and survey data fed into the iterative design process. Potential effects upon ecology and ornithology are fully assessed in the EIA and the findings are presented in Chapter 6: Ecology and Chapter 7: Ornithology.

6.2. Design Strategy

There were a number of elements considered during the design process, these included (but not limited to):

- Local and national planning policies;
- Sufficient wind resource;
- Proximity to grid supply point;
- Traffic and transport;
- Existing land use;
- Proximity of dwellings (to consider noise, shadow flicker, visual etc.);
- Landscape and visual;
- Ecology and Ornithology;
- Hydrology, geology & Hydrogeology;
- Cultural Heritage;
- Existing infrastructure; and

[15] Welsh Government (2021) Available from: https://gov.wales/future-wales-national-plan-2040-0 [Accessed 13/02/2023]

- Aviation.

Several of the above are illustrated on Figure 4.1 of the ES, as against the final turbine layout.

A number of surveys and assessments were undertaken during the feasibility stage, following which it was considered that the application site was technically and environmentally viable as a wind energy development. As the next stage in assessing the site's feasibility, the Applicant undertook an iterative design exercise to investigate alternative designs solutions in order to identify any issues which would make the site unacceptable for development and to ensure that the final design was environmentally, economically and technically viable.

6.3. Design Evolution

The layout evolved under guidance, requirements, and considerations from Natural Power and their specialist consultants. Consideration has also been given to issues raised by the community at, and following, the public exhibition events. A number of different wind farm layouts were devised and, following extensive investigation and consultation, an optimum layout was chosen through numerous design iterations.

6.3.1. Design 1: Initial Layout (February 2021)

As detailed in Section 4.5 of the ES, the initial layout comprised 6 turbines with rotor diameters of up to 150 m and tip heights of up to 180 m. Turbine 6 was removed prior to scoping. A preliminary full infrastructure layout was also presented.

Table 6.1: First Design Layout

Turbine ID	Easting	Northing	Capacity (MW)	Tip Height (m)	Hub Height (m)	Rotor
1	316257	208332	5.6	180	105	150
2	316365	207854	5.6	180	105	150
3	316337	207310	5.6	180	105	150
4	316626	206851	5.6	180	105	150
5	316761	206429	5.6	180	105	150
6	316947	20633	5.6	180	105	150

6.3.2. Abnormal Indivisible Loads (‘AIL’) Access Alternatives

As part of the EIA process, detailed feasibility assessments were undertaken on a number of potential routes to site for AILs – particularly, turbine blades. AIL’s associated with the wind turbines will travel from the port of entry at Swansea to the site boundary via the A483, M4, A465 (T), Bryn Serth Road, Beaufort Road and Manmoel Road.

It is anticipated that the turbine components’ port of entry to the UK will be at Swansea. From Swansea Docks the anticipated route for AIL’s will be:

- A483 Fabian Way;
- M4 Junction 42 to Junction 43;
- A465 (T) to Rassau;
- Bryn Serth Road;
- Beaufort Road; and
- Manmoel Road.

An appraisal of the delivery route for turbine components has been prepared and includes swept path analysis at critical points along the AIL route. The appraisal is included as Appendix A11.1, Volume 3 of the ES.

6.3.3. Evolution of Market for Wind Turbines

Following the initial layout in December 2018, at which point in time the maximum size of rotor diameters generally available on the market was 150 m (~75 m blades), and prior to EIA Scoping in January 2021, a wave of new generation wind turbines has been brought to market by the main manufacturers, reflecting the drive for lowest Levelised Cost of Energy (LCOE).

In January 2019, Vestas introduced their 162 m rotor machine (~81 m blade length), with 5.6 MW capacity16 Siemens-Gamesa announced their new 155 m and 170 m rotor machines (~77.5 m and ~85 m blade length respectively) later that year in April[17], with 5.8 MW capacity (now a whole 1 MW above the highest capacity considered in the tender submission). Nordex followed suit in August, announcing a 163 m rotor machine (~81.5 m blade length) with up to 5.5 MW capacity[18].

Since 2019, further regular announcements can be found from these and other turbine manufacturers, for new or upgraded models. For instance, Vestas have (to date) increased the capacity of their V162 machine to up to 6.8-7.2 MW; Siemens-Gamesa have increased the capacity on their 155 m and 170 m machines to up to 6.6 MW[19]; Nordex have increased the capacity on their N163 machine to up to 6.5 MW[20]. GE unveiled their 164 m rotor machine (~82 m blade length) with 6.0 MW capacity in November 2020[21]. Vestas announced a new 172 m rotor (~86 m blade length) 7.2 MW machine in April 2022[22]. The increase in turbine size and capacities is a trend that can be reasonably expected to continue over the coming years.

