Y Bryn Wind Farm

Design and Access Statement

31 May 2023 1275975

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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.
North section	Section of development located north of Bryn settlement, within Penhydd forestry.
South section	Section of development located south of Bryn settlement, within Bryn forestry.
The proposed development	Y Bryn Wind Farm development
Y Bryn Site Boundary	The area within which the proposed development will be located.

List of Abbreviations

Abbreviations	Descriptions
BCBC	Bridgend 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
FCW	Forestry Commission Wales
GW	Gigawatt
HGV	Heavy Goods Vehicles
IEMA	Institute of Environmental Management & Assessment
kWh	Kilowatt hours
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 Ltd
NPTCBC	Neath Port Talbot County Borough Council
NRW	Natural Resources Wales
PEDW	Planning and Environment Decisions Wales
PINS	Planning Inspectorate
PAA	Pre-Assessed Areas for Wind Energy
PPA	power purchase agreement
PRoW	Public Right of Way
PPW	Planning Policy Wales
RVAA	Residential Visual Amenity Assessment
SSA	Strategic Search Areas
TAN	Technical Advice Note
WGWE	Welsh Government Woodland Estate

1. Introduction

Natural Power Consultants Limited (Natural Power) on behalf of Y Bryn Wind Farm Limited (the Applicant) is submitting an application which is considered a Development of National Significance (DNS) to seek consent from the Welsh Ministers for the development of Y Bryn 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 DNS application, 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;
- Consideration of the proposed development against the Local Development Plan (LDP) for Neath Port Talbot County Borough Council (NPTCBC) and Bridgend County Borough Council (BCBC), being the administrative areas within which the proposed development is located, and other relevant considerations.

1.1. The Applicant

The Applicant, Y Bryn Wind Farm Limited, is a project company wholly owned by development partners ESB and Coriolis Energy.

ESB is Ireland's premier energy company and is a leading independent power generator in the UK market. ESB has a track record of over 30 years as a successful investor in the UK since commissioning one of the first independent power generating plants at Corby in Northamptonshire in 1994.

ESB owns and operates wind farms across the UK and Ireland with a total installed capacity of 1.2 Gigawatt (GW), including the operational Mynydd y Betws Wind Farm (34.5 MW) in Carmarthenshire.

Coriolis Energy identifies and works on the development of wind farm proposals, and ESB constructs and operates those wind farms.

Coriolis Energy is a specialist independent wind farm development company operating throughout the UK. Its principals have been responsible for successfully developing 15 onshore wind farms in the UK with a capacity of 700 Megawatt (MW) over three decades.

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 Environmental Impact Assessment (EIA) Quality Mark scheme[1]. In addition, Natural Power also operates in formally accredited occupational health and safety (ISO 45001), environmental ISO14001) and quality (ISO9001) 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 (NPTCBC and BCBC), and from other consultees including Natural Resources Wales (NRW) (land manager). 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.
- Chapter 11: Traffic and Transport deals with access primarily of larger components to the site during the construction phase (including Appendix 11 and associated figure).

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

[1] IEMA website, *EIA Quality Mark*. Available from https://www.iema.net/corporate-programmes/eia-quality-mark [Accessed 10/05/22]

4. Overview of the proposed development

The proposed development lies approximately 1.1 km west of Maesteg, 2.7 km north-east of Port Talbot, 1.8 km east of Goytre, and 1.6 km south of Cynonville. The north section of the proposed development is located north of the B4282 road, within Penhydd forestry, while the south section is located south of the B4282, within Bryn forestry. The overall elevation range within the proposed development area is from c.100 m to 363 m above ordnance datum. The site boundary covers an area of approximately 2,320 hectares.

The proposed development comprises the following main elements:

- up to 18 wind turbines (ranging between up to 206 metres (m), up to 230 m and up to 250 m to tip),
- turbine foundations;
- external transformer housings;
- crane pads and hardstand areas;
- on-site substation, control building and compound;
- battery/energy storage facility;
- 2 wind monitoring locations, with anemometry masts (up to 131 m height) or other ground-based equipment (e.g. LiDAR);
- upgraded and new on-site access tracks;
- alterations to the public road network;
- new slip road exiting the M4 for Abnormal Indivisible Loads (AIL);
- underground electricity cables connecting infrastructure within the proposed development;
- site signage;
- borrow pits;
- temporary construction and storage compounds, concrete batching plants, laydown areas and ancillary infrastructure;
- micrositing allowance of turbines and associated infrastructure of up to 50 m
- drainage and drainage attenuation measures, to be designed by the contractor post-consent and approved by relevant authorities prior to construction. Attenuation measure will mimic greenfield runoff rates and ensure that no untreated water enters natural watercourses;
- habitat management and enhancement measures, including broadleaf woodland restoration, wet woodland creation, creation of ponds and ditches to aid flood prevention, control of dense bracken and control of invasive species; and
- access management and enhancement measures, including reinstatement and restoration of Public Right of Way (PRoWs), upgrades and ongoing maintenance to mountain biking trails, measures to promote and support greater use of e-bikes, and promotion of a strategic link between Afan Forest Park and Margam Park mountain biking trails.

The land where turbines will be erected is currently productive forestry, on Welsh Government Woodland Estate (WGWE) managed by NRW (land manager). Forestry felling and replanting 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. Habitat management and enhancement as described above will be undertaken within Y Bryn Site Boundary.

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

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 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 and within Chapter 2 Legal and Policy Context of the ES, which accompany this 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

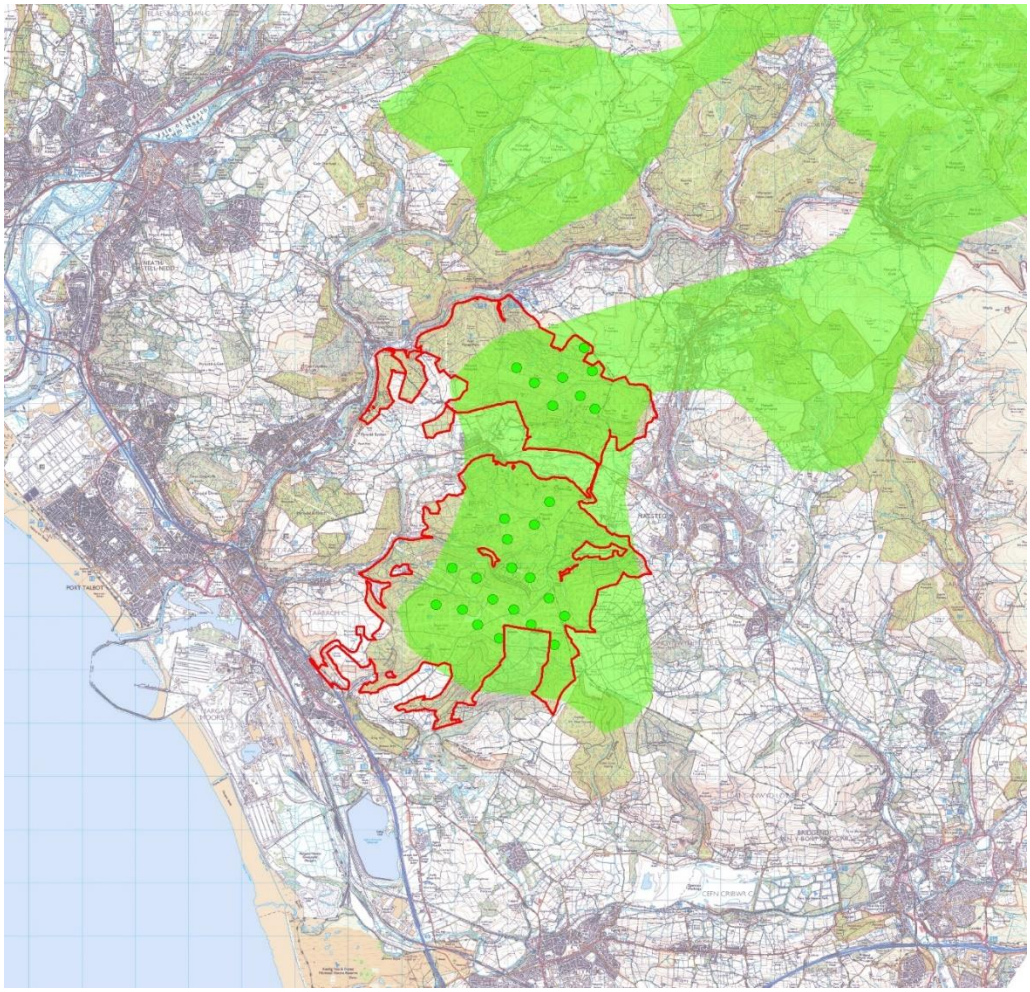
5.1.1. Strategic Search Areas

As the time of the tender submission in December 2018, Technical Advice Note 8: Renewable Energy ('TAN 8') and its Strategic Search Areas ('SSAs') were still extant policy, and so were a significant factor in the identification of the site's development potential by both Welsh Government and the applicant. The SSA's were first identified in 2004, with a 5 km buffer, together with targets for delivery up by 2010 and 2020, based on detailed constraints-mapping and technical analysis by Arup[2]. The whole of the proposed turbines lie within the SSA F boundary (see Figure 5.1).

Section 8.4 of TAN 8 stated that: '*Within (and immediately adjacent to) the SSAs, the implicit objective is to* ***accept landscape change*** *i.e. a significant change in landscape character from wind turbine development*.' (Emphasis added).

