atmos CONSULTING

61253

Environmental Impact Assessment Report

Cummeennabuddoge Wind Farm

Chapter 3: Design Evolution and Consideration of Alternatives

Cummeennabuddoge Wind (DAC)

September 2024

Contents

Contents

Tables

Figures

List of Technical Appendices

None

Glossary of Terms

Term	Definition
The Applicant	Cummeennabuddoge Wind Designated Activity Company (DAC)
The Agent	Atmos Consulting Limited
Environmental Advisors and Planning Consultants	Atmos Consulting Limited
Environmental Impact Assessment	A means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development
Environmental Impact Assessment Regulations	Schedule 6 of the Planning and Development Regulations 2001(as amended)
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations
The Proposed Development	Cummeennabuddoge Wind Farm
The Proposed Development Site	The land enclosed by the red line shown on Figure 1-1a
The Planning Act	Directive 2011/92/EU (as amended by Directive 2014/52/EU, the EIA Directive).

List of Abbreviations

Abbreviation	Description
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FEI	FutureEnenrgy Ireland
FoS	Factor of Safety
GIS	Geographical Information Spatial
NIAH	National Inventory of Architectural Heritage
NHA	Natural Heritage Area
PNHA	Proposed Natural Heritage Area
RMP	Record of Monuments and Places
RESS	Renewable Electricity Support Scheme
SAC	Special Area of Conservation
SPA	Special Protection Area
ZTV	Zone of Theoretical Visibility

3 Design Evolution and Consideration of Alternatives

3.1 Introduction

This Chapter of the EIAR presents a description of the reasonable alternatives that were studied by the Applicant which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment, in accordance with Article 5(1) of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended (the 'EIA Directive', European Commission 2011, 2014).

In accordance with Annex IV (2) of the EIA Directive This includes:

> *"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".*

3.2 Do-nothing Alternative

An alternative land-use option to the development of a renewable energy project at the Proposed Development Site would be to leave the site as it is, with no changes made to existing land-use practices. As such, commercial forestry operations would continue at the site.

A comparison of the potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of developing a renewable energy project at this site are presented in Table 3-1.

Table 3-1: Comparison of environmental effects of alternative land-use option when compared against the Proposed Development

Environmental Consideration	Do Nothing Scenario (existing land use continue)
Population & Human Health (incl. Shadow Flicker)	No increase in local employment and no long-term financial contributions towards the local community. No potential for shadow flicker to affect sensitive receptors. No offset of emissions from fossil fuel energy generation, which are harmful to human health.
Biodiversity	No habitat loss
Land, Soils & Geology	Peat extraction avoided
Geotechnical/Peat Stability	Neutral
Water (Hydrology & Hydrogeology)	Neutral
Air & Climate	No opportunity for a reduction of greenhouse gasses. No contribution towards achieving the renewable energy targets set out in the Climate Action Plan.
Noise & Vibration	Potential for increased noise impacts on nearby

Environmental Consideration	Do Nothing Scenario (existing land use continue)
	sensitive receptors avoided.
Landscape & Visual	Landscape and visual impacts avoided.
Cultural Heritage & Archaeology	No potential for impacts on unrecorded, subsurface archaeology.
Material Assets (including transport and telecommunications)	Avoidance of impacts due to windfarm construction traffic

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant renewable energy resource would be lost, as would the opportunity to contribute to Government and EU targets for the production of electricity from renewable resources and the reduction of greenhouse gas emissions (See Chapter 1).

The opportunity to generate local employment, local authority development contributions, rates and investment in the local area would also be lost.

On the basis of the positive environmental effects arising from the project as demonstrated by the carbon offset by the operation of the Proposed Development as quantified in Chapter 12 Air and Climate, when compared to the do-nothing scenario, the do–nothing scenario was not selected to proceed with.

The Proposed Development is not seen as detrimental to the surrounding existing land use and commercial forestry operations in the wider area.

3.3 Strategic Site Screening

The project Developers, FEI and SSE, continuously examine the lands under their stewardship and otherwise for candidate sites for wind energy development.

In 2014, Coillte's Renewable Energy Development Team, which became FEI in 2021, undertook a detailed screening process, through Geographical Information Spatial software (GIS), using a number of criteria and stages to assess the potential of a large number of possible sites, on lands within its stewardship (c. 441,000 hectares), suitable to accommodate a wind energy development.

The GIS database drew upon a wide array of key spatial datasets such as forestry data, ordnance survey land data, house location data, transport, existing wind energy and grid infrastructure data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time.

The following is a summary of the methodology used in this screening process.

