3.0 Development Description

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3.1 Introduction

This section of the EIAR, which was prepared by ABO Energy Ireland Ltd. describes the component parts as well as the physical elements of the wind farm, outlining the anticipated construction programme, operation and de-commissioning phases. The purpose is to provide an appropriate level of detail to form the basis of the EIAR. The description includes all phases of the development including the construction, operation and decommissioning of the wind turbines and associated infrastructure.

3.2 Development Infrastructure

The proposed development seeks a ten-year permission for the development of a wind energy project with an operational life of 30 years. For the purposes of the planning application the proposed development will consist of:

- Construction of up to 8 No. wind turbines with a maximum overall tip height of between 176-180m, comprising rotor diameters ranging between 133-150m and hub heights ranging between 105-112m high;
  - *Turbines with varying hub heights and blade lengths within the defined ranges will be considered, not exceeding a maximum overall tip height of 180m.*
  - *Foundation size to be confirmed by turbine manufacturer but will be approximately 26m diameter, depth of 3m.*

- Associated hard stand areas at each turbine;
  - *Each turbine will have an associated hardstanding area to facilitate construction which will be finished with compacted stone.*

- 1 No. 38kV electrical substation and all associated infrastructure and works;
  - *A 38kv substation building is proposed with adjoining compound for outdoor electrical equipment. The substation compound will measure c.50m x 26m and be enclosed by a palisade security fence & vehicular access gates.*
  - *The substation will have an associated hardstanding area to facilitate construction which will be finished with compacted stone.*

- 20kV underground cables facilitating the connection of turbines to 38kV electrical substation and all associated infrastructure and works;
  - *An underground cable will connect the wind turbines to an internal 38kV substation running along or alongside the new and existing internal access roads.*

- Provision of a new temporary roadway connecting the R315 and the L51723 in the townland of Ballinglen to facilitate construction traffic, the delivery of turbine components and other abnormal loads;

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- Widening and ancillary works to sections of the L51723 in the townlands of of Keerglen and Ballkinlettragh;
- Provision of new permanent site access of the L51723;
- Upgrading of existing tracks and drainage infrastructure and construction of new internal site tracks and all associated works as required;
    - *Construction of new internal access tracks circa 3.7km in length. Access tracks will typically be 5m in width and 8m at bends and be finished with locally sourced compacted stone.*
    - *Upgrade of existing tracks circa 3.5m in length*
- Provision of one no. borrow pit located to the centre of the proposed wind farm;
- Designated peat storage areas alongside internal side roads;
- Construction of a clear-span bridge crossing the Keerglen River within the development area;
- A temporary welfare site compound and all associated works;
    - *The temporary site construction compound will measure circa.50m x 50m*
- Associated site drainage;
- Ancillary forestry felling to facilitate construction and operation of the proposed development;
- All associated infrastructure and site development works.

For the purposes of the EIA Directive[1], the EIAR further considers:

- Temporary minor off-site works along the turbine delivery route;
- Approximately c. 22.8km of 38kV underground cable grid connection and associated works along public roads and private lands to include horizontal directional drilling at bridge locations;
- Temporary met mast of between 100-112m in height and all associated infrastructure and works;

All elements of the Proposed Development described in the list above have been assessed as part of this EIAR. The proposed development is shown in detail in the Planning Drawing Pack which accompanies the EIAR.

[1] Please note there are differences in what is being applied for under Part III of the *Planning and Development Act 2000, as amended* and what is being presented under Part X of the same statute.

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Turbines

The specifications of wind turbines are undergoing a continuous process of development. On this basis and as the project is at the early planning stage, a decision on the final turbine model selection has not been made. However, a number of candidate turbines which fit within the hub height (between 105-112m high), rotor diameters (between 133-150m in length) and maximum tip height (ranging from 176m to 180mparameters defined in the development description have been considered in order to allow a worst-case assessment for each environmental factor.

Closer to the construction stage should planning permission be granted, and when a definite date for connection to the national grid has been confirmed by the network operator, the applicant will be in a position to select the most appropriate turbine for the site within the parameters of the planning permission based on the range of design parameters listed in this application and the latest technological developments. At that point the final specification of the proposed turbines shall be submitted to the planning authority for written agreement. It is important to note that the final choice of turbine will comply within the range of design parameters sought as part of this planning application and accordingly will comply with the requirements of any grant of planning permission and the relevant planning policy and wind energy guidance in place at that time. The applicant therefore welcomes the inclusion of a suitably worded planning condition requiring that the final specification of the proposed turbines are submitted to the planning authority for their assessment and agreement.

The turbine comprises a horizontal, modular and tubular steel tower upon which is mounted a nacelle containing a rotor hub. Off this will be of the three generic blades bolted to the central hub, which is connected to a gearbox located in the nacelle. Earthing and isolation protect all components from lightning strikes. The turbines have multiple coatings to protect against corrosion and shall be finished in a matt off-white or light grey finish. All service cables and power lines from the turbines to the substation and any other cabling shall be either internal to the turbine or run in underground ducts. The turbine will be lit in accordance with IAA recommendations. The typical lifetime of a turbine is approximately 30 years, however recent technological advancements, are serving to elongate the lifespan of turbines beyond 30 years.

The proposed turbines will have a maximum tip height up to 180m (refer to the Planning Drawing Pack for the turbine elevations). The Irish Grid co-ordinates of the proposed turbines are set out in the Table 3.1 below:

Table 3.1 ITM co-ordinates of proposed turbines

Turbine ID	X (easting)	Y (northing)
WTG1	505565	832360
WTG2	505470	831909
WTG3	505827	831743
WTG4	505920	832214
WTG5	506383	832271
WTG6	506344	831817
WTG7	506978	831969

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WTG8	507325	832404

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Turbine Tower

The tower of the turbine is a conical steel tube, with triple paint finish. It is generally delivered to site in four to five sections. The first section is secured to the foundation by anchor bolts cast into the reinforced concrete. The foundation can vary in size. The detailed design and the resulting exact dimensions of the foundation will depend on the final turbine type and the findings of the detailed geotechnical ground investigation. However, a typical foundation for a turbine of the proposed scale would be approximately 26m in diameter with a total depth of 3m, as shown in Planning Drawing KGL 7.102. Each foundation will require approximately 600m^3 of concrete and approximately 70 tonnes of steel. It will have service ducts to allow electrical and communication service connections. The upper sections of the tower are bolted to the lower sections in sequence, tapering from around 4.5m in diameter at the base to around 3m in diameter at the nacelle. The first floor of the tower is typically 2m above ground level. The tower is accessed via steps and a locked steel door.