[2] TAN 8 Annex D study of Strategic Search Areas E and F; South Wales Valleys. Final Report. December 2006. Ove Arup & Partners Ltd. Available from: https://www.bridgend.gov.uk/media/1155/tan-8-annex-d-study-of-strategic-search-areas-e-and-f-south-wales-valleys.pdf '[accessed 05/06/22]

Figure 5.1 Strategic Search Area F



Key: SSA F shaded green; site boundary outlined red; Design 1/ Design 2 turbine layout green dots

5.1.2. Annex D: Refined Search Areas

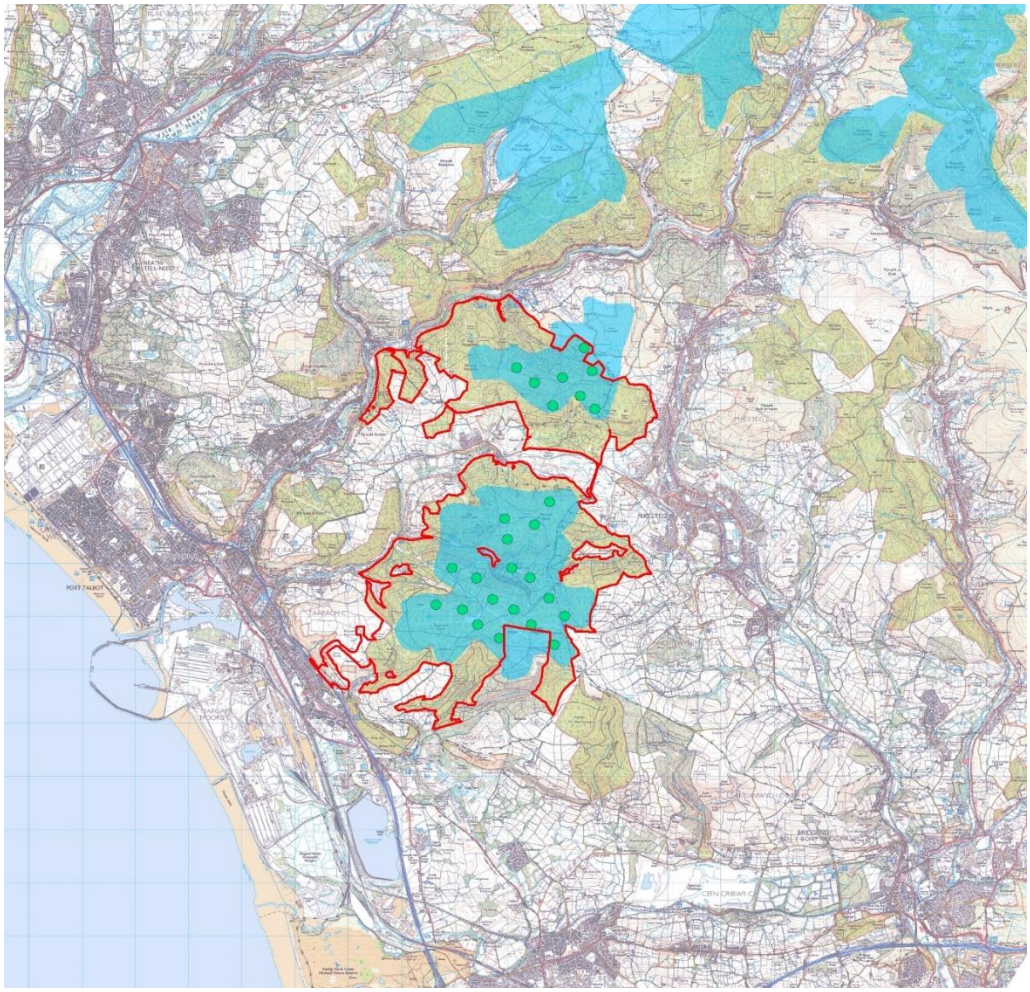
Following the adoption of TAN 8, local authorities had the opportunity, under Annex D, to undertake local refinement in order to guide and optimise development. The 'Consortium of South Wales Valleys Authorities' did so, issuing a final report in December 2006. The whole of the proposed turbines lie within the Annex D refined boundary for SSA F (see Figure 5.2).

A key part of the Annex D process was for establishing "accepted thresholds of change" in landscape and visual terms. A recommendation of the study was that the 'zones' comprising the proposed development site would be accepted for "Large" wind turbines of up to 100 m, as opposed to then "Very Large" wind turbines of up to 130 m (140 m in forested areas).

Section 8.6 of TAN 8 however stated: '*At a local level, accepted thresholds of change,* ***having regard to nationally developed energy capacity targets****, can be established by more detailed assessments*' (emphasis added). Accordingly, it can only be said that the 2006 Annex D local refinements were reflective of the national energy capacity targets and policy of the time.

As is generally accepted with landscape capacity studies, 'capacity' is the *acceptability* of change in planning balance terms, and as climate, energy and planning policy can change (and with reference to the Planning Statement, has changed) over time substantially strengthening the need case for delivery of large-scale onshore wind energy in Wales, it follows the threshold and thus capacity of the proposed development site in planning balance terms can only have risen.

Figure 5.2 Annex D local refinements to SSA F



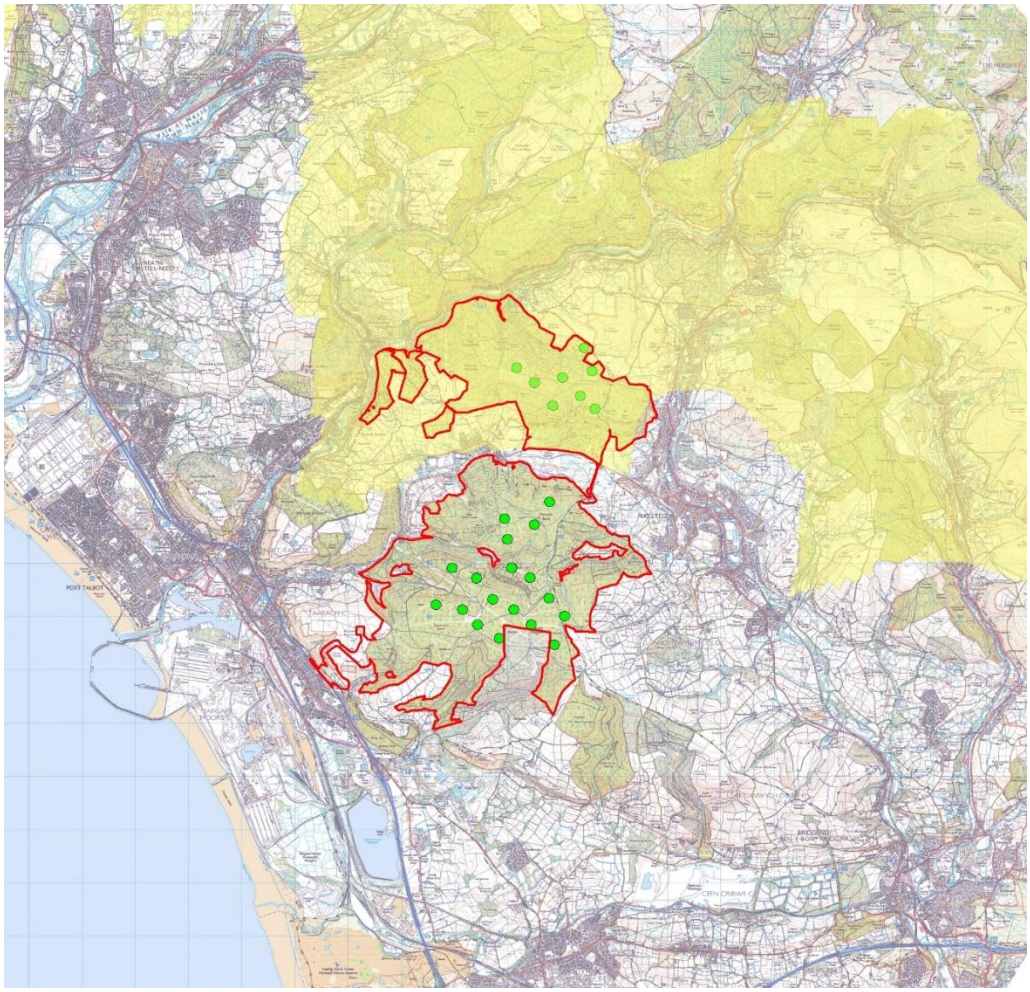
Key: Annex D refined areas shaded blue; site boundary outlined red; Design 1/ Design 2 turbine layout green dots

5.1.3. Pre-Assessed Areas

As addressed in more detail in the Planning Statement, Future Wales: The National Plan 2040 ('Future Wales') was adopted in February 2021. Based again on assessment by Arup, Pre-Assessed Areas for Wind Energy ('PAAs') were identified where 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, and where therefore a presumption in favour of large-scale wind energy development (subject to criteria-based policy) would apply. The whole of the northern section of the proposed turbines lies within PAA 9 (see Figure 5.3).

The southern section was omitted owing predominantly to the existence of a Registered Historic Landscape. It is noted that the four operational turbines of Mynydd Brombil wind farm lie within the same area, and that 50 other operational and consented turbines within 15 km, comprising Pen y Cymoedd, Maerdy, Ferndale, Nant-y-Gwyddon, Fforch Nest 2, and Llwyncelyn Re-submission lie within The Rhondda historic landscape, indicating that even at a local level this is not considered a constraint to wind turbine development.

Figure 5.3 Pre-Assessed Areas

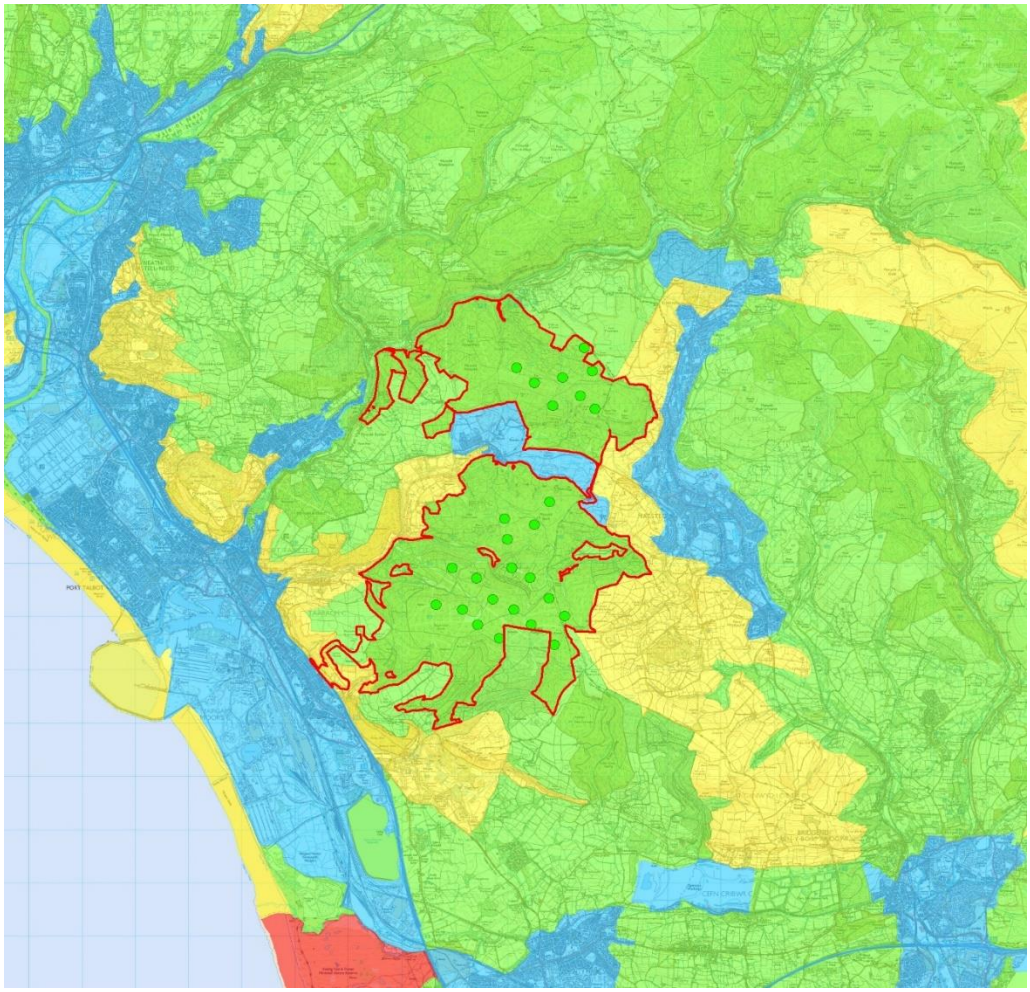


Key: PAA 9 shaded yellow; Site boundary outlined red; Design 1/ Design 2 turbine layout green dots

5.1.4. 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 5.4).

