Chapter 4

Development Description

SCOTTISHPOWER RENEWABLES

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Development Description

4.1 Introduction

1. This chapter provides a description of the proposed Development and its geographical context. It also outlines the anticipated construction and operation activities connected with the proposed Development. The proposed Development layout is illustrated in **Figure 4.1 (a to d)**.

4.2 Description of the Development

2. The proposed Development will comprise 11 turbines, giving a combined generating capacity of around 62 MW, and around 20 MW of installed solar photovoltaic arrays along with associated infrastructure including:

- turbine foundations;
- crane hardstandings;
- transformer/switchgear housings located adjacent to turbines and solar arrays;
- solar photovoltaic modules
- access tracks (existing, upgraded or new as required);
- watercourse crossings (existing, upgraded or new as required);
- underground electrical cabling to the Operational Kilgallioch Windfarm substation;
- permanent anemometer mast and Lidar compound;
- up to two temporary Power Performance Masts;
- closed-circuit television mast(s);
- communication mast(s);
- permanent operations building;
- up to two borrow pit search areas; and
- a temporary construction compound area.

3. As an extension to the Operational Kilgallioch Windfarm the proposed Development will re-use and share existing infrastructure from the Operational Kilgallioch Windfarm where possible. This includes sharing much of the access track and connecting to the existing Operational Kilgallioch Windfarm substation, thus maximising efficiency and reducing the cost to the consumer.

4.2.1 Access to Site

4. Following the applicant's recent experience of constructing the Operational Kilgallioch Windfarm, it is proposed that a dual port strategy is considered for the delivery of the wind turbine components. The wind turbines would be delivered to the King George V (KGV) Dock in Glasgow, but with the possibility of using the port of Cairnryan. The port of Cairnryan has some restrictions including limited water depth and port handling facilities/component storage and may limit the use of this port. The turbines would be moved from the port of entry to the Site under escort. Where the KGV Dock is used the wind turbine components would transit via the motorway (i.e. M8, M74) and then onto the A75 and finally the A714, before accessing the Site. In the case of Cairnryan, turbine components would be moved south along the A77, A751, A75 and then the unclassified road past Newton Stewart and then north along the A714 to the Site entrance.

5. A transport assessment has been undertaken in support of the application for the proposed Development and this provides detail on access routes to the Site for construction vehicles and provides an estimate of trip generation during construction. The transport assessment includes a review of the proposed route, construction traffic impacts, and an abnormal load route review. Traffic and transport effects are discussed further in **Chapter 12: Access, Traffic and Transportation.**

6. Prior to construction, any required improvements to public roads will be undertaken and appropriate highway safety measures will be agreed with DGC roads department and Transport Scotland, with necessary signage or traffic control measures implemented throughout the construction phase on the agreed basis.

4.2.2 Grid Connection

7. The electrical power produced by the individual turbines and solar array(s) will be fed back to the Operational Kilgallioch Windfarm substation, via underground cables parallel to new and existing access tracks, for onward connection to the national electricity network. The substation compound is located within the Operational Kilgallioch Windfarm site, as shown on **Figure 4.2**. The indicative cable route from the proposed Development to the Operational Kilgallioch Windfarm substation is also shown in **Figure 4.2**.

8. The cables will be laid in trenches, typically approximately 1.2 m deep and up to 3 m wide, surrounded by sand and then backfilled with the as-dug material. The trenches will also carry earthing and communication cables for the operation of the proposed Development. Cabling will mainly be located parallel to the access tracks within the windfarm(s) itself.

4.2.3 Wind Turbines

9. The proposed Development will comprise 11 wind turbines of up to 180 m maximum tip height, each with a typical generating capacity of around 5.6 MW. The exact model of wind turbine to be installed at the proposed Development would be selected through a competitive procurement process. In each assessment in the EIA a maximum-case scenario of the turbine dimensions/characteristics has been used. An indicative turbine for the windfarm is shown on **Figure 4.3.**

10. The proposed final locations of the turbines have been defined in order to enable the EIA to describe fully the proposed Development for which permission is being sought. The British National Grid coordinates denoting where each of the turbines are proposed to be located are listed in **Table 4.1** and shown on **Figure 4.1**.

Turbine	Easting	Northing
1	224926	569849
2	222904	570588
3	223603	570349
4	222907	569869
5	224015	570833
6	224832	570361
7	224572	570851
8	223403	570880
9	224228	569777
10	223551	569794
11	224519	569291

Table 4.1: Wind Turbine Coordinates (British National Grid)

11. Each of the turbines comprises the following components:

- blades;
- towers;
- nacelle; and
- hub.