The history of wind turbine evolution has been that, as economics naturally favour the newer larger models, particularly now in a subsidy-free environment of competitive contract-for-difference (CfD) auctions and power purchase agreement (PPA) tenders, older smaller models quickly go out of fashion and then entirely out of production as limited factory space is given over to new lines, and given the sometimes-lengthy development process that wind farms can go through around the UK it is now not at all unusual to see “tip-height extension” or full-scale redesign applications with larger machines being made for relatively recently consented projects that may have been first conceived in a world with subsidies and with turbine dimensions that are simply no longer viable or even being produced.

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[16] Vestas, (2023). Vestas introduces EnVentus – Vestas’ innovative modular platform, starting with two new industry-leading wind turbine variants. [Online]. Available from https://www.vestas.com/en/media/company-news/2019/vestas-introduces-enventus---vestas--innovative-modular-c2963237 [Accessed 15/02/2023]

[17] Siemens Gamesa, (2023). [Online]. Available from https://www.siemensgamesa.com/en-int/newsroom/2019/04/190403-siemens-gamesa-new-onshore-5-x-platform [Accessed 15/02/2023]

[18] Nordex, (2023). *Nordex launches 163 metre rotor for the Delta400 5.X*. [Online]. Available from https://www.nordex-online.com/en/2019/08/nordex-launches-163-metre-rotor-for-the-delta4000-5-x/ [Accessed 15/02/2023]

[19] Siemens Gamesa (2023). [Online]. https://www.siemensgamesa.com/en-int/newsroom/2021/09/husum-fair-upgrade-5x Available from [Accessed 15/02/2023]

[20] Nordex, (2023). Press release: Nordex announces entry into the 6 MW class with the N163/6.X turbine. [Online] Available from https://www.nordex-online.com/en/2021/09/press-release-nordex-announces-entry-into-the-6-mw-class-with-the-n163-6-x-turbine/ [Accessed 15/02/2023]

[21] General Electric, (2023). *GE’s Most Powerful Onshore Wind Turbine Gets Even More Powerful*. [Online]. Available from https://www.ge.com/news/press-releases/ge-most-powerful-onshore-wind-turbine-gets-even-more-powerful [Accessed 15/02/2023]

[22] Vestas, (2022). *Vestas introduces the V172 – 7.2 MW, enhancing performance in low to medium wind conditions*. [Online]. Available from https://www.vestas.com/en/media/company-news/2022/vestas-introduces-the-v172-7-2-mw--enhancing-performanc-c3539648 [Accessed 15/02/2023]

There is now a very clear trend in the UK, and around the world, towards new and redesigned applications in excess of 200 m to tip height. The UK's Renewable Energy Planning Database[23] shows that since the December 2018 tender submission there have been at least 32 applications submitted including turbines of 200 m to tip and above, with 11 above 220 m to tip, and 2 with 250 m to tip; 11 such applications have been consented to date, with only 2 refused. Looking around Europe there are a great many more consented and operational, at heights up to 260 m. At time of writing there are a number of scoping and pre-scoping projects being announced in the UK with tip-heights of up to 260m[24] and taller heights still are possible with current technology.

The very clear intention of the applicants for the proposed development is to seek consent for a scheme which is both environmentally acceptable on balance, but also actually implementable at the earliest opportunity, without need for future redesign or tip-height increases, in order to be delivering the climate change and community benefits it offers as soon as possible.

6.3.4. Design 2: Scoping (June 2021)

In June 2021 the Applicant carried out an EIA scoping request, with a layout constituting the same turbine locations as Design 1 but with maximum tip-height dimensions reflecting the now current state of the turbine market (as outlined above), with all machines having indicative 105 m rotor diameters, up to 180 m to tip, and indicatively up to 5 MW capacities. Advances in the new wave of technology, including improved durability and algorithmic control of turbine wakes, meant that this was feasible with the previously generous inter-spacing. This layout consisted of 5 turbines located across the majority of the site, at elevations between 435 m and 480 m Above Ordnance Datum (AOD). The layout seeks to reduce the extent of development and reduce visibility from residential properties to the east of the site by positioning turbines further into the interior of the plateau westwards and a greater distance from the break of slope, as well as decreasing the tip height slightly.

