Chapter 4 Project Description

Contents

4.1. Introduction 1
4.2. Development Description 1
4.3. Site Layout 3
4.4. Public Road Access 4
4.5. Construction Phase 4
4.6. Specifications of Turbines 10
4.7. Turbine Foundations 12
4.8. Specifications of Ground Mounted Solar 13
4.9. Specifications of Battery Energy Storage 13
4.10. Permanent Crane Hardstandings 14
4.11. Site Tracks and Borrow Pits 14
4.12. On-site Cabling, Substation and Control Building 16
4.13. Temporary Construction Compound and Facilities 18
4.14. Signage 19
4.15. Employment During Construction 20
4.16. Site Reinstatement 20
4.17. Operational Phase 21
4.18. Decommissioning 23
4.19. Waste Management 23
4.20. Health and Safety 25
4.21. Conclusion 27

List of Abbreviations

Abbreviation	Description
AIL	Abnormal Indivisible Loads
AOD	Above Ordnance Datum
BESS	Battery Energy Storage System
BPA	Borrow Pit Assessment
CAA	Civil Aviation Authority
CDM	Construction Design Management

CEMP	Construction environmental Management Plan
CMS	Construction Method Statement
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FLS	Forestry and Land Scotland
FSC	Forestry Commission Scotland
HSE	Health and Safety Executive
HVAC	Heating, Ventilation and Air Conditioning
kV	Kilovolt
LBS	Local Biodiversity Site
LPA	Local Planning Authority
MoD	Ministry of Defence
MW	Megawatt
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
OEMP	Operational Environmental Management Plan
PC	Principal Contractor
PD	Principal Designer
PMO	Planning Monitoring Officer
RAMS	Risk Assessment's and Method Statement
SBC	Scottish Borders Council
SCADA	Supervisory Control and Data Acquisition System
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage System

Glossary

Abbreviation	**Definition**

The Applicant	Fred. Olsen Renewables Limited
EIA Regulations	The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together by the developer, in a systematic way, a description of the development and information relating to of the likely significant environmental effects arising from a proposed development
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017
Natural Power	The lead consultant EIA co-ordinator is Natural Power Consultants Limited.
Proposed Development	The proposed Lees Hill Renewable Energy Park as described in Chapter 4, Volume 2 of this EIAR
Proposed Development Site	The project development area within the site boundary as shown in Figure 1.2, Volume 3a

4. Project Description

4.1. Introduction

4.1.1. This Chapter sets out the detailed project description of the Proposed Development as summarised in Chapter 1: Introduction including specifications of turbines, access tracks and electrical infrastructure. The Chapter also describes the general construction methodology, timescales and typical construction equipment likely to be used. Activities associated with the operational and decommissioning phases are also described within this Chapter.

4.1.2. The construction methods detailed within this Chapter build on best practice methodologies developed at other wind farms to comply with Health and Safety requirements for construction and operations in addition to relevant environmental guidance including:

- Scottish Environment Protection Agency's (SEPA) Pollution Prevention Guidelines;
- Scottish Natural Heritage's (SNH) (now known as NatureScot however SNH branding still appears on some guidance documents) Good Practice During Wind Farm Construction; and
- SNH/Forestry Commission Scotland's (FCS) (now known as Forestry and Land Scotland (FLS) however FCS branding still appears on some guidance documents) Floating Roads on Peat Guidance.

4.1.3. Further construction details and mitigation are provided below in Section 4.5: Construction Phase. The Construction Method Statement (CMS) incorporating a Construction Environmental Management Plan (CEMP) are described setting out in detail the individual items of works associated with the construction of the Proposed Development (see Chapter 9: Hydrology, Geology & Hydrogeology for further detail on the CMS related to hydrological impacts). The CMS and the CEMP, along with other forms of embedded mitigation, have been incorporated into the design of the Proposed Development to avoid and reduce the potential environmental impacts of the proposal as far as it is practical to do so. The effect of these measures on the Environmental Impact Assessment (EIA) process is discussed throughout the remainder of this Environmental Impact Assessment Report (EIAR).

4.1.4. This chapter refers to the following chapters (Volume 2), Figures (Volume 3a-c) and Technical Appendices (Volume 4):

- Chapter 1: Introduction;
- Chapter 3: Site Selection and Design Evolution;
- Chapter 5: Statutory and Policy Framework;
- Chapter 6: Landscape and Visual Impact Assessment;
- Chapter 7: Ecology;
- Chapter 9: Hydrology, Geology and Hydrogeology;
- Chapter 12: Traffic and Transport;
- Chapter 13: Aviation and Other Considerations;
- Chapter 14: Socioeconomics;

4.2. Development Description

4.2.1. Figure 1.1 (Volume 3a) shows the location and extent of the Proposed Development in a regional context. The Proposed Development is located 5 km west of Duns in the Scottish Borders. The valley side of the site rises relatively gently from the west to east to a height of approximately 250 m Above Ordnance Datum (AOD). The Southern edge of the Proposed Development Site is bound by the B6456 and to the north by an unnamed road between Longformacus and Duns.

4.2.2. The application is for a renewable energy park comprising of up to six wind turbines (up to 200 m tip height), solar PV arrays and battery storage units. The Proposed Development has a total generation capacity between 100 MW and 200MW, comprising of six turbines providing between 37-45 MW, up to 60MW of Solar PV and 60 MW of Battery Energy Storage System (BESS). The operational life for the renewable energy park is 35 years.

4.2.3. The application also includes associated infrastructure, including:

- On-site substation;
- Up to six wind turbines up to 200 m to tip height;
- Turbine foundations and hardstandings;
- On-site substation;
- 69.83 ha of solar PV;
- 0.5 Battery storage;
- External transformer housing;
- Crane pads;
- Access tracks including one water course crossing;
- Underground electricity cables;
- Up to three borrow pits;
- Temporary construction and storage compounds and ancillary infrastructure;
- Site signage;
- Approximately 4 ha of forestry clearance (areas of windblown trees) and replanting;
- Temporary construction gatehouse; and
- Drainage and drainage attenuation measures (as required)

4.2.4. It is intended that the Proposed Development will make use of the available capacity on the local transmission network. The connection from the local transmission line will likely be to Eccles Substation. Eccles Substation is located approximately 11 km southeast of the Proposed Development (see Figure 1.1: (Regional Context) in Volume 3a) and is out with the Proposed Development Site. The connection to the substation will be fully assessed as part of a separate application submitted by the network operators.

4.2.5. An area within the Proposed Development Site of 4ha has been subject to wind blow and therefore the trees have been cleared. This area will remain unplanted for wind resource reasons. It is proposed the 4 ha of wind blow forestry will be replaced out with the site. The replacement planting will include broadleaf trees for habitat enhancement purposes, The replacement planting has been identified as part of the habitat management plan for the Proposed Development (see Operational Environmental Management Plan, Technical Appendix 7.3).

4.2.6. The woodland planting areas are targeted to provide increased connectivity between the Langtonlees Cleugh SSSI and existing smaller woodland blocks, as well as benefit species associated with the Wellcleugh Burn.

4.2.7. In addition to the broadleaf woodland planning additional habitat enhancements are targeted at the northernmost portion of the Proposed Development Site which is adjacent the Dunter Lee Cleughs – Hells Cleugh and White Burn Local Biodiversity Site (LBS). These enhancements will be realised, through the creation of increased wetland habitats. Further enhancement will be achieved by the continual scaling back of habitat management over summer periods, which aims to benefit rare plants and invertebrates associated with the adjacent LBS. See Figure 7.7 (Volume 3a) for further information on the proposed habitat enhancements that form part of this application.

4.3. Site Layout

4.3.1. Chapter 3: Site Selection and Design Evolution provides details of the design process that resulted in the final layout being presented for determination.

4.3.2. The turbine, solar, battery storage layout and associated infrastructure is presented in Figure 1.2 (Volume 3a). This figure illustrates the relevant elements, including locations for the proposed six turbines, solar PV area, battery/energy storage, site tracks, crane pads, substation, storage compound areas, current on-site quarry and preferred and potential borrow pit search areas[1].

4.3.3. Micro-siting of 50m has been included in the assessment to facilitate minimisation of the impact of the proposed infrastructure on the local environment. The extent of the micrositing will be determined following detailed ground investigation and ground clearance with a record of the exact turbine, solar, battery storage and infrastructure locations being submitted to Local Planning Authority (LPA), via an appropriately worded planning condition. Table 4.1 below gives the centre point coordinates for each of the proposed turbines.

Table 4.1: Turbine Coordinates

Turbine	Easting	Northing
1	372540	651914
2	372162	652293
3	371900	652691
4	371793	653349
5	372508	653873
6	372477	653302

4.3.4. Figure 1.2 (Volume 3a) including the micro-siting allowance was developed taking into account the technical and environmental constraints. The constraints included topography, ecological, geological, hydrological, archaeological, topographical, landscape, visual and noise. The layout being presented in Figure 1.2 (Volume 3a), evolved, taking into account the identified constraints, to ensure an optimal energy yield for both the wind turbines and solar PV area (see Chapter 3: Site Selection and Design Evolution).