12. Each turbine will be mounted on a tapered tubular steel tower and consist of a nacelle to which are attached a hub and rotor assembly including three blades. The turbines will be of a typical modern, three-blade, horizontal axis design in semi-matt white or light grey with no external advertising or lettering except for statutory notices, to be agreed with Dumfries and Galloway Council (DGC).

4.2.4 Turbine Foundations

13. Turbine foundations would be designed to accommodate the final choice of turbine and to suit site specific conditions. The final design would depend on the findings of detailed ground investigation at each turbine location. An illustration of a typical turbine foundation is provided **Figure 4.4**.

14. The turbines would have gravity foundations approximately 30 m in diameter and would be constructed using reinforced concrete. Foundation excavations would be approximately 3.5 m deep, dependent on ground conditions. The sides of the excavation would be graded back, from the foundation to an approximate 37 m excavation diameter to ensure that they remain stable during construction. The turbines would be erected using cranes brought on to the Site for the construction phase.

4.2.5 Turbine Transformers

15. Each turbine would be served by an electrical transformer/switchgear unit that would be located externally adjacent to the turbine base. The transformer housing would measure approximately 10 m (l) x 5 m (w) and 4 m (h) and mounted on a concrete plinth. The external finishes would typically be metal or glass reinforced or moulded plastic. An indicative external transformer is shown on **Figure 4.5**.

4.2.6 Crane Hardstandings

16. To enable the construction of the turbines, a crane hardstanding area and turning area at each turbine location will be required to accommodate assembly cranes and construction vehicles. This will comprise a crushed stone hardstanding area measuring approximately 80 m long by 30 m wide, with a typical thickness of approximately 1000 mm, but subject to the specifications required by the selected turbine manufacturer and crane operator and following detailed ground investigations prior to construction. Adjacent to the crane hardstanding would be laydown areas for the blades comprising a disturbance area of approximately 85 m long by 25 m wide.

17. The crane hardstandings and laydown areas will remain in place during the lifetime of the proposed Development to facilitate maintenance works. Indicative crane hardstandings are illustrated as part of the Site layout on **Figure 4.1a** and **Figure 4.6**.

4.2.7 Solar Development Search Areas

18. The proposed Development also comprises four areas identified for solar development, ranging from approximately 3.8 to 13.5 ha in area with the potential for an installed capacity of approximately 20 MW. These four solar search areas are labelled A1, A2, C and G on **Figure 4.1a**.

19. For the purposes of assessing the potential environmental effects associated with the development of solar energy within the search areas, an indicative layout is provided within **Figure 4.7**. The design and layout of the solar element of the proposed Development will be finalised and confirmed prior to construction.

20. The indicative layout consists of an array of solar photovoltaic modules orientated in a southerly direction. The modules will stand approximately 0.5 m Above Ground Level (AGL) at their minimum point and will be angled around 25° to the horizontal and arranged in rows. Depending on the finalised angle of elevation, and the number of rows of modules stacked, the maximum height of the modules will be around 3.0 m AGL. An indicative elevation drawing of a solar module is provided in **Figure 4.8**.

21. Each module will be mounted upon a pre-fabricated alloy metal frame. The module frames will likely be anchored to the ground via steel piles which will be driven or screwed approximately 1.5 m below ground without prior excavation. The photovoltaic modules will be fixed to the frame. It is intended that the land will remain in agricultural use and that sheep would be able to graze between the panels to maintain the vegetation.

22. Power units, comprising the inverters and transformers, will be installed within each of the solar search areas to convert the Direct Current (DC) produced by the solar modules, into an Alternating Current (AC) which is compatible with the local electricity distribution network. Approximately one power unit is expected to be installed per c.2 MW installed, comprising an area of approximately 5 m by 12 m placed on a concrete plinth. They will be located at the end of a row adjacent to the access track and will feed into the wider proposed Development cable network via underground cables adjacent to the onsite access tracks. The power units will have a 2.75 m AGL fencing surrounding them.

4.2.8 Access Tracks

23. Almost two thirds of the proposed access tracks for the proposed Development will use existing infrastructure, whether upgrading of existing farm tracks or tracks used within the Operational Kilgallioch Windfarm. The existing access track is in good condition. It was previously widened for the construction of the Operational Kilgallioch Windfarm and is generally suitable for very large turbine component deliveries. It is not expected to have to carry out any significant engineering works along this route into the Operational Kilgallioch Windfarm; however, there may be small sections which require very minor upgrades or limited repair works within the existing road corridor as detailed fully within **Chapter 12: Traffic and Transportation**. All new access tracks have been designed to avoid any sensitive environmental receptors, will be made of locally sourced stone from the onsite borrow pits and have a typical running width of approximately 5 m, with an average stone thickness of 500 mm. Access tracks will widen at the new passing place identified on **Figure 4.1b** and on bends and junctions to allow the passage of abnormal loads. An indicative cross section of the proposed access tracks is provided in **Figure 4.9**.