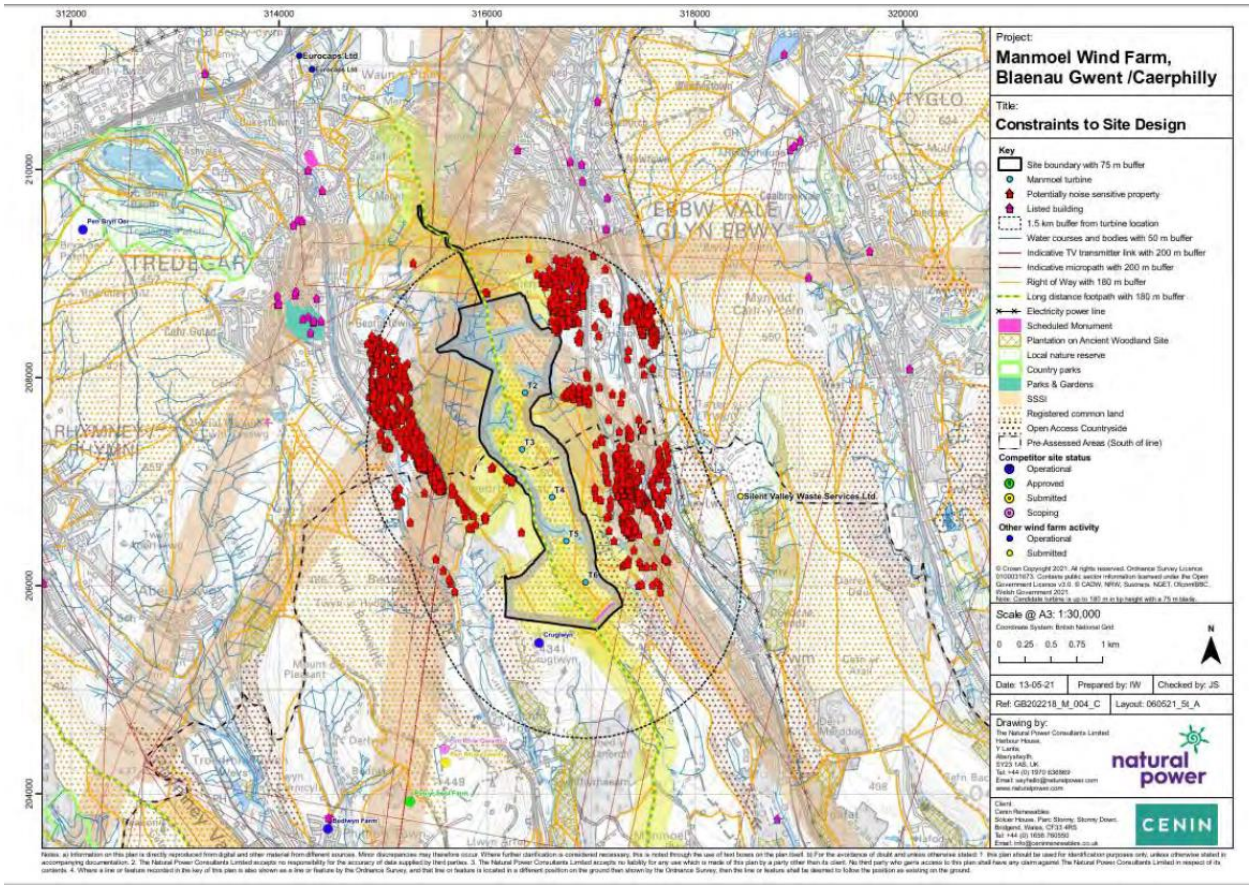
T1 has been removed from the layout in order to limit the visual stacking of turbines from views in the north.

Main constraints to site design considered through the EIA process are shown in Figure 6.1.

[23] GOV, (2023). Renewable Energy Planning Database: quarterly extract. [Online]. Available from https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract [Accessed 15/02/2023]

[24] Dunside Wind Farm (2022). [Online]. Available from https://dunsidewindfarm.co.uk/ [Accessed 15/02/2023]

Figure 6.1: Site constraints map from figure 3.2 in scoping report



6.3.5. Scoping Responses (August ,2021)

This 5 turbine layout was presented to the Planning Inspectorate (PINS now PEDW) and consultees in the scoping report on 8th June 2021. A copy of this can be found in Appendix A3.1, Volume 3 of the ES. The full scoping direction was issued by the Planning Inspectorate on 24th August 2021 and is provided in Appendix A3.2 of the ES and contains a copy of all the consultee scoping responses. This consultation helped identify and clarify key issues, promoted dialogue with both consultees and stakeholders, and confirmed methods for survey, evaluation and assessment going forward. The consultee responses were reviewed in partnership with the specialist sub-consultants in order to make sure all relevant issues identified were assessed as part of the site survey work and were addressed in the relevant ES chapters.

