Appendix A
Carbon Balance

1. Introduction

1.1.1 The 2017 Town and Country (Environmental Impact Assessment) (EIA) Regulations[1] require consideration of the impact of the Proposed Development on climate (for example the nature and magnitude of greenhouse gas (GHG) emissions) and the vulnerability of the Proposed Development to climate change (climate change resilience (CCR)).

1.1.2 This appendix reports on the carbon balance calculation that has been completed for the Proposed Development. The assessment determines the benefit of the Proposed Development in terms of reduced carbon emissions compared to a reference energy mix. This is considered in the context of carbon budgets and targets for Wales and the UK, aligned to a trajectory compatible with limiting the increase in global average temperature below 1.5°C. This includes consideration of GHG emissions in the production, transportation, erection, operation and decommissioning phases of the Proposed Development.

1.1.3 Given the inherent carbon benefit of wind farms, a standalone GHG Environmental Statement (ES) chapter is not required. Planning and Environmental Decisions Wales' (PEDW) Scoping Direction for the Proposed Development is in agreement with this approach. The Scottish Government Carbon Calculator Tool[2] has been used for the carbon balance calculation, in line with advice given by PEDW within Scoping Directions for other Welsh wind farms. The Carbon Calculator Tool is designed for applications for the construction and operation of onshore windfarms in Scotland located where peat is present. The calculated mean depth of recorded peat at the Proposed Development Site is 0.1 m (peat depths in the range of between 0.0 m and 0.4 m) and the Welsh Government define 'true peat' as being ≥0.4 m in depth. Despite 'true peat' not being present at the Site, the Carbon Calculator Tool has been used as it is considered to be the most reliable tool for estimating the carbon payback time associated with the Proposed Development.

1.1 Climate change resilience

1.1.4 As agreed with PEDW through the Scoping Direction, a standalone assessment of CCR has not been completed as part of the EIA. The projected impacts of climate change on the Proposed Development are considered in relevant sections of the following ES chapters:

- **Chapter 6: Landscape and Visual**;
- **Chapter 8: Biodiversity**;
- **Chapter 10: Water Environment**:
  - Flood Consequence Assessment (**Appendix 10A**).
- **Chapter 11: Ground Conditions**.

1.1.5 The design of the Proposed Development will consider climate projections for a variety of environmental parameters (e.g. rainfall, temperature, etc.) to ensure that appropriate

[1] *Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017* [online]. Available at: https://www.legislation.gov.uk/wsi/2017/567/contents [Accessed 15 August 2024].
[2] Scottish Environment Protection Agency (2020). *Carbon Calculator Tool v1.8.1* [online]. Available at: https://informatics.sepa.org.uk/CarbonCalculator/index.jsp [Accessed 15 August 2024].

mitigation measures are embedded within the design. The worst case climatic conditions at the end of the design life of the Proposed Development will be considered. Climate change impacts will be considered within the detailed design of the Proposed Development where appropriate.

1.1.6 The vulnerability to climate change measures are summarised in **Section 7: Climate change resilience.**

2. Renewable Energy Policy Context

2.1.1 **Chapter 5: Legislative and Policy Overview** provides an overview of the applicable renewable energy policy and strategies that the proposals should have regard to. This includes the relevant UK wide and Welsh legislative and policy framework for the development of renewable energy schemes. Current legislation, national policies, and local policy and guidance recognise climate change as a pressing concern. GHG emissions are expected and required to reduce in the future.

2.1.2 The approach taken by the UK and Wales to addressing climate change has been shaped and informed by a range of international agreements and climate change obligations including the Kyoto Protocol[3], the Paris Agreement[4] and the 2021 Glasgow Climate Compact[5] reflecting the UK's role as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC).

