# Chapter 3: Description of Development

## Creag Riabhach Wind Farm Extension

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# 3 Description of Development

## 3.1 Introduction

This chapter describes the proposed development, including the current site conditions, the site selection and design process, and details the finalised design proposed in this application.

## 3.2 Site Selection and Design Evolution

### *3.2.1 Site Selection*

In accordance with Schedule 4 (2) of the EIA Regulations, and Regulation 5 of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, reasonable alternatives (in terms of project design, technology, location, size and scale and characteristics) of the proposed development should be considered. However, the rationale for site selection of the proposed development was as an extension to Creag Riabhach Wind Farm; therefore, alternative sites have not been considered.

The application site enjoys the following benefits:

- There is good wind speeds;
- there is a commercially viable grid connection maximising the available capacity of the connection already installed for Creag Riabhach Wind Farm (CRWF);
- infrastructure sharing with CRWF is possible, including making use of the established road access and internal access track network;
- the location is distant from nearest residential properties and settlement; and
- development within the application site is considered to have limited potential for impacts on international or national, environmental, landscape or cultural heritage designations.

### *3.2.2 Site Design*

#### *Key Design Principles*

The key design principles for the proposed development were as follows:

- The extension turbines will form an integral part of the CRWF turbine array and are a logical infill as they are in the same alignment as current consented turbines.
- There would be no lateral extension to the CRWF turbine array. The extension turbines take advantage of the natural topography and are broadly within the existing visual envelope of the CRWF turbine array.
- The candidate extension turbines will be the same make or similar as those at CRWF and there will be no discernible difference in tip heights.
- Overall, the design achieves an appropriate balance between scale of development, receiving environment and an opportunity to maximise generation potential.

A series of baseline surveys and studies were undertaken to inform the siting and design of the extension turbines.

### *Iteration of Design*

Since scoping (**Figure 3.2a**), the proposed development design has evolved following additional survey work and further consultation. Amendments have been made to the location of the proposed turbines and internal access track alignment in order to mitigate potential impacts by design. There has been no change to the proposed location of the Battery Energy Storage System (BESS).

### Turbines

In consultation with the Scottish Environment Protection Agency (SEPA) and based on the results of additional peat probing, the following changes to turbines were made to minimise impacts on peat:

- Repositioning of EXT-02 *c*. 60m to the north;
- Repositioning of EXT-03 *c*. 145m to the north; and
- EXT-01 crane pad rotated to a north-east direction.

The location of each turbine is also the result of the best track and crane pads design possible that has led to a substantial reduction of the earth movements (according to the turbine specifications).

### Access Track

The proposed development has been designed to make use of the existing main access track of CRWF.

Several track routes were considered as part of the engineering design process. These are identified in **Figure 3.2a-e**. Through consultation with consultees, additional baseline survey work (including peat probing) and engineering design work a proposed track route has been selected that is considered to minimise potential environmental disturbance and achieve a material balance for the proposed development.

The following represents the stages of design iteration the track route went through:

- As shown on the scoping site layout (**Figure 3.2a**), initially a direct route from the existing CRWF access track to the proposed turbine locations was taken and an additional length of track was included to create a loop route with the existing access track at T13 of CRWF.
- The additional length of track to T13 was discounted due to the amount of additional engineering works required to construct in a form that would be usable for the wind farm and the consequential impact that would have on the peat, forest and environment. The proposed route was refined to take into account onsite constraints, and an alternative track route option starting from nearer to the proposed BESS was considered in order to improve the material balance. This iteration is shown on **Figure 3.2b**.
- The route option starting from the BESS was preferred; however the track alignment was amended to follow the route of the previous option where they met (this process is described in more detail below). Peat was recognised as a key design driver and SEPA were consulted on this track layout prior to it being finalised.

Once a preferred route option was chosen it underwent refinement in order to address comments provided by SEPA in their scoping response. SEPA requested that no new borrow pit is opened for the proposed development. The initial preferred option (**Figure 3.2c**) would have resulted in an aggregate requirement of 2000m$^3$ (**Table 3.1**); however, due to load restrictions on the A836 and distance from the nearest quarry near Tain this was discounted. An alternative to this was designed (**Figure 3.2d**); however, this have resulted in 58,000m$^3$ of additional aggregate to be removed from site (**Table 3.2**). A new alternative was considered (**Figure 3.2e**), which would result in an additional 10,000m$^3$ aggregate for removal from site (**Table 3.3**). Minor localised changes to the track alignment and amendments to site levels were made and these combined changes have reduced net balance from circa 10,000m$^3$ additional material to circa 3,000m$^3$ (**Table 3.4**). The additional 3000m$^3$ can be incorporated into the bunding topographical shaping so overall material balance will be achieved.