4.3.5. The design evolution was tested from a series of 'design viewpoints' and the iterative process continued until a series of key design objectives had been met to an appropriate degree. These are set out in Chapter 3: Site Selection and Design Evolution.

4.3.6. The total land take of the Proposed Development, after completion of reinstatement measures including: foundations; crane pads (see Section 4.16 for proposed reinstatement measures); site tracks; and new sections of access track, has been assessed to be approximately 41.1 ha excluding batter slopes. Indicative drawings for current available technologies that suit site conditions are presented in Figures 4.1-4.13 (Volume 3a).

4.3.7. Drawings include:

[1] Local temporary sources of construction aggregate which are solely for the purpose of the wind farm construction

- Figure 4.1 - indicative turbines,
- Figure 4.2 indicative turbine foundations,
- Figure 4.3 indicative turbine hardstandings,
- Figure 4.4 -substation/control building,
- Figure 4.5 indicative site track cross sections,
- Figure 4.6 indicative access track drainage
- Figure 4.7 indicative cable ducts
- Figure 4.8 indicative battery and transformer;
- Figure 4.9 Indicative Battery Storage Layout
- Figure 4.10 Indicative Construction Compound
- Figure 4.11 temporary concrete batching plant
- Figure 4.12 Indicative Solar Panel Unit Layout
- Figure 4.13 signage.

4.4. Public Road Access

4.4.1. Chapter 12: Traffic and Transport details the public road network proposed for the transportation of turbine components. The preferred turbine delivery route would start at the port of entry at Rosyth Dockyard in Fife heading east onto Keith Road, St Margaret Way and King Malcolm Drive/B981, from where the loads would join the Ferrytoll Gyratory.

4.4.2. Loads would then follow the A9000, onto the M90 ramp travelling south towards Edinburgh. From the M90, loads would take the exit towards M8/Glasgow/Edinburgh/A8/Airport/Broxburn and merge onto M9. Exiting the M9, the loads would then follow the A720 until the Old Craighall Junction with the A1 where they would turn back and travel south on the A720 exiting at the A720/A68 junction onto the A68. Loads would follow the A697 before accessing the site from the B6456 from the west (Appendix 12.2 (Appendix A)).

4.4.3. Notwithstanding the above, the final approved AIL route will not be known until the turbine supplier is appointed and they have in turn reached contractual agreements with the port, sea freight/shipping company and road haulier.

4.4.4. The condition of the smaller, public roads (A68, A697 and B6456) along the access route would be surveyed and recorded prior to them being used for the deliveries and construction traffic associated with the Proposed Development. Where required, repair and maintenance work will be carried out on utilised roads during and following the construction period to rectify any identifiable damage which is directly attributable to the Proposed Development.

4.4.5. The impact of the Proposed Development construction and operation traffic on the public road system is assessed in Chapter 12: Traffic and Transport.

4.5. Construction Phase

Construction Timetable

4.5.1. The construction period for the Proposed Development is envisaged to last for 18 months, from commencement of construction through to installation. Commissioning of the Proposed Development Site reinstatement (as shown on the construction programme in Table 4.2 below) will ensure reinstatement of any removed peat or habitat occurs as soon as possible after Commissioning and Testing to minimise the duration of construction related cut and fill impacts

on setting and views. Construction would consist of the following phases which, although presented in a typical sequence, may overlap or occur concurrently:

- Winning of material from current onsite quarry or borrow pits if required;
- Construction of a site storage compounds for off-loading materials and components, and to accommodate site offices and mess facilities. Depending on where the site storage compound is, normally some tracks would be required;
- Construction of site tracks and excavation of cable trenches;
- Public highway improvements;
- Construction of hard stands and platforms;
- Construction of foundations and crane pads;
- Laying of on-site cabling;
- Installation of turbine transformers;
- Works to the on-site substation and control building;
- Battery storage installation;
- Solar PV delivery and installation;
- Delivery and erection of turbine towers, and installation of nacelles and blades;
- Testing and commissioning of the turbines and the wind farm electrical system including solar PV and battery/energy storage; and
- Site reinstatement (on-going during works).

4.5.2. A typical 18 – month construction programme is presented in Table 4.2.

Table 4.2: Construction timeline for a typical wind farm with 6 turbines

Month > Task Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Mobilisation & site setup	X																	
Construction Compound setup		X																
Access and site tracks		X	X	X	X	X	X	X	X	X	X							
Hardstands and Platforms			X	X	X	X	X	X	X	X	X	X						
Turbine Foundations										X	X	X	X					
Substation Compound and Control Building										X	X	X	X					
Cabling and Electrical Works											X	X	X					
Turbine Abnormal Loads														X	X			
Crane delivery/demobilisation													X				X	
Erection of Turbines														X	X	X		
BESS							X	X	X	X								
Solar Panel Delivery and installation							X	X	X	X	X	X	X	X				
Solar cable delivery and installation											X	X	X	X	X	X		
Solar Fencing and CCTV														X	X	X		
Commissioning & Testing															X	X	X	
Site Restoration & Demobilisation																		X
Proposed Development HGV Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Monthly Movements																		
Dunside WF HGV Total Monthly Movements	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Total Cumulative HGV Monthly Movements	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

**Restoration work around track edges, turbine bases and other areas of infrastructure will be on-going to ensure reinstatement of any peat substrate occurs as soon as possible.*

Source: Natural Power

Typical Equipment Used at the Site

4.5.3. The following is an indicative list of equipment that would be required to construct the Proposed Development. The equipment would be in use on the site or stored on-site within the construction compound. Where appropriate, vehicles such as cranes, trucks, excavators and bulldozers may be secured and left on the track at appropriate working areas overnight.

- One 800/1000 tonne capacity crane and 400/500 (or less) tonne capacity cranes. The 400/500 tonne cranes would be used for general construction duties such as the preparation of the reinforcement cages at the turbine bases and as tailing cranes for steerage during the turbine erection. The larger crane would be used for the turbine erection to lift the heavy components into place.
- 30/40 tonne 360-degree excavators. These would be used at the preferred or optional borrow pits for excavating stone and for excavation of turbine foundations. Ripper buckets or hydraulic breakers may be used for the excavators winning stone.
- Smaller excavators in the range of 10 to 20 tonnes. These would be used for road construction and profiling, and restoration of verges, foundations and for excavation of cable trenches.
- Tracked bulldozers would be used for a number of tasks such as stockpiling material from excavations, management of stockpiles within the borrow pits, road construction, crane pad preparation and re-grading of the track running surface.
- Dumper trucks would be used for moving material around the site, e.g. for moving excavated peat or soils from cut site tracks to any stretches of floating track over deeper peat, and stone from the quarry or borrow pits for track construction.
- Heavy duty vibrating rollers would be used to compact new roads, foundation formations and are essential in compacting the crane pads and backfill to the appropriate densities.
- Mobile concrete pumps would be used on-site during the concrete works for the turbine foundations and the metering building. The pump would be lorry mounted and have a large boom to enable placement of the concrete within the turbine base excavations. The concrete wagons would reverse up to the rear of the pump and deliver the concrete into a hopper which would be connected to the pump. Using the pump allows a controlled and highly flexible method of pouring foundations.
- Cable laying vehicles. This would comprise a lorry or tractor with a revolving drum attachment for laying of cables in trenches alongside site tracks and a tracked excavator with drum attachment for the offsite cabling on stretches where it is not routed alongside a new or existing track.
- Small trucks or four-wheel drive vehicles with trailers. This would be used for transporting of small loads around the site i.e. ducting pipes for cables in turbine foundations.

- Minibuses and four-wheel drive vehicles would be used for transporting construction workers and site managers around the site. These would be likely to leave the site on a regular basis transporting workers to and from their billets off-site.
- A number of other vehicles would bring loads to the site but would not themselves be stored at the site. These would include lorries with flatbed extendable trailers carrying all turbine components including transformers, lorries carrying cabling, steel rods for concrete reinforcement and concrete lorries with revolving drums.
- To prevent mud entering the public road system, if necessary, the wheels of all lorries leaving the site would be washed either using a manual spray or a wheel washing drive through unit.
- Cabins/Welfare Facilities. Due to the requirement under Health & Safety Legislation and the Construction Design Management (CDM) Regulations for welfare facilities on-site and the exposed nature of the site, a number of cabins would be needed in the construction compound(s). These would have offices, canteens, drying-rooms, toilets and washing facilities. The units would be self-contained and no discharge of drainage would be made to the surrounding land unless otherwise agreed with SEPA and the local authority. Smaller, mobile self-contained units are likely to be required as work progresses throughout the site. These would be placed at suitable locations to tie in with the work interfaces as required. A typical layout of the construction compound area is presented in Figure 4.4 (Volume 3a).
- Fuel & Chemical Storage. Fuel would be required for the vehicles, generators and other equipment on-site. The storage facilities would typically comprise of a bunded concrete pit containing a lockable, bunded fuel tank and a separate lockable housing for the storage of construction chemicals. In addition, there would typically be a wheeled, double skinned bowser for transport of fuel to tracked vehicles. Drip trays would be used when refuelling vehicles on the site. Emergency spill kits would be kept on-site adjacent to the fuel storage area and with the mobile bowser. A Principal Contractor would have a 24-hour emergency response company on standby in the event of a spillage incident. Vehicles would be refuelled at their working location to prevent loss of time and use of fuel returning to any designated refuelling areas. All previous stated measures would be used when refuelling vehicles, taking into account all guidance and pollution prevention measures, and the bowser operator would be suitably trained to deal with any spillage.
- Construction Materials. A variety of materials would be utilised during the construction of the Proposed Development including, but not limited to; concrete, reinforcing steel, timber for joinery work and shuttering, stone and sand for road construction, general construction sundries and electricity cables. Wherever possible, the re-use of materials would be carried out, i.e. formwork to be re-used, excavated material from foundations to be reused in the preparation of crane pads and roads, topsoil for re-instatement and landscaping, etc. An indication of the materials used and the amount of resources (plant and labour) is generally included in the preparation of the CMS. Handling of potentially hazardous materials would be carried out in accordance with SEPA Pollution Prevention Guidelines, but particularly; Pollution Prevention Guidelines 6: Working at Construction and Demolition-sites: Pollution Prevention Guidelines 6 concerning the delivery, handling and storage of materials. For example, the preparation of contingency plans and briefing operatives on the procedure to follow if a spillage occurs would be covered by the appointed civil engineering contractor, displayed on-site and contained within the CMS document prior to construction commencing.