3.3.1 Phase 1 - Initial Screening

This stage in the selection process discounted lands that were not available for development under a number of criteria, as follows:

- Committed Lands for other developments;
- Millennium Sites (This is a Coillte environmental designation – these sites were planted and managed for provision of a tree for every household in the country as part of the Millennium tree planting project);
- Life Site (This is a Coillte environmental designation – these former forested sites were cleared and are managed for biodiversity);

- Wild Nephin Properties (This is a Coillte designation. Since 2014 these properties have been incorporated into National Parks);
- Farm Partnerships and Leased Lands;
- National Parks; and
- Sites in a Natura 2000 and Nationally Designated Sites (SAC, SPA, NHA, pNHA)

Lands where the average wind speed at 80 metres above ground level is less than 7 m/s and, therefore, potentially not suitable for a commercially viable wind energy development were also discounted at this stage. In addition, sites with a contiguous area of less than 300 hectares were discounted.

3.3.2 Phase 2 – Grid Constraints

The electricity transmission system is the backbone of the nation's power system, efficiently delivering large amounts of power from where it is generated to where it is needed. As part of the site selection process, it was necessary to consider the potential for grid connection, including in terms of distance to potential connection nodes and the grid capacity at the nodes, in the local area, to accommodate the connection.

3.3.3 Phase 3 – Screening

The next stage of screening out lands from further analysis was due to the presence of the following:

- Sensitive Amenity or Scenic Areas designation in CDPs (at the time of the screening process);
- Tourist areas/sites/trails;
- Lands utilised for other wind farm developments;
- Telecommunications masts and links
- Sensitive habitat/species of bird;
- Land Ownership title Issues;
- Relatively high residential density in vicinity; and
- Unfavourable slopes and ground conditions.

This stage of screening was generally applied using in-house expertise and local knowledge and was subsequently validated externally in terms of the engineering considerations and the likelihood of obtaining a successful grant of planning permission based on industry trends in 2014.

3.3.4 Results of the Screening Process

A screening process was conducted across the country in 2014 and again in 2017 which identified a number of suitable sites, which were then taken forward for detailed assessment. As these sites have all been brought forward to planning (or are in that process), and are subject to EIA, a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts, are provided in the EIAR accompanying the applications for same.

Sites that emerged from the 2014 site selection process, outlined above, for which planning applications have been submitted are as follows:

- Croagh, County Leitrim;
- Carrownagowan, County Clare;
- Glenard, County Donegal;
- Bottlehill (Coom), County Cork; and
- Castlebanny, County Kilkenny.

As such, a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regard to their environmental impacts, is provided in the EIAR accompanying the planning application for each project.

In 2017, Coillte once again examined the lands under its stewardship for candidate sites for wind energy development using the same site selection process as described above, but this time, reducing the required contiguous site area from 300ha to 50ha.

The proposed sites that emerged from this process are:

- Ballinagree Co. Cork;
- Croaghaun, Co. Carlow;
- Gortyrahilly, Co. Cork;
- Inchamore Co. Cork; and
- Lissinagroagh, Co. Leitrim.

Similar to the sites which emerged in 2014; these sites which emerged in 2017 are projects in their own right which are/will be subject to EIA.

As such, a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts, is/will be provided in the EIAR accompanying the applications for same.

As stated above, Coillte conducted two reviews of its land in recent years in which it examined candidate sites for wind energy development. However, as also stated above FEI continuously assesses lands for wind opportunities and other sites also emerge periodically.

SSE also regularly undertakes similar screening exercises to identify sites with wind farm potential. SSE applied for planning permission for this site in 2010, which was subsequently refused planning permission by Kerry County Council in the same year. Since this time, additional studies were undertaken relevant to the reasons for refusal. The site was ultimately selected for development on the basis of:

- A viable connection to the electricity grid in close proximity to the Site;
- Favourable wind speed;
- The topography of the site having the potential to restrict visibility and limit impacts on landscape and visual receptors; and
- A review of the planning history indicating that a design could be developed that did not significantly affect the qualifying features of the nearby Macgillycuddy's Reeks and Caragh River Catchment SAC and the Loch Leane catchment.

In our continuous review of the portfolio, other sites which have also emerged are as follows:

- Knockshanvo wind farm; and
- Scart Mountain wind farm.

Each are projects in their own right which are/will be subject to EIA. As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts has/will be provided in the EIAR accompanying the applications for same.

It should be noted that FEI continuously assess lands for wind opportunities, on its own and in conjunction with other developers. Sites previously identified or not progressed for various reasons, including local county development wind designations or commercial viability, have been and will be brought forward as circumstances evolve. Such circumstances may include an increased national ambition for onshore wind development, changes on foot of cyclical review/updates to local wind energy policies in county development plans, or third-party lands becoming available and resulting in new commercial opportunities/joint venture projects.