24. The total length of roads for the proposed Development is approximately 24.4 km and can be sub-divided into the categories detailed in **Table 4.2** and as represented on **Figure 4.10.**

Type	Description	Length (m)	Percentage of Total
Existing	Existing tracks, part of the Operational Kilgallioch Windfarm, to be upgraded where necessary.	14,710	60%
New cut tracks	Spine road and spur road to the proposed Development turbines.	6,750	28%
New floating tracks	Floating tracks to avoid excavation of deep peat	1,870	8%
Existing farm tracks	Existing tracks, used for farm access, to be upgraded	1,080	4%

Table 4.2: Access Track Composition

25. Construction of the floating access tracks will require the placing of a geotextile membrane on existing topsoil and vegetation followed by aggregate layers. Depending on ground conditions two or more layers of geotextile will be placed in layers of 300 mm to 500 mm. The access tracks will be capped with layers of Type 1 or similar material. Type 1 is unbound aggregate mixture specified under Clause 803 of the Specification for Highway Works (2016) as suitable for vital load bearing foundation in road construction.

4.2.9 Watercourse Crossings

26. Watercourse and ditch crossings have been avoided in the design of the access track layout as far as possible, however there would be 21 watercourse crossings within the Site (coordinates provided in **Table 4.3**). Nine of these watercourse crossings are to be new, eleven are existing and can be used without modification and one is an upgrade of an existing watercourse crossing. These are shown on **Figures 4.1a** to **4.1d**. Further discussion on the water crossings proposed as part of the proposed Development is provided in **Chapter 7: Hydrology, Hydrogeology, Geology and Soils.**

Water Crossing	Easting	Northing	Description
WX01	230208	580492	Existing. No change
WX02	229226	579219	Existing. No change
WX03	227465	578353	Existing. No change
WX04	227156	578132	Existing. No change
WX05	225988	577561	Existing. No change

Water Crossing	Easting	Northing	Description
WX06	225177	577308	Existing. No change
WX07	223581	576470	Existing. No change
WX08	223123	576212	Existing. No change
WX09	222482	573650	Existing. No change
WX10	222338	573225	Existing. No change
WX11	222467	572200	Existing. No change
WX12	222555	571749	New. Culvert
WX13	222685	571005	New. Open arch/bridge
WX14	223064	570916	New. Culvert
WX15	223504	570639	New. Culvert
WX16	224368	569809	New. Culvert
WX17	224215	569384	New. Culvert
WX18	224620	570401	New. Culvert
WX19	224711	569907	New. Culvert
WX20	225007	569387	New. Culvert
WX21	225908	568833	Existing. Requires upgrade

Table 4.3: Watercourse Crossings

4.2.10 Meteorological Monitoring Masts and Lidar Compound

27. A 105 m lattice structure anemometer mast may be installed onsite at OSGB grid reference 224092 569418 (as shown on **Figure 4.1a**). The purpose of this is to provide operations and performance monitoring data and the mast height would be dependent on the final turbine selection.

28. The mast would be delivered to Site in sections and would be bolted to a concrete pedestal typically measuring 5 m x 5 m and 0.5 m high, centred on this concrete pad. During construction, the crane would be supported using a stone pad and hardstanding measuring approximately 25 m x 25 m and the depth dependant on a suitable bearing strata. A 3 m high anti-climb fence would also be installed around the base of the mast to restrict access.

29. Up to two, 105 m temporary Power Performance Masts (PPM), may be erected dependant on the final turbine selected. If required, the temporary masts would be erected early in the construction programme and would record data for several months before turbine erection. Prior to the turbines being constructed, the temporary masts may be decommissioned and removed, or remain in place for a period of up to two years following turbine commissioning.

30. Furthermore, a Lidar station will be located adjacent to the operations building, which will comprise a 3 m x 3 m fenced compound with a Lidar on a raised 2 m platform. The Lidar station would provide operations and performance monitoring data alongside the anemometer mast.

4.2.11 Operations Building

31. The operations building would be single storey, built on a concrete base and would measure approximately 16 m x 12 m and 7 m high. The operations building would also host solar panels on the roof to reduce the carbon footprint of the building and will likely include other energy efficient measures such as rain water harvesting for flushing of toilets etc. An indicative layout for the operations building is provided in **Figure 4.11**.

32. The operations building would be located within a compound which would measure approximately 400 m^2 in total. The compound would include an area for car parking.

4.2.12 Temporary Construction Compound

33. A construction compound will be required as the control centre for all site activities and to provide facilities for the day-to-day needs of the project and the workforce. The construction compound will be located on the main access track at the north western entrance to the main body of the Site as shown on **Figure 4.1a**. It will comprise an area of approximately 100 m long by 50 m wide. An indicative layout of a typical construction compound is provided in **Figure 4.12**. The detailed location, size and engineering properties of the construction compound will be confirmed prior to the start of construction, after the turbine supplier and model have been confirmed.