In addition to the formal scoping and consultation, meetings and discussions took place with BGCBC, CCBC and statutory consultees to agree the specifics of survey methodologies, potential mitigation should the proposed development gain consent and to update these consultees on progress.

Table 6.2: Scoping Design Layout

Turbine ID	Easting	Northing	Capacity (MW)	Tip Height (m)	Hub Height (m)	Rotor
1	316365	207854	5.6	180	105	150
2	316337	207310	5.6	180	105	150
3	316626	206851	5.6	180	105	150

Turbine ID	Easting	Northing	Capacity (MW)	Tip Height (m)	Hub Height (m)	Rotor
4	316761	206429	5.6	180	105	150
5	316947	20633	5.6	180	105	150

6.3.6. Design Review Day (September 2021)

The first formal design review day was held virtually (due to COVID-19) via Microsoft Teams in September 2021 between the Applicant and specialist consultants from relevant departments of expertise including; planning, ecology and ornithology, hydrology, civils, traffic and transport, cultural heritage, landscape and visual, noise, and aviation. The aim of the design review day was to review the layout following receipt of the scoping direction, consultee responses and collection of more desk study and site survey data.

Ahead of the design review day consultants reviewed the proposed layout from scoping (Design 2) which included assessing the proposed turbine locations together with preliminary infrastructure locations from the 2021 tender.

6.3.7. Public consultation (August 2022-February 2023)

Detailed analysis of written feedback from the 1st round of public consultations can be found in the Pre-Application Consultation (PAC) Report. Key concerns raised in design terms, in summary, related to noise and landscape and visual impacts. All information regarding PAC can be found in the PAC Report which is a standalone document submitted alongside this ES.

Cenin Renewables have undergone community consultation to ensure effective engagement between the developer and the local authority, local community, and consultees to help make sure that the proposal will:

- Reflect more accurately an understanding and appreciation of local interests and concerns;
- Provide a higher quality and more active and well-timed consideration of evidence of the potential benefits and impacts of the proposal (enabling better and prompt decision-making in the planning process, focusing on the material issues); and
- Ensure that, if the proposal does go ahead, local communities, the local authority and other consultees have had opportunities to shape how the development is actually realised and the continuing relationship they may have with it.

6.3.8. Post-Consultation (August 2022-April 2023)

Based on the comments received from scoping, design reviews and public consultation, the Applicant amended the layout to produce Design 3. Changes that were made are summarised:

- One turbine was removed: T1 to reduce landscape and visual impacts and to limit the visual stacking of the turbines from views in the north; and
- The maximum tip height reduced to 180 m to tip (while maintaining rotor diameter 150 m) and moved further into the interior of the plateau inwards to minimise visual impact and visibility from residential properties to the east of the site.

Following discussions the changes taken forward are summarised:

- Tip heights; 180 m all with rotor diameters of 150 m for the 5 turbines; and
- All turbines (5 in total) reduced to 180 m to tip with 150 m rotor diameter: Turbine ID; 1, 2, 3, 4, 5.

Table 6.3: Design 2 layout 22/09/2021

Turbine ID	Easting	Northing	Tip Height (m)	Hub Height (m)	Rotor
2	316340	207310	180	112	136
3	316579	207026	180	112	136
4	316657	206666	180	112	136
5	316799	206331	180	112	136
6	316970	206016	180	112	136

6.4. Residential Visual Amenity Assessment (RVAA)

During the design process, views from residential receptors within the 2 km study area was a key design consideration and turbines were positioned further back from these sensitive receptors to reduce the vertical extent and avoid being overbearing within the view or alter the area such that it becomes an unpleasant place to reside. The RVAA contained within ES Appendix A8.7 drew upon guidance from the Landscape Institute[25] . It does not constitute a formal 'test', rather a set of factors, but it is widely used in the industry to help form a judgement with respect to the visual amenity component of residential amenity. All residential properties within 2 km area from turbines were assessed using this approach and effects were assessed to not breach the threshold. In terms of nearest properties, this was typically influenced by the location and directions of main views from properties, intervening screening from vegetation and buildings, the screening effects of topography, the existing appearance and influence of other human artefacts and built features, as well as the visual appearance and relative dominance of turbines in views.

7. Final Design

7.1. Introduction

The final design of the proposed development is a consequence of undertaking site surveys and taking consultee responses into consideration during the detailed design phases of the project.

Consideration has been given to the design issues in terms of location and size of each of the component parts of the proposed development, as well as the technical and environmental requirements.