3.4 Alternative Technologies

After site selection was carried out and the Proposed Development Site had been selected, a review of potential suitable alternative renewable technologies was undertaken.

The review identified solar photovoltaic generation as being the only other likely candidate to wind generation that could meet the objectives of the project.

However, solar energy production requires a substantially larger land-take and would result in considerable changes to existing forestry practices.

Typically, solar farms require 1.5-2ha of photovoltaic arrays (panels) per MW (Teagasc, 2023). Therefore, approximately 145.35ha to 153ha is estimated to be required at minimum for a solar farm. This compares to approximately 19.2ha associated with the proposed turbines and hardstand areas for the Proposed Development (See Chapter 4 - Description of Development).

Moreover, a solar energy project would not generate renewable electricity in a similarly efficient manner as a wind energy development.

The Renewable Electricity Support Scheme (RESS) High Level Design (Government of Ireland 2020) considers that onshore wind has a generating capacity of 31% while solar PV has a capacity factor of 11%; thus illustrating the substantially greater efficiencies offered by onshore wind energy developments compared to solar energy developments.

This would result in increased environmental impacts such as impacts upon land use, increased felling requirements, geology, hydrology, and ecological impacts. This is shown in Table 3-2.

Accordingly, no other form of renewable energy technology has been considered through the design process.

Table 3-2: Environmental effects of Solar Photovoltaic relative to the Proposed Development

Constraint	Comment
Population and Human Health	Significantly impact on land use change due to increased infrastructure footprint. Potential for visual impact due to glint and glare
Landscape and Visual	Reduced landscape and visual impact at greater distances. Potential for increased impact in closer proximity
Traffic and Transport	Greater impact on traffic during construction phase due to the requirement for more construction materials. Reduced impact due to abnormal loads as no abnormal loads would be required
Biodiversity	Greater habitat loss due to larger infrastructure footprint
Ornithology	Reduced risk of collision in absence of turbines. Loss of habitat for ground nesting birds
Soils and Geology	Neutral
Hydrology and Hydrogeology	Greater potential for silt laden runoff due to the larger area of infrastructure required. Potential for greater impacts on water courses due to larger forestry felling required.
Air and Climate	Reduced benefit on climate due to lower generation efficiency
Noise	Neutral. Noise from inverters instead of noise from turbines
Cultural Heritage	Greater potential for impact on unrecorded cultural heritage assets due to larger infrastructure footprint
Material Assets	Potential for impact on aviation due to glint and glare
Risks and Major Accidents	Neutral

3.5 Design Evolution

The design of the Proposed Development has been driven by the objective of positioning the turbines and associated infrastructure so that it captures the maximum wind energy possible whilst ensuring the minimum environmental impact possible. This starts with a theoretical layout based on the maximum number of turbines that can be fitted onto an area of land.

This layout is then modified in an iterative three-stage process taking into account constraints identified through desktop analysis and fieldwork and other parameters including grid connection and access.

The key constraints to site design, which were assessed and informed the design of the Proposed Development, include:

- Ground conditions, topography and peat;
- Proximity to noise sensitive receptors;
- Presence of and proximity to watercourses;
- Presence of sensitive biodiversity receptors;
- Presence of sensitive cultural heritage features; and
- Presence of and proximity to existing infrastructure such as dwellings, telecommunication links, other wind farms, substations and electrical cables.

These constraints are discussed further below, in addition to their relevant chapters.

In developing the final layout of the Proposed Development the recommendations and guidelines set out in the 'Wind Energy Development Guidelines' (Department of the

Environment, Heritage and Local Government, 2006) and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012) have been followed.

The design and layout of the Proposed Development also accords with the proposed changes to the development management standards associated with onshore wind energy developments outlined in the Draft Revised Wind Energy Development Guidelines, December 2019.

3.5.1 Design Iteration 1 / Scoping Layout

Constraints mapping

The first design of the Proposed Development was informed by a desk-based constraints mapping process. This included:

- An initial review of Ecological baseline conditions and potential impacts;
- An initial review of Landscape and Visual baseline conditions and potential impacts;
- An initial review and appraisal of the historic environment of the site and surrounding area, including historical landscapes and cultural heritage assets;
- Location of residential receptors;
- Location of watercourses; and
- Location of cumulative turbines.

Once constraints were identified, buffers (separation distance) around different types of constraints were calculated to identify the areas within which no turbines would be placed where possible.

The size of the buffer zone for each constraint has been assigned using standards presented in the wind energy guidance documents (2006, 2012 and 2019). For the purpose of the initial constraints study, a rotor diameter of 162m (81m blade length), and tip height of 200m was assumed.