2.1.3 The UK Government has set a net zero target which requires the UK to reduce GHG emissions by 100% below 1990 levels by 2050[6], this being the UK position in terms of meeting international obligations to reduce carbon emissions. The UK carbon budgets[7] require the UK to continually reduce emissions in line with the net zero target. Wales is also committed to a net zero target for 2050, and has interim targets for 2030 and 2040, and a series of 5-year carbon budgets.[8]

[3] UNFCC (1998). *Kyoto Protocol* [online]. Available at: https://unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 15 August 2024].
[4] UNFCC (2015). *Paris Agreement* [online]. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf [Accessed 15 August 2024].
[5] UNFCC (2021). *Glasgow Climate Pact* [online]. Available at: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf [Accessed 15 August 2024].
[6] *The Climate Change Act 2008 (2050 Target Amendment) Order 2019* [online]. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made [Accessed 15 August 2024].
[7] *The Carbon Budgets Order 2009* [online]. Available at: https://www.legislation.gov.uk/uksi/2009/1259/contents/made [Accessed 15 August 2024].
[8] Welsh Government (2021). *Climate change targets and carbon budgets* [online]. Available at: https://gov.wales/climate-change-targets-and-carbon-budgets [Accessed 15 August 2024].

3. Scope and Receptors

3.1.1 The scope of the assessment of GHG emissions associated with the Proposed Development includes GHG emissions from all activities within the Site, arising from the construction, operation, maintenance and decommissioning phases, as well as the GHG emissions associated with material processing and transportation of materials and labour outside of the Site.

3.1.2 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global climate is the only receptor for the climate change assessment.

3.1.3 Given the global impacts of climate change and the globally recognised requirement to limit GHG emissions to maintain global average temperature increase below 1.5°C to 2°C, as laid out in the Paris Agreement[4], the receptor is considered highly sensitive to GHG emissions.

4. Potential Energy Contribution of the Proposed Development to Government Objectives

4.1 Energy Yield

4.1.1 The installed capacity of a wind turbine is a measure of its maximum rated output, which in the context of the Proposed Development is an estimated 29.4 MW (assuming 7 x 4.2 MW machines). Calculations of the likely electricity generation of the turbines are dependent on the 'capacity factor', which involves an assessment of the actual output of the Proposed Development against its installed capacity[9].

4.1.2 On this basis, and with an estimated installed capacity of 29.4 MW, the amount of electricity to be produced by the Proposed Development over its 30 year life cycle has been estimated to be 74.0 GWh per year based on the Welsh onshore wind capacity factor of 28.8% (average over the 5 years Q2 2019- Q1 2024)[10].

4.1.3 This 28.8% capacity factor has been used to calculate potential annual energy yield for the Proposed Development, shown in **Table 4.1**.

4.2 Carbon Dioxide Savings and Electricity Generation

4.2.1 It is widely accepted that electricity produced from wind energy has a positive benefit with regard to reducing carbon dioxide (CO_2) emissions. However, there has been much debate about the actual level of emissions savings that might arise from a wind farm development.

4.2.2 In estimating the actual saving it is important to consider the mix of alternative sources of electricity generation, for example, coal, oil and gas powered. Digest of UK Energy Statistics (DUKES) (July 2023) sets the static figure of emission related with electricity generated by 'all non-renewable fuels' at 424 tonnes of CO_2 for every GWh generated[11]. A figure of 424 tonnes of CO_2 savings per GWh has therefore been assumed for the purposes of this assessment, with savings of CO_2 estimated on the basis of the capacity factor.

4.2.3 The Department for Energy Security and Net Zero (formerly BEIS) produces a range of statistics detailing electricity consumption across the UK. The average domestic consumption in the Great Britain (GB), was 3,387 kWh per household in 2022[12].