Construction Method Statement

4.5.4. Prior to the commencement of construction, a CMS incorporating a CEMP would be produced setting out in detail the individual items of works associated with the construction of the Proposed Development. The CMS would be prepared in accordance with the detail provided in this EIAR and relevant planning conditions. This would ensure that each activity is carried out safely, in accordance with best practice and the relevant guidelines, and to minimise environmental

impact, in accordance with SEPA's pollution prevention guidance. Typically, the document would cover the following topics:

- Site health and safety plan;
- Risk Assessments and Method Statements (RAMS) to include for environmental considerations, e.g. sympathetic construction methodology with regard to weather and ground conditions;
- Location and description of project;
- Consent and regulation approvals e.g. discharge of planning conditions;
- Pre-construction survey work undertaken;
- Turbine description/specification;
- Construction schedule;
- Public highway works;
- Site tracks;
- Temporary construction compound;
- Crane pads;
- Cable trenches;
- Foundation works;
- On-site substation and control building;
- Preferred and optional borrow pits including restoration;
- Monitoring - ecological, hydrological and geotechnical, and archaeological;
- Emergency procedures; and
- Pollution control and waste management – potential waste material, materials that can be reused onsite or elsewhere and mitigation measures.

4.5.5. A Site Waste Management Plan will be drawn up as part of the CMS prior to the commencement of construction. See section 4.19 for detail on waste management.

4.5.6. Previous experience of agreeing the construction methodology during the post-consent/pre-construction stage has proved effective in securing accurate and realistic method statements. By agreeing the construction methodology at this stage of the project, additional data will be available for consultation in the form of detailed site investigations. Furthermore, the civil engineering and the turbine supply contractors will have been chosen by this stage, enabling more detailed preparation of individual method statements. During the preparation of the CMS, correspondence and meetings with NatureScot, SEPA, local planning authority (LPA) and other relevant consultees would be undertaken to review the working methods proposed and if necessary, incorporate changes. This iterative process when preparing the CMS ensures that once construction commences, there is a documented procedure and risk assessment. The documented procedure and risk assessment process makes monitoring of the construction activities, either by the appointed site representative or by the various bodies associated with the preparation of the document, more straightforward.

4.5.7. Each section of the CMS will provide a detailed description of the tasks to be completed along with risk assessments, where necessary, covering items such as waste management, pollution prevention, control of waters, nuisance and material use.

4.5.8. A section of the CMS regarding the handling and storage of peat would be prepared in accordance with recommendations of a suitably qualified geotechnical designer, ecologist and hydrologist following a detailed site investigation. Additional detailed ground investigation would be conducted prior to construction. In respect of matters regarding construction methodology and peat stability at the site, the following general recommendations would be adhered to and would form part of the overall CMS documentation:

- Environmental awareness training to be provided to all staff entering on to site which will include a basic environmental site induction;
- Avoid placing excavated material and local concentrated loads on peat slopes;
- Avoid uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge;
- Avoid unstable excavations. All excavations would be suitably supported to prevent collapse and development of tension cracks;
- Avoid placing fill and excavations in the vicinity of steeper slopes;
- During construction install and regularly monitor geotechnical instrumentation as appropriate, in areas of possible poor ground such as deeper peat deposits;
- Implement site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions are to be assessed by a suitably experienced geotechnical engineer;
- Form a contingency plan to detail the level of response to observed poor ground conditions;
- Routine inspections of the wind farm site by maintenance personnel including an assessment of ground stability conditions;
- Carry out an annual inspection of the site following completion of works by suitably experienced and qualified geotechnical personnel;
- Maintain stored peat in a suitable condition to minimise the peat drying out; and
- Minimise the need to handle stored peat so as to reduce any drying or changes to the peat.

4.5.9. The iterative design process applied to the site layout has evolved to predominantly avoid peatland areas. The majority of infrastructure is on habitats unlikely to be peatland and the rest is on mineral soils. See Chapter 9: Hydrology, Geology and Hydrogeology for the full assessment on peat and Figure 9.3 (Volume 3a) for a carbon and peatland map of the site. All procedures will follow best practice guidelines.

4.5.10. Sections relating to site-specific items, including landslide hazard and geotechnical risk register identified during the pre-construction phase, may also form part of the CMS.

4.5.11. It is intended that the CMS will be an evolving document and staged updates would be undertaken in line with the progression of construction. Updating of the document to reflect changes in the construction methods to be used would also be carried out, as and when necessary.

Wind Farm Construction

4.5.12. Commencement of the Proposed Development would begin within a defined period following consent granted by the Scottish Government. The Applicant seeks a minimum 5-year period to allow time for the discharge of conditions, procurement of the turbine equipment, procurement of associated infrastructure delivery and reaching an investment decision for the project.

Pre-construction surveys

4.5.13. Pre-construction surveys, for each separate infrastructure item, will be carried out by the on-site Ecological Clerk of Works (ECoW) to ensure construction is not having an unacceptable impact on any species of concern.

4.6. Specifications of Turbines

Description

4.6.1. The application seeks permission to construct up to six turbines with a blade tip of up to 200 m. The final model of turbine has still to be selected and will depend on procurement processes, therefore the final hub heights and blades lengths will vary depending on market availability at the time of procurement. However a hub height of 119m and a blade length of 81m are being

assessed for EIA purposes. (The Vestas V162 wind turbine is currently available and is offered as a potential candidate turbine that complies with the maximum tip height of 200m).

4.6.2. The selected turbines would be of a modern design with three blades mounted on a horizontal axis, attached to a nacelle, housing the generator, gearbox and other operating equipment. The nacelles would be mounted on a tubular tower which allows access to the nacelle. It is expected that the turbine cut in wind speed will be around 3 m/s and will rotate clockwise.

4.6.3. A reduced lighting scheme has been agreed with the Civil Aviation Authority (CAA) which specifies:

- Medium intensity steady red (2000 candela) lights on the nacelles of turbines T01, T04 and T05;
- A second 2000 candela light on the nacelles of the above turbines to act as alternates in the event of a failure of the main light; and
- Infra-red lights to Ministry of Defence (MoD) specification installed on the nacelles of turbines T01, T02, T03, T04, T05 and T06

4.6.4. See Chapter 13: Aviation and Other Considerations and Technical Appendix 6.7 (Volume 4) for additional details.

4.6.5. Wind turbine towers will likely be constructed from steel and the blades from fibreglass. It is proposed that the turbine tower, nacelle and blades be finished in a semi-matte, off-white/pale grey colour. Typical turbine specifications, of the type being considered for use on the site, are presented in Figure 4.1 (Volume 3a). In order to comply with Health and Safety requirements for the site the applicant would propose to apply identification numbers to the sides of the turbines. Numbers would be up to 1000 mm tall by 900 mm wide and would be positioned between 1.5 m and 3 m from ground level so to be visible from the approaching access track. Details of these would be agreed as part of the CMS.

4.6.6. Transformer housings are likely to be situated adjacent to each of the turbine towers. The requirement for such structures, along with their dimensions, will vary based on the final turbine choice (some turbine types require two stacked transformer housings).

Erection of Turbines

4.6.7. Two types of cranes are required for the erection of the turbines; 800/1000-tonne capacity cranes and 400/500- tonne capacity tailing cranes. The cranes would use the crane hard standing area as indicated in Figure 4.3 (Volume 3a).

4.6.8. Where possible, the delivery of the turbine components would be scheduled, weather dependent, to allow for direct lift off the transport trailers. Otherwise, turbine components would be stored on, or adjacent to, the crane pad areas. Alternatively, components may be delivered to the construction compound for internal distribution by a separate tractor unit. The tower sections would be erected, followed by the nacelle and hub. Following erection of the tower sections and the nacelle, the blades would either, be lifted and attached individually to the hub in position, or the hub and blades would be raised together, as a unit, and attached to the nacelle. The cranes would then move to the next turbine location.