7.1.1. Design 5: Design Freeze (July 2022)

Following public consultations, no changes to turbine or built infrastructure locations were considered necessary. However, the identification of borrow pits for stone to use during construction, the scope of tree felling and restocking, and also habitat management and enhancement plans still needed to be worked through between the Applicant and consultants. A final agreed overall design incorporating all of these elements was arrived at in July 2022.

The most common concerns raised by the public through consultations included the size and number of turbines as well as visual impact on surrounding settlements. By deleting one turbine, reducing the tip-heights of those remaining and relocating multiple turbines to minimise visual impact from a number of locations these concerns have been considered as part of the design evolution.

Table included above identify the details the old and new numbering and turbine tip heights.

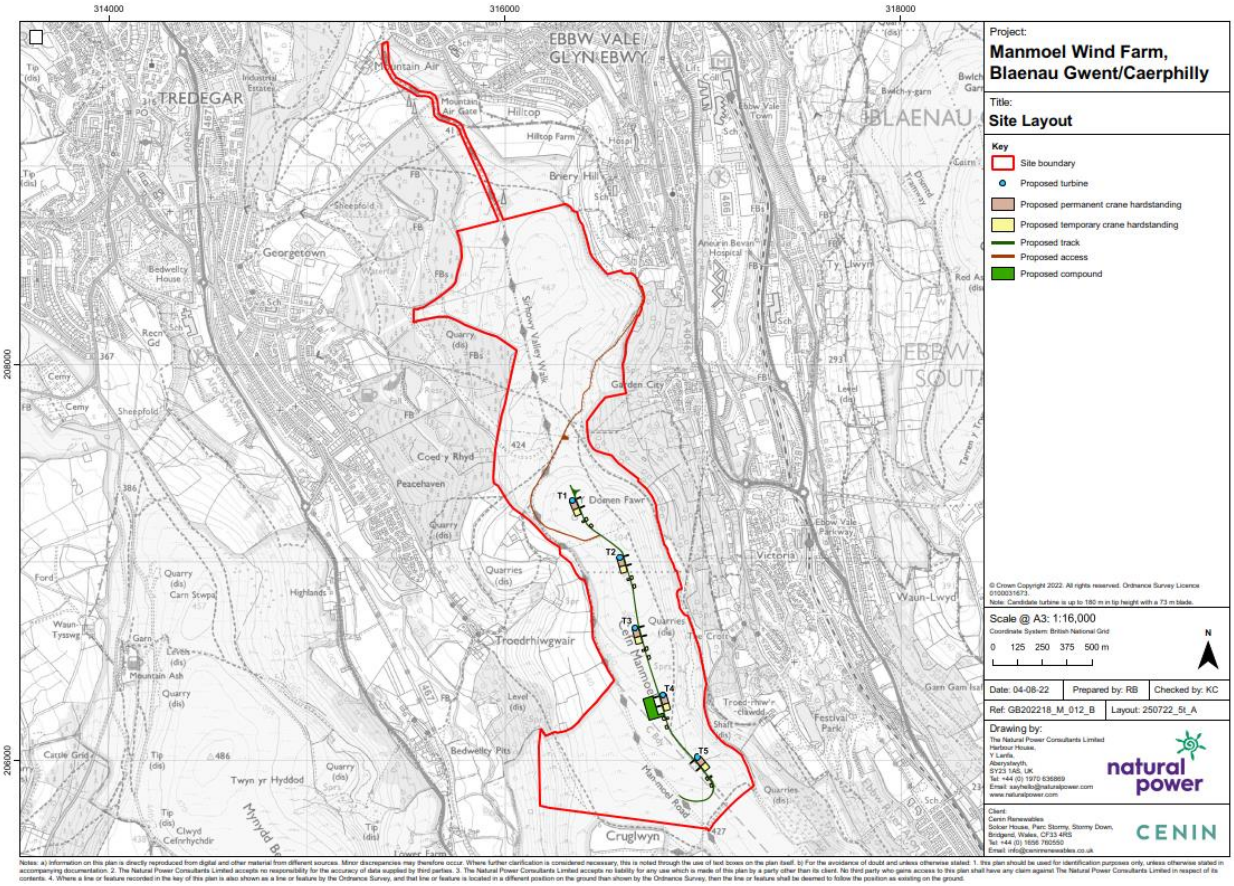
[25] Landscape Institute Technical Guidance Note 2/19 Residential Visual Amenity Assessment. Available from: https://www.landscapeinstitute.org/technical-resource/rvaa/ [Accessed 15/02/2023]

Table 7.1: Design freeze layout

Number	Easting	Northing	Max Tip Height (m)	Max Rotor Diameter (m)
1	316342	207314	180	150
2	316582	207027	180	150
3	316659	206670	180	150
4	316800	206332	180	150
5	316971	206018	180	150