34. The compound area will house temporary portable cabin structures to be used as the main Site office and welfare facilities, including toilets, clothes drying and kitchen, with the provision for sealed waste storage and removal. It will also be used for the storage and assembly of certain components, containerised storage for tools and small parts, and oil and fuel storage. Adequate parking will be provided for cars and light vehicles. A portable cabin controlling access to the main Site with mandatory signing in and out procedures will be located at the entrance to the compound.

35. The proposed location of the compound is on firm ground and avoids habitats of highest sensitivity and other onsite environmental constraints. Prior to commencing construction work, a detailed appraisal of the areas will be undertaken if required, including trial pits and /or boreholes to confirm the nature of the sub-strata and an assessment by the project ecologist.

36. A concrete batching plant will be located within the construction compound and will comprise aggregate and cement hoppers, water bowsers/tanks, a mixer and a control cubicle. Aggregates and sand would be stockpiled and contained adjacent to the plant. It will be necessary to provide a limited private water supply and foul drainage; this is considered further in **Chapter 7: Hydrology, Hydrogeology, Geology and Soils**.

37. On completion of construction works, it is proposed that all temporary structures be removed and the compound area be restored for agricultural grazing purposes.

4.2.13 Borrow Pits

38. To minimise the volume of imported material brought onto the Site and any associated environmental impact, borrow pits located within the Site will be used to source aggregate for Site construction. A borrow pit is an area where material has been excavated for use at another location.

39. Two borrow pit search areas have been identified in order to provide a total of approximately 90,900 m^3 of material required to construct the proposed Development, (refer to **Table 4.4**). It is proposed that the actual borrow pit(s) would be located within these search areas, however, may only require using a portion of the search areas. The location of the two search areas are shown on **Figure 4.1a**.

Borrow Pit	Easting	Northing	Area (m^2)	Est. of Volume (m^3)
BP1	222850	570494	7,000	31,500
BP2	225861	568638	13,200	59,400

Table 4.4: Borrow Pit Information

40. Detailed site investigations prior to construction will be carried out to further confirm the rock type, rock characteristics and suitability, as well as potential volumes to be extracted from the search area. The final borrow pit(s) identified during the geotechnical evaluation will be defined within the Construction Environmental Management Plan (CEMP) (refer to **Section 4.3.2**). The pollution control measures to be implemented during usage of the borrow pit(s) and its reinstatement will also be covered within this document.

41. The borrow pit(s) will require the use of plant to both win and crush the resulting rock to the required grading. It is anticipated that rock will be extracted by breakers and other relevant methods that may be required, such as blasting. Noise associated with stone extraction is discussed in **Chapter 10: Noise**.

42. Environmental considerations have influenced the location of the borrow pit search area to minimise the effect on ecology, cultural heritage and hydrology, and to allow successful reinstatement measures to be put in place as appropriate. Following construction, the borrow pit(s) will be restored and reinstated to agreed profiles.

4.3 Construction

43. The onsite construction period for the proposed Development is expected to be approximately 18 months (refer to **Table 4.5**). Normal construction hours will be between 07:00 and 19:00 Monday to Friday and 07:00 to 16:00 on weekends, or as agreed with the Environmental Health Officer (EHO). These times have been chosen to minimise disturbance to local residents. It should be noted that out of necessity due to weather conditions and health and safety requirements, some generally quiet activities, for example abnormal load deliveries (which are controlled by Police Scotland) and also the lifting of the turbine components, may occur outside the specified hours stated. **Table 4.5** provides an indicative programme for the main items of work to be carried out.

Task	Month								
	2	4	6	8	10	12	14	16	18
Mobilisation									
Forest Felling									
Access & Site Tracks									
Foundations									
Crane Hardstands									
Onsite Cabling									
Turbine Delivery									
Turbine Erection									
Solar Installation									
Commissioning & Testing									
Site Reinstatement /Restoration									

Table 4.5: Indicative Construction Programme

44. **Table 4.6** below summarises the approximate areas for which aggregate material will be required for each of the main infrastructure elements described in **Section 4.2**. The transport assessment has been prepared on a "worst-case" basis that a capping layer of construction aggregate will be imported to Site and no concrete batching will take place on Site. However, if all base materials and concrete batching takes place on Site this would result a reduction in delivery volumes / traffic. Further detail on traffic volumes associated with the importation of construction materials is provided in **Chapter 12: Access, Traffic & Transportation**.