Turbine Nacelle

The nacelle is located at the top of the turbine tower and holds the turbine components, including the generator, gearbox and braking system, electrical components and the control unit. A glass fibre reinforced polyester hood covers the nacelle. This is sound insulated, ensuring minimal noise emissions.

Turbine Blades

The blades of a modern turbine are made of glass fibre reinforced polyester. They typically turn at between 5-20 revolutions per minute depending on wind speed and make of turbine. A typical turbine begins generating electricity at a wind speed of 2.5-4ms^{-1} depending on turbine type, with optimum power generation at approximately 12-16ms^{-1}. All turbine blades shall have the same rotational speed and shall rotate in the same direction. The turbines usually shut down at wind speeds greater than 25ms^{-1}, although some machines are designed to operate at up to 30ms^{-1}. The yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism.

Turbine Colour

The turbines have a multiple coating to protect against corrosion. They are coloured off-white or light grey to blend into the sky background. This colour application minimises visual impact and is recommended by relevant guidelines[2]. This colour is applied in the visualisations and photomontages contained in Volume 5 of the EIAR.

[2] Department of the Environment, Heritage and Local Government (2006) *Wind Energy Development Planning Guidelines*. Energy Technology Support Unit (ETSU) (1999) *The Influence of Colour on the Aesthetics of Wind Turbine Generators (ETSU W/14/00533/00/00)*. The Scottish Government (2008) *PAN 45: Annex 2: Spatial Frameworks and Supplementary Planning Guidance*. Department of the Environment Welsh Office (1993) *Planning Policy Guidance Note: Renewable Energy*. Welsh Assembly Government (2005) *Technical Advice Note 8: Renewable Energy*.

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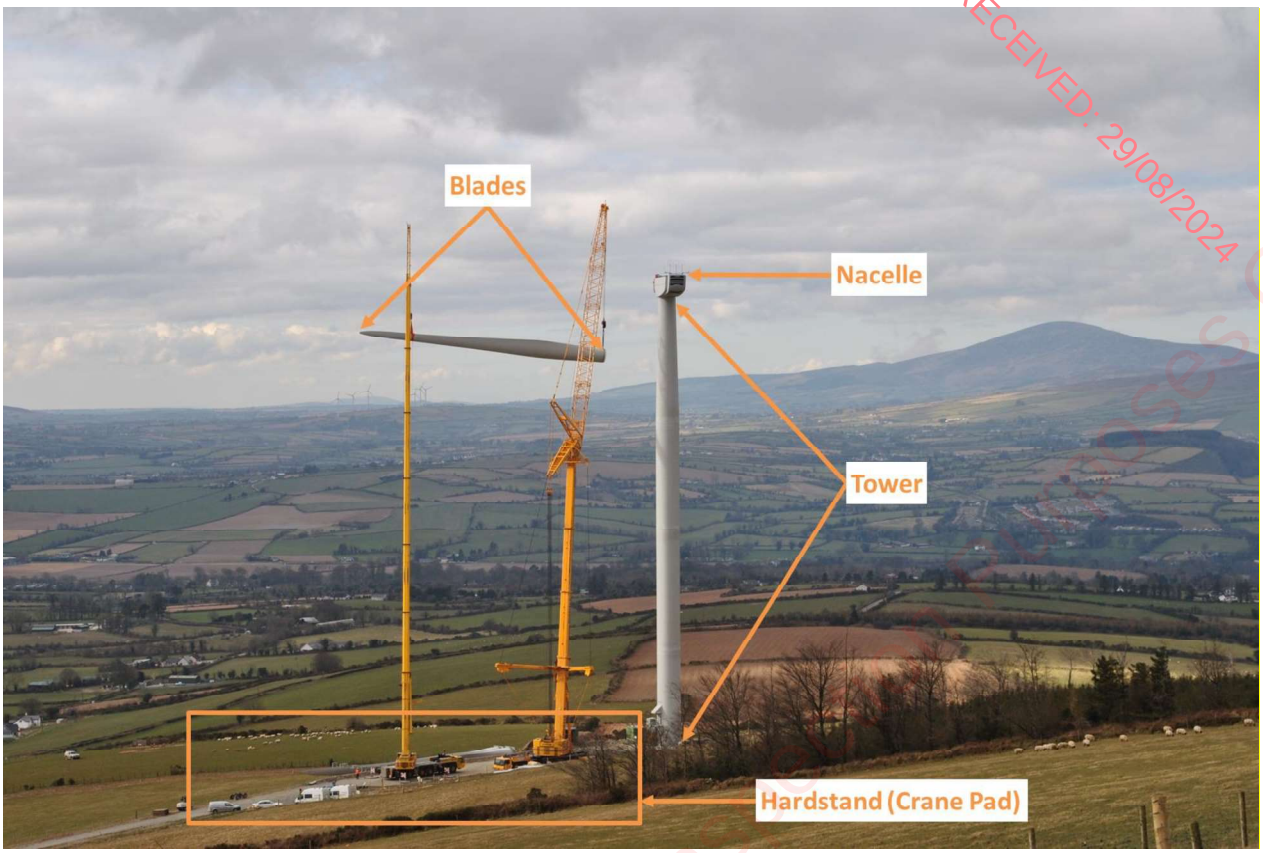

Plate 3.1 Turbine, with components labelled, being erected at Gibbet Hill Wind Farm, Co. Wexford.

Plate 3.1 Turbine Base and Foundations (constructed and awaiting turbine components at Gibbet Hill Wind Farm, Co. Wexford)

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Turbine Micrositing

Following detailed site investigations at construction stage micrositing of turbines and other components of the development form part of the proposal. This will allow scope for further detailed mitigation should it be considered appropriate. It is anticipated that this agreed *"tolerance"* micrositing distance will form a condition accompanying a grant of permission for the proposal. A micrositing allowance of 20m radius from the proposed turbine locations is generally considered appropriate, subject to site constraints. This degree of flexibility is recommended at section 5.3 of the WEDGs (2006) and Section 7.5 of the DWEDGs (2019). The WEDGs (2006) state at section 5.3:

> *"permission must be made for carrying out site-specific geo-technical investigations in order to identify the optimum location for each turbine. These investigations may suggest minor adjustments to turbine location. In order to accommodate this practise, there should be a degree of flexibility built into the planning permission and EIS. The extent of flexibility will be site specific but should not generally extend beyond 20 metres. Any further changes in location beyond the agreed limits would require planning permission".*

Power Output

Each wind turbine will have a rated electrical output of circa 5MW, dependent on the chosen turbine model. The proposed development will have a Maximum Export Capacity (MEC) of circa 40MW with a maximum power output of circa 119,136[3] megawatt hours of electricity per year. This would be enough electricity to power approximately 26,061 homes per year based on the average Irish household using 4.2 MWh[4] of electricity.