Figure 5.4 LANDMAP Visual and Sensory Evaluation



Key: Evaluations – outstanding (shaded red), high (yellow), moderate (green), low (blue); Site boundary outlined red; Design 1/ Design 2 turbine layout green dots

5.2. National Planning Policy on Design

5.2.1. Future Wales: The National Plan 2040

Outcome 11 of Future Wales[3] 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.*'

[3] Future Wales: The National Plan 2040. Available from: https://gov.wales/future-wales-national-plan-2040 [Accessed 30/05/2022]

5.2.2. 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 5.5 of this statement.

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*.'

Source: PPW 11th Edition (2021)

Figure 5.5 Good Design

[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 30/05/2022]

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

TAN 12: Design[5] 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

5.3.1. Neath Port Talbot County Borough Council Local Development Plan, 2011-2026

Neath Port Talbot County Borough Council Local Development Plan 2011 – 2021[6] Policy TR 2 (Design and Access of New Development) states that: '*Development proposals will only be permitted where…The development does not compromise the safe, effective and efficient use of the highway network and does not have an adverse impact on highway safety or create unacceptable levels of traffic generation*.'

5.3.2. Bridgend County Borough Council Local Development Plan, (2006-2021)

Bridgend County Borough Council Local Development Plan (2006 – 2021)[7] Policy SP2 (Design and Sustainable Place Making) states that:

'All development should contribute to creating high quality, attractive, sustainable places which enhance the community in which they are located, whilst having full regard to the natural, historic and built environment by:

1. Complying with all relevant national policy and guidance where appropriate;

2. Having a design of the highest quality possible, whilst respecting and enhancing local character and distinctiveness and landscape character;

3. Being of an appropriate scale, size and prominence…

8. Avoiding or minimising noise, air, soil and water pollution;

9. Incorporating methods to ensure the site is free from contamination (including invasive species);

10. Safeguarding and enhancing biodiversity …'

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[5] TAN 12 – Design. Available from: https://gov.wales/technical-advice-note-tan-12-design [Accessed 30/05/2022]

[6] Neath Port Talbot County Borough Council Local Development Plan 2011 – 2026. Available from: https://www.npt.gov.uk/7328 [Accessed 30/05/2022]

[7] Bridgend.gov.uk, Bridgend Local Development Plan 2006 – 2021. Available from: https://www.bridgend.gov.uk/media/1899/written-statement.pdf [Accessed 30/05/22]

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 Guidance[8],' (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)[9] 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.

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 Scottish 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

[8] '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]

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

further detailed assessment and given priority in influencing the layout iterations of the proposed development. The design evolution process is described in detail below.

6.1. Site Selection

As noted above, the development potential of the site has been appreciated by the UK wind industry and Welsh Government since at least the early 2000s.

As a result of much land within each of the SSAs forming part of the Welsh Government's woodland estate, in 2006 the Forestry Commission Wales (FCW) tendered all of their holdings to a single individual wind development partner within each of the SSAs, in order to avoid competing cumulative developments/developers emerging on the estate.

In 2018, NRW brought the site back to market for tender proposals, receiving ten bids including that of the development partners for this application[10]. This high level of interest alone gives evidence for the persisting recognition of the potential for the site. As part of the tender process, bidders were required to undertake and present sufficient technical analysis across a number of topics (including: technical layout, grid proposals, access to site, impact on forestry, and impact on ecology and soils) to be scored highly enough to pass a stage-gate process and, in combination with scores in other aspects of their proposals, to place first or high enough amongst bids for final consideration.

As part of preparing their tender proposals, the development partners undertook reviews of energy and planning policy; various environmental and technical aspects (including landscape and visual; cultural heritage; geology, hydrogeology, hydrology and flood risk; shadow flicker; wind resource; aviation and radar; telecommunications; coal mining; and construction) in developing a proposed layout. This entailed working with a number of expert consultants, carrying out site visits and surveys, the accumulation of design constraints, and the production of visualisations, which following an iterative design work-shop process resulted in a proposed scheme of 26 turbines, each of up to 200 m to blade tip, and with rotor diameters of up to150 m (the largest then available on the market), comprising turbines of up to 4.8 MW in capacity. Whilst battery energy storage was incorporated into the successful plans, co-locating other technologies – including solar photovoltaic and hydropower or hydro-storage – were discounted for undue scale of impacts within the forested environment.

All bidders' proposals were subject to scoring by NRW's specialist external environmental consultants, with seven out of the 10 passing the stage 2 technical requirement. Of those parties - other than the development partners - who passed stage 2 and had looked at both parts of the site, the average number of turbines proposed was 23, and tip heights were up to 200 m.

Following the tender award in 2019[11] the evolution of the site design and layout continued through the EIA.

Natural Power was chosen by the applicant to progress the DNS wind farm application.

A key aim of the design process has been to limit the overall footprint of the 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 of the ES, section 4.3.

[10] Response to Welsh Government FOI Request 15447. Available from: https://gov.wales/sites/default/files/publications/2021-09/atisn15447doc3.2.pdf [Accessed 30/05/2022]

[11] https://naturalresources.wales/about-us/news-and-events/news/plans-for-port-talbot-renewable-energy-project/?lang=en [Accessed 30/05/22]

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;
- Forestry;
- Existing infrastructure; and
- 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.

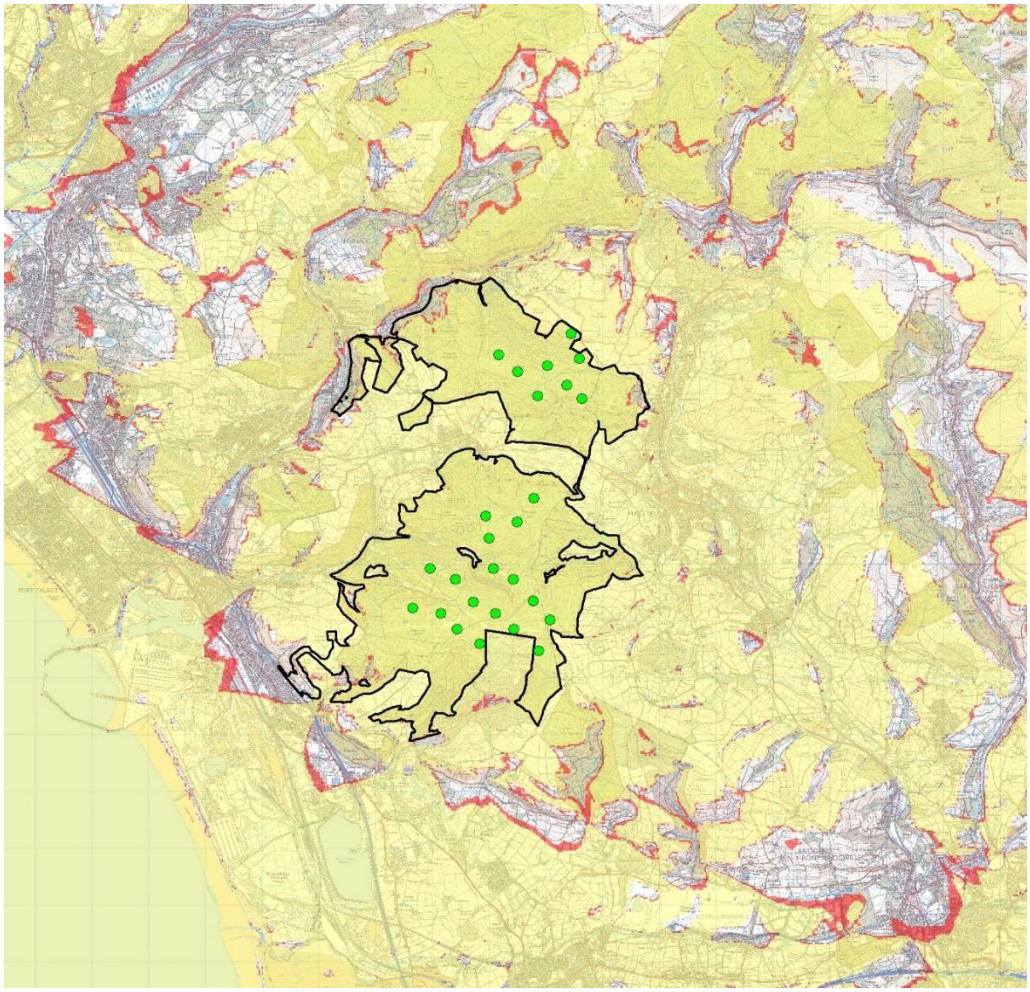
6.3. Design Evolution

The layout evolved under guidance, requirements, and considerations from Coriolis, ESB, Natural Power and their specialist consultants, including NRW acting as landowner in respect of forestry management. 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: Tender Layout (December 2018)

As detailed in Section 4.2 of the ES, the tender layout comprised 26 turbines with rotor diameters of up to 150 m and tip heights of up to 200 m. A preliminary full infrastructure layout was also presented. Figure 6.1 illustrates the zones of theoretical visibility for Design 2, based on a bare-earth model.