[9] The net capacity factor of a wind farm is the ratio of its actual energy output (after energy losses within the wind farm have been accounted for) over a defined period of time (typically a year) to its energy output, had it operated at maximum power output continuously, over the same period of time.
[10] Department of Energy and Climate Change (2024) *Long term average figures for Wales and the UK - Energy Trends Section 6: Renewables (ET6.1 Renewable Electricity Capacity and Generation, July 2022. Capacity factor for UK* [online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437811/et6_1.xls [Accessed 15 August 2024].
[11] Renewable UK (2023). *Wind Energy Statistics Explained* [online]. Available at: https://www.renewableuk.com/page/UKWEDExplained [Accessed 15 August 2024].
[12] Department for Energy Security and Net Zero. (2024) *Regional and local authority electricity consumption statistics*. [online] Available at: https://www.gov.uk/government/statistics/regional-and-local-authority-electricity-consumption-statistics [Accessed 15 August 2024].

4.2.4 The electricity generated by the Proposed Development will enter the National Grid, and therefore cannot be tracked to the individual consumer. Therefore, it is relevant to consider electricity demand in the context of GB as a whole, rather than within the area surrounding the Proposed Development.

4.2.5 The potential electricity generation and 'Homes Equivalent' electricity generation (based on 3,387 kWh annual domestic consumption in the UK) are provided in **Table 4.1.** The potential CO_2 savings as a result of the Proposed Development generating electricity instead of conventional power stations, with an assumed 424 tonnes of CO_2 per GWh generated, are also presented.

Table 4.1 Potential electricity generation and CO_2 savings

Capacity factor (%)	Electricity generation (MWh per year)[13]	Homes equivalent (based on average consumption)[12]	CO_2 savings (Tonnes of CO_2 per year) based on Renewable UK savings figure[11]
28.8% (Welsh average)	74,200	21,900	31,500

[13] Figures are derived as follows: 29.4 MW × 8,760 hours/year × 0.288 (capacity factor) = 83,003 MWh.

5. Carbon Balance of the Proposed Development

5.1 Overview

5.1.1 The following sections outline the specific values for the carbon losses and carbon gains associated with the Proposed Development. For each input parameter (as outlined in **Annex A** to this document), an expected minimum and maximum value is required to provide an expected, minimum and maximum scenario for the carbon payback.

5.1.2 For this application, version 1.8.1 of the online Scottish Government Carbon Calculator Tool[2] was used on 20 August 2024, the reference number is not supplied in this document, but has been communicated separately to relevant consultees.

5.1.3 A table containing the values for each scenario and the justification for the values used for the carbon balance calculations is found in **Annex A.**

5.2 Carbon Losses

5.2.1 The manufacturing, construction and installation of the wind turbines, access tracks and all other onsite infrastructure at the Proposed Development has an associated carbon cost. Using figures from the online calculator, the expected carbon emission losses associated with the manufacture, construction and decommissioning of the seven turbines of 29.4 MW installed capacity, is 25,416 tCO_2 equivalent (tCO_2e), which equates to approximately 60% of total CO_2 losses.

5.2.2 The carbon payback model attributes carbon losses due to the requirement for extra capacity to back up wind power generation at times of peak demand. This is quantified as a percentage of total capacity, which was input as 5% for this case (the recommended figure within the model) and equates to 16,380 tCO_2e (i.e., approximately 38% of total CO_2 losses).

5.2.3 Carbon losses associated with CO_2 release from soil organic matter for the expected case amount to 522 t CO_2e which equates to approximately 1.2% of total CO_2 losses. These losses result from organic soil removal and drainage effects following excavation for items of infrastructure, notably turbine foundations, hard standing and access tracks. It is worth noting that this figure assumes 100% loss of CO_2 from removed/disturbed soil, as this is the default value within the carbon model and cannot be amended. The calculated mean depth of recorded peat at the Proposed Development Site is 0.1 m (peat depths in the range of between 0.0 m and 0.4 m). 'True peat' is defined as a thickness of 30 to 40cm by the Welsh Government and the LQAS.

5.2.4 Although no true peat is being disturbed small carbon losses are generated by the reduction of carbon fixing potential as a result of wind farm construction which occurs due to the loss of bog plants that may be present in the organic soils. For the expected case, this is 427 tCO_2e, which equates to 0.9% of total carbon dioxide losses.