**Table 3.1:** Alternative Track Alignment 1 (Figure 3.2c)

| Project Component | Volume of Material (m$^3$) |
|---|---|
| **Cut** | |
| Roads and Platforms | 28,000 |
| BESS | 11,500 |
| Other Earthworks | 28,500 |
| **Total** | **68,000** |
| **Fill** | |
| Roads and Platforms (to formation) | 17,000 |
| BESS | 12,500 |
| Other Earthworks | 28,500 |
| Roads and Platforms Make Ups | 12,000 |
| **Total** | **70,000** |
| **Cut/Fill Balance** | **+2,000** |

**Table 3.2: Alternative Track Alignment 2 (Figure 3.2d)**

| Project Component | Volume of Material ($m^3$) |
|---|---|
| **Cut** | |
| Roads and Platforms | 40,000 |
| BESS | 11,500 |
| Other Earthworks | 32,000 |
| **Total** | **83,500** |
| **Fill** | |
| Roads and Platforms (to formation) | 11,000 |
| BESS | 12,500 |
| Other Earthworks | 5,000 |
| Roads and Platforms Make Ups | 11,500 |
| **Total** | **32,000** |
| **Cut/Fill Balance** | **-51,500** |

**Table 3.3: Alternative Track Alignment 3 (Figure 3.2e)**

| Project Component | Volume of Material ($m^3$) |
|---|---|
| **Cut** | |
| Roads and Platforms | 29,750 |
| BESS | 11,500 |
| Other Earthworks | 16,750 |
| **Total** | **58,000** |
| **Fill** | |
| Roads and Platforms (to formation) | 6,000 |
| BESS | 20,000 |
| Other Earthworks | 10,000 |
| Roads and Platforms Make Ups | 13,000 |
| **Total** | **48,000** |
| **Cut/Fill Balance** | **-10,000** |

**Table 3.4: Final Track Alignment (Figures 3.1a-c)**

| Project Component | Volume of Material ($m^3$) |
|---|---|
| **Cut** | |
| Roads and Platforms | 29,000 |
| BESS | 9,000 |
| Other Earthworks | 16,000 |
| **Total** | **54,000** |
| **Fill** | |
| Roads and Platforms (to formation) | 6,000 |
| BESS | 22,000 |
| Other Earthworks | 10,000 |
| Roads and Platforms Make Ups | 13,000 |
| **Total** | **51,000** |
| **Cut/Fill Balance** | **-3,000** |

## BESS

The proposed location for the BESS is in the area of the temporary construction compound for CRWF. This location was chosen after careful consideration based upon the concept of trying to focus the site infrastructure around the substation location. This approach has the additional advantage of requiring minimal ground works so minimising further environmental impact.

A bund, comprising re-used materials from site excavations, has been proposed adjacent to the south east of the proposed BESS, which would provide screening from the A836.

### *Final Layout*

As a consequence of the positioning of the extension turbines on the shoulder of the ridge, the turbine bases will be approximately 30m below the average base height of CRWF turbines, (similar to consented T13 and T18). The lower AOD height allows an increase in base to tip height from 125m to approximately 149.9m which will be below the base to tip heights of the consented CRWF turbines. The increase in hub height for the extension turbines significantly increases the power capacity and maximises the turbine's operational efficiency.

Through consultation with statutory consultees, the design has evolved to avoid areas of deep peat and minimise peat disturbance. The engineering design includes measures to protect water environment from the surface water run-off.

The extensive engineering design process undertaken has ensured that construction of the proposed development can be achieved by balancing material that is removed and what is reused. No new borrow pits will be required, no rock material will need to be imported or exported and all disturbed peat will be re-used.

## 3.3 Outline of Proposals

Consent is being sought for the installation and operation of three turbines, with a maximum blade tip height of 149.9m and an indicative rotor diameter of 115m.

The proposed development includes a BESS, which will function with CRWF and the extension turbines. The BESS will help energy efficiency at CRWF by storing energy produced when the wind is blowing but the grid cannot take the power. This will help address intermittency and balance demand and supply for the grid. In turn this will support the flexible operation of the National Grid and the decarbonisation of electricity supply.

The turbines would have an indicative output of approximately 12.6MW and the BESS would have an indicative capacity of 37.3MW. The combined export capacity would be up to 50MW.