Figure 6.1 – Design 1 (200m) vs Design 2 (250m) ZTV comparison



Key: Zones of theoretical visibiliity – Designs 1 and 2 visible (shaded yellow), Design 2 only visible (red); Site boundary outlined black; Design 1/ Design 2 turbine layout green dots

6.3.1.1. Abnormal Indivisible Loads ('AIL') Access Alternatives

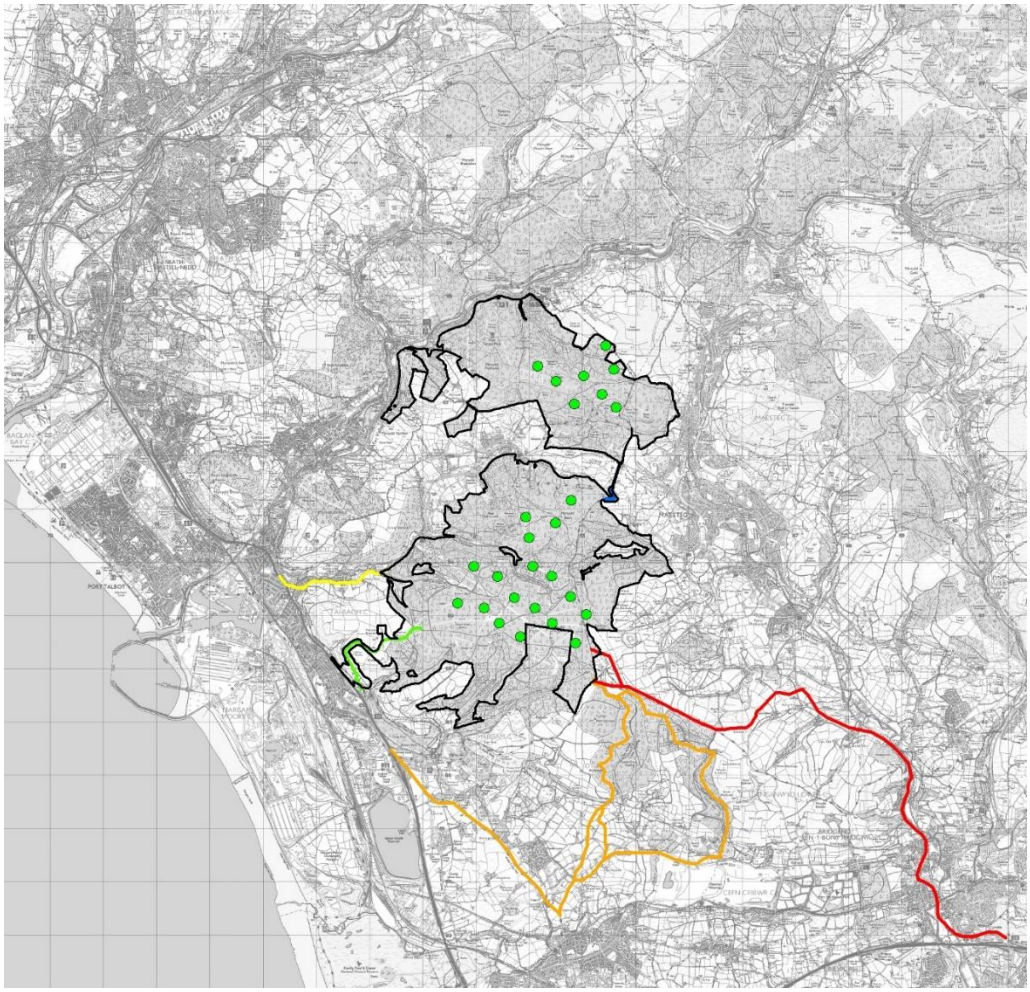
As part of the tender process, detailed feasibility assessments were undertaken on a number of potential routes to site for AILs – particularly, turbine blades. Certain options, including coming via Maesteg as the operational Mynydd Brombil Wind Farm had previously, were quickly ruled out as not possible for turbines any larger those already installed there (80 m rotors). Four theoretically feasible routes identified (all coming from Swansea docks are illustrated on Figure 6.2) comprised:

- (1) Loads exiting the M4 at Junction 36, proceeding northwards on the A4063 via Aberkenfig/ Tondu and the Llynfi valley towards the south of Maesteg, before turning west at a point to the south of Llangynwyd to climb up to Ogwr Ridgeway and enter the site from the south;
- (2) Loads exiting the M4 at Junction 38, proceeding southwards on the A48 towards Pyle, before turning north to find a route (potentially via Dŵr Cymru land at 'Craig yr Aber') into the site from the south;
- (3) Loads exiting the M4 at Junction 40, proceeding via Pen-y-Cae and the village of Goytre, entering the site from the west; and
- (4) Loads being crane-lifted from vehicles parked on or besides the M4, onto waiting vehicles on private land, to follow the route of an existing road up Mynydd Brombil, and via the existing wind farm roads into the site from the south-west.

Whilst each of these options presented challenges, options 1 to 3 were all concluded as unfavourable owing to combinations of high impacts on local road networks; hard physical constraints to turbine dimensions from pinch-points; high impacts on farmland and the environment (including scheduled monuments); and need for manifold third-party land involvement.

Consequently, option 4 (coming directly from the M4) was put forward as preferred option. Following the tender award in 2019, and further consultations with transport engineering experts, Welsh Government Highways Department and South Wales Trunk Road Agency personnel, the creation of a new single-purpose slipway works-exit junction was identified as preferable to craning options.

Figure 6.2 – AIL access route alternatives



NB: AIL access options – 1 (red line), 2 (orange), 3 (yellow), 4 (green); Site boundary outlined black; Design 1/ Design 2 turbine layout green dots

6.3.1.2. Evolution of the Market for Wind Turbines

Following the tender submission 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 LCOE.

In January 2019, Vestas introduced their 162 m rotor machine (~81 m blade length), with 5.6 MW capacity[12] Siemens-Gamesa announced their new 155 m and 170 m rotor machines (~77.5 m and ~85 m blade length

[12] Vestas introduces EnVentus – Vestas' innovative modular platform, starting with two new industry-leading wind turbine variants [Accessed 04/05/22]

respectively) later that year in April[13], 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[14].

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[15]; Siemens-Gamesa have increased the capacity on their 155 m and 170 m machines to up to 6.6 MW[16]; Nordex have increased the capacity on their N163 machine to up to 6.5 MW[17]. GE unveiled their 164 m rotor machine (~82 m blade length) with 6.0 MW capacity in November 2020[18]. Vestas announced a new 172 m rotor (~86 m blade length) 7.2 MW machine in April 2022[19]. Nordex then announced their 175 m rotor (~87.5 m blade length) 6.22 MW machine in September 2022[20]. The increase in turbine size and capacities is a trend that can be reasonably expected to continue over the coming years, with up to 10 MW onshore machines already in development[21] and reasonable expectation of widely available 8 MW+ onshore machines this side of 2030.

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.

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[22] shows that since the December 2018 tender submission there have been at least 44 applications submitted including turbines of 200 m to tip and above, with 17 above 220 m to tip, 3 with 250 m to tip, and 1 with 260 m to tip; 12 such applications have been consented to date. 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 260 m[23] and taller heights still are possible with current technology, with applications of tip-heights up to 320 m and turbine capacities up to 10 MW already being lodged on the continent[24].

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

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[13] New Siemens Gamesa 5.X platform, with a 170-meter rotor - the largest in the industry [Accessed 04/05/22]

[14] Nordex launches 163 metre rotor for the Delta4000 5.X - Nordex SE (nordex-online.com) [Accessed 04/05/22]

[15] Nordex launches 163 metre rotor for the Delta4000 5.X - Nordex SE (nordex-online.com) [Accessed 04/05/22]

[16] Siemens Gamesa upgrades leading onshore turbine to deliver more competitive power output [Accessed 04/05/22]

[17] Press release: Nordex announces entry into the 6 MW class with the N163/6.X turbine - Nordex SE (nordex-online.com) [Accessed 04/05/22]

[18] GE’s Most Powerful Onshore Wind Turbine Gets Even More Powerful | GE News [Accessed 04/05/22]

[19] Vestas introduces the V172-7.2 MW, enhancing performance in low to medium wind conditions [Accessed 04/05/22]

[20] Available from: https://www.nordex-online.com/en/2022/09/new-rotor-for-the-energy-transition-nordex-group-presents-the-n175-6-x/

[21] Available from: https://renews.biz/83740/envision-unveils-10mw-turbines/ [Accessed 27/03/2023]

[22] Available from: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extractt [Accessed 07/02/2023]

[23] Available from: https://dunsidewindfarm.co.uk [Accessed 04/08/2022]

[24] Available from: https://www.ymparisto.fi/fi-FI/Asiointi_luvat_ja_ymparistovaikutusten_arviointi/Ymparistovaikutusten_arviointi/YVAhankkeet/Pyoriannevan_tuulivoimahanke_Pyhanta [Accessed 047/02/2022]

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.

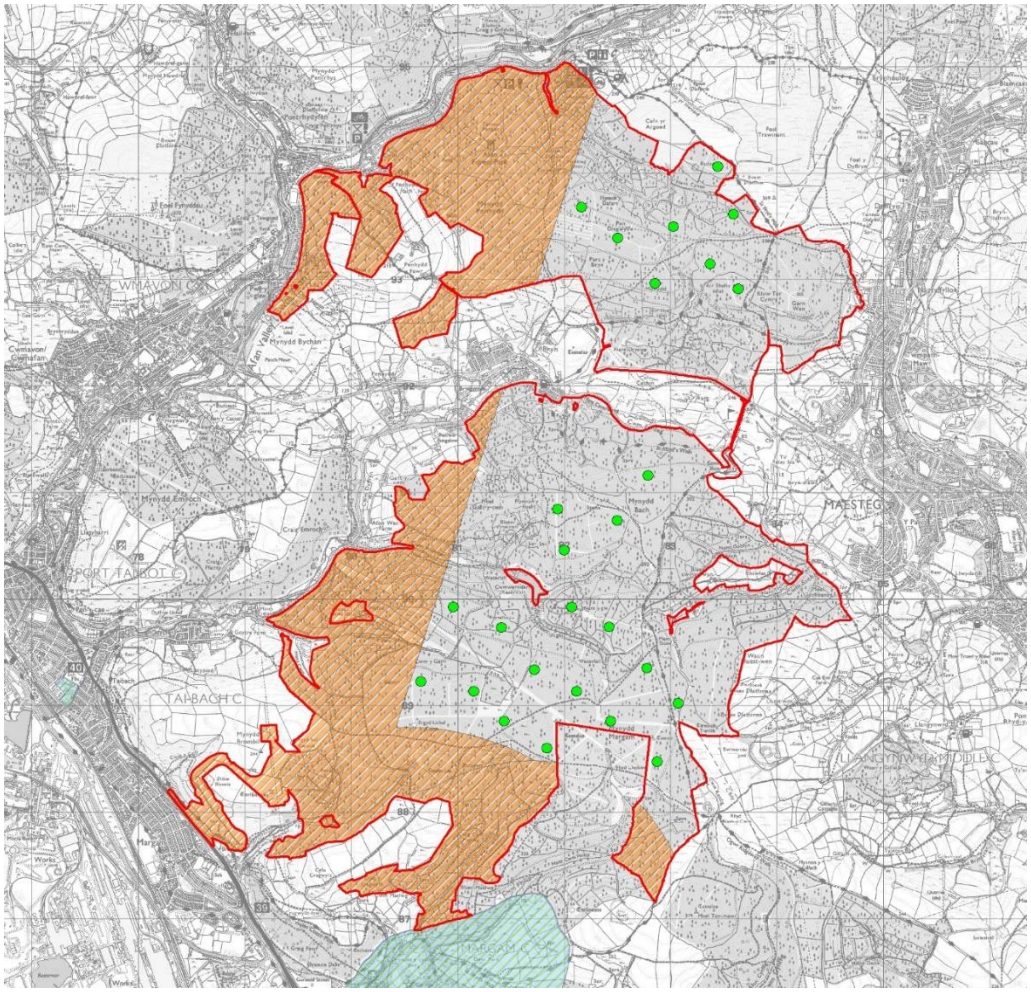
6.3.2. Design 2: Scoping (January 2021)

In January 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 170 m rotor diameters, up to 250 m to tip, and indicatively up to 6.6 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 8 turbines located in the northern section of the site in an orderly, evenly spaced grid within the eastern half of the available area; with 18 turbines located in the southern section, with an orderly, evenly spaced arrangement of south-west facing loosely linear arrays, avoiding the south-westernmost quadrant of the available area.