The constraints maps for the site encompasses the constraints and associated buffers on Table 3-3.

Table 3-3: Constraints and associated buffers applied to compile Design Iteration 1

Constraint	Calculation / rationale of Buffer	Buffer distance (m)
Residential dwellings	4 x tip height (200m) separation distance	800m
Watercourses	50m buffer + extra 10m due to generalisation of Environmental Protection Agency rivers dataset	60m
Consented Knocknamork Wind Farm and Solar Array cabling	Two potential routes for the cabling identified (see Figure 3-1). Buffer allows for either to be development	25m
Oversail onto private lands	To avoid turbine blade oversail of neighbouring properties. Oversail of neighbouring Coillte land parcels has been agreed so this buffer only applies to the northern and southern site boundaries where third party landowners are adjacent	81m
Turbine Separation from approved and consented	An ellipsis of 7 x 3 at 240° (7 x rotor diameter for prevailing wind; 3 x rotor diameter for non-prevailing wind)	1,134m Prevailing wind and

Constraint	Calculation / rationale of Buffer	Buffer distance (m)
turbines		486m non prevailing wind
Topography (slope)	Areas of 12-14% slope should be avoided and slope above 14% were excluded	
National monuments	Record of Monuments and Places (RMPs) and National Inventory of Architectural Heritage (NIAH) sites include statutory zones of notification (50m buffer zones) under Section 12 of the National Monuments Act,	50m
Garrow Substation	Risk of damage from turbine fall over. Safety margin of 2 x maximum x tip height (200m) + 10%	420m

Turbines

At this early stage of design, consideration to the size of the potential turbines was given, taking into account that larger turbines produce a smaller footprint per MW. This in turn can produce a reduced likelihood of significant environmental effects; particularly in respect of likely landscape, noise and shadow flicker impacts.

Larger wind turbines typically have greater generating capacities and increased capacity factor. As a result, larger turbines are able to generate substantially more energy than their smaller turbine counterparts, thus contribute more towards Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions.

The first design of the Proposed Development consisted of 19 wind turbines with a rotor diameter of 162m and tip height of up to 200m. The size of the turbines was informed by consideration of the topography and initial Zone of Theoretical Visibility (ZTV) modelling.

This initial turbine layout was used for scoping and consultation purposes and is shown in Figure 3-2.

A comparison of the environmental effects of a larger number of smaller turbines against DI1 of the Proposed Development is shown below.

Table 3-4: Environmental Effects of a Larger Number of Smaller Turbines Compared to Design Iteration 1

Constraint	Comment
Population and Human Health	Greater impact on land use changed due to increased infrastructure footprint Greater scope for shadow flicker but over a shorter distance
Landscape and Visual	Maximum visibility distance may be less, however, the overall impact on landscape and visual would be greater due to larger number of turbines
Traffic and Transport	Greater impact on traffic during construction phase due to the requirement for more construction materials and turbine components
Biodiversity	Greater habitat loss due to larger infrastructure footprint
Ornithology	Greater potential for impacts on birds due to larger number of turbines
Soils and Geology	Greater impacts on peat due to larger excavation volumes required for larger infrastructure footprint

Constraint	Comment
Hydrology and Hydrogeology	Greater potential for silt laden runoff due to the larger area of infrastructure required. Potential for more watercrossings to facilitate access to the larger number of turbines. Potential for greater impacts on water courses due to larger forestry felling required.
Air and Climate	Greater release of dust from construction due to larger infrastructure footprint
Noise	Noise impact per turbine may reduce, however, there is a greater potential for noise impacts due to larger number of turbines
Cultural Heritage	Greater potential for impact on unrecorded cultural heritage assets due to larger infrastructure footprint
Material Assets	Neutral
Risks and Major Accidents	Neutral

Access Tracks

Access tracks were not considered as part of the initial layout. However, the Applicant intended to utilise the existing forestry tracks where possible for future design iterations.

A comparison of the environmental effects of utilising a wholly new internal access track network against the proposed approach for DI2 of the Proposed Development is presented below.

Table 3-5: Environmental Effects of a Wholly New Internal Track Layout Compared to Design Iteration 1

Constraint	Comment
Population and Human Health	Greater impact on land use changed due to increased infrastructure footprint
Landscape and Visual	Neutral
Traffic and Transport	Greater impact on traffic during construction phase due to the requirement for more construction materials
Biodiversity	Greater habitat loss due to larger infrastructure footprint
Ornithology	Neutral
Soils and Geology	Greater impacts on peat due to larger excavation volumes required for larger infrastructure footprint
Hydrology and Hydrogeology	Greater potential for silt laden runoff due to the larger area of infrastructure required. Potential for more watercrossings to facilitate access to the larger number of turbines. Potential for greater impacts on water courses due to larger forestry felling required.
Air and Climate	Greater release of dust from construction due to larger infrastructure footprint
Noise	Neutral
Cultural Heritage	Greater potential for impact on unrecorded cultural heritage assets due to larger infrastructure footprint
Material Assets	Neutral
Risks and Major Accidents	Neutral

Connection to the National Grid

Consideration was given to connecting to the Garrow Substation. However, it was understood that Garrow Substation did not have capacity nor have plans to increase capacity to facilitate the Proposed Development.

