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Introduction

9.1 Ben Sca Wind Farm Limited (the Applicant) proposes to construct and operate a wind farm comprising of nine wind turbines with a maximum blade tip height of 149.9m and associated infrastructure known as the Ben Sca Redesign Wind Farm (the Proposed Development) in the northwest of the Isle of Skye. The site is located approximately 2.5km to the southwest of Edinbane and 7km to the east of Dunvegan. The location of the site is shown on **Figure 1.1**.

9.2 The Applicant was previously granted planning permission by the Highland Council (THC) on the same site for:

- Ben Sca Wind Farm (reference 20/00013/FUL) in December 2020. The approved development is for the construction and operation of up to seven wind turbines with a maximum blade tip height of up to 135m and associated infrastructure; and
- Ben Sca Wind Farm Extension (reference (21/05767/FUL) in April 2022. The approved development is for the construction and operation of two wind turbines with a maximum blade tip height of up to 149.9m and associated infrastructure.

9.3 For the purposes of this Environmental Impact Assessment (EIA) Report, the consented Ben Sca Wind Farm and Ben Sca Wind Farm Extension is referred to as the 'consented development'.

9.4 This Chapter presents a summary of the other potential environmental effects that do not warrant full assessment within the EIA framework due to the likelihood of significant effects being low and/or the effects having been scoped out of the assessment in consultation with The Highland Council (THC) in the EIA Screening and Scoping Report (dated 20 September 2023).

9.5 The purpose of the review presented in this Chapter is as follows:

- to confirm that the baseline for the topics considered in the EIA Reports for the consented development which are set out in this Chapter (not considered in **Chapters 3 to 8**) remain valid and that no changes or additional aspects (including cumulative impacts) have occurred to the baseline;
- to confirm that the assessment methodologies used for the previous assessments in the EIA Reports for the consented development remain valid; and
- where updated surveys and/or additional assessment for the Proposed Development have been undertaken to supplement that contained in the EIA Reports for the consented development, details of this information and where it is included within this EIA Report is identified in the remainder of this Chapter.

Approach to Other Effects

Consultation with THC

Traffic and Transport

9.6 An EIA Screening and Scoping request was submitted to THC for consideration in September 2023. A consultation response was received from Transport Planning, dated 17 October 2023 (also included in THC Scoping Response of 17 November 2023) confirmed that there was no objection in principle to the use of the previous traffic and

transport related assessments (undertaken for the consented development) to support the planning application for the Proposed Development. It was also confirmed that there was no objection in principle to the scope of works set out in the Screening and Scoping Report (SLR, 2023). Reference was made to the requirements as set out in previous advice and planning conditions issued in response to the consented development.

Noise and Vibration

9.7 The Environmental Health Officer (EHO) at THC was consulted on 28 September 2023, when a letter was issued that set out the approach to the noise assessment. In their response dated 09 October 2023, THC EHO agreed to the proposed approach to consider all turbines together under one combined limit and, provided that the revised design meets the combined limits, no further cumulative assessment was required to be undertaken. The EHO did advise that if the limits can only be met through the use of noise reduction operating modes, further consideration may be required as this has the potential to result in an increase in noise exposure.

9.8 The EHO confirmed that a cumulative noise assessment was not necessary as the impacts previously reported have not changed and any alterations in the cumulative situation surrounding the consented development have already been taken into account within the noise assessments for subsequent cumulative developments.

Supporting Technical Appendices

9.9 Effects on noise and traffic and transport receptors due to the construction and operation of the Proposed Development are not assessed within the **Chapters 3 to 8**, as there are not likely to be significant effects and consultees confirmed that they did not warrant full EIA Chapters.

9.10 Notwithstanding that no likely significant environmental effects are predicted, a detailed review of the impacts of the Proposed Development on each of the topics that were previously considered in the EIA Reports for the consented development has been undertaken and the results are summarised in this Chapter with detail provided in supporting Technical Appendices where necessary.

9.11 The topics considered in this Chapter include:

- site access, traffic and transport;
- noise and vibration;
- carbon balance;
- shadow flicker;
- telecommunications;
- aviation; and
- other issues including risk of accidents and other disasters, population and human health and waste and environmental management.