Census 2022 results record a total housing stock of 70,643 units in Co. Mayo. Based on a capacity factor of 34%, Keerglen Windfarm could therefore produce enough electricity to power approximately 37% of all houses in County Mayo.

Turbine Transformers

The turbine will have a transformer located within the turbine. The transformer location is a specification of the turbine manufacturer. The turbine will generate electricity at approximately 660 volts. The turbine transformer will step up the voltage to 20kV to reduce electrical losses on the cabling connector circuits that connect to the site substation.

Hard-Stand Areas (Crane Pads)

A hard-standing area is proposed at each turbine location, with details shown in the Planning Drawing pack. This area will accommodate a main crane and an assist crane during construction and the assembly of the

[3] Number of hours per year (8,760) x Capacity Factor (34%) x Rated output of the wind farm 40MW)
[4] Derived from CRU data on average Irish household consumption, available at https://www.cru.ie/wp-content/uploads/2017/07/CER17042-Review-of-Typical-Consumption-Figures-Decision-Paper-1.pdf

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turbine. It will also serve maintenance requirements during the operation phase of the wind farm. The area of the hard standing provided is deemed suitable for the assembly of a turbine with the proposed dimensions. These are required to be adjacent to the turbine foundation and comprise granular material with a surface area of approximately 1550m^2.The main crane hard standing will be left in place following construction in order to allow for use of similar plant should major components need replacing during the course of the wind farm's operational life and to allow for eventual decommissioning once operation has ceased. Ancillary temporary hardstanding areas (such as blade set down areas) required for the construction and erection of each wind turbine are also included in the design at each turbine location. These areas will be fully reinstated following the construction phase of the development.

38kV Electrical Substation

An onsite electrical substation is proposed for the site at the following location:

Table 3.2 38kV Substation Location (Approximate) – Irish Grid (ITM)	
Easting	**Northing**
506358	832102

The substation building will be divided into three rooms, ESB room, Independent Power Provider (IPP) wind farm control room and IPP switch room. The substation building will provide the housing for the switchgear and metering equipment necessary to connect the wind farm to the local distribution network. The substation will also have an associated secure compound of approximately 1,300m^2 with palisade fencing. The compound will contain a transformer(s) and other electrical equipment for the connection of the wind farm. Drawing KGL 7.201 illustrates the location of the substation. The substation building will contain a toilet and wash hand basin.

The substation building will be single storey with a footprint of approximately 100m^2, a height of approximately 6m, and an associated area of hard-standing to the front for access and car parking to accommodate operational staff vehicles. The walls will be of a traditional block cavity construction with external rough rendering and a grey harled finish. The roof will be of a pitched design incorporating artificial slate tiles. A telecommunication aerial and telecommunications equipment will be mounted on the gable wall. A welfare facility area with toilet is proposed in the substation. It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. Drawings KGL 7.201, 7.202, b and c show the proposed substation building and compound.

Temporary Meteorological Mast

The Proposed Development includes the screening in for a temporary meteorological mast at the wind farm. The impacts of temporary meteorological mast, measuring between 100-112m; works are assessed throughout this EIAR but not included in the planning application. The purpose of the masts is to measure

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and log wind speeds and direction at a range of heights. The masts will be installed for two years. They will then be removed from the site. The masts will be decommissioned at the end of the two year measurement period, following a similar method to installation i.e. the instruments will be first removed then each section dismantled from the top down. The ground anchors will be cut off below ground level and all materials removed from site for re-use or recycling. The exact details of a temporary meteorological mast will be included in a subsequent planning application. For the purposes of screening in the mast at this stage, the location of the met mast is adjacent to the proposed substation, centrally located on site at following location:

Table 3.3 Temporary Meteorological Mast Location – ITM	
Easting	**Northing**
506416	832111

The exact details of the mast will be included in a subsequent planning application. However, for informative purposes the future proposed met mast will be a cable stayed structure of triangular lattice bolted galvanised steel construction. Drawing KGL 7.300 shows the mast elevation details. Drawing KGL 2.102 shows the location of the meteorological mast. It will be fitted with an anti-climb device. The face width at the base of the mast will be around 500mm. A lightning finial will be fitted to the top of the mast for protection, and the mast will be lit (if required) in accordance with IAA recommendations. The bottom section of the mast will be supported on a temporary timber raft construction comprised with anchor points for each of the guy wires.

Construction Compound5

As part of the planning application, ABO seek permission for the provision to construct a construction compound which will be created centrally on site adjacent to the site substation:

Table 3.4 Site Compound's Location (Approximate) – ITM		
	Easting	**Northing**
Centrally Located Compound	506416	832111

Drawing KGL 2.102 shows the location of the proposed construction compound. The compound will include the following elements:

Table 3.5 Site Compound Elements	
Element	**Description**
Portacabin	Modular Buildings will be used as site offices, canteen facilities, and the monitoring of incoming vehicles.
Welfare Facilities	Facilities will include toilets and associated sealed waste storage system.
Storage Areas	Area will be assigned for tools, small plant, parts and other materials.
Bunded Fuel Storage Area	A bunded fuel storage area (out with 100m hydrology buffer).
Parking	Parking and turning area for up to 20 cars and a receiving area for incoming vehicles.
Fencing	Heras style fencing around the compound, if required.

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A layout plan of the construction site compound is included in Drawing KGL 7.203. The ground will be prepared for the compound in accordance with the techniques described in an Outline Construction Method Statement (OCMS) in Appendix 3.1.

New / Upgraded Site Tracks

Access to the proposed turbines will be via the existing and proposed internal site track network as shown throughout the Planning Drawing pack. The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operation phase, and for vehicles to decommission the turbines at the end of the life of the development.

The site benefits from a modest network of high-quality tracks which currently facilitate turf cutting operations on site. These tracks will be upgraded and widened to a minimum of 5m. Approximately 3.7km of new tracks are proposed at the site, with approximately 3.5km of existing roads upgraded. All access tracks will be a minimum of 5m wide along straight sections and up to 8m at bends. Bends will require a minimum inside radius of 35m and an obstacle free radius of 50m.