The nearest substation with capacity to facilitate the Proposed Development was Ballyvouskill Substation and was therefore selected as the preferred option.

It was anticipated that the initial grid connection corridor would likely exit the eastern portion of the site via an existing track and continue along this track north towards the townland of Caherdowney. The underground cable would then traverse agricultural fields before connecting to Ballyvouskill Substation.

Underground cabling was proposed instead of overhead lines as although overhead lines are cheaper to build and maintain, the visual impact is greater

Table 3-6: Environmental Effects of a Wholly New Internal Track Layout Compared to Design Iteration 1

Constraint	Comment
Population and Human Health	Neutral
Landscape and Visual	Significantly greater due to the introduction of additional large structures into the landscape
Traffic and Transport	Neutral
Biodiversity	Neutral
Ornithology	Neutral
Soils and Geology	Neutral. Cable trenches require temporary excavation. Overhead cabling requires excavation for tower footings
Hydrology and Hydrogeology	Minor reduced potential for silt laden runoff due to less excavation during construction
Air and Climate	Neutral
Noise	Neutral
Cultural Heritage	Minor potential for impact on unrecorded cultural heritage assets due less excavation
Material Assets	Neutral
Risks and Major Accidents	Neutral

Other Infrastructure

Other infrastructure such as substation, hardstands or construction compounds were not considered for the initial turbine layout.

3.5.2 Design Iteration 2 / Interim Layout

Design Iteration 2 took into consideration detailed site surveys and newly identified baseline information in particular peat and habitats and feedback from consultees, in particular from telecommunication operators including telecommunication links and feedback from.

The interim layout is shown is Figure 3-4.

Constraints Mapping

Table 3-7 shows the updated or additional constraints applied to compile Design Iteration 2. These are additional to the constraints previously considered in Table 3-3.

Table 3-7: Additional Constraints and Associated Buffers Applied to Compile Design Iteration 2

Constraint	Calculation / rationale of Buffer	Buffer distance (m)
Residential dwelling for a previously unknown property	A 500m separation distance from this property and the turbines has been agreed between the owner and Applicant in accordance with the 2019 Guidelines.	500m
Biodiversity – Habitats	Generally, the habitats have been assessed as being of local value. There is one however, which has been considered as nationally important - HH3 wet heath. As a result, this was identified as a constraint to avoid where possible.	To avoid areas identified
Minor Watercourses	Additional minor watercourses identified during hydrological surveys buffered by 10m	10m
Telecommunication Links	Informed by the telecommunication links identified during the consultation with stakeholders	Various (specific to the links)
Previously unknown Cultural heritage assets	Although the previously unknown cultural heritage sites do not have a statutory zone of notification, a buffer zone was applied. A 50m buffer has been applied to Townland Boundaries, except where there is a need for infrastructure to cross the boundary (grid route and site access)	50m
Peat	Peat depths above 3m were avoided to minimise potential for peat landslide risk and excavation.	Areas of 3m peat depth or above avoided
Peat Exclusion Zones	Exclusion zones based on the observations during site visits, site investigation (peat probing) and results of a Factor of Safety (FoS) based analysis. FoS identifies through stability calculations any potential areas predisposed to peat landslide hazard due to combinations of key conditions such as peat depth, peat strength and slope angle.	To avoid potentially unstable areas including a buffer to allow for FoS)
Existing MV and HV electrical cables	To ensure that construction would not affect existing cables present on the site	5m

Turbines

During detailed site surveys a previously unidentified property was identified at approximately ITM X 519142, Y 583765 within the separation distance adopted for the initial design (four times the maximum proposed tip height).

The design and location of the turbines was adjusted to allow for a separation distance of 500m x and agreed with the current resident. This allows for compliance with the Draft 2019 Wind Energy Guidelines.

A 3-D assessment was undertaken to determine potential impacts to telecommunication links of the proposed turbine layout . This indicated a potential impact as a result of Turbine 2 (see Figure 3-3). All other turbines had an appropriate

vertical clearance between the turbine blades and separation distances from the links (see Chapter 17 - Material Assets (including Aviation and Telecommunications).