Operation

4.6.9. Once installed and fully commissioned, the wind turbines would operate automatically and can be controlled remotely or from the on-site metering building. Regular visits will be made by technicians to the infrastructure and turbines in four-wheel drive vehicles or similar. In addition, longer servicing visits would be required, typically every six months, along with reasonable unscheduled maintenance, as may be necessary. Occasional use of larger vehicles, such as cranes or lorries similar to those used during construction, may be necessary should there be a requirement for replacement of major turbine components.

4.6.10. Wind farm performance would be remotely monitored using the existing permanent anemometer masts, together with a Supervisory Control and Data Acquisition system (SCADA) that would monitor the individual turbines and the grid connection.

Environmental Conditions

4.6.11. All turbine transformers would be sited on bunded foundations that are able to contain 110 % of the oil contained within each transformer. Any leaks from equipment within the nacelle would be contained within the turbine.

4.6.12. Infrastructure for the Proposed Development will have a direct impact on some sensitive habitats, mainly acid dry dwarf shrub heath, wet dwarf shrub heath and marshy grassland, resulting in some habitat loss. However, an Operational Environmental Management Plan (OEMP)(as part of a unified land use plan) will be implemented to reduce any impacts from construction and to restore and enhance habitats during the operational phase of the project. Details of this are provided within Chapter 7: Ecology.

4.7. Turbine Foundations

Construction

4.7.1. Reinforced concrete gravity foundations are envisaged for use on the proposed turbines. This foundation type is typically an inverted T shape consisting of a large pad with a protruding upstand with approximately 200 mm proud of the finished ground level. The pad is back filled with selected as-excavated material or stone material placed and compacted over the foundation. The base tower section of the turbine is subsequently connected to the foundation by using holding down bolts that are cast into the upstand section of the foundation. Stability of the turbine is provided through the weight of the foundation and the material replaced and compacted over it.

4.7.2. A typical turbine foundation specification is presented in Figure 4.2 (Volume 3a). Detailed design specifications for each foundation would depend on the site-specific factors such as ground conditions, the specific turbine used and various other engineering considerations. Typically, a circular concrete base of approximately 28 m diameter usually suffices for turbines with the dimensions identified in Figures 4.2. Combined with the protruding upstand, the overall depth of the foundation would be around 3 m – 3.5 m. Following construction of the foundations, a layer of peat, peat turfs and/or mineral soils that was excavated from the turbine foundation area would be reinstated. Transformers would be located within housings, as shown in Figure 4.1 (Volume 3a), adjacent to the turbines with power cables from the turbines passing through ducts cast into the foundation.

Environmental Considerations

4.7.3. Depending on the height of the water table at each foundation location, a drainage system may be installed around the foundation to prevent the build-up of water pressure under the foundation. Alternatively, in locations that were particularly sensitive to hydrological disturbance, a submerged foundation design could be employed which would not require a drainage system around the foundation.

4.7.4. Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. As an on-site batching plant is required it would be situated away from water courses, either within a borrow pit or at another secure location which would be agreed in advance with SEPA. It has currently been situated beside the substation, BESS and construction compound area, as shown in Figure 1.2 (Volume 3a). Particular care would be taken when pouring concrete at turbine foundations in the vicinity of watercourses and in areas

of deeper peat. SEPA's Pollution Prevention Guidelines 5: Works In, Near or Liable to Affect Watercourses as well as Pollution Prevention Guidelines 6: Working at Construction and Demolition Sites would be adhered to and SEPA would also be consulted during the preparation of the CMS to ensure that the appropriate measures are put in place. This may include construction of a settlement pit within the construction compound or elsewhere for treating rinse water from concrete lorries, and measures to prevent water from entering excavations in the vicinity of watercourses.

4.7.5. Depending on the height of the water table at each foundation location, a drainage system may be installed around the foundation to prevent the build-up of water pressure under the foundation. Alternatively, in locations that were particularly sensitive to hydrological disturbance, a submerged foundation design could be employed which would not require a drainage system around the foundation.

4.8. Specifications of Ground Mounted Solar

Description

4.8.1. A part of the Proposed Development site, extending to 69.83ha or thereby, will accommodate the construction of an array of photovoltaic panels . This element of the Proposed Development will involve the erection of ground mounted fixed solar PV modules, invertor substations, perimeter deer fencing and pole mounted CCTV cameras.

4.8.2. The panels are typically made of crystalline silicon and consist of semi-conductors and photovoltaic cells protected by a thin layer of glass. The panels have a dark blue/black appearance and are designed to absorb sunlight.

Construction

4.8.3. These would result in the arrangement of fixed arrays, mounted on a framework system upon which the panels would be attached. Each panel will typically have a length of 1950mm, a width of 1000mm and a depth of 50mm.

4.8.4. The framework will likely be driven into the ground using the spiked galvanised steel legs of the frames. This preferred method means that the frames can be driven or screwed directly into the ground without prior excavation, meaning minimal disturbance to surrounding soils.

4.8.5. The banks of solar panels would typically be arranged in sets of 24-48 panels and then organised into rows or arrays. Each string would be mounted on racks described above with a distance of no more than 3-6m between strings to avoid any shadowing occurring from one panel to another and to allow access for maintenance.

4.8.6. The maximum height of these arrays are around 3m above the ground and tilted to a maximum of typically 25 degrees from the horizontal, facing south towards the sun.

4.9. Specifications of Battery Energy Storage

4.9.1. The BESS will store excess renewable electricity generated by the Proposed Development and discharge to the grid when required. The BESS compound will be approximately 0.5 ha or thereby, enclosed by security fencing, and will house approximately 72 BESS container units and external ancillary equipment including 24 inverters. The BESS units are similar in size to a 20 x 8 x 8 ft container and will be situated on a hardstanding area with small concrete foundations. Cabling will then be routed from each BESS container to a transformer which will then be routed to the substation compound. An indicative BESS layout compound is shown in Figure 4.9 (Volume 3a)

4.9.2. The Proposed BESS would be expected to utilise a modern lithium-ion cell chemistry. There is very low risk of fires starting or spreading through what is called 'thermal runaway' with the latest

generation of lithium-ion battery energy storage systems, which benefit from a layered protection strategy. To mitigate any potential risk of uncontrolled fire spreading, a minimal external buffer of 10 m from the very edge of the battery storage hardstanding area will be applied to any trees. It is therefore concluded that fire risks from the proposed battery energy storage are low. However, the final design details of any battery energy storage, including fire monitoring and suppression systems, can be approved by the local authority via a deemed planning permission condition.

4.10. Permanent Crane Hardstandings

Description

4.10.1. Permanent crane hardstandings (pads) as well as temporary lay down areas will be constructed to facilitate the cranes required for the erection of turbine components. To provide stable, firm ground for safe operation of the cranes, areas of hardstanding would be laid down on one side of each turbine foundation. These would need to be suitable for the outriggers[2] of the respective cranes(as illustrated in Figure 4.3 (Volume 3a)). Their locations will be finalised following further site investigation, but will maximise use of the access tracks, where possible, to minimise the carbon footprint of the Proposed Development.

Construction

4.10.2. Typically, construction of the hardstanding areas would be similar to construction of the site tracks (on shallow soils) with 100-150 mm of topsoil removed and stored adjacent to the hardstanding areas and remaining soil removed down to a suitable bearing stratum and stored at a pre-agreed location within the Proposed Development Site. Geotextile material would be laid down with crushed stone on top, to a depth of around 700 mm. The crushed stone would be sourced from the borrow pit location identified indicatively in Figure 1.2.

4.10.3. Additional temporary hardstandings may be required at various stages during turbine construction and erection. This may include temporary hardstanding to facilitate the erection of crane components, lattice boom or turbine components e.g. rotor assembly.

Environmental Considerations

4.10.4. Prior to excavation for the crane pad, the vegetation layer would be carefully removed followed by any underlying peat. The crane pad will be excavated to form a level, solid platform with suitable graded stone excavated from borrow pits and turbine foundation excavations. On completion of erection and installation works, it is proposed that the areas of hardstanding will remain as it may be required during the operational phase of the Proposed Development. It is envisaged that the surrounding grassland vegetation will re-colonise the area. A diagram of a typical crane hardstanding can be found in Figure 4.3 (Volume 3a), although the final detail may vary depending on the exact make and model of turbine chosen.

4.11. Site Tracks and Borrow Pits

Description

4.11.1. The main access track connects onto site from the B6456 coming from the west. The track then ascends to the Proposed Development Site in a northerly direction and joins the wind turbine array at T1. From the main access tracks spurs will also connect into each of the development areas accommodating the solar PV infrastructure. The access route for turbine and other

[2] Outriggers are essentially the 'legs' of a crane and act as supports that spread the weight of the crane over a larger area which in turn allows the crane to lift more without tipping over.

abnormal load deliveries to the site is assessed and discussed in Chapter 12: Traffic and Transport. The proposed route can be viewed in Figure 12.1(Volume 3a). Figure 1.2 (Volume 3a). These Figures show the proposed turbine layout and the proposed new access track. The tracks allow plant to dig new cable trenches and thereafter to access the site for operational and eventual decommissioning purposes.