The proposed development would be connected to the operational substation which provides the connection for CRWF to the GB electricity network. From studies undertaken to date by the Transmission Operator, there is sufficient capacity within the system linking CRWF to the grid for the additional turbines. Consequently, no offsite works are required for the grid connection. This is a significant environmental and technical benefit, allowing good use to be made of existing infrastructure capacity and for the extension turbines and BESS to make a timeous contribution to renewable energy generation and emission reduction targets.

All traffic (including abnormal loads) will access the site via the existing CRWF access junction from the A836 to the east of the site. Track access along with crane bases and hardstandings will be required for the turbines. Underground cables will run alongside the tracks to take the power generated to the existing substation.

It is proposed that traffic associated with the proposed development would utilise the same routes as those used during the construction of the CRWF. There are no proposals for any new access points onto public roads.

Access for construction materials would be predominantly from the south via the A9, A836 and A839. On the A836, north of Lairg, the section between the Dalnessie Estate entrance and the existing forestry access just south of the Crask Bridge through Dalchork Forest would be used for all abnormal loads and Heavy Goods Vehicles (HGVs) traffic in accordance with the route used for CRWF.

Access from the south via the B9176 Struie Road is not considered suitable for bulk materials deliveries due to the twisting nature of the road and the natural constraints at the Allt Fearna Burn bridge, Strathrory River bridge and bends and at the River Avereon bridge. Bulk construction traffic would be prohibited from this route via the Balance of Plant (BoP) contract as the applicant does not consider the road suitable for articulated HGV deliveries, where alternatives routes such as the A9 and A836 exist.

Abnormal loads associated with the wind turbines only have one route available to access the site and this is via the A9, A839 and A836, with loads passing through The Mound, Rogart and Lairg. There would be no abnormal load movements associated with the BESS components.

The final layout is shown on **Figure 3.1a**.

It is intended that the operational life of the proposed development will be for up to 40 years. If both the S36 proposed extension development application and the S36C operational life extension application for CRWF (See the Project Background Section of **Chapter 1: Introduction**) are consented, it is the intention of the applicant to decommission the proposed development with CRWF resulting in an overall operational life of the proposed development turbines (functioning as a single generating station) of approximately 37 years.

In terms of mitigation and enhancement measures included as part of the proposed development:

- A Schedule of Mitigation (Annex 1 of **Technical Appendix 3.1**) includes detail of all best practice measures and additional mitigation measures intended to minimise potential impacts associated with construction, operation and decommissioning of the proposed development.
- An area adjacent to the original peatland habitat restoration area for CRWF has been identified for further restoration similar to that of the consented scheme. Proposals for this Biodiversity Enhancement and Restoration Plan has been included within **Technical Appendix 6.2** of this EIA Report.
- The compensatory planting requirement for the loss of forestry resulting from the felling of woodland in the vicinity of EXT 02 and EXT 03 has been identified within **Technical Appendix 14.1** of this EIA Report.
- A Stage 1 Peat Management Plan detailing site investigation completed, demonstrate how the design has avoided areas of deep peat as far as possible, quantify the excavation volumes for acrotelmic and catotelmic peat, outline associated good practice measures and also proposals for peat re-use and reinstatement is included in **Technical Appendix 9.1** of this EIA Report.

This EIA will consider the potential impacts arising as a result of the proposed development, including the infrastructure, all construction, operation and decommissioning activities and all mitigation and enhancement measures.

## 3.4 Project Components

This section details the components comprising the proposed development. The proposed turbine locations and BESS, as well as ancillary infrastructure, would be subject to a proposed maximum micrositing tolerance of 50m in any direction. Where environmental features may be potentially impacted by micrositing this would be managed in consultation with an Environmental Clerk of Works (ECoW) for the proposed development and with consideration of the onsite constraints detailed in this Environmental Impact Assessment (EIA) Report. Any movement of the turbines from the proposed development layout outwith the micrositing tolerance would be agreed with The Highland Council (THC) and would be in accordance with the mitigation set out in this EIA Report.

### *3.4.1 Wind Turbines*

#### *Turbine Parameters*

The candidate turbines, on which assessments will be based, is the Enercon E115 (4.2MW capacity) with a rotor diameter of 115m, if consent is granted and should these turbines not be available then turbines would be

installed that have comparable dimensions to those in the indicative turbine drawing (**Figure 3.3**). These turbines are the same as those erected at CRWF.