The final maximum tip height is proposed at up to 180 m for turbines 1-5; all with rotor diameters of up to150 m. At this early stage of a project the final turbine selection isn't known and therefore a possible range of turbines that could fit the maximum turbine height criteria is selected. For the purpose of the LVIA, the maximum rotor diameter from the turbine models currently available to fit this maximum tip height criterion was used for the visuals; all turbines are based on 150 m rotor diameter. All information on turbine dimensions is discussed in Chapter 5: Project Description and included in Figure 5.1. It is expected that detail of final turbine dimensions and appearance will be a requirement of a condition to be agreed with the PEDW prior to commencement of construction.

Figure 7.1: Final Design of proposed development



7.2. Character Elements

The following sub sections address each of the character elements of the proposed development.

7.2.1. Turbines

The selected turbines would be of a modern design with three blades mounted on a horizontal axis, attached to a nacelle, housing the generator, gearbox, and other operating equipment. The nacelles would be mounted on a tubular tower which allows access to the nacelle. It is expected that the turbine cut in wind speed will be around 3 m/s and will rotate clockwise.

Chapter 14: Aviation and Existing Infrastructure provides details of a lighting scheme proposed for the turbines which the Civil Aviation Authority (CAA) have been consulted on.

It is expected that some of the wind turbine towers will be constructed from steel only, and some may be steel/concrete hybrids towers subject to individual turbine manufacturer specifications. All of the blades will be constructed from fibreglass. It is proposed that the turbine tower, nacelle, and blades be finished in a semi-matte, off-white/pale grey colour, and the final finish will be agreed through a planning condition with the local planning authorities. Typical turbine specifications, of the type being considered for use on the site, are presented in Figure 5.1 in Volume 2 of the ES.

7.2.2. Site infrastructure

The proposed development layout is shown on ES Figure 1.2, designed in line with the technical and environmental requirements detailed in Section 6 of this report, including (but not limited to) visual impact, location of watercourses, ecological constraints, location of infrastructure, impact on cultural heritage and site topography. Technical factors such as appropriate spacing between turbines have also been a consideration.

The proposed development will involve the erection of five turbines, up to 180 m tip height. The proposed development also includes associated infrastructure including: associated crane hardstandings; transformer house adjacent or in turbines; onsite access tracks plus underground cable runs alongside; an onsite sub-station building; construction compound; and access into the site boundary. Further details on each of these elements can be found in ES Chapter 5: Project Description.

The final design presented within this application represents the best layout which seeks to minimise adverse environmental effects, and which has allowed the most appropriate layout to be achieved,

Minor further refinement (micrositing) may be required post consent in order to construct the project, this will follow detailed ground investigations and ground clearance and will be allowed up to 50 m from the consented infrastructure locations.

7.3. Community Safety

Wind turbines that are properly designed, erected and maintained are a safe form of technology. The nature of the proposed development is such that it raises no issues in terms of ‘secured by design’ criteria. The Applicant would commit to installing wind turbines and components that meet BS EN IEC 61400-1:2019 or IEC 16400 as appropriate.

Due to the industrial operations occurring during construction, signs are required on-site for safe day-to-day navigation for works traffic and personnel; access for emergency vehicles; and for the health and safety of the public.

The site boundary hosts a number of Public Right of Way (PRoW), including footpaths and long distance footpaths (LDF), such as the Sirhowy Valley path and permissive routes during construction and decommissioning, health and safety requirements will make it necessary to manage the use of PRoW and permissive paths where they come within close proximity to infrastructure. It is likely that temporary closure orders will be required and arranged through consultation with the local planning authorities. Where possible temporary alternative routes will be provided. Prior to any temporary closures, notices will be posted in publicly available documents e.g. local media and the routes will be clearly marked with warning signs to discourage the public from entering the construction area. The aim is to have temporary closure orders in place for as little time as possible without compromising the health and safety of members of the public.

During construction (as would be for the decommissioning phase) it is proposed that an Access Management Plan (AMP) will be prepared to indicate the restrictions for users and any proposed mitigation (through means of alternative routes and enhancement opportunities). Details of safety requirements will be confirmed post-consent.

It is proposed that some routes will be closed during construction for health and safety reasons and appropriate signage and security measures will be installed, informing the public of any closures to recreation routes and keeping construction vehicles contained within defined parts of the site. Closures will be kept to a minimum during the construction phase.