Infrastructure	Volume (m^3)
New Tracks	43,400
Track Upgrades	6,600
Crane Hardstanding and Laydown Areas	28,100
Construction Compounds	2,500
Operations Building	600

Table 4.6: Proposed Development Areas

4.3.1 Construction Materials

45. The main materials likely to be required in part or total for the construction of the track, turbine and substation/operations building foundations, hardstanding areas and cable trenches are described below:

- crushed stone;
- geotextile;
- cement;
- sand;
- concrete;
- steel reinforcement; and
- electrical cable.

46. Necessary excavations will be made, initially by stripping back the soil from the area to be excavated. This soil will typically be stored separately either in a mound adjacent to the excavation area for backfill, if required, or stored at a designated area on Site for further use or reinstatement of temporary works areas. The handling of soils will be undertaken in accordance with best practice techniques.

47. Should surface water run-off or groundwater enter the excavation during construction of the turbine foundations, appropriate pumping measures away from watercourses will be implemented to ensure the works are safely carried out and the excavation is sufficiently dry to allow concrete placement. Once the concrete is cast, the excavated material will be used for backfill and compacted to the required design density. Once this backfill is completed, the crane hardstanding areas will be constructed.

48. The turbines will be erected using two cranes, positioned on the hardstanding adjacent to the turbine base.

49. As soon as practical, once installation is complete, the immediate construction area will be restored to a profile to be agreed with DGC, although the crane hardstandings will be retained for future maintenance. The soils will be replaced where appropriate and as advised by an onsite Environmental Clerk of Works (ECoW). Any surplus soils will be used to restore track edges after construction. This progressive reinstatement has been found to assist with re-establishment of the local habitats as it minimises the time soils are in storage.

4.3.1 Micrositing

50. During the construction process there may be a requirement to microsite elements of the proposed Development infrastructure (e.g. due to unsuitable ground conditions, environmental constraints). It is proposed that a 50 m micrositing tolerance of turbines and all other infrastructure would be applied to the proposed Development. Within this distance any changes from the consented locations would be subject to approval of the ECoW as required and in consideration of other known constraints.

4.3.2 Traffic and Transportation

51. Construction traffic associated with the construction and maintenance of the proposed Development falls into two main categories, namely Abnormal Indivisible Loads (AIL) and Construction/Maintenance Loads. The AILs are those that will require an escort, either by private contractor or by police escort. Construction / maintenance loads are those that do not require any special escort or permissions and are only influenced by normal traffic regulations.

52. The Applicant will ensure that the vehicles will be routed as agreed with the Local Authority, Transport Scotland, Police Scotland and other relevant consultees, to minimise disruption and disturbance to local residents and road users. Further details regarding transport and access can be found in **Chapter 12: Access, Traffic & Transportation** of this EIA Report.

4.3.3 Construction Environmental Management Plan (CEMP)

53. As part of the construction contract, the Principal Contractor (PC) responsible for undertaking the construction works would adhere to a CEMP produced by ScottishPower Renewables (SPR). The CEMP shall be developed in accordance with the joint Scottish Renewables, SNH, SEPA, and Forestry Commission Scotland guidance on Good Practice During Wind Farm Construction (SNH, 2019). The PC shall consult with the Scottish Ministers, SNH, SEPA, Historic Environment Scotland (HES) and DGC on the production of the CEMP. An Outline CEMP is provided in **Technical Appendix 4.1**.

54. The CEMP shall describe how the PC will ensure suitable management of, but not limited to, the following environmental issues during construction of the proposed Development:

- noise and vibration;
- dust and air pollution;
- surface and groundwater;
- ecology and ornithology (including protection of habitats and species);

- agriculture (including protection of livestock and land);
- cultural heritage;
- waste (construction and domestic);
- details of the size, location and volumes to be extracted from borrow pits;
- pollution incidence response (for both land and water); and
- Site operations (including maintenance of the construction compound, working hours and safety of the public).

55. SPR will engage an ECoW onsite during the construction phase. The services of other specialist advisors will be retained as appropriate, such as an Archaeological Advisor, to be called on as required to advise on specific environmental issues. The PC will ensure construction activities are carried out in accordance with the mitigation measures outlined in this EIA Report and any planning conditions, and this will be monitored by SPR and the ECoW.

56. To ensure all mitigation measures outlined within this EIA Report are carried out onsite, the CEMP will form an overarching document for all Site management requirements, including:

- Traffic Management Plan (TMP);
- Construction Methodology Statement (CMS)
- Pollution Prevention Plan (PPP) (including monitoring, as appropriate);
- Site Waste Management Plan (SWMP);
- Peat Management Plan; and
- Water Management Plan (WMP).

57. Specific requirements of the CEMP for each of the environmental topics assessed in the EIA are provided in the relevant EIA Report chapters.