**Table 3.5: Candidate Turbine Information**

| | |
|---|---|
| Number of turbines | 3 |
| Maximum tip height | 149.9m |
| Candidate rotor diameter | 115m |
| Candidate hub height | 92m |
| Candidate turbine 1 coordinates | 252944E, 927105N |
| Candidate turbine 2 coordinates | 253071E, 928221N |
| Candidate turbine 3 coordinates | 253056E, 927846N |
| Candidate turbine 1 level (AOD) | 217m |
| Candidate turbine 2 level (AOD) | 228m |
| Candidate turbine 3 level (AOD) | 213m |

### *Turbine Design and Lighting*

The turbines would be three bladed, horizontal axis turbines with solid tubular towers. The colour and finish of the wind turbine blades, nacelles and towers would be subject to agreement with the Scottish Government Energy Consents Unit (ECU) and THC and would be subject of a condition upon the granting of a consent. The turbine blades would be made from glass fibre/carbon spar with glass fibre airfoil shells. The turbine towers would be of tapering tubular steel construction, likely finished in a light grey, semi-matt colour. An indicative turbine elevation drawing for the proposed development is shown on **Figure 3.3**.

As the turbines are below 150m to blade tip height, no Air Navigation Order (ANO) visible red lighting would be required. The proposed development turbines will be fitted with MOD accredited infrared lighting as necessary, which is not visible to the naked eye.

### *Transformers*

A transformer would be required for each turbine, and would likely be located internally. However, and depending on the final model of turbine selected, an external kiosk may be required to house a cooler and this would be located adjacent to the turbine as shown on **Photo 1** below.

**Photo 3.1: External Cooler**

### *Turbine Foundations*

The detailed design specification for each foundation would depend on the type of turbine procured, and the specific ground conditions at the location of each turbine. However, it is envisaged that installation of the turbines would be installed on foundations comprising both stone and steel-reinforced concrete.

As the concrete gravity foundations would be located underground, a quantity of earth would, therefore, need to be removed. The amount of earth to be removed would depend upon site-specific ground investigations at each turbine location. Topsoil, peat and other material would be removed from the foundation area and stored so that it may be used later for reinstatement (peat removal will be, at the turbine location, minimal as each location has been improved).

Turbine foundations would be set down to the depth of suitable bearing strata (for the purposes of the EIA, a maximum (worst case) scenario for turbine foundations of 3m approximately depth (with no slope from middle to outside edge) has been assumed) with an approximate diameter of 22m approximately and circular or octagonal shape; however, should geotechnical investigations demonstrate that the required bearing capacities are not achievable; a piled foundation design would be adopted using the same overall design footprint.

An anchor ring and foundation bolts would be cast into a central column onto which the turbine tower would be fixed. It is proposed that a concrete batching plant would be included and located within the temporary construction compound. The concrete bases would be allowed to cure (i.e., reach its design strength) before turbines are fitted.

An indicative turbine foundation and hardstanding drawing is provided as **Figure 3.4**.

#### *Turbine Erection*

The turbine components would be delivered to the relevant storage area for each component, either to a specific turbine hardstanding, until weather conditions are appropriate for turbine erection. The bottom turbine tower section would be fixed to the anchor ring and foundation bolts imbedded into the central column of the foundations, followed by the upper turbine tower sections. All components would be lifted into place by two cranes (a heavy lifting capacity crane, and a smaller service crane). The cranes would then lift the nacelle into place on the top section of the turbine tower. After, blades would be fitted to the rotor hub on the ground before lifting altogether onto the nacelle, or individually lifted for connection to the rotor hub *in situ*.

#### *Crane Hardstanding*

Level hardstanding areas are required adjacent to each turbine base for the operation of a heavy lifting capacity crane, and a smaller service crane, used for assembly of the turbine components. They would also be used as storage areas for the turbine components and the hardstandings would be to the same general specification as the adjoining turbine access tracks, but a slightly greater depth of construction is expected.

It is anticipated that area for the permanent crane hardstanding beside the turbine base will be approximately 2700 $m^2$. Indicative crane hardstand dimensions are shown on **Figure 3.5**. Comprising parking area (6m x 15m), storage area (18m x 61m), waste collection point (6m x 9m), access road (5m x 77m), crane platform (25m x 42m), assembly area (40m x 53m and 17m x 13m), and container zone (24m x 6m). The access road, foundation, tower, crane platform and assembly area hardstandings provide safe access for maintenance and repairs and would, therefore, remain in place for the operation of the proposed development. The remaining hardstandings would be reinstated following the construction phase. The cut-and-fill batters required on the hardstandings would be dictated by pre-construction detailed site investigation surveys.