Accordingly, Turbine 2 was removed from the design.

Turbine 1 was also removed on the basis of initial visualisations which suggested that this would be viewed as an 'outlier' unconnected to the main development at key viewpoints.

These amendments resulted in a 17 turbine layout.

Hardstand Configuration

The configuration of crane hardstands (main crane area, auxiliary crane area, blade, ballast and tower storage areas and boom supports). developed as part of the site design captured the maximum dimensions specified by turbine suppliers for the dimensions of the largest turbine under considerations

The hardstand configuration considered therefore represents the largest area required considering all turbine suppliers and models being considered for the development.

Access Tracks and Hardstands Layout

Table 3-8 shows the constraints applied to design the road and hardstand layout associated with Design Iteration 2.

Table 3-8: Constraints and associated buffers for road and hardstand layout associated with Design Iteration 2

Constraint	Calculation / rationale of Buffer	Buffer distance (m)
Biodiversity – Habitats	Most habitats have been assessed as being of local value. There is one however, which has been considered as nationally important – HH3 wet heath (see Figure 3-3). As a result, this was identified as a constraint to avoid where possible.	To avoid areas identified
Major watercourses	50m buffer + extra 10m due to generalisation of Environmental Protection Agency rivers dataset	60m
Minor Watercourses	Additional minor watercourses identified during hydrological surveys buffered by 10m	10m
National monuments	Record of Monuments and Places (RMPs) and National Inventory of Architectural Heritage (NIAH) sites include statutory zones of notification (50m buffer zones) under Section 12 of the National Monuments Act,	50m
Previously unknown Cultural heritage assets	Although the previously unknown cultural heritage sites do not have a statutory zone of notification, a buffer zone was applied. With regards to Townland Boundaries, a 50m buffer has also been applied where possible	50m
Peat Exclusion Zones	Exclusion zones based on the observations during site visits, site investigation and results of a Factor of Safety (FoS) based analysis. Through stability calculations which assess the balance of stabilising and destabilising forces, the FoS analysis identifies any potential areas predisposed to peat landslide hazard due to combinations of key conditions such as peat depth, peat strength and slope angle.	To avoid potentially unstable areas

Constraint	Calculation / rationale of Buffer	Buffer distance (m)
Existing MV and HV electrical cables	Applied to hardstands only to ensure that construction would not affect existing cables present on the site	5m

The roads and hardstand layout was developed to limit the number of watercrossings required and orientated to minimise non-standard turbine component deliveries (i.e. deliveries where reversing of fully loaded delivery vehicles is required).

Roads and hardstandings were also located and orientated to minimise earthworks required for construction of the development. This was analysed using Civil 3D software which determines earthworks by comparing existing ground and proposed road and hardstand alignment levels.

With regards to accessing the Proposed Development Site from the existing Coillte entrance, the route of the tracks considered the use of an existing road which runs adjacent to the River Clydagh and entered the main site form the north-west.

The engineering design parameters adopted for the design of the roads and hardstands alignment are shown in Table 3-9.

Table 3-9: Engineering design parameters for roads and hardstands associated with Design Iteration 2

Engineering parameters	Calculation / rationale of constraint	Value
Minimum road width	Typical width required for the delivery of turbine components	5m
Max. gradient for internal roads to be used for turbine deliveries	Typical gradient limit for turbine component delivery without assistance or bound road surface	10% vertical gradient
Min. horizontal radius for internal roads and site access to be used for turbine deliveries	Conservative radius limit to allow delivery of >80m turbine blades on trailers without the need for manual steering	100m
Max. gradient for site access road	Typical gradient limit for turbine component delivery with pulling assistance without bound road surface – a 10% site access gradient road was not achievable	14%
Max. gradient for internal roads for substation component deliveries only (low loaders)	Typical gradient limit for low loader vehicles used for delivery of substation components (transformers etc)	12%
Min. horizontal radius for internal roads for substation component deliveries only (low loaders)	Conservative radius limit to allow delivery of substation components (transformers etc) low loader vehicles	20m
Max. gradient for internal roads for construction traffic only	Typical gradient limit for dumpers and 4x4 traffic, similar gradient limits as existing forestry tracks	16%
Gradient for hardstands	Typical gradient limit for hardstands to provide safe access for cranes and plant for turbines and other infrastructure crane suppliers	0%

Connection to the National Grid

Underground Cable Route

The layout of the underground cable was designed to achieve the following objectives:

- Follow existing roads as much as possible;

- Maintain minimum distance from existing cables to avoid de-rating of cables; and
- To minimise cable crossing points with existing cables.