Main constraints to site design considered at the time of the 2018 tender (as updated to early 2021) were shown on Scoping Report Figure 3.1, however early ecological and forestry factors also played a key part in developing this layout. In particular though, landscape and visual and cultural heritage expert advice had established ‘exclusion zones’ (illustrated on Figure 6.3): in the northern section to the direct north of the village of Bryn so to avoid perceptions of encirclement; together with areas within roughly 1.0-1.5 km from the boundary of Margam Park or Margam Castle so to avoid any presence of turbines being sat directly behind Margam Castle in views looking back from the grassland to its south-east side. Visualisation work carried out in 2018 with 200 m turbines was revisited with 250 m tip heights to ensure this remained the case from both locations.

Figure 6.3– Initial Bryn encirclement and Margam Park/Margam Castle exclusion zones



Key: Exclusion zones hatched/shaded orange; Margam Park hatched/shaded blue; Site boundary outlined red; Design 1/ Design 2 turbine layout green dots

6.3.2.3. Scoping Responses (March 2021)

This 26-turbine layout was presented to the Planning Inspectorate (PINS now PEDW) and consultees in the scoping report on 7th January 2021. A copy of this can be found in Appendix 3, Volume 3. The full Scoping Direction was issued by the Planning Inspectorate (now PEDW) on 8th March 2021 and is provided in Appendix 3 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 NPTCBC, BCBC and NRW to agree the specifics of survey methodologies, potential mitigation should the proposed development gain consent and to update these consultees on progress.

6.3.2.4. Design Review Day #1 (March 2021)

The first formal design review day was held virtually (due to COVID-19) via Microsoft Teams in March 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, forestry, 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 2018 tender.

6.3.2.5. Mini Design Review Day (May 2021)

Following the first design review day there were some outstanding issues concerning landscape and visual and cultural heritage that had not been discussed in detail due to time constraints. Therefore, in May 2021 a mini design review day was held via Microsoft Teams between the applicant, Natural Power, and landscape and visual, and cultural heritage specialists. The mini design review day focussed on 14 turbines (then numbered 13 to 26) all in the south section of the site with regards to potential impacts on Margam Country Park and associated receptors and assets.

The applicant used the 3D interactive virtual model and wind farm design software to pan around the landscape assessing views from a variety of viewpoints and discussing possible amendments to turbine locations and size to potentially minimise negative impacts on cultural heritage assets and landscape and visual receptors (for example, see Figures 6.4a and 6.4b).

Figures 6.4a and 6.4b– 3D virtual model review outcomes

Key: Margam Park viewpoint, Design 2. NB: protrusion of T25 and T26 hubs above the tree-line of Mynydd-y-Castell; visual stacking of T26 with T20; extent of turbines rightwards along the horizon.

Key: Margam Park viewpoint, Design 3. NB: T26 shifted leftwards out of visual stacking, more evenly spaced; hub of T25 effectively hidden behind tree-line of Mynydd-y-Castell; narrower extent from deletion of T22; generally recessed/ less competing with the ridgeline and interest within the park

6.3.2.6. Public Consultation (June 2021)

Detailed analysis of written feedback from the 1st round of public consultations can be found in the PAC report. Key concerns raised in design terms, in summary, related to the number, size, proximity and relationship of turbines to dwellings and communities, but also possible impacts to existing on-site recreational infrastructure (including footpaths and mountain-biking trails) and ecology. Turbine noise was also a regularly raised issue.

6.3.3. Design 3: Post-Consultation (July 2021)

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 below:

- Five turbines were removed: T1, T2 and T9 to reduce landscape and visual impacts mainly from Bryn settlement; T22 and T23 to reduce landscape and visual impacts mainly from Margam Park, as well as Ogwr Ridgeway and scheduled monuments to the south-east of the site boundary.
- T3-T8 maximum tip heights reduced to 206 m to tip (while maintaining rotor diameter 170 m) to minimise visual impact from Bryn, Cwmafan, Maesteg and areas within the northern Afan and Llynfi valleys.
- South section: T17, T21, T24-T26 maximum tip heights reduced to 206 m to tip (rotor diameter 170 m) to minimise visibility from areas to the south including Port Talbot and Margam Park. This also reduced visibility from areas further afield such as Cefn Cribwr.
- T10, T11 and T16 reduced maximum tip height to 230 m to further improve views from Bryn, Cwmafan, Maesteg and Llangwynyd.
- Relocation of remaining turbines to optimise location based on feedback, including avoidance of deep peat (e.g., T7), reduce visual impact from settlements and communities surrounding the turbines, increase the spacing between turbines to enhance energy performance and output.

Following discussions the changes taken forward are summarised below:

- Range of tip heights; 206 m, 230 m & 250 m all with rotor diameters of 170 m for the 21 turbines.
- North Section:
  - All turbines (6 in total) reduced to 206 m to tip with 170 m rotor diameter: 3, 4, 5, 6, 7 & 8 (please note this is the old turbine numbering based on design 2 and turbines do not correlate to design freeze - see Table 4.2 within Chapter 4 of the ES)).
  - The location of T6 required further investigation to consider the visual effect and stacking with other turbines (when turbines appear in front of each other). T6 was moved from design 2 to the east to increase the setback from Bryn village and was able to move into the space created by moving T7. The new position also resulted in minimising the felling area and improved energy production.
- South Section:
  - 15 turbines all with 170 m rotor diameter
  - Turbines at 206 m to tip: 17, 21, 24, 25 & 26 (all turbine numbering are referring to old number layout).
  - Turbines at 230 m to tip: 10, 11 & 16
  - Turbines at 250 m to tip: 12, 13, 14, 15, 18, 19 & 20.
  - Further investigation required to determine whether it is necessary to reduce tip height of T16.any further to improve the composition of views from Maesteg and Llangynwyd to the east.

Leading from the mini design review day, following the deletions of T22 and T23 the locations of T24, T25 and T26 were all shifted westward to improve views from Margam Country Park and also to minimise impacts from other viewpoints whilst considering all other constraints. Specifically, T25 was positioned so as that its hub would be screened by woodland on Mynydd y Castell in views from the grasslands to south-east of the Castle, while T26 was moved away from of stacking with T19 behind it. These and other relevant design changes were later demonstrated

to the NPTCBC Park Manager and Physical Activity and Cultural Services Manager[25]as part of cultural heritage and community benefit engagement.

6.3.3.7. Design Review Day #2 (August 2021)

The second formal design review day was held via Microsoft Teams in August 2021. Attendees included the Applicant, members of staff from NRW (acting as land manager, from the energy delivery team), and consultants from relevant departments of expertise including; planning, ecology and ornithology, hydrology, civils, traffic and transport, cultural heritage, landscape and visual, forestry, noise, and aviation.

The aim of the day was to discuss whether further improvements could be made to the layout following further site surveys and feedback from ongoing community consultation.

6.3.4. Design 4: Post-Surveys (October 2021)

Following the second design review day and completion of all necessary on-site survey works, together with ongoing consultations with NRW's energy delivery team, a further new layout (Design 4) was produced. This layout consisted of 21 turbines (still numbered 3 to 26) at a range of three tip heights; up to 206 m, 230 m, and 250 m.

Changes to turbine locations that were made and reasons for changes are summarised below:

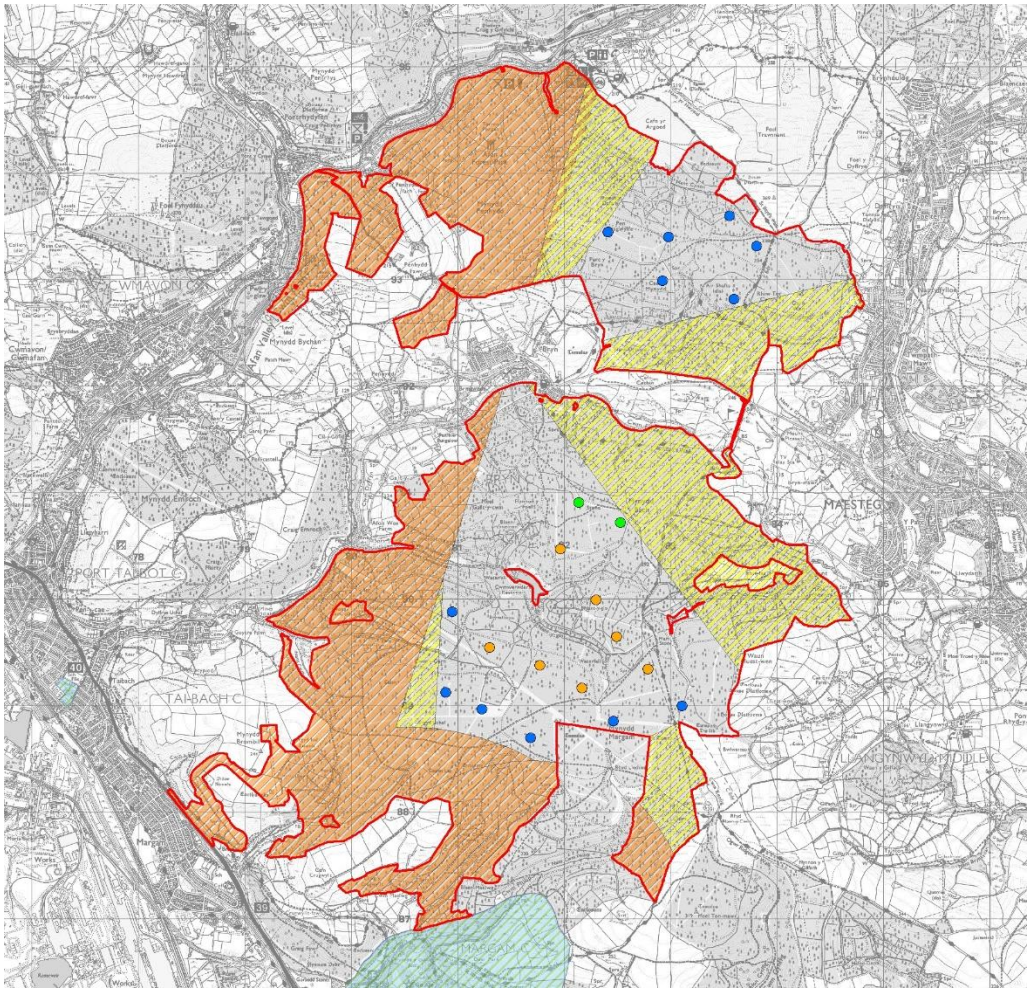
- North Section
  - The only change in the section being T6 moved ~ 40 m NW to minimise the felling area by locating the crane hardstanding within a single forest coupe.
- South Section
  - T10 moved ~15 m E, and T11 moved ~15 m S, to pull both out of stacking alignment in views from Cwmafan (Brynna Road).
  - T12 moved ~ 30 m NE to avoid earth work impacts on low impact silvicultural system (LISS) forestry to the west.
  - T13 moved ~ 35 m NW to reduce the extent of earthworks to the west.
  - T16 reduced tip height from 230 m to 206 m and moved ~ 55 m SE to improve views from the NE – Maesteg and E - Llangynwyd, together with views from the Ogwr Ridgeway and scheduled monuments to the south-east. The new location also minimises felling area by facilitating locating the crane hardstandings and access spur within a single forest coupe.
  - T17 moved ~ 75 m W to avoid earthwork impacts on the forestry road to the east.
  - T18 moved ~70m SW, to pull out of stacking alignment with T17 in views from Cwmafan (Brynna Road).
  - T24 moved ~ 100 m NE to further reduce the possibility of visibility from the grasslands at Margam Park (screening the turbine behind Mynydd y Castell).