Where possible, all hardstandings would be constructed using suitable surplus material generated from the excavation process elsewhere within the turbine area. Topsoil and peat would be excavated, with stone laid and compacted to the required depth, however, the depth of the hardstandings would depend on the ground conditions at specific locations.

### *3.4.2 Temporary Construction Compound*

The existing CRWF temporary construction compound would be used for the additional construction works and then the temporary construction compound would be removed in full or in part and the rest of the BESS completed

*in situ*. As the infrastructure has already been assessed and consented, the construction effects will not be considered within this EIA. However, the delay in restoration of temporary infrastructure will be considered within **Chapter 5: LVIA** and **Chapter 6: Terrestrial Ecology**.

During the construction period, the construction compound would include laydown areas for storage area for the various components (excluding turbine components which would be delivered directly to the turbine hardstanding areas), fuels and materials required for construction. The main construction site office and compound would likely comprise temporary cabins to be used for the site offices, the monitoring of incoming vehicles and welfare facilities for site staff including toilets; parking for construction staff, visitors, and construction vehicles; secure storage for tools and small parts; a receiving area for incoming vehicles; and security fencing around the compound. Any lighting would be directional in accordance with Institute of Lighting Professionals (ILP) guidance and mounted on the individual portacabins.

### *3.4.3 Battery Energy Storage System*

The BESS would be installed after the completion of the construction of the proposed development's wind turbines on the hardstand of the construction compound. The battery storage facility would provide back-up power to the National Grid for the benefit of providing stability to the electricity supply network and the integration of more renewable energy generation.

Within the space provided by the construction compound (90m x 75m), based on the assumed parameters, it is considered possible to achieve an arrangement comprising 16 battery storage units, each unit is approximately 12.8m x 18.2m with a height of approximately 2.35m. Based on a current industry Grid Battery
Storage solution, it is considered there is sufficient space within the temporary construction compound to accommodate a battery energy storage facility with up to 37.3MW capacity.

The BESS will consist of a palisade fenced open compound of batteries along with inverters and transformers connected by an underground cable to the substation. The batteries will either be a series of individual cabinets mounted on a concrete base for stability or housed within a container for protection against the weather. The battery storage duration will be in the range of 1-4 hours dependent upon the battery selection.

The indicative design is the maximum parameters for the BESS, with the exact technology confirmed at the time of procurement. Indicative energy storage facility units are shown on **Figures 3.7-9**.

### *3.4.4 Site Access and Internal Access Tracks*

During construction the proposed development will be accessed from the A836 via the existing CRWF site access junction located south of Vagastie Bridge. All vehicles will access and egress the site through this access; there are no proposals for any additional construction access junctions on the public road network. Following construction this access junction will remain in place during the operation phase of the proposed development.

No upgrades to existing access tracks are proposed. Approximately 1.5km of new track would be constructed as part of the proposed development. Tracks would be used by construction vehicles would and retained throughout the lifetime of the proposed development for use by maintenance vehicles. The width of the tracks would be approximately 4m; although there may be some localised widening. The track surface would have a cross fall in for the runoff to drain into ditches on the downhill side of the track where necessary. Lateral and cross drains would also be installed, with erosion protection, where required.

Indicative track details are shown in **Figure 3.6**.

The internal access tracks will be constructed using 'cut track' design. Topsoil is stripped to expose a suitable rock or sub-soil horizon on which to build the track. The track is then built up on a geotextile layer by laying and compacting crushed rock to a depth dependent on ground conditions and topography. Generally, the surface of the track will be flush with or raised slightly above the surrounding ground level.

### *3.4.5 Watercourse Crossings*

The Water Environment (Miscellaneous) (Scotland) Regulations 2017 came into force from the 1st January 2018. This regulation requires a formal Controlled Activities Regulations (CAR) licence to discharge water to the environment for construction sites (such as wind farms) larger than 4ha.

The number of proposed water crossings required for the proposed development has been kept to a minimum (three) and uses existing disturbed/previously developed ground where possible. Any new crossings would be designed in accordance with Scottish Government best practice and taking due regard of SEPA guidelines to enable the passage of fish and other wildlife. Any upgrades to existing water crossings that are required would also comply with Scottish Government and SEPA best practice.