4.11.2. It is expected that the majority of new stone for access tracks will be from the existing quarry within the development site. However a worst case traffic volumes for importing all required stone is assessed in Chapter 12: Traffic and Transport in reaction to the scoping responses from consultees. In addition, a Borrow Pit Assessment (BPA) has been carried out on site. As a result of this assessment, indicative borrow pits are shown in Figure 9.3 with borrow pit five (the extension of the current onsite quarry) being suggested as the best location to source the required stone. The final extent of this borrow pit (within the 50 m micro-siting allowance) would be agreed as part of the CMS for the scheme and subject to detailed ground investigations to confirm suitability of material. Should further stone be required, any further borrow pit locations will be subject to the successful outcome of a relevant Mineral Extraction Licence application which would be made to the relevant authority. The final reinstatement of these borrow pits would be agreed with the local authority in consultation with NatureScot prior to reinstatement works commencing.

4.11.3. After construction is complete the tracks will be left in place for routine maintenance of turbines and the solar panels. It should be noted that the access track to be installed can also be used to provide access to the gas pipeline that runs through the site with gas pipeline crossing points intersecting the track from turbine four to turbines five and six.

Water Course Crossings

4.11.4. There is one water crossing between turbine two and turbine three. The water crossing is a drain from an undisturbed peat bog. The drain has been assessed as a conduit from an acrotelm (one layer in an undisturbed peat bog) and is reviewed in Chapter 9: Hydrology, Geology and Hydrogeology.

4.11.5. Approximately six km of new on-site tracks would link the proposed turbines and infrastructure to the road network. The design philosophy behind the track layout has taken into account a number of factors including topography, hydrology, watercourse crossing, ground conditions and construction parameters and has been based on best practice methodology developed at other renewable energy sites. The proposed track layout has been designed following an onsite review and minimised the number of water crossings necessary.

Environmental Conditions

4.11.6. The initial stripping of topsoil for the new tracks and placement of stone material for construction of new tracks has the biggest potential to release sediment into watercourses. Therefore, using methods consistent with industry best practice would be put in place ahead of the track construction activities. Sediment has the potential to be transported the furthest distance by existing surface water channels and manmade drainage systems, therefore proactive mitigation measures would require the existing surface water channels to be identified prior to the track construction. Within the channels and drains and any necessary settlement ponds, silt traps would be constructed prior to track construction. The silt traps would likely be constructed using straw/hay bales or specialized siltation fencing, pinned into place, allowing water to either percolate through the bale or flow over. Where machinery is required for any of these up-front activities, they would have low pressure bearing tracks. Sediment transport mitigation drainage systems would be subject to regular maintenance during the lifetime of the Proposed Development. Chapter 9 provides an assessment of the potential effects on hydrology.

4.11.7. Depending on-site specific conditions alternative methods would be utilised for different areas of the site for construction of new sections of track. For each construction method, the track running width (excluding drainage channels and cable trenches) would be approximately five metres wide, with the exact width depending on the local ground conditions. Track widths may be wider for short sections such as lengths with passing places, sharp bends and track junctions. Excavated road would be used for the majority of the access tracks, where overlying soil or peat material would be removed with a foundation formed on the underlying glacial till or the weathered rock horizon.

4.11.8. In addition, there would be a requirement for drainage channels along one or both sides of each section of track depending on the ground conditions along each track segment (see Figure 4.6 (Volume 3a)) to prevent the track itself acting as a watercourse. Tracks would be designed with a crossfall, towards the drainage ditches to prevent build-up of water on the running surface. It is important that the water flowing along the drainage ditch is not able to build up enough volume and velocity to act as a major sediment transport route. To prevent this happening, cross drainage pipes would be placed under the road at regular intervals. The cross track drainage pipes also help to minimise the effect the road construction on the hydrology in the adjacent area and prevent concentration of water flow higher in the catchments' area. The drainage ditch would also be blocked just above the cross drainage inlets, thus preventing water from simply flowing past the inlet. Using stone available onsite, a head wall would be constructed to prevent erosion around the inlet. A silt trap would also be constructed at the inlets to the cross drainage, to minimise sediment entering the pipes. The outlet of the cross drainage would allow the water to filter through the adjacent vegetation.

4.11.9. For safety reasons, marker posts may be placed in the ground by the edge of the track in order to guide on-site vehicles during times of poor visibility or at night.

4.11.10. Tracks between turbines and the solar area are required during the operational period of the Proposed Development to allow for routine maintenance operations and the replacement of larger turbine/electrical components.

4.12. On-site Cabling, Substation and Control Building

Description

4.12.1. The candidate wind turbines on the Proposed Development will initially generate electricity at 690-1000 Volts. This voltage needs to be converted to 33,000 Volts (33 kV), via a transformer located immediately adjacent to the tower of each turbine, to allow the electricity to be exported to the wider grid. Any external transformer would be linked to the turbines through cable ducts in the turbine foundations. Each transformer will then be directly connected to the onsite substation via underground cables. The underground cable routes between turbines and the substation compound would generally follow track routes. These would be placed up to 2 m from the track verge and drainage ditches.

4.12.2. The on-site substation and control building compound will accommodate metering equipment, switchgear, transformers, the central computer system and electrical control panels. A spare part storeroom and domestic facilities will also be located in the control building. Figure 4.10 (Volume 3a) shows a typical compound and layout. Although not permanently staffed, the buildings would be visited periodically by maintenance personnel. There is no requirement for any other permanent buildings on the site.

60 MW of Battery Storage

4.12.3. Although the specific battery model has not yet been selected it is assumed 24 inverter and 48 storage container units will be required, providing 60 MW of battery storage at the Proposed Development. The dimensions of one unit are 20 x 8 x 8 ft (excluding Heating, Ventilation, and

Air Conditioning (HVAC)). The battery storage infrastructure shall be located near to the substation compound (see Volume 3a Figure 1.2).

Construction

4.12.4. The transformers would be linked to the on-site electrical substation and metering/control building via 33 kV underground cables placed in trenches. The cable route within the site would generally run adjacent to on-site tracks where possible. The underground cables between the turbine infrastructure and the on-site substation and battery/energy storage will likely be routed adjacent to tracks.The route would be marked above ground with clearly identified posts, spaced at suitable intervals along the length. The details would be agreed as part of the CMS.

4.12.5. Cables would be laid from a drum attached to a suitable vehicle. Each 33 kV cable would arrive as three insulated cores. These would be gathered in the trench and bound together along the entire length of the trench in a trefoil arrangement. Communication cables and earth tapes would also be laid in the same trench. The cables would be protected from mechanical damage by a sand bed and surround. Two layers of marker tape and/or tiles would be laid above the cables to prevent accidental excavation, and concrete marker posts would be placed at regular intervals to enable the cables to be located in the future.

4.12.6. Silt, scour and run-off could pose a problem as the cable trench can act as a preferential drainage channel. Backfilling of the trench should be carried out as soon as is practicable and the road drainage installed should be set up with suitable silt traps as the construction proceeds. In steep sections, impermeable plugs should be used in the cable trench to prevent the channel becoming a preferential drainage run, ideally using locally sourced clay material.

Environmental Conditions

4.12.7. Where cabling is required, pre-commencement surveys will be undertaken to give a contemporary assessment of any ecological and other environmental sensitivities and will inform the CMS. Cabling will be carried out in a staged process, with vegetation and topsoil temporarily removed to be back filled as soon as the cables are laid. This method ensures vegetation is replaced as soon as possible and any disturbance during the works is kept to an absolute minimum and is temporary in nature.

4.12.8. Following the pre-commencement and pre-construction surveys (and due to the staged nature of the cabling process) the impact on habitats, the wider environment and any species of concern will be reduced to a minimum and will be a short-lived disturbance where it exists.

4.12.9. In areas where the surrounding soils are very coarse gravel or peat, the cable trench footprint shall have a geotextile wrap placed within it to prohibit fines migrating from the backfill into the surrounding sub-soils. These areas shall be identified on-site during the commencement of the works. Where surplus mineral soil material is present, this shall be transported back to the borrow pit for use in the reinstatement and final profiling.

4.12.10. On-site cable trenches would be located to minimise the area of disturbance, up to 5 m beyond the edge of the site track in case of multiple circuits. Trench excavation, cable laying and backfill would be carried out in a continuous operation (minimising the length of trench open at any one time) and may occur subsequent to the construction of on-site tracks or after the erection of turbines. Prior to excavation, the topsoil/turfs would be stripped and placed to the side in a temporary stockpile. A trench would then be dug with a small excavator or backhoe to approximately 1 m in depth and up to 1.5 m in width.

4.12.11. Where cables cross contours on steeper areas of ground, clay plugs would be placed at intervals within the trench to prevent the trench acting as a water conduit. Figure 4.7 (Volume 3a) gives an indicative outline of the cable trench. The final cable positions would be surveyed and supplied in 'as built' drawings for the Operations and Maintenance team.

4.12.12. Alternatively, cable ploughing may be adopted if ground conditions permit. The final choice of method will depend on the appointed contractor and the results of further site investigation.