5.2.5 Total CO_2 losses due to the Proposed Development are 42,685 tCO_2e.

5.3 Carbon Gains

5.3.1 There are no carbon gains associated with the Proposed Development.

6. Carbon Payback of the Proposed Development

6.1.1 To calculate the carbon payback period, the online calculator uses three different fossil fuel displacement scenarios, which are updated automatically using data from DUKES:

- Grid mix, the mix of electricity sources supplying the UK as a whole;
- Coal fired for coal fired electricity generation; and
- Fossil fuel mix for fossil fuel sourced electricity generation alone.

6.1.2 The carbon calculator[14] recommends using the fossil fuel sourced grid mix scenario as the most appropriate for calculating the carbon payback time (the counterfactual)[15]. Based on this scenario, the payback for the Proposed Development is predicted to be 1.4 years for the expected outcome.

6.1.3 The payback period could be as low as 0.6 years for the minimum scenario but increases to 1.9 years for the maximum scenario for fossil fuel mix and 4.0 years for grid mix. The carbon payback time for each scenario is shown in **Table 6.1**.

Table 6.1 Payback in years for each scenario used in the carbon calculator

Fuel source	Carbon payback time (years) Expected value	Carbon payback time (years) Minimum value	Carbon payback time (years) Maximum Value
Coal fired	0.6	0.3	0.9
Grid mix	2.8	1.4	3.9
Fossil fuel mix	1.4	0.7	1.9

[14] Scottish Environment Protection Agency (n.d.) *Carbon Calculator: technical guidance* [online]. Available at: https://www.gov.scot/publications/carbon-calculator-technical-guidance/ [Accessed 20 August 2024].
[15] Note on limitations: wind power will not replace all forms of conventional generation equally, so the true carbon emissions displacement will be dependent on a combination of factors e.g. the types of power generation being replaced, any decrease in efficiency of conventional plant operating at part load, and the impact of any increase in frequency of start-up and shut-down of conventional plant.

7. Climate change resilience

7.1.1 The vulnerability of the Proposed Development to climate change has been considered in the design and other relevant topic chapters listed in **Section 1.1.** The environmental measures identified in topic assessments related to improving the climate change resilience of the Proposed Development have been reproduced in **Table 7.1.**

Table 7.1 Embedded measures improving climate change resilience

Chapter	Environmental measure	Relevance for climate change resilience
Chapter 4 Project Description	Modern wind turbines are designed to withstand high wind speeds and are normally certified against structural failure for wind speeds up to 150mph. At high wind speeds, the wind farms will shut themselves down to avoid excessive wear.	These measures increase the resilience of the wind turbines to increasing wind speeds that may be experienced as part of storm events associated with climate change.
	The wind turbines will be fitted with a lightning protection system as part of the design.	These measures increase the resilience of the wind turbines to increasing lightning strikes that may be experienced associated with climate change.
	Occasionally very heavy snow and ice may affect the anemometer or aerodynamics of the turbine blades resulting in temporary automatic shutdown. The wind turbine would restart automatically after accumulations have naturally thawed.	Although climate change trends show increasing mean annual temperatures, cold weather events could still occur. These measures increase the resilience of the wind turbines to cold weather events.
	Turbines and High Voltage equipment (substation) would be inspected and maintained by a local team of technicians. Turbines would be typically maintained at 6 monthly internals.	This allows for adaptative capacity to be built into the operation of the wind turbines. The routine maintenance would identify any impacts to the wind turbines from extreme weather associated with climate change, allowing for replacement or upgrades, if required.
Chapter 6 Landscape and Visual **Chapter 8 Biodiversity**	Hedgerow and habitat loss has been kept to a minimum and largely confined to improved grassland, semi-improved grassland and areas of bracken. These temporary losses associated with working areas will be revegetated and reinstated post-construction. Where vegetation removal takes place within the Sites of Importance for Nature Conservation (SINC), the outline	The landscape proposals are confined to grassland reinstatement of species considered tolerant of broad environmental conditions. Higher temperatures as a result of climate change could encourage bracken to dominate, however the objectives of the oLEMP are to achieve enhancement of the