The proposed access track will typically be constructed by placement of compacted stone to a minimum 400mm depth on mineral soils or rock formation after removal of topsoil. Depths would be increased for fill areas. The stone will be compacted in 200mm layers. Geogrids or similar may be used in certain areas of the site, depending on ground conditions. Material for the site tracks will be partly sourced from the site borrow pit.

In designing the layout of internal tracks the main considerations have been as follows:

- Environmentally Sensitive Areas: tracks have been routed to avoid ecological and hydrological sensitive areas.
- Maximise Use of Existing Access Track: wind farm has been designed having regard to the presence of existing agricultural tracks.

Roadside drainage will be provided along the proposed roads and will discharge into stilling ponds, as appropriate. The discharge from these ponds will be of sufficient quality for release into the existing drainage of the site. Drainage is discussed in more detail in Chapter 7 of this EIAR. All internal electrical cables connecting the turbines to the substation and external export cables exiting the site will typically run parallel or sub-parallel to the proposed access tracks.

Construction of a 10m Clear Span Bridge

A new 9.5m clear span bridge is proposed to cross the Keerglen River on site. The location of the proposed bridge is indicated on Drawing KGL 2.104 while detailed drawings are provided in Drawing KGL 4.300. The bridge, formed using precast concrete deck units, is proposed to facilitate crossing the Keerglen River. The bridge will be supported by abutments founded on each bank and will have vehicle safety barriers. The

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bridge will be in place for the lifetime of the wind farm as it will be needed for access during construction, maintenance and decommissioning works. The bridge will also contain the electricity export cable.

Temporary Access Road

As part of the proposed development a temporary access roadway connects the R315 and the L51723 in the townland of Ballinglen to facilitate the delivery of turbine components and other abnormal loads. The same temporary access roadway connects with the L51723 which directs access to the wind farm site. Full details of the same are set out in Chapter 14 of this EIAR.

New Site Entrance

A new permanent site entrance off the L51723 will serve as the main construction and operations entrance to the site, facilitating material deliveries (stone, steel, and concrete) and staff access, as well as large oversize components such as turbine blades, tower sections and substation components. It will also be used for the operational phase, facilitating occasional site maintenance vehicles.

Table 3.6 Site Entrance Location – Irish Grid

Easting	Northing	Townland
508675	333268	Keerglen

To assist with accessing the site the application proposes road widening and ancillary works to sections of the L51723 in the townlands or Keerglen and Ballkinlettragh to facilitate the delivery of turbine components and other abnormal loads. The access road will be upgraded and widened to a minimum of 5m.

20kV Underground Cables

Lengths of underground cable will connect each turbine to the onsite electrical substation. Cables will be laid in trenches typically 0.6 m wide by 0.8 m deep (minimum), or on the surface and covered with excavated material (to safe depth of cover). Typically, cables will run parallel or sub-parallel to the proposed access tracks.

Borrow Pit

As part of the planning application a borrow pit with an estimated volume of 145,000m^3 is included in the development works (Planning Drawing No. KGL4.200). The proposed borrow pit location is detailed in the Drawing Pack. The method of extraction of materials at the borrow pit will be by excavator, and if required, a hydraulic hammer mounted on a hydraulic excavator (rock-breaker) will also be used locally. The borrow pit will be managed in stages with cells opened and closed in sequence. Due to the elevated topography of the borrow pit site and low permeability of the rock, groundwater is not expected to be significantly encountered within the borrow pit.

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In addition to the borrow pit, the application details designated peat storage areas alongside internal side roads. Please view Drawing Pack for locations of the same.

Forest Felling

Ancillary forestry felling is proposed as part of the planning application. A total of 0.5ha of forestry will have to be permanently felled within the development site. The area to be felled is located to the south of the L51723 along a new proposed site access track. The total area to be felled accounts for 0.6% of the proposed development site area.

All felling will be carried out in one single phase in advance of the windfarm construction phase and on receipt of and in compliance with a Limited Felling Licence from the Forest Service and in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. Applications for such felling licences are required to be accompanied by a copy of the planning permission for the approved wind farm project and thus, licences for the necessary tree felling at Keerglen Wind Farm cannot be obtained until such time as planning permission for the proposed project is granted.

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for wind farm-related uses will have to be replaced by replanting at an alternative site. The Forest Service policy requires replacement or replanting on a hectare for hectare basis. Replacement of forestry can occur anywhere in the State subject to licence.

As it is proposed to fell approximately 0.5 hectares of forestry, replant lands of the same area are required. A potential replanting site has been identified within the wind farm land holding. The proposed site is shown in Figure 3.3. These lands will be used for replanting should the proposed wind farm receive planning permission. If these replant lands are considered unsuitable by the Forest Service, other lands will be sourced and used for replanting.

3.3 38kV Underground Electricity Export Connection Works

Overview

Electricity generated by the Proposed Development will be exported from the proposed 38kV electrical substation at the Keerglen wind farm site via a 38kV underground connection cable. The 38kV connection cable will connect into the existing Tawnaghmore 110kV electrical substation or a potential Large Energy User located at the lands at Killala Business Park. The underground electricity export connection works do not form part of this planning application, however they have been assessed as part of this EIAR.

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The typical electricity export connection works being screened in comprises:

- 110mm diameter HDPE ducts laid in a trench excavated to typically 1.2 m deep by 0.6 m wide (38kv Connection);
- three phase electrical cables;
- optical fibre cables;
- draw pits and joint bays;
- communication chambers;
- cable sheath sectionalising chambers;
- water crossings (i) bridge crossings, (ii) directional drilling as described in the Underground Electricity Connection Cable Route Construction Methodology (Appendix 3.2) or as detailed in Road Opening License;
- Technical works to terminus substation at Tawnaghmore 38kV/110kV Substation or large energy user at Killalla Business Park;
- Ancillary works.

The proposed circa. 22.8 km route of the 38kV underground cable between Keerglen Wind Farm and Tawnaghmore substation and the lands at Killala Business Park are shown in Figure 3.1. The route follows the public roads in a general south easterly direction through the townlands of: Keerglen, Ballykinlettragh, Ballinglen, Clydagh, Annagh More, Annagh Beg, Creevagh Beg, Creevagh More, Farmhill, Kincon, Ardnagor, Kinnavally, Ballinagavna, Lecarrowanteean, Ballygowan, Knockaunderry, Cloonalough, Cloonmaan, Coolcran, Cloonfada, Farragh, Cloonawillin, Mullafarry and Tawnaghmore.