9.12 This Chapter is supported by Volume 4, Technical Appendices as follows:

- Technical Appendix 9.1: Transport Statement;
- Technical Appendix 9.2: Construction Traffic Management Plan (CTMP);
- Technical Appendix 9.3: Noise Assessment; and

- Technical Appendix 9.4: Carbon Balance Assessment.

Other Effects

Traffic and Transport

9.13 The original Ben Sca Wind Farm application (20/00013/FUL) was supported by an EIA Report, which included Chapter 12: Site Access, Traffic and Transport Chapter, which is included in this EIA Report as **Annex 9.1A**. The assessment considered the impacts associated with nine turbines and so represents a worst-case assessment of the possible maximum traffic flows generated during construction. The assessment of the consented development, as presented in Chapter 12 of the Ben Sca Wind Farm EIA Report concluded that all effects resulting from the additional traffic would not be significant.

9.14 A Transport Assessment for the Proposed Development is presented in **Technical Appendix 9.1**. This assessment reviews the Proposed Development against the consented development.

9.15 As per the consented development, the Proposed Development would be accessed via the existing Ben Aketil Wind Farm track, a purpose-built track linking into the site from the A850 and so the access arrangements will not change from those already consented.

9.16 The Proposed Development changes which are likely to result in a change to the traffic generation during the construction phase relate to the additional aggregate required for the increased hardstanding area and the increased lengths of tracks; the increased turbine blade tip height has also been considered in relation to transportation of turbine blades to site. The proposed larger hardstanding areas and the additional lengths of tracks would result in a slightly greater volume of aggregate required for construction and so the materials calculator has been updated to take account of the increase.

9.17 There would be an additional 111 HGV trips over the 18 month construction period, however, based on the most realistic construction phasing in accordance with the current design specification, assuming a 5.5 day week, the peak HGV trips are predicted to be 70 two-way movements per day, which is a decrease of two HGV two-way movements compared to the consented development.

9.18 Since there wouldn't be any additional daily HGV movements the assessment of the effects and conclusions would not change from the consented development. Therefore, no significant effects would result for the Proposed Development.

9.19 It also concludes no significant negative cumulative effects on the A850 and that the measures outlined in the Construction Traffic Management Plan (CTMP) presented in **Technical Appendix 9.2** will ensure that any impacts will be managed.

Noise and Vibration

9.20 A noise assessment was carried out for each of the previous two applications and planning consent was granted by The Highland Council (THC) which included conditioned noise limits at nearby noise sensitive receptors (NSRs).

9.21 The Proposed Development would not alter the construction noise and vibration impacts previously reported in the EIA Reports for the consented development.

9.22 An updated operational noise impact assessment for the Proposed Development has been undertaken in accordance with current policy, latest good practice guidance and agreed with THC, and is presented in **Technical Appendix 9.3**. The operational wind

turbine noise from the Proposed Development has been assessed against the combined consented noise limits for Ben Sca Wind Farm and Ben Sca Wind Farm Extension. It is demonstrated that the Proposed Development can operate within the consented noise limits; and, therefore, would be acceptable.

9.23 In the event that noise levels from the Proposed Development were subsequently found to exceed the consented limits, a mitigation scheme could be implemented via a suitably worded planning condition. If required in practice, the mitigation scheme would be developed following the identification of the specific receptor, together with the wind speeds and directions at which the consented noise limits are exceeded.

9.24 The Proposed Development would not introduce any amendment to the methods employed to construct the wind farm that would materially change the previous construction noise assessments undertaken for the consented development. Therefore, it was agreed with THC EHO that an additional construction noise assessment would not be undertaken.

9.25 In line with good practice measures the following measures would be implemented:

- all roads would be kept clean and maintained in a good state of repair to avoid unwanted rattle from vehicles;
- materials would be handled in a manner that minimises noise;
- all plant would have noise emission levels that comply with the limiting levels defined in EC Directive 2000/14/EC, and any subsequent amendments;
- consideration would be given to the recommendations set out in Annex B of BS5228-1:2009+A1:2014 with respect to noise sources, remedies and their effectiveness;
- plant would be operated in a proper manner with respect to minimising noise emissions, i.e. minimisation of drop heights, no unnecessary revving of engines, etc.;
- plant would be started up sequentially, rather than all at once;
- plant would be subject to regular maintenance and kept in good working order to meet manufacturers' noise rating levels;
- plant that is used intermittently would be shut down when not in use;
- vehicles would not wait or queue on the public highway with engines idling; and
- reversing alarms would incorporate one of the following features where practicable – directional sounders, broadband signals, self-adjusting sounders or flashing warning lights. Alternative and comparable systems could be used to minimise noise and nuisance from reversing alarms.