Chapter	Environmental measure	Relevance for climate change resilience
	Landscape and Ecology Management Plan (oLEMP) sets out management proposals to improve the status of the sites.	SINCs on site through effective management of bracken.
Chapter 10 Water environment	The temporal scope of the hydrology assessment will consider NPS EN-1 climate change emissions scenarios appropriate for the Proposed Development's lifetime.	Flood risk is considered to pose a limited risk to the Proposed Development. See full Flood Consequence Assessment for further detail (**Appendix 10A**)
Appendix 10A Flood Consequence Assessment	The drainage strategy has incorporated climate change uplifts of 20% and 40% to account for increased rainfall intensity due to climate change, for the construction and operational phases of the project, respectively. A suite of sustainable drainage systems (SuDS) have been proposed to manage runoff from the new areas of hardstanding associated with the development.	The drainage design and sizing of SuDS to appropriately account for climate change will help prevent damage or deterioration to the assets resulting from extreme precipitation and the action of pluvial flooding.
Chapter 11 Ground conditions	The design for the Proposed Development will comply with good practice in structural design including compliance with the Eurocodes and relevant British Standards. The design will account for the expected ground conditions and design loads, accounting for the effects of climate change.	The detailed design of the foundations and supports will take into account changing ground conditions for the soil type with fluctuations in rainfall anticipated with climate change.

8. Summary

8.1.1 On the basis of potential annual CO_2 savings of 31,500 tonnes/year (based on figure of 424 tonnes of CO_2 savings per GWh and a capacity factor of 28.8%), the Proposed Development could result in a total carbon saving of approximately 1.1 M tonnes over its 30-year operational life and generate electricity to annually supply the equivalent of 21,900 homes.

8.1.2 It is predicted that the carbon loss in developing the Proposed Development would be paid back in ~1.4 years (4.6% of the 30-year operational life) based upon the expected outcome under the fossil fuel mix scenario. Even considering the maximum scenario against the fossil fuel mix, the Proposed Development would have achieved the carbon balance within ~1.9 years (6.3% of the 30-year operational life).

8.1.3 It is concluded that the GHG impact of the Proposed Development will have a significant beneficial effect. The Proposed Development causes an indirect reduction in atmospheric GHG emissions which has a positive impact on achievement of carbon budgets and targets for Wales and the UK, and a 1.5°C compatible trajectory.

8.1.4 The vulnerability of the Proposed Development to climate change has been addressed throughout the ES in relevant topic chapters identified in **Section 1.1**. The design of the wind turbines includes measures to improve the resilience of the Proposed Development, which will continue to be developed throughout the detailed design.

Annex A
Carbon Calculator - Justification for Values Used

For this application, version 1.8.1 of the online calculator was used on 15/08/2024, the reference number is not supplied in this document, but has been communicated separately to Pennant Walters Ltd and relevant consultees. A table containing the values for each scenario and the justification for the values used for the carbon balance calculations is found below.

Input data	**Mynydd Llanhilleth Wind Farm (Revised Development)**			**Comments/Assumptions**
	Expected	**Minimum**	**Maximum**	
Wind Farm Characteristics				
Dimensions				
No. of turbines	7	7	7	Chapter 4 - Description of the Proposed Development.
Lifetime of wind farm (years)	30	30	30	Chapter 4 - Description of the Proposed Development.
Power rating of turbines	4.2	4.2	4.2	Chapter 4 - Description of the Proposed Development.
Capacity factor	28.8%	26%	31.7%	Chapter 4 - Description of the Proposed Development. No site specific capacity factor available. Welsh average onshore capacity factor for the last 5 years have been used. UK average onshore capacity factor has been used for the minimum and maximum has been placed as 10% higher that the Welsh average
Extra capacity required for back up	5%	5%	5%	Following the guidance provided by Nayak et al (2013)[16] and the carbon calculator a 5% back up is required.
Additional emissions due to thermal inefficiency of back up generation (%)	10%	10%	10%	Extra emissions due to reduced thermal efficiency of the reserve power generation = 10% (Dale et al 2004)[17].
Carbon dioxide emissions from turbines' life	Calculate w.r.t installed capacity			Total CO_2 emission calculated using installed capacity (default equation provided by carbon calculator).
Peatland Characteristics before wind development				