The combined results of further landscape and visual and cultural heritage inputs on reducing impacts on Bryn village, Margam Park and other heritage features through expanded exclusion zones are demonstrated on Figure 6.5. The results of deleting T1 and T9 in particular on reducing the extents of visibility and avoiding encirclement from Bryn village are evident.

The placement of all built infrastructure (excluding only borrow pits) was considered during the design review day and through site ground-truthing visits with NRW's energy delivery team, including use of existing access tracks where possible, and location of the substation and battery energy storage (BES), main construction compounds and wind monitoring equipment. Initial indicative tree felling plans were also outlined (as shown on Figure 6.9).

[25] Virtual meeting of Coriolis Energy and Headland Archaeology with Michael Wynne and Paul Walker of NPTCBC, 09/11/2021

Figure 6.5– Further Bryn encirclement and Margam Park/Margam Castle exclusion zones



Key: Initial exclusion zones hatched/shaded orange; further exclusion zones hatched/shaded yellow; Margam Park hatched/shaded blue; Site boundary outlined red; Design 4 turbines – 206m (blue-dots), 230m (green), 250m (orange)

Public Consultation (November 2021)

Detailed analysis of written feedback from the round two public consultations can be found in the PAC report. Whilst generalised concerns, particularly around visibility, continued to be raised, with the reduction in local visual impacts from design 2 there were few tangible or actionable comments on specific turbine locations or views. Concerns around impacts on private views and amenity were often noted, as well as questions around the draft tree felling plans which were exhibited for comment.

Proposed transportation routes and access points for AILs and Heavy Goods Vehicles (HGV) were presented for consultation. There was a strong consensus against the proposed HGV access point at Royal Oak, Bryn.

6.3.5. Design 5: Design Chill (April 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, consultants and NRW.

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 five turbines, significantly reducing the tip-heights of

two-thirds of those remaining and relocating multiple turbines to minimise visual impact from a number of locations these concerns were believed to have been addressed as part of earlier phases of the design evolution.

The only change between Design 4 and Design 5 was the renumbering of the turbines. Details of the old (Design 2) and new (Design 5) numbering and turbine tip heights are detailed in Table 6.1.

Table 6.1: Design Chill layout

Original Number	Number	Max Tip Height (m)	Max Rotor Diameter (m)
3	1	206	172
4	2	206	172
5	3	206	172
6	4	206	172
7	5	206	172
8	6	206	172
10	7	230	172
11	8	230	172
12	9	250	172
13	10	250	172
14	11	250	172
15	12	250	172
16	13	206	172
17	14	206	172
18	15	250	172
19	16	250	172
20	17	250	172
21	18	206	172
24	19	206	172
25	20	206	172
26	21	206	172

Source: Natural Power

6.3.6. Design Freeze (January 2023)

Following design chill in April 2022, EIA specialists began drafting their assessments, applying appropriate methodology to identify the significance of effects upon environmental receptors. No unacceptable adverse impacts were identified from Design 5 by any topic authors. Informal consultations were then carried out on draft ES chapters with most relevant statutory consultees in August 2022. Whilst no objections were raised to Design 5, taking stock with further information and context, including further on-site wind data, at this point gave rise to the possibility of further reducing the visual impacts of the scheme for key receptors, particularly Bryn village and Margam Park, through further expanded exclusion zones are demonstrated on Figure 6.6.

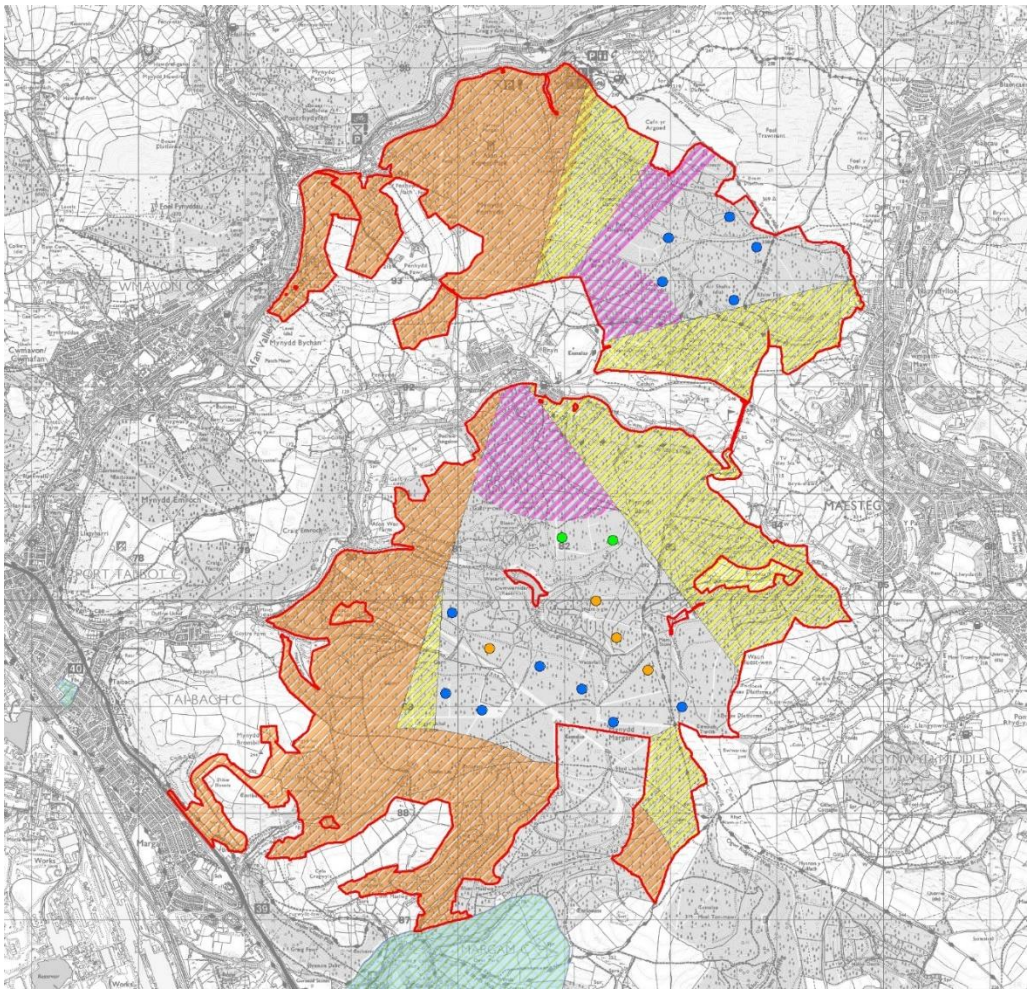
Amendments to the layout include:

- Three further turbines removed: T1, T7 and T21 (Design 5 numbering) to reduce visibility from key receptors;
- Removed associated access tracks, crane pads to the deleted turbines (T1, T7 and T21);
- Tip height reductions for T9 (Design 5 numbering): 250 m reduced to 230 m to reduce visibility from Bryn village;

- Tip height reductions for T16 and T17 (Design 5 numbering): 250 m reduced to 206 m to reduce visibility from Margam Park;
- T8 and T9 were relocated as a result of removing T7 (Design 5 numbering) to reduce visibility from Bryn village;
- Hardstanding's and tracks to T8 and T9 were realigned resulting in reduced new track length;
- Borrow pits around T8 and T9 were redesigned;
- Remaining turbines were renumbered; and
- Associated changes were made to the tree felling plan and habitat enhancement plans.

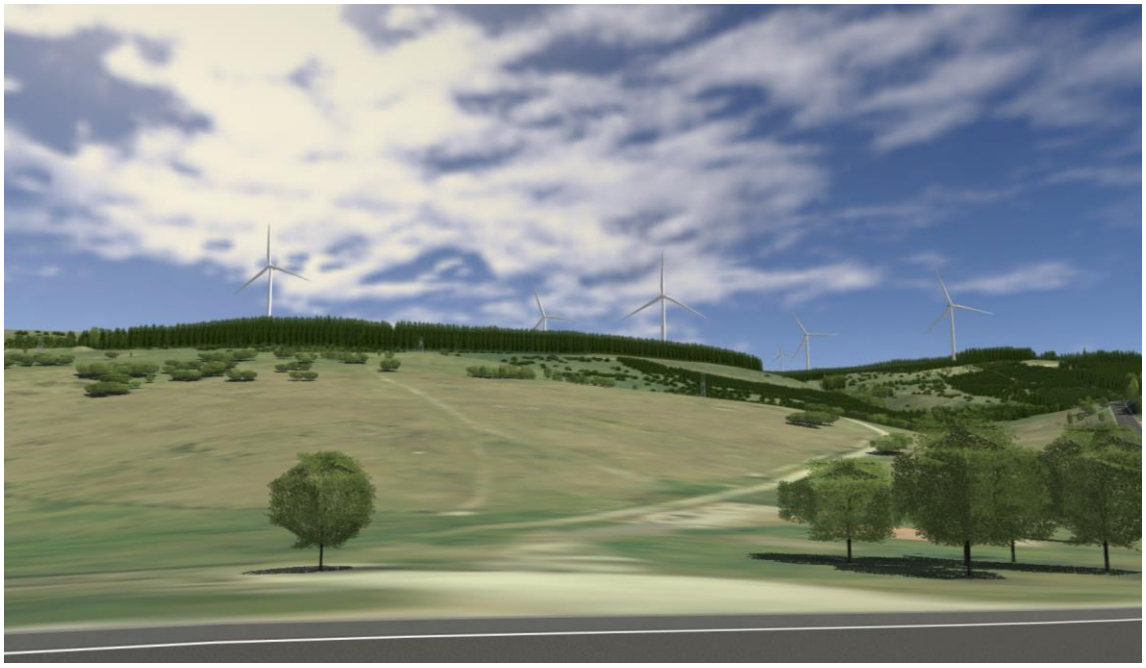
Table 6.2 details the old (Design 5) and new numbering (Design 6) and final updated turbine tip heights