4.3.4 Temporary peat storage

58. Where possible, “restore-as-you-go” techniques will be used to place excavated peat material in its final destination rather than in temporary stockpiles. However, there may, in some circumstances, be a time-delay between these actions. During the interim period, peat would be stored onsite. It is important both for the peat itself and for the surrounding environment that the peat is not allowed to substantially erode or become dry, while it is stored. Procedures to control the hydrology of stored peat would be covered by the CEMP and the outline Peat Management Plan (**Technical Appendix 7.2)**. These would include:

- prior to the excavation of relevant infrastructure, vegetation, peat and superficial geology will be removed and stored in overburden stockpiles (or used directly in restoration of other areas; see below);
- overburden stockpiles will be located adjacent to the infrastructure at least 50 m from watercourses in order to reduce the potential for sediment to be transferred into the wider hydrological system;
- run-off from overburden stockpiles will be directed through the infrastructure SUDS measures including silt fences and mats, drainage measures and settlement lagoons, as appropriate; and
- peat will not be allowed to dry out in the overburden stockpiles.

59. The catotelm layer will not be used for the dressing of roads and hardstandings, unless back-bladed to prevent erosion. A minimum approximate thickness of 300 mm will be adopted to prevent erosion. It will only be used for the dressing of slopes and batters on slopes no greater than 45 degrees.

60. The full details for peat storage areas and dimensions will be determined following detailed design, and the peat condition and requirements are better known.

4.3.5 Drainage

61. Surface or sub-surface water flow within the vicinity of the access tracks and hardstanding areas will be routed into drainage channels. The drainage channels will be situated on the upstream side of the infrastructure and run in parallel with them. These channels will pass under the hard areas, via small diameter carrier drains, to the downstream side where the run-off will percolate to the riparian zone.

62. Where ground conditions permit, channels may connect with infiltration trenches on the downhill side of the hard areas, with a small sump at the inlet to collect silt and treat run-off prior to infiltration to the surrounding soils. Silt traps will also be located along trenches to further facilitate the collection of silts. These will be cleaned out periodically, as required.

63. The edges of the access tracks will be flush to allow the surface water from the road to route directly into the collection channels or infiltration trenches. On steeper sections of track, regular cross drains, connected to infiltration trenches, will be installed to collect surface run-off and ensure longitudinal flow is intercepted, thus avoiding rutting and subsequent breakup of the track surface. Trenches will maintain linear flows to downstream areas avoiding point discharge of large flows.

64. Where the access tracks follow contours, earthworks may be required to accommodate these. Where earthworks are required a collection ditch will be installed at the head of the cutting, with appropriate dams and sumps, to collect silt and prevent sediment transfer to watercourses.

65. A detailed drainage design will be undertaken and submitted to the Scottish Ministers, in consultation with the Scottish Environment Protection Agency (SEPA), for approval prior to construction.

4.3.6 Site Restoration

66. Soils would be used for reinstatement works associated with access tracks, cable trenches, turbine foundations, crane hardstandings, borrow pits and the temporary construction areas. The upper vegetated turfs would be used to dress infrastructure edges and to reinstate the surface of restoration areas. It is anticipated that most of the soil resources within areas directly affected by construction activities would be able to be stored and reinstated as close as possible to where they were excavated in accordance with good practice; so that the Site would be restored with minimal movement of material from its original location. It is not anticipated that any excavated material would leave the Site.

67. Further detail on restoration will be provided within the CEMP, an outline of which is provided (**Technical Appendix 4.1**).

4.4 Forestry

4.4.1 Felling

68. The proposed Development would require up to 9.2 ha of commercial plantation woodland to be felled in order to facilitate the new access track connecting the main development area of the proposed Development with the existing access track within the Operational Kilgallioch Windfarm. The requirements of which would be undertaken in close consultation with FLS and documented in the Forestry Plan.

4.4.2 Compensatory Planting

69. As a result of the construction of the proposed Development, there would be a net loss of woodland area. The area of stocked woodland in the study area would decrease by up to 5.87 ha. In order to comply with the criteria of the Scottish Government's Control of Woodland Removal Policy, offsite compensation planting will be required. The Applicant is committed to providing appropriate compensatory planting. The extent, location and composition of such planting to be agreed with Scottish Forestry, considering any revision to the felling and restocking plans prior to the commencement of operation of the proposed Development.

4.5 Operation & Maintenance

4.5.1 Operational Lifespan

70. There is no proposal to limit the lifetime of the proposed Development. Therefore, the assessment of all technical areas considers the effects of the operational phase of the proposed Development, without time limitations. Should decommissioning of any of the proposed Development be required, or part thereof, it is considered that the environmental effects of decommissioning would be similar to, or less than, those during construction. With the exception of habitat loss which would have already occurred under the construction phase.