[16] Nayak, D.R., Miller, D., Nolan, A., Smith, P., Smith, J. 2008 (corrected in 2010) Calculating Carbon Savings form Wind Farms on Scottish Peat Lands – a New Approach, available at: : http://www.gov.scot/Resource/Doc/917/0117390.pdf
[17] Royal Academy of Engineering 2014 Wind Energy, implications of large-scale deployment on the GB electricity system, available at: http://www.raeng.org.uk/publications/reports/wind-energy-implications-of-large-scale-deployment

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Type of peatland	Acid bog	Acid bog	Acid bog	An 'acid bog' is fed primarily by rainwater and often inhabited by sphagnum moss, thus making it acidic. See Stoneman & Brooks (1997)
Average annual air temperature at site (°C)	9.25	5.8	12.7	Average annual temperature taken for Tredegar, Met Office station 1991-2020. Expected value calculated using average of minimum and maximum average temperatures.
Average peat depth at site (m)	0.1	0	0.4	"Mynydd Llanhilleth Wind Farm - Peat Depth Survey Report: potential peat depths in the range of between 0.00m and 0.40m. The calculated mean depth of recorded peat was <0.1m. The Welsh Government define true peat as being >0.4m in depth.
Content of dry peat % by weight	55	49	62	Expected value calculated using the average depth from all onsite infrastructure and average tracks depth measurements. Minimum and maximum values chosen as a 20% range.
Average extent of drainage around drainage features at site (m)	7.5	5	10	Calculated using typical values provided in carbon calculator tool.
Average water table depth at site (m)	0.3	0.2	0.4	No site-specific measurements available, precautionary values used.
Dry soil bulk density (gcm^{-3})	0.25	0.2	0.3	No site-specific values available. Values taken from a similar upland site with underlying peat.
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	3	2	5	Estimated values, based on condition of the current vegetation.
Carbon accumulation due to C fixation by bog plants in undrained peat ($tC\ ha^{-1}\ yr^{-1}$)	0.25	0.12	0.31	Default values provided by Turunen et al., 2001[18]; Botch et al., 1995[19].
Forestry Plantation Characteristics				
Method: Enter simple data				
Area of forestry plantation to be felled (ha)	0	0	0	Chapter 4 - description of the Proposed Development: no forestry felling expected.
Average rate of carbon sequestration in timber	0	0	0	Chapter 4 - description of the Proposed Development: no forestry felling expected..
Counterfactual emission factors				

[18] Turunen J., Tahvanainen T., Tolonen K. and Pitkänen A. 2001 Carbon accumulation in West Siberian mires, Russia. Global Biogeochemical Cycles 15: 285-296.
[19] Botch M.S., Kobak K.I. Vinson T.S. and Kolchugina T.P. 1995 carbon pools and accumulation in peatlands of the former Soviet Union. Global Biogeochemical Cycles 9: 37-46