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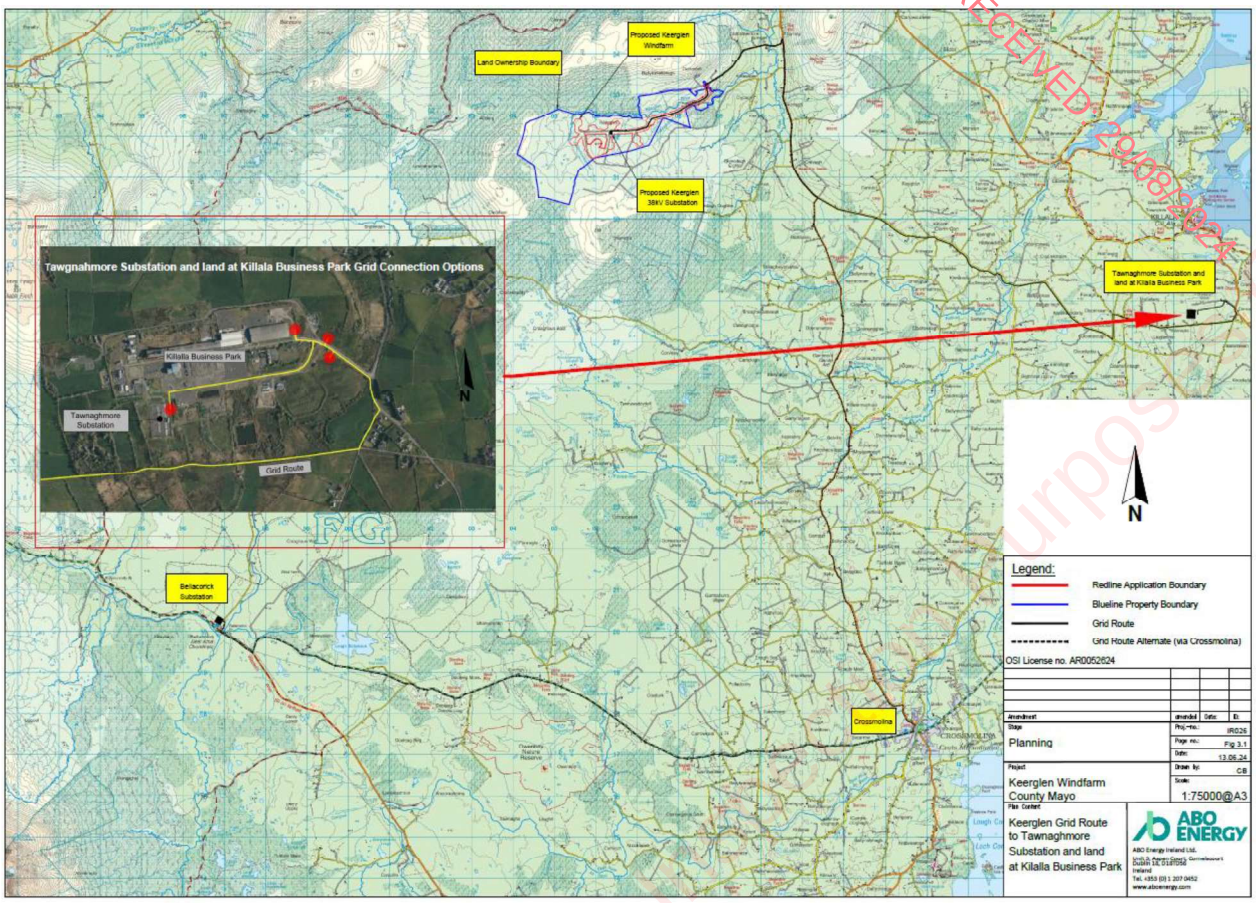

Figure 3.1: Proposed Electricity Export Connection Route being screened as part of this EIAR

The route of the proposed electricity export connection is shown on Plate 13.5. The proposed connection will follow existing roads as outlined below:

- Wind Farm Substation to the L51723
- L51723 Ballykinlettragh / to R315
- R315 turn off onto L1110 via Kincon
- L1110 turn onto the L1107
- L1107 turn onto L1111
- Entrance to Killalla Business Park
- Killalla Business Park to Tawnaghmore Substation

Wind Farm Substation to the L51723: Commencing at the proposed wind farm site substation the proposed electricity export route travels east, on new and existing access tracks before connecting with the public L-51723. From here it travels along the L-23051 in a general easterly direction before connecting to the R315

L51723 Ballykinlettragh / to R315: The proposed electricity export route goes south along the R315 for c. 4.15km and connecting with the L1110. This local road is a relatively narrow minor road with a carriageway width of 5-6m, and there is little or no road verges. The route continues on the L1110 via Kilcon.

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L1110 turn onto the L1107: From turning off the R315 the proposed electricity export route then goes along the L1110, for 8.45km, continuing through Kilcon before joining the L1107 to travel north on this route. This section of local roads is typically 5-6m wide and with narrow or no verges along its length. Travelling north, the proposed underground electricity cable connection route will be set for c.630m before turning right onto the L1111.

L1107 turn onto L1111: The proposed electricity export route travels west on the L1111 for c.3km on a carriageway with a width of 5-6m, with little or no road verges.

L1111 to R314 to Entrance of Killalla Business Park: Turning north from the L1111 junction for c.200m, the electricity export route joins the R314 travelling north for c.160m before entering the Killalla Business Park.

Killalla Business Park to Tawnaghmore Substation: The electricity export connection route goes through the Killalla Business Park through to Tawnaghmore Substation for c.1.4km.

Cable Installation and Traffic Management: To facilitate the installation of the necessary 38kV underground cable along these local and regional roads will require the implementation of traffic management including the operation of mobile traffic management with one-way shuttle systems. In some locations where the existing road is particularly narrow and constrained, and there are good alternative routes, it may be better to temporary close the road to through traffic and divert traffic onto alternative route. Any local diversions will be agreed with Mayo County Council in advance of the construction stage and when applying for a Road Opening License.

Following detailed site investigations at construction stage micro siting of the cable and other components, particularly draw pits, joint bays, communication chambers and cable sheath sectionalising chamber may be required. It should be noted that works within the curtilage of the public road will be subject to further consents in the form of a road opening licence issued by Mayo County Council and the precise cable design will be subject to detailed design and approval by the competent authority (ESBN)..