Substation

The same environmental constraints were applied to the location of the substation and associated hardstand as were applied for roads hardstands (refer to Table 3-8). In addition to this, a buffer was applied to all existing and proposed turbines in the vicinity representing a turbine fall distance in accordance with EIRGRID specifications whereby the fall distance is calculated as 2 x (turbine tip height +10%).

Borrow Pits

The same environmental constraints were applied to the location of the borrow pits as were applied for roads and hardstands (refer to Table 3-8). Selection of Borrow pit areas were determined on the following basis:

- In areas of minimal peat depth (generally <0.5m);
- Spread across site for good access during construction;
- Away from the River Clydagh;
- Near to existing forestry roads for early access during construction; and
- To meet stone volumes required to construct the proposed development.

Four borrow pit areas were identified as part of Design Iteration 2, which have been taken forward into the final design.

Table 3-10 provides a comparison of the environmental effects of sourcing aggregate from local quarries against the use of borrow pits as proposed for the Proposed Development.

Table 3-10: Environmental Effects of utilising local quarries against the use of borrow pits

Constraint	Comment
Population and Human Health	Neutral
Landscape and Visual	Neutral
Traffic and Transport	Greater impact on traffic during construction phase due to the requirement for more construction materials
Biodiversity	Neutral
Ornithology	Neutral
Soils and Geology	Reduced on site impact due to the requirement to excavate less peat
Hydrology and Hydrogeology	Neutral
Air and Climate	Reduced benefit of lower carbon emissions due to increased traffic volumes. Greater potential for dust impacts due to higher traffic volumes
Noise	Minor increase due to increased traffic volumes
Cultural Heritage	Neutral
Material Assets	Potential impact on local quarry resource
Risks and Major Accidents	Neutral

Peat Storage Areas

The same environmental constraints were applied to the location of the peat storage areas as were applied for roads and hardstands (refer to Table 3-8). Selection of peat storage areas were determined on the following basis:

- In flat areas or areas of low slope angle (less than 5% gradient);
- Spread across site for good access during construction;
- Away from the River Clydagh;
- Near to existing forestry roads and proposed borrow pits for early access during construction; and
- To meet storage peat storage requirements to construct development in conjunction with the borrow pits, landscaping and side casting.

Seven potential peat storage areas were identified as part of Design Iteration 2.

The selection of the peat storage areas took into consideration the estimated volume of peat excavated as a result of the Proposed Development, reinstatement of peat across the Proposed Development Site such as borrow pits and side casting adjacent to infrastructure. The selection of peat storage areas also aimed to limit the disruption of the ongoing commercial forestry land-use.

3.5.3 Design Iteration 3 / Final Layout

The final layout consisted of minor adjustments to the Proposed Development taking into consideration realignments of proposed track, access and minor turbine movements as described below.

Chapter 4 – Description of Development contains a detailed description of the final layout and is shown in Figure 1-2.

Turbines

Discussions with the operator of Coomacheo Wind Farm (SSE Renewables) indicated that Turbine 7 was potentially located within the buffer distance of existing MV and HV electrical cables associated with that windfarm. As a result the turbine was relocated to avoid affecting the cable

Minor movements of turbines were undertaken to capture maximum wind energy within the constraints identified.

Turbines were renumbered to take into consideration the removal of Turbine 1 and 2 as a result of Design Iteration 2.

Hardstands

The hardstand locations were revised to reflect the revised turbine layout taking into account the constraints identified. Again, the hardstands orientations were optimised to minimise non-standard turbine component deliveries.

Access Tracks

Road layouts from the existing Coillte site entrance along an existing road as part of Design Iteration 2 was discontinued due to the potential for significant earthworks and felling requirements near the River Clydagh.

As a result, the site access route from the existing Coillte entrance was amended to take into consideration an alternative route. The alternative route runs adjacent to and along an existing road that veered south away from River Clydagh and accesses the main site from the south-west.

This route minimises impacts by moving earthworks and construction away from the River Clydagh. Thus, this was selected as part of Design Iteration 3 and is shown in Figure 1-2.

Some existing forestry roads were identified for minor upgrade to allow them to be used as alternative access routes around the Site for light traffic during construction and turbine delivery.

Connection to the national grid

Underground Cable Route

The layout of the underground cable was amended to suit land available. It was again designed to achieve the following objectives:

- Follow existing roads as much as possible;
- Maintain minimum distance from existing cables to avoid de-rating of cables; and
- To minimise cable crossing points with existing cables.

Substation

The exact design for the substation was refined to provide sufficient space for substation infrastructure and to optimise earthworks for the platform and the access road.

Other Infrastructure

Borrow pits and peat storage areas were amended and refined to suit the final turbine selection, hardstand requirements and internal track layout using the same approach and constraints used in Design Iteration 2.