4.12.13. Indicative details of the cable/service trenches are shown in Figure 4.7 (Volume 3a). Cables would be laid in sand for protection with warning tapes/boards placed above to mitigate the risk of unintentional excavation. Impermeable barriers (plugs) would be placed in the sand layer at regular intervals to prevent the trench acting as a water conduit with more frequent spacing between plugs on steeper gradients.

4.12.14. In all cases, the cables would be buried to a depth of approximately 1 m. Reinstatement would be carried out to relay the previously stripped top layer of peat turfs containing the seed bank, over the top of the cable trench. This reinstatement would be conducted following the backfilling of each cable trench section.

4.12.15. At track crossings and within concrete foundations, the cables would be laid within plastic ducts.

4.12.16. Existing watercourses should be monitored during the works, both to prevent water entering the excavation, and also for runoff and silt escaping and entering these. These may need temporary diversions/piping until the track is complete and the watercourses can be reinstated.

4.12.17. On decommissioning of the Proposed Development, on-site cabling will be left in-situ, unless ducted. Most modern cables are aluminium and are relatively benign and inert; over time these will break down to clay. These can be electrically isolated and left in-situ, as is common practice.

4.13. Temporary Construction Compound and Facilities

Construction Compounds

4.13.1. The dimensions of the compound would be approximately 100 m x 50 m and would be surrounded by a security fence. Due to the requirement under health and safety legislation, the CDM Regulations for welfare facilities on site, and the exposed nature of the site, a number of cabins would be needed in the construction compound. These would have offices, canteens, drying-rooms, toilets and washing facilities. Smaller mobile, self-contained units are likely to be required as work progresses throughout the site. These would be placed at suitable locations to tie in with the work interfaces as required. A typical layout of the compound area is presented in Figure 4.10 (Volume 3a).

4.13.2. The compound would be used, where necessary, for temporary storage of the various components and materials which are required for construction.

4.13.3. A settling pit/concrete washout bay and wheel wash may be included near the construction compound. When concrete lorries have deposited their loads, there is a requirement to wash out the inside of the concrete drum. This requires a few gallons of water that would then be washed out from the drum into a settlement pit. The size of this pit would depend upon the flow of concrete lorries up to the site (or within the site if an on-site batching plant is employed) but would be lined with an impermeable sheet and granular fill to assist in the settling process. The construction compound will be reinstated at the end of the Proposed Developments construction period. The stored subsoil and the stored topsoil would be laid over the geomembrane separating it from the underlying stone surface and then reseeded using a seed mix selected or, where possible, turfs would be reinstated.

4.13.4. The settlement pit would be located away from watercourses with details included as part of the CMS following consultation with SEPA. Any drainage from these facilities would be collected and treated prior to discharge via the Sustainable Drainage System (SuDS). The washout bay would be maintained as necessary by replacing the granular fill with clean stone. At close of construction, all material within the washout bay would be removed from site and the area reinstated.

Concrete Batch Plant

4.13.5. A concrete batch plant allows for concrete to be mixed in-situ for use throughout the site and relieves pressure on the road network by avoiding additional transportation of materials onto the site during construction. This is proposed to be located beside the substation and BESS near to the site entrance, as shown in Figure 1.3 (Volume 3a).

Environmental Considerations

4.13.6. On-site access to fuel would be required for the vehicles, generators and other equipment. The fuel storage facilities would typically be comprised of a bunded concrete area containing a lockable, bunded fuel tank and a lockable housing for the storage of construction chemicals. In addition, there would typically be a wheeled, double-skinned bowser for transport of fuel to tracked vehicles. All construction equipment would be inspected on a daily basis to check for spillages. Drip trays would be used when refuelling vehicles on the site. Emergency spill kits would be kept on site adjacent to the fuel storage area and with the mobile bowser. Site operatives would be briefed on the emergency procedures to be undertaken in the event of a large spillage. The principal contractor would have a 24- hour emergency response company on standby in the event of a spillage incident. Vehicles would be refuelled at their working location to prevent loss of time and use of fuel returning to any designated refuelling areas. All previous stated measures would be used when refuelling vehicles and the bowser operator would be suitably trained to deal with any spillage. The units would be self-contained, and no discharge of drainage would be made to the surrounding land unless otherwise agreed with SEPA and the local authority.

4.13.7. Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. As an on-site batching plant is required, it will be situated in a borrow pit or other suitable location away from watercourses and agreed with SEPA prior to construction. It has currently been situated beside the substation, BESS and construction compound area, as shown in Figure 1.2 (Volume 3a). An indicative diagram of a typical batching plant is shown in Figure 4.11 (Volume 3a).

4.14. Signage

4.14.1. Due to the isolated location of the Proposed Development and the industrial operations occurring during construction, signs are required on-site for safe day-to-day navigation for works traffic and personnel; access for emergency vehicles; and for the health and safety of the public. To further protect the health and safety of all those visiting the site a comprehensive risk assessment for visitors will be produced. Signage would consist of nonilluminated post and panel sign locations and non-illuminated turbine identification signs with a maximum of three signs per post facing at the Proposed Development. Signs would also be placed on the turbines to help identify them as indicated in Figure 4.13 (Volume 3a).

4.14.2. The signage on-site would comprise of two elements; directional signs and roundels displaying the site speed limit. The directional and speed roundel sign measure 300 mm x 400 mm x 3 mm and 300 mm x 300 mm x 3 mm respectively, which will be mounted on a 2500 mm x 76 mm grey aluminium pole as shown on Figure 4.13 (Volume 3a). The poles will be set within a 460 mm deep concrete foundation as indicated in Figure 4.13 (Volume 3a). This will ensure the stability of the signs, in line with current guidance for such installations.

4.14.3. The sign fixtures allow back-to-back mounting and are used on sign locations where more than two signs are specified. The signs will be hard wearing using tamperproof fixtures, securing the signs in place. A high-quality typeface is used to maximise readability. The signage is uncluttered and designed to be legible from vehicle or from foot.

4.14.4. The exact number of signs required at any of the post locations will be decided post-consent, following a full review of the health and safety requirements and will be confirmed in the CMS.

4.15. Employment During Construction

4.15.1. During the construction period there will be construction operatives carrying out the works on-site which have been described. There would be indirect local benefits arising from the construction phase, including use of hotels, Bed & Breakfasts and other accommodation, hire of local equipment and plant, temporary employment of local work force and potential contracting of local subcontractors. The Applicant seeks to spend a minimum of 30 % of the contract value locally and will host a local supply chain event to support this. The construction mobilisation would likely be spread over an 18-month period. Such effects are assessed in Chapter 12: Traffic and Transport and Chapter 14: Socioeconomics.

Site Representatives and Support Staff

4.15.2. It is envisaged that the Proposed Development would be constructed employing a number of main contractors; probably one for the civil infrastructure works, one for the electrical works, and one for the supply, erection and commissioning of the wind turbines – all of whom would be coordinated and overseen by a project manager. In order to monitor the progression, a number of site representatives would be employed full-time to ensure the quality and health and safety aspects of the construction, and to ensure the development is carried out in accordance with the CMS methodologies. The site representatives, Planning Monitoring Officer (PMOs), would be individuals with previous experience of wind farm construction and would, as required, be supported on-site by a suitably qualified ECoW. The site representatives would carry out daily checks on the site to monitor on-going activities, particularly when subcontractors are being used on-site. In addition to this, and in conjunction with the ecologist, and hydrologist, environmental audits of the site operations would be undertaken on a regular basis accompanied by representatives of the relevant contractors. Where necessary, additional specialists may attend the site including geotechnical and archaeological representatives.

4.15.3. In line with guidance, appropriately competent operatives would be employed for handling, storing and arranging for the disposal of potentially polluting substances. Licensed waste disposal companies would be used to dispose of potentially polluting wastes.

4.16. Site Reinstatement

Access Tracks

4.16.1. During track excavation works, where possible the vegetated top layer of material, which holds the seedbank, will be stripped and carefully set to the side of the worked area for re-use in the re-profiling and track verge reinstatement works. Where practical, if storage is required, the layers will be correctly stored in their respective soil/peat horizons, i.e. in the layers that they were stripped in, so when reinstated they can be put back in the correct order. If temporary storage of excavated materials is required, then such material will be stored safely and the method of storage will not lead to any areas of additional disturbance.

Cable Trenches

4.16.2. The reinstatement and storage of any excavated materials for the cable trenches will involve replacement of previously stripped soils, vegetated layers or turves. Timing of trench reinstatement works will also take into account adjacent construction activities which may disturb any reinstatement works already carried out. The amount of time between the excavation of the trench and subsequent reinstatement following cable laying will be minimised as much as practically possible. The reason for this is that the longer the stripped turves are stored for the

more they will degrade and become unsuitable for successful reinstatement. The optimum scenario for the cable trench works will be to ensure that no cable trenches are excavated until the electrical contractor has their cables ready for installation on-site.

Turbine Foundations

4.16.3. Reinstatement methods associated with turbine foundations will include where practical the storage of turves and topsoil around the perimeter of the foundation excavation. A plan showing where the material is to be stored will be created prior to the works commencing. In areas where storage of the turves or excavated material adjacent to the works is not possible, then the material will be taken to the nearest agreed storage areas as soon as possible.