4.5.2 Lighting

71. As the proposed Development turbines would be in excess of 150 m to blade tip, they are required to be lit pursuant to *Article 222* of the *UK Air Navigation Order (ANO) 201*6. The Civil Aviation Authority (CAA) Policy Statement on *Lighting of Onshore Wind Turbine Generators in the United Kingdom with a Maximum Blade Tip Height At or In Excess of 150 m Above Ground Level* (CAA, June 2017) modifies the strict application of Article 222 to require only the hub to be lit by 2000 candela steady red lights, with a single set of intermediate steady red lights halfway down the tower at a reduced intensity of 32 candela. Aviation lighting will be installed as soon as practicable on erected turbines.

72. The turbines will be lit as described above, and as such, during hours of darkness may have a visual impact. The night time visual effect of lighting the turbines is assessed within **Chapter 6: Landscape and Visual**.

73. It is proposed that visibility sensors are installed on the proposed Development turbines in line with the *2017 CAA Policy Statement* so that where visibility is restricted to 5 km or less from all the turbines in the proposed Development, the lights would operate at 2000 candela and where visibility is greater than 5 km from all the turbines, the nacelle obstruction lights would be dimmed to 200 candela. Further information can be found in **Chapter 14: Other Issues**.

74. In addition, SPR proposes to explore the possibility of installing an aircraft detection lighting system whereby the lights would only be switched on when aircraft enter the volume as described above around the turbines. Given the lights are only required for aircraft flying at night in the vicinity of the Site at altitudes of up to 2500 ft, it is anticipated that the lights will be rarely on in this quiet airspace. If an aircraft detection lighting system is required, this would be subject to a separate planning application, radar licensing and relevant CAA approvals. Optimally, any such radar deployment could benefit multiple windfarms in the Dumfries and Galloway or South Ayrshire regions.

4.5.3 Maintenance

75. The proposed Development would be maintained throughout its operational life by a service team comprising up to five full time equivalents made up of operation management, operations technicians and support functions. During periods of scheduled maintenance up to four technicians who may be based in the local area would be required for up to seven weeks per year, whilst additionally the technicians would be required to undertake unscheduled maintenance throughout the year. This team would either be employed directly by the developer or by the turbine manufacturer. Management of the proposed Development would typically include turbine/array maintenance, health and safety inspections and civil maintenance of tracks, drainage and buildings.

76. Maintenance activities include the following:

- civil maintenance of tracks and drainage;
- scheduled routine maintenance and servicing;
- unplanned maintenance or call outs;
- HV and electrical maintenance;
- blade inspections;
- fencing;
- snow clearing;
- replacement of inverters approximately every 10-15 years; and
- possible management of grass around the panels will be required, though likely to be grazed by sheep.

4.6 Climate Change & Carbon Considerations

77. Whilst the proposed Development will reduce carbon emissions by replacing the need to burn fossil fuels for power, carbon emissions will result from the component manufacturing, transportation and installation processes associated with the proposed Development. There is also the potential for carbon fixers and sinks to be lost through the clearing of vegetation during construction. There must, therefore, be a sufficient balance between the carbon reduction associated with renewable energy development and that which is produced through construction/ fabrication processes and lost through Site preparation.

78. The electrical output capacity from the proposed Development will be around 82 MW, comprising around 62 MW wind energy and around 20 MW solar energy, with the exact capacity depending on the model and type of turbine and solar panel selected. It would be expected that the Site would generate around 165.24 GWh per year (again depending on the turbine and solar panel selected).

79. The average electricity consumption per household in the UK quoted by the Department of Business, Energy and Industrial Strategy is 3,729 kWh (BEIS, 2019). Assuming generation of around 164.27 GWh annually, the proposed Development would generate enough power to supply over 44,000 average UK households.

80. **Chapter 14: Other Issues** provides details of the assessment undertaken to calculate the carbon emissions which would be generated during the construction and operation of the proposed Development as well as the carbon payback period resulting from the operation of the proposed Development. The proposed Development is expected to take around 31 months (2.6 years) to repay the carbon exchange to the atmosphere (the CO_2 debt) through construction of the windfarm; the Site would in effect be in a net gain situation following this time period and can then claim to contribute to national objectives of reducing greenhouse gas emissions and meeting the 'net zero' carbon targets by 2050.

81. Although the proposed solar array cannot be accounted for within the carbon calculator calculations (as the construction of the solar infrastructure will not include the removal of carbon (peat) from the Site), it will support potential savings in CO_2 emissions due to the decreased requirement for other electricity sources and will also support the 'net zero' carbon targets, full details of which are included within **Chapter 14: Other Issues** and **Technical Appendix 14.3.3: Estimated Solar Yield and Carbon Benefit Calculations**.