Estimates of excavated peat during the construction and remaining peat from expected reinstatement of peat through borrow pits, side casting and landscaping resulted in six peat storage areas.

Site Boundary

The application boundary (red line as shown in Figure 1-1) was amended to encompass the Proposed Development, working areas and proposed modification along the Turbine Delivery Route.

3.5.4 Assessment of Alternative Designs

Table 3-11: Comparison of environmental effects when compared against the chosen option (final turbine layout)

Environmental Consideration	Design Iteration 1	Design Iteration 2
Population & Human Health (incl. Shadow Flicker)	No material environmental difference. Potential for increased noise and shadow flicker at nearby sensitive receptors.	No material environmental Difference. Potential for noise and shadow flicker remain the same at nearby sensitive receptors.
Biodiversity	No significant environmental difference for either biodiversity or birds. Larger development footprint d and therefore, increased overall habitat loss.	No significant environmental difference for either biodiversity or birds. Similarly-sized development footprint with no material difference in overall habitat loss.
Land, Soils & Geology	Larger development footprint development footprint and therefore, increased peat and spoil volumes to be excavated and would require more stone to be extracted for construction.	Similarly-sized development footprint would have meant no material difference in peat and spoil volumes to be excavated or crushed stone to be extracted for construction.
Geotechnical/Peat Stability	This layout was amended following detailed geotechnical investigations to reduce risk of peat instability.	This layout was amended following further detailed geotechnical investigations to reduce risk of peat instability.
Water (Hydrology & Hydrogeology)	Overall no significant environmental difference, however the access to the Proposed Development is in closer proximity to the Clydagh River.	Overall no significant environmental difference, however the access to the Proposed Development is in closer proximity to the Clydagh River.
Air & Climate	Additional turbines would have maximised wind resource of the site and positively contribute to Ireland's climate change targets, however, overall, no significant difference.	Neutral
Noise & Vibration	Potential for greater noise impacts due to reduced separation distance between turbines and closest sensitive receptors.	Neutral
Landscape & Visual	Potential for visual impacts due to more turbines resulting in a wider visual	Neutral

Environmental Consideration	Design Iteration 1	Design Iteration 2
	extent.	
Cultural Heritage & Archaeology	No material environmental difference for cultural heritage	No material environmental difference for cultural heritage
Material Assets (including transport and telecommunications)	Potential for increased construction traffic volumes due to increased number of turbines	No material environmental difference for material assets.

3.6 Conclusion

A description of the reasonable alternatives in terms of project design, technology, and location has been studied by the Applicant are relevant to the Proposed Development and its specific characteristics (17 wind turbines with a maximum tip height of 200 metres (m) and a maximum export capacity of 122.4 Mega Watts (MW)).

An assessment of the alternatives considered has included an evaluation of the environmental effects of the alternatives compared to the Proposed Development.

This has produced a design that:

- Contributes to low carbon energy generation thereby contributing to National and EU targets;
- Generates electricity more efficiently compared to other renewable generation technologies; and
- Has a layout which maximises the benefits of the Proposed Development in terms of low carbon electricity generation whilst minimising environmental impacts through an iterative design process.

3.7 References

Department of the Environment, Climate and Communications (2023). Climate Action Plan 2023. Available: https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

Department of the Environment, Heritage and Local Government. (2006). Wind Energy Development Guidelines. [Online]. Available at: https://www.gov.ie/en/publication/f449e-wind-energy-development-guidelines-2006/ [Accessed 19/12/2023]

Department of the Environment, Heritage and Local Government. (2019). Draft Revise Wind Energy Development Guidelines 2019. [Online]. Available at: https://www.gov.ie/en/publication/9d0f66-draft-revised-wind-energy-development-guidelines-december-2019/ [Accessed 19/12/2023]

European Commission (2011, 2014). Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (as amended by Directive 2014/52/EU). [Online]. Available at: https://environment.ec.europa.eu/law-and-governance/environmental-assessments/environmental-impact-assessment_en [Accessed 19/12/2023]

Government of Ireland (2020). The Renewable Electricity Support Scheme (RESS) High Level Design. [Online] Available at https://assets.gov.ie/77091/0c8db804-e10c-47c3-8a11-9a45777601fd.pdf Accessed 20/10/2022

Irish Wind Energy Association. (2012). Best Practice Guidelines for the Irish Wind Energy Industry. [Online]. Available at: https://windenergyireland.com/policy/policy/best-practice-guidelines [Accessed 19/12/2023]

Teagasc (2023). Solar PV (Solar Panels) Introduction. [Online] Available at: https://www.teagasc.ie/rural-economy/rural-development/diversification/solar-pv-solar-panels/ [Accessed 19/12/2023]