Blade icing is a rare occurrence that will only happen when the blades of the turbine are stationary and under near freezing temperatures and relatively high humidity, with either freezing rain or sleet. When ice becomes detached from the blades (through temperature increase or activation of blade heating systems), it can be thrown from the blades if they are rotating or fall vertically to the ground if the blades are at standstill. The risk of ice throw is dependent on the local climate and weather conditions in which the wind turbines are situated.

Siting the turbines away from occupied buildings, roads and public areas can mitigate the risk, and this has been done as far as is practical with the proposed development. However, as the proposed development is located on publicly accessible common land, some residual risk remains. To mitigate this, warning signs will be installed at entry points to the proposed development as well as in proximity to turbines.

Turbine manufacturers offer anti-icing and de-icing technological solutions to mitigate against icing of turbines. Anti-icing solutions aim to prevent ice build-up and include water and ice repellent blade coatings. De-icing solutions free turbine blades of ice if icing does occur by heating turbine blades, causing the ice to melt while the blades are stationary or moving slowly. The overall view is that modern turbines which are fitted with climatic detection systems and passive/active de-icing solutions - like the models being considered for the proposed development - will help to mitigate against the occurrence of ice throw. Turbine procurement, together with good practice site management procedures, including the use of visual warnings signs and curtailment during periods of ice build-up on blades, will mitigate and manage this potential hazard. Prior to the start of commercial operation, confirmation of the application of ice monitoring and/or de-icing systems and/or protocols for all turbines located within 1 x tip-heights distance of any registered public footpaths on the definitive map shall be provided to the relevant Local Planning Authorities (LPAs).

7.4. Environmental Sustainability

Due to the location of the proposed development, it is unlikely that transport to and from the site by staff will be undertaken by public transport, walking or cycling, although it is assumed that there will be an element of car sharing.

The ES outlines other measures which will be employed in relation to pollution prevention, such as the bunding of areas used for fuel storage in the site compound.

The essential benefits of using wind energy for the generation of electricity are that it is renewable, safe and does not release any gaseous emissions into the atmosphere during operation. It also provides for diversity and security of supply which remain part of the Government's energy policy.

Based on historical Government published data, it is anticipated that the proposed development could generate around 61,320 megawatt hours (MWh) of electricity per year or 61,320,000 kilowatt hours (kWh) (domestic units)[26].

[26] Based on average capacity factor for Welsh onshore wind farm BEIS stats 2017-2021 (released in March 2022) is 28%. [last accessed 25/05/2022]. It is important to note that the capacity factors used here will not typically reflect the final capacity factor of the proposed development and are much lower than energy yield assessments for this proposed development and candidate turbines indicate. The actual capacity factor would be anticipated to be greater, as modern turbines are more efficient and taller than many of the older turbines on operational wind farms where the BEIS data is derived from. 25 MW x 8760 hours in a year x 28% capacity factor = 61,320 MWh / 3,185 kWh (the temperature adjusted UK household average electricity consumption figure, BEIS Energy Consumption in the UK (2021)) = *19,250* households. Figures all rounded to nearest 100.

This is equivalent to the annual electricity needs of 19,250 average UK homes, or approximately 59% of households in Blaenau Gwent[27].

When generating electricity, the wind turbines would offset the generation of a similar amount of electricity that would otherwise be generated by conventional power stations. While the displacement or offset figure would change as the generation mix changes, the proposed development based on the current UK generation mix, offset the production of over 26,490,240 kg of carbon dioxide-equivalent per year[28].

Based on the findings of a Carbon Balance Assessment, see Appendix A10.1, the construction, operation and decommissioning of the proposed development is expected to result in the net emission of 44,140 tonnes of carbon dioxide equivalent. The carbon payback time for the wind farm is then calculated by comparing the net loss of CO_2 from the site due to wind farm development with the carbon savings achieved by the wind farm while displacing electricity generated from coal-fired generation, grid-mix generation or fossil-fuel mix electricity generation. On the basis of the methodology used in that assessment, this could result in a carbon-payback time for the proposed development of 1.7 years (for the expected scenario based on replacement of fossil fuel-mix electricity generation).

The carbon dioxide offset would make an important contribution towards the government target to reduce carbon dioxide emissions by 100% by 2050. The proposed development would also offset emissions of the other greenhouse gases from conventional power stations; in particular coal fired generating plant. These gases including sulphur dioxide and oxides of nitrogen cause environmental problems such as acid rain.

Onshore wind farms, particularly those close to areas of electricity demand, provide an important contribution towards making Wales and the UK more energy self-sufficient. If constructed, the proposed development would help improve this self-sufficiency and narrow the energy supply gap.

Once the operational life of the proposed development has ended, a decision will be made about whether to refurbish, remove or replace the turbines.