Figure 6.6– Final Bryn encirclement and Margam Park/Margam Castle exclusion zones

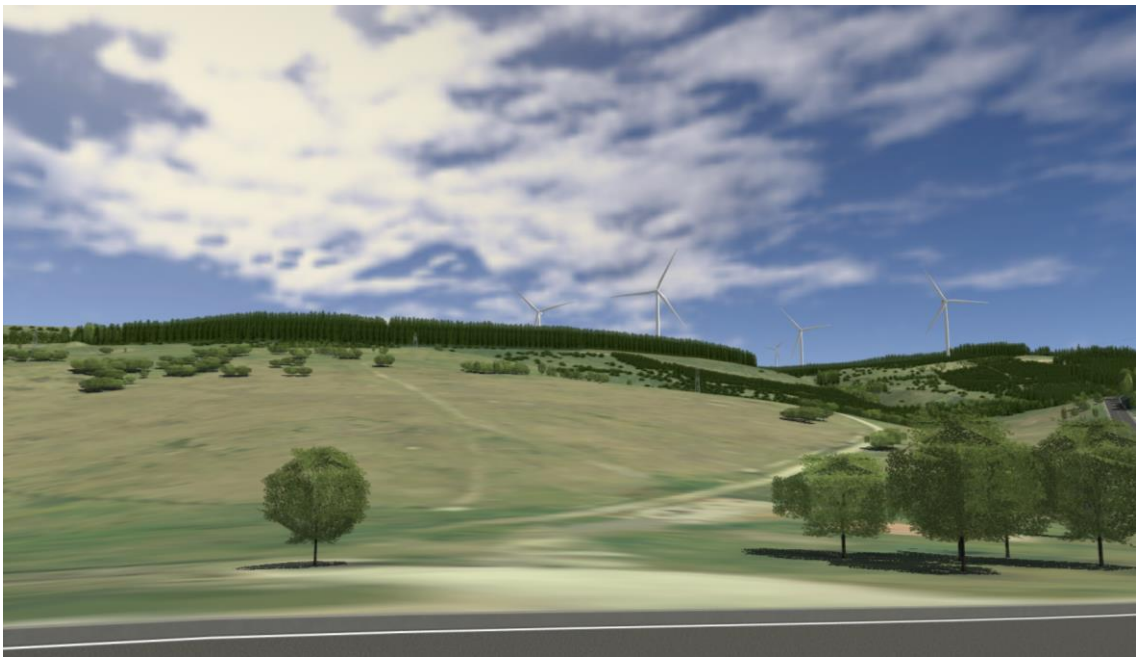


Key: Initial exclusion zones hatched/shaded orange; further exclusion zones hatched/shaded yellow; Margam Park hatched/shaded blue; final exclusion zones hatched/shaded pink; Site boundary outlined red; Design 4 turbines – 206m (blue-dots), 230m (green), 250m (orange)

Figures 6.7a and 6.7b– 3D virtual model review outcomes

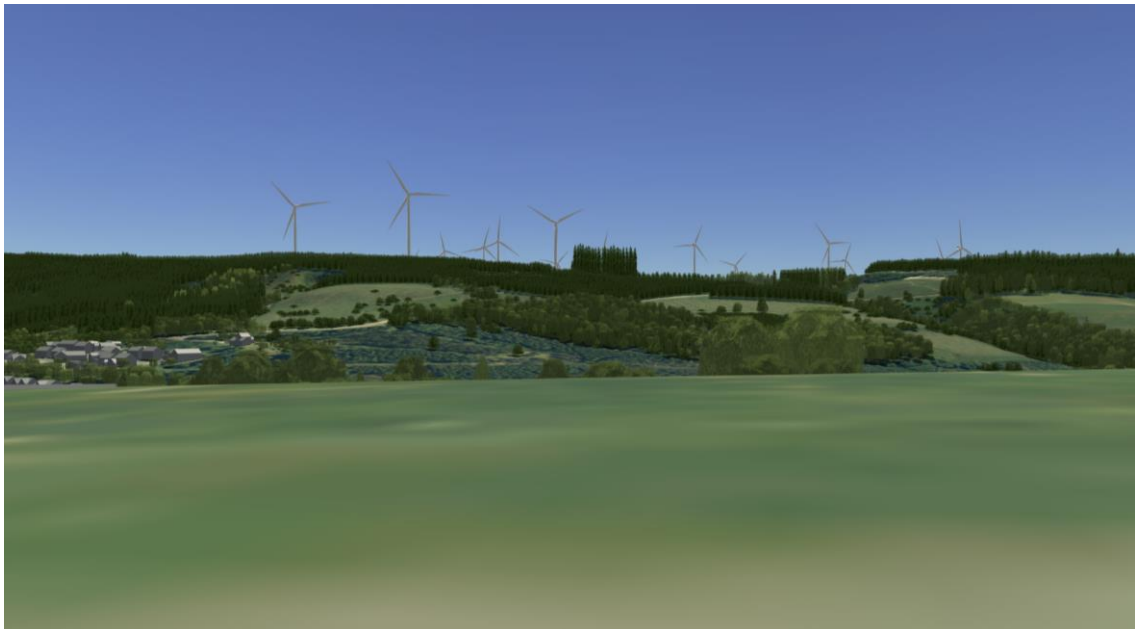


Key: Royal Oak Public House, Bryn, Design 5.

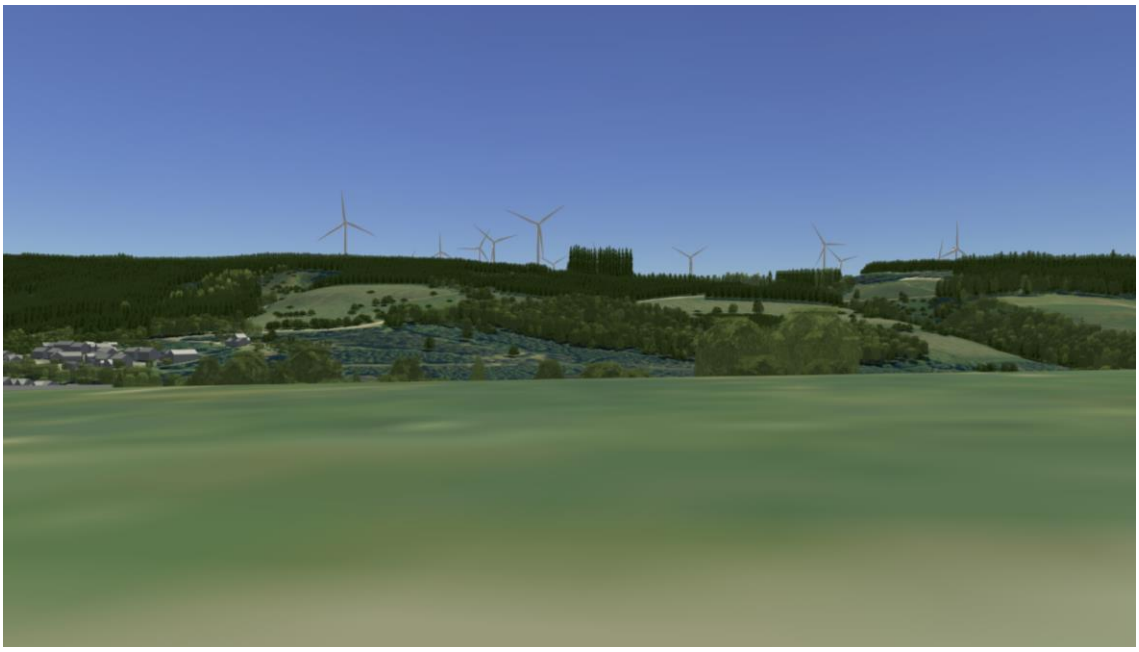


Key: Royal Oak Public House, Bryn, Design 6. NB: T1 (Design 5 numbering) deleted.

Figures 6.8a and 6.8b– 3D virtual model review outcomes



Key: Bryn play area, Design 5.



Key: Bryn play area, Design 6. NB: T7 (Design 5 numbering) deleted, T9 tip-height reduced, T8 and T9 (Design 5 numbering) relocated

Table 6.2: Design freeze layout

Old Number	New Number	Max Tip Height (m)	Max Rotor Diameter (m)
2	1	206	172
3	2	206	172
4	3	206	172
5	4	206	172
6	5	206	172
8	6	230	172
9	7	230	172
10	8	250	172
11	9	250	172
12	10	250	172
13	11	206	172
14	12	206	172
15	13	250	172
16	14	206	172
17	15	206	172
18	16	206	172
19	17	206	172
20	18	206	172

Source: Natural Power

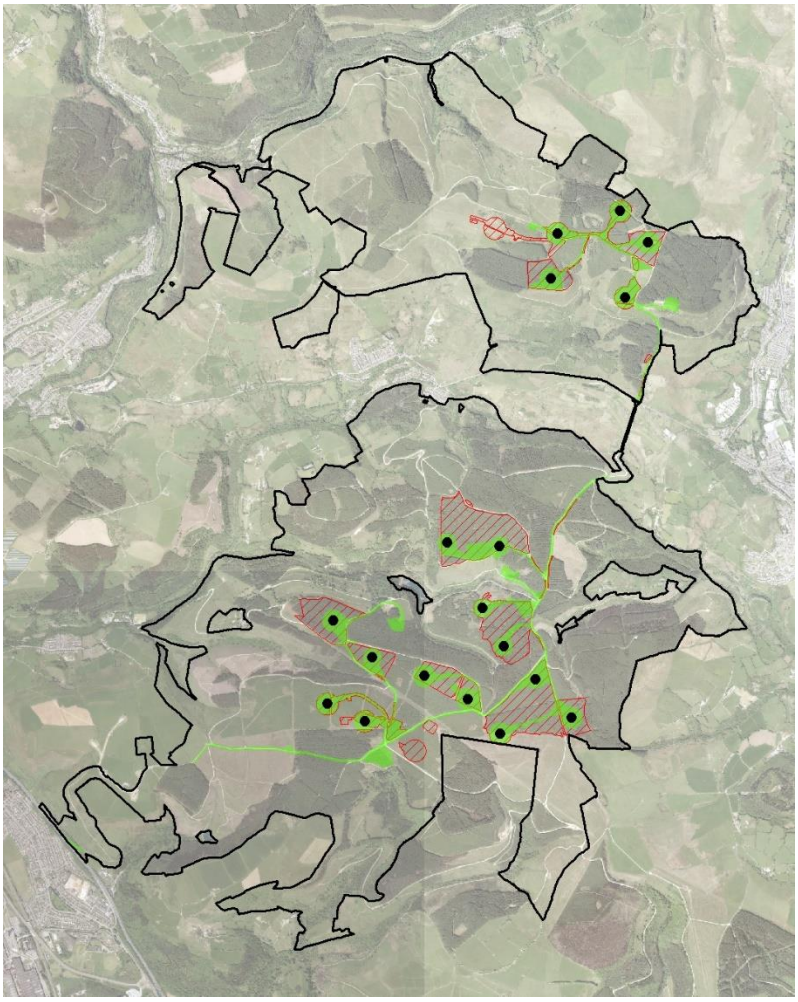
The results of these final changes were to reduce visibility of the southern section turbines from lower parts of Bryn village (for example, see viewpoint 25 at the picnic area opposite the Royal Oak pub), whilst from more elevated parts (for example, viewpoint 3 at the Play Area, off Neath Road) now all southern section turbines would be seen as predominantly contained behind foreground topography in a low array against the wide forested horizon. At the same time, the horizontal and vertical fields of view towards northern section turbines were markedly reduced (see again viewpoint 3).