### *3.4.6 Drainage*

The drainage design will comply with General Binding Rules (GBR's) 10, 11 and 21 for the track drainage, under the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) 2011 (as amended) (Scottish Environment Protection Agency (SEPA), 2011). Surface or sub-surface water flow within the vicinity of the internal access tracks and hardstanding areas will be routed into drainage channels or will flow across the hardstanding areas. The drainage channels will be situated on the upstream side of the infrastructure and run in parallel with them. These channels will pass under the hard areas, via small diameter carrier drains, to the downstream side. A Drainage Management Plan, which will detail proposed surface drainage measures to treat and deal with surface runoff from the site, will be designed in accordance with sustainable drainage systems (SuDS) principles. The plan will further detail how groundwater flows will be maintained around sub-surface structures such as foundations and cable ducts. This plan will form part of a Construction Environmental Management Plan (CEMP) and in consultation with THC and SEPA.

The general drainage arrangement is shown on **Figure 3.9** and in detail on **Figure 3.10**. A conceptual drainage layout plan for EXT-01 to inform the likely arrangement of the drainage network to minimise potential adverse effects on the River Vagastie has been prepared (**Figure 9.1**).

### *3.4.7 Electrical Connections*

The electrical power produced by the individual turbines will be fed to the existing onsite substation via underground cables. On site cabling will typically consist of array cables, predominantly at 11,000 or 33,000 volts (11KV or 33KV). The typical installation depth for cables of this voltage is approximately 0.5m as shown in **Figure 3.6**. It is anticipated these cables will be sited within the footprint of the new and existing access track and will be suitably marked on the surface. Approximately 2km of cabling will be required for the proposed development.

It is anticipated that the proposed development would be connected to the electricity network via the CRWF substation. There will be no requirement to upgrade the Transmission Network beyond the CRWF substation in order to facilitate the proposed development. The Substation already constructed for CRWF will house the necessary switchgear for the proposed development.

### *3.4.8 Access, Health and Safety*

The RenewableUK Onshore Wind Health and Safety Guidelines (2015) note that wind turbine development and operation can give rise to a range of risks to public safety including:

- traffic (especially lorries during construction, and abnormal loads for the transport of wind turbine components; including beyond the application boundary);
- construction site hazards (particularly to any people entering the site without the knowledge or consent of the site management);
- effects of catastrophic wind turbine failures, which may on rare occasions result in blade throw, tower topple or fire; and
- ice throw, if the wind turbine is operated with ice build-up on the blades.

The RenewableUK guidance (2015) states that “Developers should ensure that risks to public safety are considered and managed effectively over the project lifecycle, and should be prepared to share their plans for managing these risks with stakeholders and regulators; effective engagement can both build trust, and help to reduce the level of public safety risk by taking account of local knowledge.”

Site security and access during the construction period would be governed under Health and Safety at Work Act 1974 and associated legislation. The Land Reform (Scotland) Act (2003) which came into effect in February 2005 establishes statutory rights of responsible access on and over most land. The legislation offers a general framework of responsible conduct for both those exercising rights of access and for landowners. However, during construction, some restrictions on use of the paths running through the site and along the site access may be required for public safety in accordance with the Construction (Design and Management) Regulations 2015.

The proposed development will have suitable signage to provide directions, contacts and health and safety information. There will be signs at the site entrance providing the operator's name, the name of the development and an emergency contact telephone number.

Once the construction period and commissioning of the proposed development is complete, no special restrictions on access are anticipated. Informal recreational access within the site and along the site access during the operational phase, would be permitted in line with existing arrangements. Appropriate warning signs would be installed concerning restricted areas such as the substation compound, transformers, switchgear and metering systems. All onsite electrical cables would be buried underground with relevant signage.

## 3.5 Construction

### *3.5.1 Construction Programme*

Construction of the proposed development is anticipated to take approximately 23 months from mobilisation to completion. An indicative programme is outlined in **Table 3.6**. Reinstatement will be undertaken as soon as practicable after each stage of the project is completed.

Table 3.6: Indicative Construction Programme

| Activity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site Establishment & Remediation | | | | | | | | | | | | | | | | | | | | | | | |
| Track / Hardstanding / Foundation /Bess platform Construction | | | | | | | | | | | | | | | | | | | | | | | |
| Cable and Ducting Deliveries and Installation | | | | | | | | | | | | | | | | | | | | | | | |
| BESS Deliveries and Installation | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine Deliveries and Installation | | | | | | | | | | | | | | | | | | | | | | | |
| Commissioning and Demobilisation | | | | | | | | | | | | | | | | | | | | | | | |

Construction working hours would be 8am to 7pm Monday to Friday and 8am to 1pm on Saturdays.