In relation the Road Opening Licence, the licensee shall not carry out any works on the public road outside the scope of works submitted as part of this licence or in a manner or on a date other than as authorized by this licence. A road opening licence is required to open a footpath, road or street for any reason. Application is made through the national Map Road Licencing system, administered by the National Road Management Office and conditioned by the Roads Office of Mayo County Council. It should also be noted that no work should be carried out without prior notice to the competent authorities (Mayo Council and ESB), even when the licence is obtained. Adequate signage is also a necessity and a condition of the licence.

Ducts

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Ducts will be installed by principally open trenching within the public road. The trench will be typically 0.6 m wide by 1.2 m deep and the trench will be reinstated to approved specification and backfilled with subsoil and finished with topsoil, or if in the public road backfilled with granular fill and bituminous surfacing to local authority specification.

The typical sequence of operations for installing ducts in road verge will be to strip off the topsoil, this material will then be side cast (or stored where there is insufficient space) to form an outer bund parallel to the cable trench. The underlying sub-soil will be excavated and side cast (or stored if there is insufficient space) to form a second bund inside the seed bank / topsoil bund. A trench will then be formed to the required depth and width. The ducts will be laid in trefoil formation on a bed of lean mix concrete, then surrounded with lean mix concrete. Cable protection strips will be laid on top and the trench will be backfilled with selected sub-soil and finally top soil and seeded. The small amount of surplus soil will be used for local restoration and landscaping along the route of the cable (and not left as side casting). For trenches constructed within the public road, excavated material will be removed from site and disposed at an appropriately licence facility. Ducts will be laid in trefoil formation and surrounded in lean mix concrete to approved specification and the trench reinstated with imported granular sub-base and bituminous surfacing materials to local authority specification.

Joint Bay, Communications Chambers, Cable Sheath Sectionalising Chambers

Several joint bay and communications chambers will be required. These are precast concrete structures, manufactured and installed to approved specification. For the 38kV connection voltage the joint bay is typically 4.5m x 1.6m in plan area. Joint bays will be backfilled. The communications chamber is typically 1.2m x 1m in plan area and will be fitted with an approved cover.

The arrangements of draw pits, joint bays, communications chambers, cable sheath sectionalising chambers are illustrated in Planning Drawings pack.

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Plate 3.3 - A Typical Joint Bay

Crossings

There are 17 watercourse crossings / bridges that the proposed electricity export connection route will cross. Appendix 3.3 provides an inventory of the existing bridges. The preferred method for crossing bridges is in a standard trench with ducts in trefoil formation or in flat formation for reduced cover. However, where the depth of cover is below the limit permissible for a reduced cover / flat formation detail, alternative methods such as horizontal directional drilling can be used. A standard trench detail is considered feasible at crossings no's 1, 2, 4, 5, 7, 10, 13, 15 and 17. However, preliminary investigations for crossing no.'s 3, 6, 8, 9, 11, 12, 14 and 16 identify that an alternative crossing method may be required. A preliminary inspection of these bridges was carried out to determine the recommended crossing works and the suitability of carrying out Horizontal Directional Drilling (HDD) under crossing no.'s 3, 6, 8, 9, 11, 12, 14 and 16. The results of this survey with associated photos are included at Appendix 3.3 'Underground Electricity Export Connection Bridge & Culvert Inventory'. This inspection considered structural and ground conditions, existing services and utilities and road width and alignment. HDD is a method of drilling under obstacles such as bridges, culverts, railways, water courses, etc. in order to install cable ducts under the obstacle. It is a method commonly employed where installing the ducts using standard crossing methods is not possible. More detail is provided in the Cable Route Construction Methodology in Appendix 3.2 and Appendix 3.3.

As noted above, the methodology for the construction of 38kV electricity export connection is provided as part of this EIAR in Appendix 3.2. It outlines standards and guidelines to be adhered to as well as providing drawings and specifications of the cabling options. Briefly, the cables will be installed in ducts with joint bays installed at suitable locations to allow the jointing of the cable at appropriate intervals. A typical trench will have dimensions of 60cm width and 120cm depth. The cable ducting within roads will be installed either

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directly within the road or in the roadside verge. A breakdown of the recommending crossing type is set out for each structure in Appendix 3.3.

Following structural detail design stage investigations, should HDD be identified as the required crossing methodology at the Bridge Crossings listed above, it may be necessary to conduct the HDD works in lands adjacent to the public road. Accordingly, these lands are screened as part of this EIAR and assessed in relevant chapters throughout the EIAR. The lands are identified in Figure 1.1 (Inset Maps 5 and 6).

3.4 Turbine Delivery Route

Certain temporary minor off-site works along turbine delivery route are not being explicitly applied for under the Section 34 *Planning and Development Act 2000, as amended*, but should be assessed for the purposes of the EIA Directive. The proposed turbine delivery route (TDR) to the application site has been considered with particular regard to the transfer of abnormal loads from the port of origin. For the purpose of screening in the turbine delivery route for the range of the proposed scheme, a route has been included where the turbines will be delivered to the application site from the Port of Killybegs, depending which turbine is chosen by the applicant at a later date. An overview for the route options and possible variations screened in to the same are presented in Figure 3.2 below (view Planning Drawing Pack for full details). A Delivery Route Bridge Inspection Report (Appendix 3.6) has been prepared to accompany the screening process. The report reviews each of the existing bridges / water crossings associated with the TDR and contains the information and comments relating to the structural condition and defects present at the time of the visual inspection and an assessment of the structural integrity of the bridges. The final route will be the responsibility of the chosen turbine supplier and subject to their detailed route assessments.

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Figure 3.2: Turbine Delivery Route screened in as part of the EIAR

Plate 3.4 - Turbine blades being hauled through Bunclody to Gibbet Hill Wind Farm, Co. Wexford.

It is proposed that the wind turbine components will be delivered from the Port of Killybegs. The delivery from the Port of Killybegs to the Site will utilise the main National and Regional classified roads as far as is possible. The route will go from the Port to Donegal town via the N56, the route will then head south on the

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N15 from Donegal town via Ballyshannon and Bundoran to Sligo town. The route then takes the N4 via Collooney turning onto the N17 via Tobercurry and Charlestown, taking the L1331 after Charlestown moving west joining the N5 east of Swinford. The TDR proposes to then turn into and through Swinford via the N26 moving in a north westerly direction through Foxford moving north towards Ballina. The route proposes to move through Ballina exiting to the west via the N59 before turning onto the L1108 in a north westerly direction before joining the R315 route which then heads north before turning onto the L51723 which leads to the site entrance. Variations and deviations to the proposed TDR are also included on the TDR as part of this screening of the TDR to enable manoeuvres to site, depending on the turbine supplier and design parameters of the chosen turbine.