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Coal-fired plant emission factor tCO_2MWh^{-1}	0.945	0.945	0.945	Values provided automatically by online calculator, updated annually based on DUKEs[20].
Grid mix emission factor tCO_2MWh^{-1}	0.207	0.207	0.207	Values provided automatically by online calculator, updated annually based on DUKEs[20].
Fossil fuel mix emission factor tCO_2MWh^{-1}	0.424	0.424	0.424	Values provided automatically by online calculator, updated annually based on DUKEs[20].
Borrow Pits				
Number of Areas	0	0	0	"No Borrow pits (confirmed by client). Chapter 4 - Description of the Proposed Development."
Average length of area (m)	0	0	0	"No Borrow pits (confirmed by client). Chapter 4 - Description of the Proposed Development."
Average width of areas (m)	0	0	0	"No Borrow pits (confirmed by client). Chapter 4 - Description of the Proposed Development."
Average depth of peat removed from area (m)	0	0	0	"No Borrow pits (confirmed by client). Chapter 4 - Description of the Proposed Development."
Access tracks				
Total length of access tracks (m)	9,800	8,820	10,780	Chapter 4 - Description of the Proposed Development. Internal wind farm tracks. Min and max values are -/+ 20% of expected values.
Existing tracks length (m)	5,800	5,220	6,380	Chapter 4 - Description of the Proposed Development. Internal wind farm tracks. Min and max values are -/+ 20% of expected values.
Length of access tracks that is floating road (m)	0	0	0	N/A
Floating road width (m)	8	0	0	N/A
Floating road depth (m)	0	0	0	N/A
Length of floating road that is drained (m)	0	0	0	N/A
Average depth of drains associated with floating roads (m)	0	0	0.5	N/A
Length of access track that is excavated road (m)	4,000	3,600	4,400	Chapter 4 - Description of the Proposed Development. Internal wind farm tracks. Min and max

[20] Department for Energy Security and Net Zero (2023). Digest of UK Energy Statistics. Available at: https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
				values are -/+ 20% of expected values.
Excavated road width (m)	5	5	5	Chapter 4 - Description of the Proposed Development. Internal wind farm tracks. Min and max values are -/+ 20% of expected values.
Average depth of peat excavated from road (m)	0.1	0	0.4	Chapter 4 - Description of the Proposed Development. Internal wind farm tracks. Min and max values are -/+ 20% of expected values. Although road depth is expected to be 0.6m, the average peat depth of roads is only 0.1m and so this value has been used
Length of access track that is rock filled road (m)	0	0	0	EIA Report Chapter 4 - Description of the Proposed Development. Assumed that road on peat depth <1m is peat excavated and hence there is no rock filled road.
Rock filled road width (m)	0	0	0	N/A
Rock filled road depth (m)	0	0	0	N/A
Length of rock filled road that is drained (m)	0	0	0	N/A
Average depth of drains associated with rock filled roads (m)	0	0	0	N/A
Cable Trenches				
Length of any cable trench on peat that does not follow access track and is lined with a permeable material (m)	0	0	0	Assume full length of cable route to follow access track.
Depth of cable trench (m)	1.00	0	1.00	"Mynydd Llanhilleth Wind Farm - Peat Depth Survey Report: potential peat depths in the range of between 0.00m and 0.40m. The calculated mean depth of recorded peat was <0.1m. The Welsh Government define true peat as being >0.4m in depth.
Additional peat excavated (not accounted for above)				
Volume of additional peat excavated (m^3)	381	0	1830	"Mynydd Llanhilleth Wind Farm - Peat Depth Survey Report: potential peat depths in the range of between 0.00m and 0.40m. The calculated mean depth of recorded peat was <0.1m. The Welsh Government define true peat as being >0.4m in depth.
Area of additional peat excavated (m^2)	3,813	3,050	4,575	Chapter 4- Description of the proposed development substation compound (37.5m x 35m) and construction compound (50m x 50m). Minimum and Maximum