### *3.5.2 Construction Materials*

The applicant has undertaken extensive engineering design to ensure that the proposed development can be achieved by a material balance between what is removed and re-used. No new borrow pits will be required, no rock material will need to be imported or exported and all disturbed peat will be re-used.

Additional materials required for the construction of the track, turbine foundation, hardstanding and cable trenches are as follows:

- Crushed stone;
- Geotextile;
- Cement;
- Sand;
- Concrete quality aggregate;
- Steel reinforcement; and
- Electrical cable.

Materials will be sourced and transported to the site from local suppliers, where possible. The foundation concrete will be of a grade that accords with the turbine manufacturer's requirements.

### *3.5.3 Construction Movements*

In order to construct the proposed development, bulk materials will be brought in from local suppliers from the south via the A836. Specialist loads such the turbine components will be transported to site from Nigg using specialist vehicles via the A9, A839 and A836. The proposals are in line with the existing CRWF.

The construction activities will lead to increased traffic volumes predominantly of the A836 during the construction phase only. Following commissioning of the proposed development, traffic flows will fall to two vehicles every week, which would already be accounted for as part of the existing CRWF. This is discussed further in **Chapter 10: Transport and Access**.

### *3.5.4 Felling*

The proposed development would require 2.28ha of woodland to be felled to facilitate construction and operation of the wind turbines and ancillary infrastructure. Further details are provided in **Chapter 14: Other Issues**.

### *3.5.5 Construction Environmental Management Plan*

A CEMP would be prepared prior to the start of construction, detailing measures to avoid or mitigate potential effects associated with key construction activities. These would reflect and expand upon measures identified in this EIA Report, and would be agreed with key stakeholders, where appropriate. The CEMP would include

documents for the Principal Contractor to adhere to throughout the construction process, including a peat management plan (outline peat management plan included in **Technical Appendix 9.1**) and construction traffic management plan (the CTMP would be as per the already submitted and agreed report used during the construction of the existing CRWF).

The CEMP would be updated when necessary to account for changes or updates to legislation and good practice methods throughout the construction phase. The CEMP would also be amended to incorporate information obtained during detailed ground investigations which would be undertaken post consent and prior to construction activities. Compliance with the CEMP (including procedures, record keeping, monitoring and auditing) would be overseen by a suitably qualified and experienced ECoW. The services of other specialist advisers would be retained as appropriate, to be called on as required to advise on specific environmental issues. An outline CEMP has been included in **Technical Appendix 3.1**.

### *3.5.6 Waste Management*

Waste would likely comprise building and construction waste, excavated soil, waste materials from deliveries, waste from plant and vehicles, and human waste from site compound. Waste will be removed off-site for safe disposal at a suitably licensed waste management facility in accordance with current waste management regulations. Wherever possible, excavated stone or soils will be re-used on site, primarily for the restoration of disturbed ground. Details of this will be included within the CEMP (an outline CEMP has been included in **Technical Appendix 3.1**). Subsoil not required for reinstatement purposes will be collected at the end of the construction phase and disposed of according to best practice and existing waste legislation. Waste oils and diesel will be removed from the proposed development site and disposed of by an approved waste contractor in accordance with provisions of the Special Waste Regulations 1996 (Scottish Government, 1996).

## 3.6 Operation

Once operational the proposed development would not be permanently manned and it is anticipated that operations would be minimal.

### *3.6.1 Operational Lifespan*

The proposed development will have an operational period of generation of up to 40 years.

### *3.6.2 Turbine Monitoring and Control*

Wind turbines have a proven track record for operating safely. All turbines are controlled by a Supervisory Control and Data Acquisition (SCADA) system, which gather data from all the turbines and allow the turbines to be controlled from a remote location. The SCADA system would gather data from all the turbines via communications cables connecting to each turbine (the cables being buried in the electrical cable trenches).

In the case of any fault, such as: over-speed of the blades, overpower production, or loss of grid connection, the turbines would shut down automatically through integrated braking mechanisms. Additionally, the turbines are

fitted with vibration sensors so, in the unlikely event a blade was damaged, the turbines would, again, be automatically shut down.

### *3.6.3 Infrastructure Maintenance*

On-going track maintenance will be undertaken to ensure that safe access is maintained. The wind turbines will also undergo regular maintenance to ensure safety, cleanliness and efficiency.