Construction Compound

4.16.4. All temporary construction areas will be reinstated as quickly as possible following construction. Following removal of temporary site accommodation, storage, equipment and materials, all areas will then be reinstated and will be carried out utilising appropriate soil materials. Care will be taken when restoring the site to ensure the soil profile is laid in appropriate horizons to facilitate the restoration strategy.

4.16.5. The material used for the reinstatement works (often that which was excavated for the temporary construction area), will be stored and managed adjacent to the temporary construction areas but away from watercourses and other sensitive receptors. It is highly probable that the temporary construction areas, such as the site compound will be required for the duration of the construction period and may be required at times during the operation and decommissioning phases. Therefore, it is unlikely that any stripped turves would be suitable for reinstatement, as the vegetation would have decomposed if stored for any length of time. Vegetation will therefore be allowed to regenerate naturally from the local seed bank.

4.17. Operational Phase

4.17.1. Operation of the Proposed Development would be mostly automated but managed by the operations team based at the existing Crystal Rig site offices. Each individual turbine would operate independently and would be managed by remote control and monitoring systems. The monitoring system controls the rotational speed of each individual turbine and ensure its continued safe operation. Should a malfunction occur or should wind speeds exceed safe limits, then the braking system of the wind turbine would automatically be applied.

4.17.2. If high winds are the cause of the shutdown, the turbine would automatically re-commence operation once average wind speeds reduce to below 25 m/s. Should a shutdown occur due to other causes, e.g. turbine malfunction, that turbine would remain shut down in a safe condition (e.g. with the rotor blades orientated 90 degrees to the wind direction). A manual restart by a member of the Operations and Maintenance team, would be carried out following satisfactory inspection and/or repair.

4.17.3. The lifetime of the Proposed Development is 35 years from completion of commissioning to commencement of decommissioning. To ensure that turbines continue to operate with acceptable reliability (i.e. with each turbine capable of operating on average, between 95 % and 98 % of the time), individual turbines will be subject to regular pre-planned maintenance and servicing programmes. A typical maintenance programme is outlined below.

4.17.4. In addition to the scheduled maintenance unforeseen mechanical breakdowns will be subject to ad hoc maintenance visits.

4.17.5. The control of the battery storage system is also automated. The battery storge equipment will receive signals through a communication link determining when to deliver power to the grid and when to recharge. The power delivery and recharge regime will be controlled via the trading

agent. The system will also undertake its own condition and alarm monitoring and take steps to either shutdown, limit operation or advise the control room of any issues.

4.17.6. Operation of the solar PV area would be mostly automated and would also be managed by control and monitoring systems to ensure continued safe operation. To ensure that the arrays continue to operate with acceptable reliability, regular pre-planned maintenance and servicing programmes will be carried out. Additionally, there may be a need to carry out ad hoc maintenance in the event of mechanical breakdowns.

4.17.7. The vegetation under and around the PV arrays will be managed by mechanical means.

4.17.8. Tracks giving access to turbines and solar arrays will be required during the operational period of the wind farm to allow for routine maintenance operations and occasional replacement of larger components.

Maintenance Programme

4.17.9. Maintenance regimes commonly begin shortly after commissioning with a 'post-construction' check on the torque levels of all bolts within the structure. This is normally performed 10 days after commissioning and again, three months after commissioning.

4.17.10. Once operational the turbines will be subject to a major and minor service regime. The major and minor servicing will be six months apart and will be carried out throughout the lifespan of the turbine.

4.17.11. Routine oil sampling and testing of lubricant maintains awareness of the integrity and condition of these lubricants. This allows cost-effective oil changes to be performed as the oil quality degrades. Routine oil sampling and testing of transformer oils is also performed in order to maintain awareness of the integrity of the electrical properties of these oils.

4.17.12. Maintenance of the high-voltage switchgear will also be conducted routinely, with routine annual checks also carried out.

4.17.13. The battery/energy storage maintenance comprises ongoing monitoring of alarms and operational data, periodic maintenance and reactive maintenance, if and when failures occur. Periodic maintenance primarily comprises of a visual inspection of equipment and replacement of any minor equipment required. Any periodic or reactive maintenance shall be based on Original Equipment Manufacturer's (OEM) recommendations and as per agreed in the Operations and Maintenance (O&M). contract

4.17.14. During routine maintenance checks, solar arrays will be assessed for dirt or damage and sections of panels can be replaced if required. Panels can be cleaned to prevent the buildup or dirt or residue to allow maximum performance to be maintained.

4.17.15. In the case of major component maintenance being required, such as generator or blade replacement, large vehicles similar to those used during construction may need to return to site. These would be subject to similar conditions of planning as agreed for the initial construction period. From time to time, when such maintenance is being undertaken, it may be necessary to restrict access to areas close to the replacement turbine components in order to secure the health and safety of both the maintenance engineers working within the restriction zone and direct the general public away from the areas required to undertake maintenance activities. In such cases, the areas affected would be clearly marked and fenced and alternative routes would be provided for the general public seeking passage through the wind farm for the duration or the maintenance activities. Once complete the status quo in terms of site access will be re-instated.

4.17.16. All maintenance of any equipment item would be performed according to the OEM stated schedules, and health and safety procedures.

4.17.17. All maintenance would also occur according to the environmental procedures aforementioned in this chapter.

Storage and Use of Polluting Substances

4.17.18. Storage of polluting substances at the site during the operational period of the proposed wind farm would only take place where agreed with the relevant authorities in accordance with Control of Substances Hazardous to Health (COSHH) regulations. Generally, substances of this nature are transported in minimum quantities on an 'as required' basis.

Employment during the Operational Phase

4.17.19. It is envisaged that the infrastructure at the Proposed Development would be included within a wider portfolio of operational renewable developments and that persons and/or technicians would be on-site as required. The applicant has an existing operations and maintenance team at their Crystal Rig project approximately 14 km to the north. For the first few years of operation the turbines, solar arrays and BESS would be under warranty and maintenance would be performed by the turbine manufacturer. During annual servicing thereafter, the number of technicians on-site would increase. The site would also support a site manager to be based in the local area. Other contract personnel would attend the site as required to maintain the civil and electrical infrastructure as well as carrying out duties in relation to ecological monitoring and reporting. Site personnel would make use of the onsite control building, which has been designed to include office space and welfare facilities. Chapter 14 assesses the socio-economic effects of the Proposed Development.

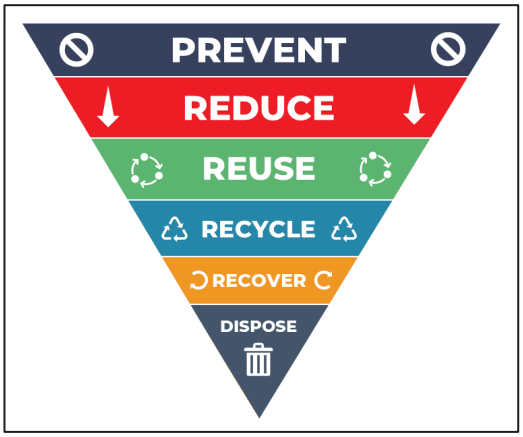
4.18. Decommissioning

4.18.1. At the expiry of the consent or the end of the Proposed Development's useful life, it is proposed that the turbines, solar arrays, BESS and transformers would be removed. The upper sections of the turbine foundations, to a depth of at least 1 m, would be removed and backfilled with appropriate material. Peat or topsoil would be replaced, and the area reseeded. Tracks will be left and allowed to grass over or would be covered with soil and reseeded. Cabling would be left in-situ, unless ducted. At least six months prior to the decommissioning of the site, a Decommissioning Method Statement would be prepared, for agreement with the local authorities and relevant consultees.

4.19. Waste Management

4.19.1. The Proposed Development will produce small amounts of general, municipal and hazardous waste during its construction, operation and decommissioning. Where waste is generated, the waste hierarchy will be applied as shown in Image 4.1 embedded in this chapter below.

Image 4.1 Waste Hierarchy



Source: Google Images

4.19.2. Waste materials generated during the construction phase include excavation waste such as vegetation, forestry residues, soil, stone, rock and similar materials. Excavated materials can be reused on-site or elsewhere if it is deemed suitable for reuse. Excavated peat associated with development on peatland is not classed as waste if it is deemed suitable for a required and predetermined end-use as part of construction works and reinstatement on a site. Other construction waste streams include municipal waste from welfare facilities, including food waste, paper, plastics, glass, cardboard, paper, and other typically domestic refuse. Industrial waste chemicals, fuel, oil and polluted water from plant, vehicle and wheel washes may also be generated as a result of the Proposed Development.

4.19.3. The operational phase of the Proposed Development is unlikely to generate significant amounts of waste except for minor quantities of material collected during routine maintenance inspections. Waste streams during this phase include municipal waste, waste chemicals, fuel and oil, sewage and polluted water from vehicle and wheel washes.

4.19.4. During the decommissioning phase of the Proposed Development waste includes demolition waste, turbine components, electrical cabling as well as municipal waste, waste chemicals, fuel and oil, sewage and polluted water. Wind turbines, solar arrays, BESS and electrical cables can be reused subject to potential ready markets for the material.