4.7 Public Access

82. There are no core paths listed across the main development area of the proposed Development Site.

83. The Southern Upland Way is a 228 km footpath, one of the original four officially designated Long Distance Routes in Scotland, and now one of the family of Scotland's Great Trails. It is a coast to coast trail from Portpatrick in Dumfries and Galloway to Cockburnspath in the Borders. The Southern Upland Way crosses the existing access track for the Operational Kilgallioch Windfarm, to the north of where the proposed Development will take access, as shown on **Figure 4.13**. This section of the Southern Upland Way is also denoted as route DW146 on the National Catalogue of Rights of Way (CROW).

84. In the interests of health and safety, and if required, a temporary diversion may be put in place for the construction period for affected path sections, with suitable alternatives clearly signposted. It is proposed that details of temporary path diversions can be secured by an appropriately worded condition.

85. Once construction is completed, the infrastructure associated with the Proposed Development will provide improved access and increased opportunities for informal recreation (walking / biking / horse riding) across the Site throughout the operational life of the Proposed Development.

86. SPR's operational Kilgallioch Windfarm provides funding towards two SUW Rangers posts to manage, maintain and promote the SUW in D&G. These Rangers can assist with managing communication of any temporary diversion to SUW users via their Website and Facebook pages. They can also raise awareness of the improved public access opportunities through the Proposed Development area.

87. The potential effects that could be experienced by tourists and recreational users of the Southern Upland Way routes, is assessed further in **Chapter 6: Landscape and Visual**.

4.8 Community Benefit and Investment

88. SPR is committed to sharing the benefits from our operational windfarms with local communities. This could include a community fund to deliver local initiatives, benefits in kind and the opportunity to invest in the operational windfarm should the community choose to do so. SPR will hold discussions with local stakeholders to decide which communities would be appropriate to participate in any opportunity to invest.

89. SPR is committed to keeping local communities informed as the project progresses and, in line with Scottish Government guidance, will provide information in a timely manner so the communities are able to fully assess the opportunity.

90. It is expected that any community benefit and potential income streams from an opportunity to invest could provide a long term revenue which could be used to support community projects within South Ayrshire and Dumfries and Galloway and local communities would have the flexibility to choose how the money is spent and prioritise it on the things which matter most to them.

91. SPR community funds across the UK total more than £32 million, with almost £12 million invested in communities near their developments in South Ayrshire and Dumfries and Galloway. Some of the initiatives that SPR community benefit funds have supported across these regions include:

- £9,899 to Hub Dumfries and Galloway to improve energy efficiency and home heating for the elderly;
- £10,000 to Glentrool and Bargrennan Community Trust to part-fund a project manager to manage an asset transfer of the former Glentrool Primary School and oversee implementation of the business plan;
- £8,985 to Kirkcowan Angling Club for the lease of fishing rights on sections of the rivers Tarff and Bladnoch;
- £4,600 to Wigtown Bay Sailing Club to contribute to the costs of a new outboard engine for the group's safety rib, and related powerboat training for club members; and
- £10,000 to Port William Community Development Trust to contribute to the costs of extending the community Youth Centre.
- £18,200 to Barrhill CIC to employ a village handyman, whose role includes garden and handyman services to residents of Barrhill aged 65 +.
- £6,720 to Girvan Community Sports Hub to fund a six-month employability pilot project seeking to identify, recruit, train and support six young people into employment in the South Carrick area.
- £2,000 to Ballantrae Trust to employ web designers to create a new website for the village of Ballantrae.

92. SPR is committed to maximising employment opportunities for those local to their projects by making sure that local people and businesses have the opportunity to be part of the industry's success. As a major infrastructure development, the proposed Development has the potential to create employment opportunities. If consent is granted, jobs would be created both during construction and after completion, in support, operation and maintenance activities. Further details on the socio-economic benefits of the proposed Development are further discussed in **Chapter 13: Socio-Economics, Tourism and Recreation**.

93. New development can bring increased opportunities for local companies to gain new business. SPR work with local businesses that are able to provide a variety of skills and services during the construction phase and the operational lifetime of SPR's developments. This may include services such as ground and road maintenance, catering, building trades and plant hire. SPR will host 'Meet the Contractor' events prior to construction, aimed specifically at small to medium businesses, to provide an opportunity for them to discuss the types of contracts being let during construction and operation.

4.9 References

Scottish Renewables, SNH, SEPA, HES, Marine Scotland Science, FCS and AEECoW (2019). *Guidance on Good Practice During Wind Farm Construction* (4th Edition).

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Kilgallioch Windfarm Extension Project Team

ScottishPower Renewables
9th Floor Scottish Power Headquarters
320 St Vincent Street
Glasgow
G2 5AD

kilgalliochextension@scottishpower.com

www.scottishpowerrenewables.com

SCOTTISHPOWER
RENEWABLES