### *3.6.4 Waste Management*

Wastes arising as a result of servicing and maintenance (e.g. lubricating oils, cooling oils, packaging from spare parts or equipment, unused paint etc.) will be removed from the site and reused, recycled or disposed of in accordance with best practice and relevant regulations.

## 3.7 Decommissioning

Once the proposed development ceases operation after the period of generation, all major equipment above ground and structures deemed permanent infrastructure will be removed from the proposed development site. Unless otherwise agreed, the upper sections of the foundations will be removed to a depth which will permit the continuation of current land use practices. Unless required in connection with ongoing land management operations, tracks and crane hardstands will be left *in situ* and allowed to grass over, or would be covered with soil and reseeded. All underground cables will be left in place and de-energised. The infrastructure would be dismantled and removed from the site in a manner similar to that of their construction, but in reverse. Where possible materials will be recycled. All material arising from demolition will be disposed of responsibly and in accordance with relevant waste management regulations prevailing at the time.

In advance of the decommissioning of the site, a detailed method statement would be prepared, for agreement with the THC and ECU and relevant consultees.

## 3.8 Enhancement and Mitigation

### *3.8.1 Schedule of Mitigation and Residual Effects*

A summary of the proposed environmental commitments is provided in **Technical Appendix 3.3**.

### *3.8.2 Biodiversity Enhancement and Recreation Plan*

The BERP (**Technical Appendix 6.2**) will supplement the existing Peatland Habitat Restoration Plan (PHRP) (Natural Power, 2019b) associated with the original CRWF. The PHRP involved offsite compensation and included the blocking of drainage ditches, restoring the water table and enhancing the peatland habitats. The BERP includes an extension area to the PHRP (85.76ha) as compensation for the proposed development, which encompasses approximately 35.91ha.

The BERP includes the following prescriptions:

- Peatland habitat restoration - drainage blocking and self-seeding trees and scrub removal to be included within the extension to the PHRP area;
- Enhancement of nectar resource for pollination insects – creation of flower-rich areas at blanket bog fringes to be included within the PHRP area, the extension to the PHRP area, CRWF site boundary and the proposed development;
- Creation of boggy pools – creation of a network of boggy pools to be included within the PHRP area, the extension to the PHRP area, CRWF site boundary and the proposed development;
- Deadwood management – provision of deadwood habitat types to support a diversity of saproxylic invertebrates and saprophytic fungi to be included within the PHRP area, the extension to the PHRP area, CRWF site boundary and the proposed development;
- Creation of solitary bee next sites – creation of slopes and bare substrate using the BESS bund; and
- Creation of reptile hibernaculum – creation of a communal hibernation site for reptiles using the BESS bund.

The BERP will enhance local biodiversity, increase habitat resilience within the wider landscape and improve connections between nature networks, in line with National Planning Framework 4. The BERP is predicted to have positive effect on habitats, invertebrates, reptiles, mammals and birds.

### *3.8.3 Deer Management Plan*

The original Deer Management Plan (DMP) was produced as part of the Environmental Statement for the proposed Creag Riabhach Wind Farm development back in 2013, and has been updated as requested for the proposed extension (**Technical Appendix 3.2**).

The purpose of the DMP is to establish the potential impact of the proposed CRWF extension on deer movements/populations and identify mitigation measures.

### *3.8.4 Compensatory Planting*

The area of compensatory planting will comprise of the 1.98ha turbine and track footprint, plus a further 15% of woodland is considered affected by the extension installation. The total area required of compensatory planting to deliver this mitigation against woodland removal area will be 2.28ha.

A potentially suitable area for the additional compensatory planting has been determined by peat and soil surveys on site. Results of the peat survey area selected for compensatory planting, (<500mm peat), are included in **Technical Appendix 14.1**. The mapped area suitable for planting comprises of a total of 3.81ha. This area is adequate to incorporate the compensatory planting for the 2.28ha footprint of the same native species within the Creag Riabhach woodland area, and allows for small swathes of open ground around the few small rock exposed areas within. A planting scheme on this location will aesthetically appear natural and will enhance the view from

the A386 below. The existing deer fence line would be extended by 715m to enclose the compensatory planting area.

Further details of the proposed compensatory planting are provided in the forestry section of **Chapter 14: Other Issues**.

## 3.9 References

Renewable UK (2015). Onshore Wind Health & Safety Guidelines. Retrieved from https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B4AB5-96C7-ECF3F0462F75/OnshoreWind_HealthSafety_Guidelines.pdf