4.19.5. Measures will be put in place to ensure waste generated from the Proposed Development is kept to a minimum and does not have a significant cumulative effect on local waste management infrastructure. Such measures will be detailed fully within the CMS.

4.19.6. Embedded mitigation to reduce the quantity of waste from the Proposed Development will include a design ethos that new turbines can be accessed by existing access tracks wherever possible. This design ethos will minimise the need to construct additional access tracks and reduce the potential for waste. All construction and decommissioning activities will be planned effectively to ensure that any materials associated with these activities are predicted well in advance, reducing the chance of over-ordering of materials which would result in waste.

4.19.7. Suitable materials will be reused on-site and remaining materials will be sent for recycling where recycling facilities are available. Other measures to ensure that waste materials sent to local waste management facilities and to landfill are kept to a minimum include the nomination of an approved person(s) to be responsible for waste management on-site; this will include the coordination of waste collection to suitable disposal and/or recycling facilities. In addition, a system to record and monitor waste will be implemented, keeping a record of reuse, recycling and disposal. It may also be possible to schedule certain activities that generate large volumes

of waste to avoid overloading local infrastructure if other construction projects in the area are also producing large volumes.

4.19.8. Pollution prevention measures will also be put in place and these will be detailed fully within individual chapters of the EIAR and within the CMS.

4.19.9. Storage of waste materials within the construction compound only. If waste materials are generated outside the construction compound, they will be taken to the compound on a daily basis;

- All waste products will be removed from site by registered waste carriers and taken to a waste management facility permitted to receive each specific waste type;
- Bonfires and the burning of waste products will be prohibited on-site;
- Labelled, double skinned waste tanks will be utilised for the storage of waste oils on-site;
- The waste storage area will be isolated from surface drains and bunded to contain any spillages; and
- A wastewater collection system will be used to prevent contamination of local water courses.

4.20. Health and Safety

Health and Safety of Construction Workers

4.20.1. The construction-site will be managed and operated in accordance with Health and Safety at Work etc. Act 1974 and comply with relevant Health and Safety Regulations, including:

- The Management of Health and Safety at Work Regulations 1999;
- Construction (Design and Management) Regulations 2015; and
- Electricity Safety, Quality and Continuity Regulations 2002.

4.20.2. In awarding any civil, electrical or other contracts for the construction of the Proposed Development, the appointed contractor is obligated by law to follow the CDM Regulations implemented by the Health and Safety Executive (HSE). These are based on standard procedures that are adapted to take account of all site-specific requirements. The Regulations require due consideration is given to construction workers and the public, with risk assessments and method statements created to cover all risks identified including access rights across the site.

4.20.3. A Principal Designer (PD) will be contracted by the Applicant to take overall control of the pre-construction phase. The PD is responsible for planning, managing and coordinating health and safety for any pre-construction activities. The PD ensures all relevant information is provided to other CDM duty holders, seeking to identify, eliminate or control foreseeable risks, ensuring designers comply with their duties as well as liaising with the Principal Contractor (PC) to help with planning, management and monitoring of the construction phase, including compiling of the Health and Safety File.

4.20.4. Under CDM 2015 the Applicant isn't expected to manage the project themselves, however they remain ultimately responsible and must ensure all required duty holders are appointed and that suitable arrangements are in place for the work to be carried out safety.

Safety of the Public

4.20.5. Throughout the construction phase of the development the relevant statutory requirements would be adhered to. All potentially hazardous areas would be fenced off and all unattended machinery would be stored in the site compound or immobilised to prevent unauthorised access and use. In addition, temporary construction safety signs would be placed at each possible

entrance to the site and in areas where there may be further danger, e.g. around settling lagoons and borrow pits.

4.20.6. The Proposed Development Site is subject to access by the public under the Land Reform (Scotland) Act 2003[3]. Under section 6 (1) (g) (i) of this legislation access rights are not exercisable where building or civil engineering works are being carried out. It would not be feasible to close a site of this size and therefore warning signage will be used to inform the public of risks. Reasonable steps will be taken by the Principal Contractor to prevent access to high risk areas such as large excavations and compounds.

Operational Phase

4.20.7. Turbines have a proven track record for safety. A very small number of wind turbines have been known to suffer from mechanical damage through lightning strikes or mechanical failure. Experience on existing sites has shown that allowing the public to access an operating wind farm does not lead to a compromise in safety.

4.20.8. Companies supplying products and services to the wind energy industry operate to a series of international, European and British standards. A set of product standards for wind energy equipment has been developed by the International Electrotechnical Commission – IEC 16400. There are a number of British Standards that correspond to it, for example BS EN 61400-1: 1995 “Wind turbine generator systems – safety requirements”.

4.20.9. The Applicant would commit to installing wind turbines and components that meet BS EN 61400-1: 1995 or IEC 16400 as appropriate.

4.20.10. Public access and ice throw have been assessed in Chapter 13: Aviation and Other Considerations. Turbine procurement, together with good practice site management procedures, including the use of visual warnings signs and curtailment during periods of ice build-up on blades, will mitigate and manage this potential hazard.

4.20.11. Appropriate warning, which includes directional and identification signs, would be installed on the turbines, transformers and on site electrical control building. Access to these would be restricted to authorised personnel. At all times these facilities would be locked. Safety and/or directional signs would be placed at strategic points across the site, particularly on any Rights of Way, to inform members of the public that they are entering a renewable energy development area, to make them aware of potential hazards and provide direction for emergency services should the need arise. Any signage would be agreed with the relevant authorities prior to installation.

4.20.12. No resulting safety risks are expected as a result of public access to the proposed wind farm site. Turbine models being considered for the site would operate automatically and have sensors to detect any instabilities or unsafe operation during high wind speeds. Should sensors, placed on the nacelle and tower of the turbine, detect any other malfunction in operation or should wind speeds increase over maximum operational thresholds, the brakes would be automatically applied in order to rapidly shut the turbine down.

4.20.13. If the cause of the shutdown was high wind speeds, then the turbine would automatically begin operation once the average wind speed reduced to within operational levels. Under other causes of shutdown, e.g. through malfunction, the turbine would remain shut down and in a safe condition (i.e. commonly with the blades oriented 90º to the wind direction) until restarted by a member of the O&M team following satisfactory investigation and rectification of the malfunction. These procedures ensure operation of the site is carried out in a manner to safely protect

[3] Land Reform (Scotland) Act 2003. Available online: Land Reform (Scotland) Act 2003 (legislation.gov.uk) [last accessed 12/03/2024]

members of the public walking, cycling or riding past during site operations and maintenance. In addition, the vibrometers in the nacelles would detect rotor imbalance in blades caused by icing and the wind turbine's control and monitoring system would shut the turbines down under these conditions. The turbines are also equipped with lightning protection equipment so that when lightning strikes it will be conducted from the nacelle down the tower into the earth.

4.20.14. The safety features of wind turbines is identified above, and it is concluded that the proposed wind farm would not present a significant safety risk to the public.

4.20.15. The proposed Battery Energy Storage System (BESS) would be expected to utilise a modern lithium-ion cell chemistry. There is very low risk of fires starting or spreading through what is called 'thermal runaway' with the latest generation of lithium-ion battery energy storage systems, which benefit from a layered protection strategy. The final design details of any battery energy storage, including fire monitoring and suppression systems. The details of this monitoring and suppression system can be approved by the local authority via a deemed planning permission condition. Further mitigation includes the BESS site design incorporating a minimal external buffer of 10 m from the very edge of the battery storage hardstanding area. This 10 m buffer will be applied to protect any adjacent trees from the BESS operations. It is therefore concluded that fire risks from the proposed battery energy storage are low. However, the final design details of any battery energy storage, including fire monitoring and suppression systems, can be approved by the local authority via a deemed planning permission condition.

4.20.16. Solar PV also have a proven track record for safety. Glint and glare is the main consideration for safety which is assessed in Chapter 13.

4.20.17. Appropriate warning, directional and identification signs would be installed on the solar PV arrays, transformers and on-site electrical control building, and access to these would be restricted to the site's personnel. At all times these facilities would be locked. Additionally, safety and/or directional signs would be placed at strategic points across the site area to inform members of the public that they are entering an area where electricity generation infrastructure is present, to make them aware of potential hazards and provide direction for emergency services should the need arise. Any signage would be agreed with the relevant authorities prior to installation.

4.20.18. Periodic maintenance primarily comprises of a visual inspection of equipment and replacement of any minor equipment required. Any periodic or reactive maintenance shall be based on Original Equipment Manufacturer's (OEM) recommendations and as per agreed in the O&M contract.

4.21. Conclusion

4.21.1. This chapter has set out a description of the Proposed Development and provided details of the activities that will be undertaken throughout the construction, operation and decommissioning phases of the Proposed Development.

4.21.2. There is sufficient detail to provide consultees with a reasonable understanding of the Proposed Development. Further construction details will be provided in the CMS, which will be in accordance with the outline CEMP provided at TA 4.1 and will be submitted by the principal contractor for approval by the SBC prior to the construction of the Proposed Development.