8. Access

8.1. Introduction

The proposed development will require vehicular access during construction, operation and decommissioning. The traffic impacts during these phases are discussed below together with any implications for public and disabled access.

8.2. Offsite Access/Construction Traffic

The distribution of construction traffic on the highway network will vary throughout the construction period depending on the types of loads being transported. All construction traffic will access and depart the site from the north in order to avoid the narrow sections of Manmoel Road to the south of the site. Where Manmoel Road meets Beaufort Road, it is assumed that construction traffic will split evenly to the east and west. The traffic is distributed further at junctions within the study area as shown in Figure 11.3, Volume 2 of the ES.

[27] StatWales, 2020: Households by Local Authority and Year – (19,250/32,641 x 100) = 59%

[28] BEIS 'Digest of United Kingdom Energy Statistics', July 2021. Table 5.14 "Estimated carbon dioxide emissions from electricity supplied". BEIS's "all non-renewable fuels" emissions equate to 440 tonnes of carbon dioxide per GWh. This is an estimate of the current UK generating plant mix but may change over the lifetime.

8.2.1. Access Point

Access to the proposed development will be from the public road Manmoel Road. From the north, Manmoel Road can be reached from Tredegar Road and Beaufort Road (A4047), which in turn link to the A465 (T) via Bryn Serth Road.

Manmoel Road can also be accessed from the south with links to the A4046 at Cwm and the B4251 at Oakdale. However this route consists of long sections of single-track carriageway where passing opportunities are limited. This is not considered suitable for construction traffic and as such the Traffic Management Plan (TMP) will prohibit construction traffic from using this route, therefore it is not included within the study area.

8.2.2. Assessment

The scenario for vehicle movements were assessed during the construction period:

The peak traffic generation during the construction period will occur in month four when it is estimated that an average of 111 vehicle movement per day will occur (73 HGV movements and 38 cars/LGV movements).

During an assumed up to a 24-month construction period, the peak traffic generation will occur in month four when it is estimated that an average of 111 vehicle movement per day will occur (73 HGV movements and 38 car / LGV movements)).

Deliveries of construction materials and turbine components to the site will be carefully managed in accordance with a detailed traffic management plan.

8.3. On-site construction traffic

1.1.1. ES Figure 1.2: Site Layout shows the proposed new access track and existing tracks to be upgraded for the proposed development. The tracks allow plant to dig new cable trenches and thereafter to access the site for operational and eventual decommissioning purposes. The site design makes use of existing access tracks wherever possible to minimise environmental effects.

8.4. Operational traffic

During operation, traffic associated with the wind farm will be minimal. Site traffic will be limited to small maintenance vehicles undertaking general maintenance work and repair. Exceptionally, larger vehicles including AILs may need to access the site, in the event that a major component needs replacing.

8.5. Public Rights of Way/Public Access

There are a number of PRoW and recreation routes that pass through the proposed development site. Public footpaths were given a blade length (75 m) distance buffer during the design process which was agreed with the PRoW officers from both BGCBC and CCBC.

After construction is complete the site tracks will be left in place for routine maintenance of turbines and for multi-use trails leading to improve recreational access for walking as the land is classed as open access under the Countryside Right of Way Act 2000.

8.6. Access for All

The proposed development will be an operational wind farm, therefore the access tracks that will be built as part of the overall development are there to facilitate construction and maintenance vehicle access. Whilst these new access tracks will provide additional walking opportunities for all, they have not been designed for this purpose and

measures such as hard surfacing or reducing gradients have not been considered in relation to specific disabled access.

9. Conclusion

The proposed development has been designed following the consideration of a range of constraints, both technical and environmental. The final design for the proposed development was the result of several design iterations which has allowed the layout to evolve.

The proposed layout comprises of up to 5 turbines with tip heights ranging from up to 180 m to tip. The use of larger turbines reflects the need for greater efficiency in the project and advances in technology thus responding to changes in Government policy, the climate change emergency and electricity market dynamics. Modelling of this layout in relation to the wind regime present has produced a viable layout without the need for even larger turbines in all locations of the site which would have given rise to additional effects.

The layout presented within this application was developed based on a thorough understanding and appreciation of the environmental and technical investigations carried out as part of the EIA process, and continued stakeholder engagement throughout the project has ensured that key issues are addressed from an early stage and incorporated into the final design. The final turbine locations and access proposed mitigate and minimise adverse effects identified within the assessment process.

Access to the site from public highways and the local road network has been considered and assessed to minimise traffic impacts where possible.

PRoW have been considered within the design of the proposal and a suitable standoff distance to these have been identified to ensure continued use throughout the lifetime of the development.

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