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
				entered as a 20% range to allow for variations.
Peat Landslide hazard				
Peat landslide hazard risk assessment	Negligible	Negligible	Negligible	Fixed value.
Improvement of C sequestration at site by blocking drains, restoration of habitat etc.				
Improvement of degraded bog				
Area of degraded bog to be improved (ha)	n/a	n/a	n/a	No bog restoration works proposed.
Water table depth in degraded bog before improvement (m)	n/a	n/a	n/a	n/a
Water table depth in degraded bog after improvement (m)	n/a	n/a	n/a	n/a
Time required for hydrology and habitat of bog to return to its previous state on restoration (years)	n/a	n/a	n/a	n/a
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	n/a	n/a	n/a	n/a
Improvement of felled plantation				No improvement of felled plantation proposed.
Area of felled plantation to be improved (ha)	n/a	n/a	n/a	n/a
Water table depth in felled area before improvement (m)	n/a	n/a	n/a	n/a
Water table depth in felled area after improvement (m)	n/a	n/a	n/a	n/a
Time required for hydrology and habitat of felled plantation to return to its previous state on restoration (years)	n/a	n/a	n/a	n/a
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	n/a	n/a	n/a	n/a
Restoration of peat removed from borrow pits				
Area of borrow pits to be restored (ha)	0	0	0	Chapter 4 – Description of the proposed development: No borrow pits expected

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0	0	0	
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0	0	0	
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	0	0	0	
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	0	0	0	
Removal of drainage from foundations and hardstanding				
Water table depth around foundations and hardstanding before restoration	0	0	0	Assume no removal of drainage.
Water table depth around foundations and hardstanding after restoration	0	0	0	Assume no removal of drainage.
Time to completion of backfilling, removal of any surface drains and full restoration of the hydrology (years)	0	0	0	Assume no removal of drainage.
Restoration of site after decommissioning				
Will you attempt to block any gullies that have formed due to the wind farm?	Yes	Yes	No	Assumes that any gullies caused by construction of the wind farm would be blocked to maintain habitats except worst case scenario (maximum column).
Will you attempt to block all artificial ditches and facilitate rewetting?	No	No	No	No
Will the habitat of the site be restored on decommissioning				
Will you control grazing on degraded areas?	Yes	Yes	Yes	If required.
Will you manage areas to favour reintroduction of species	No	No	No	No
Construction Input Data				
Area 1 - Construction Input Data for turbines in organic matter <0.5m deep				

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Number of turbines in this area	7	7	7	Chapter 4 - Description of the Proposed Development.
Turbine foundations				
Depth of hole dug when constructing foundations	0.1	0	0.4	"Mynydd Llanhilleth Wind Farm - Peat Depth Survey Report: potential peat depths in the range of between 0.00m and 0.40m. The calculated mean depth of recorded peat was <0.1m. The Welsh Government define true peat as being >0.4m in depth.
Approximate geometric shape of hole dug when constructing foundations	circular	circular	circular	Chapter 4 - Description of the Proposed Development: Circular
Length at surface (m)	20	20	20	
Width at surface (m)	20	20	20	
Length at bottom (m)	20	20	20	
Width at bottom (m)	20	20	20	
Volume of concrete used in the entire area (m3)	3,859	3,087	4,630	Chapter 4 - Description of Proposed Development: This is the total volume of concrete used for crane pads, hardstanding areas and turbine foundations. for Estimated total tonnage of concrete 9187. Amount: 1 tonne (Metric) (t) of mass Equals: 0.42 cubic meters (m3) in volume. 20% variation used for min and max values.
Hardstanding – Crane pads				
Depth of hole dug when constructing hardstanding	0.1	0	0.4	"Mynydd Llanhilleth Wind Farm - Peat Depth Survey Report: potential peat depths in the range of between 0.00m and 0.40m. The calculated mean depth of recorded peat was <0.1m. The Welsh Government define true peat as being >0.4m in depth.
Approximate geometric shape of hole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	
Length at surface (m	50	50	50	Chapter 4 - Description of the Proposed Development: Rectangular
Width at surface (m)	50	50	50	

Input data	Mynydd Llanhilleth Wind Farm (Revised Development)			Comments/Assumptions
	Expected	**Minimum**	**Maximum**	
Length at bottom (m)	50	50	50	
Width at bottom (m)	50	50	50	
Is piling used?	No	No	No	Piling not likely to be used.