The proposed TDR is presented in Figures 3.2. The final route will be subject to a separate planning application depending on the chosen turbine supplier and subject to their detailed route assessments.

Certain Points of Interest (POI), or constraint areas, have been identified along with route options from the Port of Killybegs. These are illustrated in Figure 1.1 and have been assessed in the relevant chapters throughout this EIAR. A further planning application may be required, depending on the scope of works at the POIs. ABO Energy Ireland Ltd. will ensure compliance with the *Planning and Development Act 2000, as amended* should permission be required for these works. Certain works could include:

- the stoning up of verges;
- the removal of street/road furniture and signage
- the removal/cutting of certain hedges/trees;
- widening of local roads at defined Points of Interest
- creation of areas of hardstanding on agricultural or scrub lands etc

All works would be temporary to allow the passage of the abnormal loads and the lands would be fully reinstated afterwards, in so far as possible. The proposed route is described in more detail in Chapter 14.

3.5 Ancillary works

Ancillary works will include the necessary works to support the primary construction activities of the project described above.

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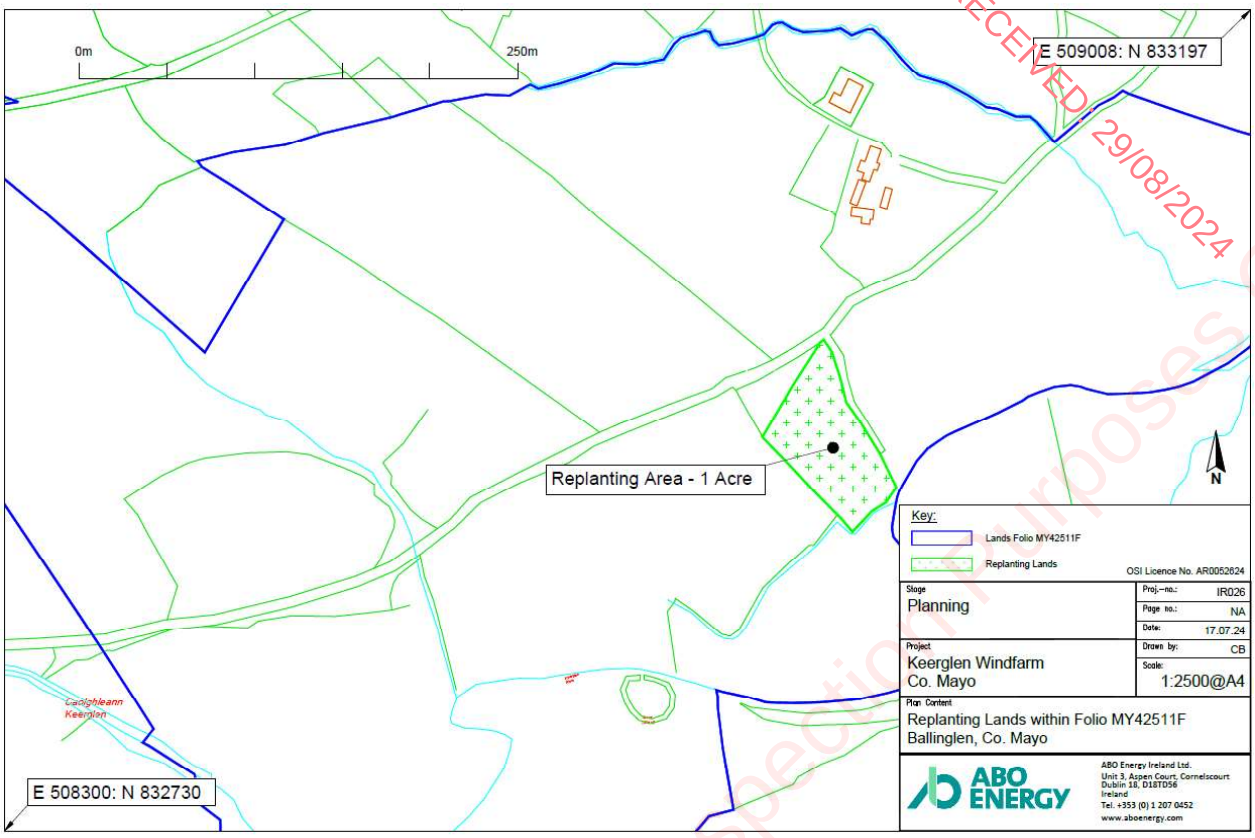

Figure 3.3: Replanting Lands

3.6 Project Phases

Following the planning stage, the project will have three distinct phases:

- Construction;
- Operation;
- Decommissioning;

Construction Phase

The anticipated construction period for the project will last for approximately 15 months from commencement of construction of the associated site access and electricity export connection works through to the installation and commissioning of each turbine. Following the commissioning of each turbine, there will be a further period of around three months to fully complete the required restoration works around each turbine.

The construction programme may be slightly amended however as a result of external factors, for example weather conditions. The methods to be used are likely to follow the following broadly sequential pattern (except for track construction and turbine foundation construction which may continue concurrently):

- Formation of access and establish construction compound;
- Formation of internal access roads and crane hard standings, including SUDs drainage;

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- Excavation of foundations for turbines;;
- Fixing reinforcing steel for foundations;
- Pouring of concrete foundations and backfill;
- Construction of site substation, laying of underground electrical cabling and earthing;
- Electrical fit out of substation including transformer and switchgear;
- ;
- Delivery and erection of turbine tower, nacelle and rotor blades; and
- Energisation, commissioning and reinstatement.

The construction of the wind farm will be designed and programmed to minimise impacts on both flora and fauna, particularly existing vegetation and bird life.

Details pertaining to the TDR and CGR construction related requirements will be detailed in subsequent planning applications.

Operation Phase

Following the construction phase, the turbines will be operational for a period of approximately 30 years. Planning permission is being sought for a 30-year operation period commencing from the date of full operational commissioning of the wind farm. Modern wind turbines have expected operational availability of over 97 % (including shutdowns due to routine maintenance). During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction. Each turbine has a computer controller that regulates every aspect of the turbine's performance. Any problems which the computer controller cannot resolve itself are referred to the operator via the computer's modem link.

Regular servicing will be carried out on the turbines in accordance with the manufacturer's specifications. This will involve the monitoring of the quality of oil in the gearbox, checking and maintaining all hydraulic and electrical systems and checking the structural integrity of the turbines. The gearbox oil is usually changed every 18 to 24 months. It will be disposed of off-site in accordance with current regulations.