6.3.7. Summary of Design Evolution

As referred to above, 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 in total eight turbines (over 30% from original proposals), reducing the tip-heights of most (by around 18%) and carefully considering the locations of all turbines, visual impacts have been noticeably reduced from a number of key locations.

The maximum tip height is proposed at up to 250 m for turbines 8, 9, 10 and 13; up to 230 m for turbines 6 and 7; and up to 206 m to tip for turbines 1-5, 11, 12, 14-18; all with rotor diameters of up to172 m.

Figure 6.9 Development of tree felling plans



Key: Initial tree felling proposals (hatched red); Final tree felling plan (shaded green); Site boundary outlined black; Design 6 turbines (black dots)

Design Consultation

Scoping was undertaken in March 2021. The full Scoping Direction was issued by the Planning Inspectorate (now PEDW) on 8th March 2021 and is provided in Appendix 3.2 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 NPTCBC, BCBC and NRW to agree the specifics of survey methodologies, potential mitigation should the proposed development gain consent and to update these consultees on progress.

Public consultation was undertaken in the early stages of the project in June 2021 and again in November 2021. Detailed analysis of written feedback from the round two public consultations can be found in the PAC report.

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 eight turbines, significantly reducing the tip-heights of two-thirds 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.

6.4. Residential Visual Amenity

During the design process, views from residential receptors within 2 km 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 Residential Visual Amenity Assessment (RVAA) contained within ES Appendix 8.16 drew upon guidance from the Landscape Institute[26]. The guidance is not prescriptive, and it recognises that every project requires its own set of criteria and thresholds, tailored to suit local conditions, circumstances and the potential scale of impacts. The methodology was therefore adapted to reflect the specific circumstances within the study area, and is described in detail in Appendix 8.15. All residential properties within 2 km area from turbines were assessed using the described approach and effects were assessed to not breach the Residential Visual Amenity 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.

7.2. Character Elements

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

7.2.1. Turbines

The turbines will be of a tubular tower design with three rotor blades on a horizontal axis, finished in a light grey semi-matt colour. Due to the continuing evolution of wind turbine manufacturing and advancements of energy yield, the exact model to be used on the proposed development will be chosen post consent and prior to construction as part of a competitive tender process. The final turbine selected will not differ materially from those assessed within the accompanying ES and will be within the specified parameters.

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 18 turbines, 12 up to 206 m, two up to 230 m and four up to 250 m tip height. A typical wind turbine is shown on ES Figure 5.1. The proposed development also includes associated infrastructure including: a substation and control building within a compound (see ES Figure 5.4); energy storage containers (see ES Figure 5.4b); a temporary construction compound (see ES Figure 5.9); access tracks

[26] Landscape Institute Technical Guidance Note 2/19 Residential Visual Amenity Assessment. Available from: https://www.landscapeinstitute.org/technical-resource/rvaa/ [Accessed 30/05/2022]

within the application site (see ES Figure 1.2 ‘Site Layout’); turbine foundations (see ES Figure 5.2); crane hardstandings (see ES Figure 5.3); and drainage works. 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. Land Use

The total permanent land take of the proposed development, after completion of reinstatement measures including foundations; crane pads; site tracks; has been assessed to be approximately 21.3 ha excluding batter slopes.

The overall land take of the proposed Development is considered to be minor.

The felling of existing forestry will be managed by the applicant prior to any construction activities. Forestry is described in Chapter 13 of the ES, and it was concluded that the impact of the proposed development on forestry is insignificant with tree felling minimised to areas which are equivalent or similar in size to areas felled by NRW under normal forest management. As a result it is considered that the impact on NRWs Forest Resource Plan (FRP) will be incorporated without significant impact to the Forest Resource Plan’s long term aims.

Operational effects on the existing land use are considered to be minimal. The current use of land within the application site for forestry will continue. The construction of the access tracks will benefit current land use practices through ease of access.

7.4. 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 PRoW (see Figure 15.2), including footpaths and bridleways, the St Illtyd's Walk and permissive routes. During construction and decommissioning, as is the case with ongoing forestry operations, 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.

It is proposed that an Access Management and Enhancement Plan (AMEP) will be prepared, to indicate the restrictions for users and any proposed mitigation during construction and decommissioning. Details of safety requirements will be confirmed post-consent.

During the operation of the wind farm, it is envisioned that there would be no restrictions placed on the movement of the public using the existing rights of way across the site, other than in exceptional circumstances e.g. turbine component replacement. The AMEP will include a range of enhancement measures, to be agreed with relevant LPAs and NRW, aiming to provide a significant benefit to recreational resources locally.

The north-west of the north section benefits from a number of world class mountain bike trails, being accessed typically from the visitor centre and tearooms at Cynonville. 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 Welsh Government owned forestry 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).

7.5. 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 317,883 megawatt hours (MWh) of electricity per year or 317,883,000 killowatt hours (kWh) (domestic

units)[27]. This is equivalent to the annual electricity needs of 85,700 average British homes, or approximately 68% of households in Neath Port Talbot and Bridgend council areas combined[28].

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 137,325,456 kg of carbon dioxide-equivalent per year[29].

Based on the findings of a Carbon Balance Assessment, see Appendix 10.4, the construction, operation and decommissioning of the proposed development is expected to result in the net emissions of 263,127 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 10 months (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.

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[27] Based on average capacity factor for Welsh onshore wind farm BEIS stats 2017-2021 (released in March 2022) is 28%. [last accessed 25/03/2022]. 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. 129.6 MW x 8760 hours in a year x 28% capacity factor = 317,883 MWh / 3709 kWh (the temperature adjusted UK household average electricity consumption figure, BEIS Energy Consumption in the UK (2021)) = *85,700* households. Figures all rounded to nearest 100.

[28] StatWales, 2020: Households by Local Authority and Year – NPTCBC = 62,768; BCBC = 63,152; combined = (85,706 / 125,920) x 100 = 68%

[29] BEIS 'Digest of United Kingdom Energy Statistics', July 2022. Table 5.14 "Estimated carbon dioxide emissions from electricity supplied". BEIS's "all non-renewable fuels" emissions equate to 432 tonnes of carbon dioxide per GWh. This is an estimate of the current UK generating plant mix but may change over the lifetime of any project at Y Bryn.

317,883,000 kWh x 432g-CO_2/kWh = 137,325,456 kg /year. Figures all rounded to nearest 100.

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

There are 3 different site access points which are proposed for AIL's, Heavy Goods Vehicles (HGVs) and Light Goods Vehicles (LGVs) accessing and egressing from the site, details are shown on ES Figure 11.1. A further 3 potential access points; south of Maesteg golf club off an unclassified road, at Tŷ Maen off the A4107 at Bryn village via the 'Royal Oak' pub, were consulted on in public exhibitions in November 2021, but were dropped from consideration going forward in response to local feedback.

8.2.1. Access Point 1 – Purpose Built Diverge Slip Road from M4 for AIL Deliveries

Access Point 1 is located to the south of the south section of proposed development, this access point is for AIL deliveries only. AILs will exit the M4 via a purpose built diverge. Once unloaded the delivery vehicles will be reduced in size to HGVs and will exit the site from one of the alternative access points. No vehicles will exit the site from the proposed M4 diverge.

8.2.2. Access Point 2 – B4282

Access Point 2 is located on the B4282 between Bryn and Maesteg settlements, south of the north section of the proposed development, at this location it will be possible for construction traffic to access or egress the north section of the site.

Traffic to this access point will either travel from the M4 Junction 40 along Highway Link A and Highway Link B; or alternatively traffic will arrive from Highway Link C and Highway Link D.

8.2.3. Access Point 3 – Goytre Road

Highway Link E on ES Figure 11.1 has been assumed as the route to access point 3, located to the west of the south section of proposed development, this access point is for traffic entering or exiting the south section of the site and is the nearest access from the M4. Traffic exiting M4 Junction 40 will then travel along Dyffryn Road and Goytre Road before entering the site. This access point is assumed to be used for limited HGV/LGV deliveries due to the distance of the construction compound areas from the access point.

8.2.4. Assessment

Two scenarios for vehicle movements were assessed during the construction period:

- Scenario 1: Expected Construction. This scenario was based on the most likely construction methods, programme and sequencing. This scenario considered stone to be sourced on site and all foundation concrete would be produced at on-site batching plants, stone required for foundation concrete has been assumed to be imported..
- Scenario 2: Worst Case Construction. This scenario is a worst case scenario which assumes the top layer of stone would need to be imported onto site and all foundation concrete would be imported to site in ready mix lorries,

The total number of vehicle journeys during the 24-month wind farm construction period is anticipated to be approximately 47,576 for Scenario 1 and 56,146 for Scenario 2. The greatest number of journeys per day for Scenario 1 will be generated when importing material for onsite batching for turbine foundations, and for Scenario 2 when the tracks, crane pads and compounds are being constructed.

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

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.

It is expected that all stone for new track construction and existing track upgrades will be won from borrow pits identified onsite (however, worst case scenario (Scenario 2) for traffic volumes assumes importing the top layer of stone and this is assessed in Chapter 11: Traffic and Transport).

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 (86 m) distance buffer during the design process which was agreed with the PRoW officers from both NPTCBC and BCBC.

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, mountain biking and horse riding, as the NRW forestry is classed as open access under the Countryside Right of Way Act 2000.

During operation, there will be no restrictions to PRoW and the applicant has proposed a scheme of mitigation through appropriate condition wording for the North to South Dragon Ride, a recorded locally authority recognised route. The AMEP will seek to provide significant benefit to recreational resources during operation.

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 18 turbines with tip heights ranging from up to 206 m - 250 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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