There may further be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes. The electricity substation and site tracks will also require periodic maintenance.

Decommissioning Phase

The operational period for the proposed wind farm is 30 years from the date of commissioning of the wind turbines. Regardless of when the commissioning occurs, the planning authority will be notified of the date, giving effect to the timelines of a Decommissioning Plan included in Appendix 3.4.

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The decision to refurbish or replace the wind farm would require express permission outside the remit of this planning application. A Decommissioning Plan (Appendix 3.4) has been prepared to establish best practice methods to successfully decommission the wind farm at the end of its operational life. Decommissioning means the removal of turbines and includes the reinstatement of the site where required. The plan also applies to re-powering wind farms which involves the replacement of older turbines with next generation technology[5].

As noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms, given there would commonly be 30 years between commissioning and decommissioning of a wind farm, it is recommended that the plan should be sufficiently flexible. This is because environmental conditions, laws and techniques may change during the lifetime of the development. The plan will be refined and updated the end of the operational period to allow for best practice at that time and to ensure the best outcome is delivered at end of a wind farm's operational life. The table below sets out the actions required in the delivery of either reinstatement or repowering.

Table 3.7 Timeline of Decommissioning Plan

Year	Action	
> 0	Submit financial bond to the planning authority, if required.	
0	Give notice to the planning authority of the date which the wind farm is commissioned.	
5	Review the Decommissioning Plan to ensure that site conditions, maintenance requirements and unexpected events do not compromise its objectives.	
10	Review the Decommissioning Plan to ensure that site conditions, maintenance requirements and unexpected events do not compromise its objectives.	
15	Review the Decommissioning Plan to ensure that site conditions, maintenance requirements and unexpected events do not compromise its objectives.	
20	Review the Decommissioning Plan to ensure that site conditions, maintenance requirements and unexpected events do not compromise its objectives.	
28-30	Review the Decommissioning Plan and ensure it is completed to provide full details of decommissioning and submit completed Plan[6] to the planning authority for review.	
28-30	Carry out necessary actions for repowering if applicable (i.e. acquire required planning consents)	
30	Carry out necessary actions for decommissioning (i.e. removal of turbines and other infrastructure)	
	Reinstatement	Repowering
30-31	Carry out necessary actions for reinstatement (i.e. restoration of the lands to original state)	Carry out further actions for repowering (i.e. replacement of older turbines with next generation technology)
30-60	Operation of agriculture or other use on site.	Operation of repowered wind farm
> 30	Monitoring of reinstated area.	

[5] Scottish Natural Heritage (SNH) (2016). Decommissioning and Restoration Plans for Wind Farms Guidance Version 2.: http://www.snh.gov.uk/docs/A1434319.pdf

[6] The final Decommissioning Plan should contain a similar level of detail to a Construction and Environmental Management Plan. It will need to be informed by contemporary habitat and protected species surveys, and other information on potential constraints (e.g. watercourses, deep peat, or sensitive areas restored during the lifetime of the development). It should include all relevant information, maps and figures. This is to ensure that future readers can understand what it is seeking to achieve, why, where, how and when.

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3.7 Development Wastes

The proposed development will generate some waste across its three phases. These are addressed in more detail below.

Construction Waste

Construction waste includes a range of materials such as:

- Hardcore, stone, gravel, and concrete;
- Timber;
- Concrete blocks;
- Plastics;
- Lubricating oils and diesel; and
- Miscellaneous building materials.

As part of the CEMP the Main Contractor will prepare and implement a site waste management plan. Waste oils and diesel will be removed from the site and disposed of by an approved waste contractor in accordance with the prevailing regulations.

Operational Waste

Operational waste includes:

- Waste from toilets;
- Miscellaneous building materials;
- Plastics; and
- Lubricating oils, and diesels.

All wastes arising as a result of servicing and maintenance will be disposed of offsite in a responsible manner. Servicing of turbines will result in small quantities of waste lubricating and cooling oil arising, which will require safe containment and disposal.

Decommissioning Waste

Decommissioning waste includes:

- Concrete blocks, stone, waste, concrete and plaster;
- Electrical equipment and turbine components;
- Plastics; and
- Lubricating oils, and diesels.

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Waste created through the decommissioning process will be treated in accordance with the specific site waste management plan prepared at that time. All above surface mechanical/electrical equipment will be removed, the concrete bases will be covered over with soil, reinstated and re-seeded. The decommissioned turbine components will have sufficient salvage value to ensure their proper recycling.

An important environmental issue in the decommissioning of the wind farm will be the proper handling and disposal of any contamination material (e.g. lubricating/cooling oils). The developer undertakes to ensure that all such contaminating material will be removed from the site in accordance with best practice.

3.8 Conclusion

Keerglen Wind Farm will comprise up to eight turbines with turbine tip heights ranging from 176-180m, rotor diameters ranging from 133-150m and hub heights ranging from 105-112m. Each turbine will require an adjacent hardstanding area for the assembly of the turbines. The turbines will be accessed by a series of existing and proposed access tracks. A 100-112m temporary meteorological mast may be required to monitor conditions on the site, this will be subject of a separate planning application but has been screened in during this EIAR. The electricity generated by the turbines will be routed to the onsite electrical substation at 20kV via underground cables. The power will be stepped up to 38kV at this onsite station and exported to the national grid network or a large energy user based at Killalla Business Park via an underground cable connection (subject to detailed design). For the purposes of the EIA Directive, an electricity exportconnection route has been screened to Killalla Business Park, Co. Mayo with a turbine delivery route screened from Killybegs to site. The site will be accessed from one new main site entrance, formed along the L51723. A 9.5m clear span bridge is proposed to cross the Keerglen River. A temporary construction compound is included in the design. A drainage design will be implemented to manage runoff. The layout of the wind farm components has evolved having regard to various constraints that have been identified as a result of the numerous specialist and technical surveys undertaken to inform the proper planning and design of the project.

It is anticipated that the construction, erection and commissioning of all wind turbines would last approximately 15 months. Construction of access tracks and foundations would be progressive, minimising the number of simultaneously active locations and ensuring that construction traffic is kept to a minimum.

A Construction Environmental Management Plan will be implemented to set out a programme of reinstatement and restoration. The wind farm will operate for 30 years and will only require periodic inspection and maintenance visits. It will then be decommissioned in line with the Decommissioning Plan included in Appendix 3.4.

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