9.26 Measures to control the noise from construction activities would be set out within the CEMP (an outline of which is provided in **Technical Appendix 1.1**).

Climate and Carbon Balance

9.27 The carbon pay-back period for the Proposed Development using the Scottish Government Carbon Calculator Tool (Scottish Government, version 1.8.1, February 2024), in accordance with the associated guidance (Nayak et al., 2008; Nayak et al., 2010 and Smith et al,.2011), has been undertaken and is presented in **Technical Appendix 9.4**.

9.28 The calculations of total carbon dioxide (CO_2) emission savings and payback time for the Proposed Development indicates that the overall payback period will be around 1.8 years

when compared to the grid fuel mix of electricity generation. This means that the Proposed Development is anticipated to take around 1.8 years to repay the carbon exchange to the atmosphere (the CO_2 debt) through construction; the site would in effect be in a net gain situation following this time period and can then claim to contribute to national emissions reduction objectives thereafter for its remaining operational life.

9.29 It is predicted that the increased output of the Proposed Development will provide enough carbon-free electricity to meet the needs of around 45,000 UK homes and offset approximately 2.46 million tonnes of CO_2 over its lifetime (when compared to fossil fuels); and 1.20 million tonnes of CO_2 over its lifetime (when compared to a grid mix). For reference this is approximately 6,500 more UK homes powered; 0.69 million tonnes of CO_2 offset over its lifetime more than the consented development (when compared to fossil fuels); and 0.21 million tonnes of CO_2 offset over its lifetime more than the consented development (when compared to a grid mix).

Shadow Flicker

9.30 Shadow flicker may occur under certain combinations of geographical position and time of day, when the sun passes behind the rotors of a wind turbine and casts a shadow over neighbouring properties. As the blades rotate, the shadow flicks on and off, an effect known as shadow flicker. The effect can only occur inside buildings, where the flicker appears through a window opening.

9.31 The likelihood and duration of the effect depends upon:

- the direction and aspect of the property relative to the turbine(s): in the UK, only properties within 130 degrees either side of north, relative to the turbines, can be affected, as turbines do not cast long shadows on their southern side;
- distance from turbine(s): the further the building is from the turbine, the less pronounced the effect would be, given the shadow fades with distance. Flicker effects are known to be strongest and most likely to have the potential to cause significant effects within eleven rotor diameters (rather than 10, due to how far north the Proposed Development is) of a turbine;
- turbine height and rotor diameter;
- time of year and day; and
- weather conditions (i.e. cloudy days reduce the likelihood of effects occurring).

9.32 If shadow flicker cannot be avoided through layout changes, then technical mitigation solutions are available, such as shutting down the turbines which cause the effect when certain conditions prevail.

9.33 Shadow flicker effects are only considered during the operational phase of a wind farm development.

Study Area

9.34 In line with the best practice guidance, a study area based on a distance of 11 rotor diameters from the proposed turbines has been employed to determine the zone of potential shadow flicker incidence of the Proposed Development. The proposed turbines have a rotor diameter of up to 138m, which gives a study area of 1,518m from the turbines. In addition to this a further 50m area was added to the 11 rotor diameter distance in order to account for potential micrositing should the Proposed Development receive consent (total study area distance = 1,568m from proposed turbine locations).

9.35 The maximum study area for the Proposed Development was mapped using GIS software. This was then refined to include only the areas within 130 degrees of north of proposed turbine locations. Properties within 11 rotor diameters (1,518m) plus 50m for the reasons outlined above (1,568m) and the 130 degree area were identified from OS AddressBase data. Just one property at Upperglen is identified within the shadow flicker study area, as shown on **Figure 9.1**, located approximately 1,456m from proposed turbine 9.

Methodology

9.36 The shadow flicker assessment comprises numerical modelling of the proposed turbines and receptors within the defined study area. It is noted that whilst there are a number of computer models available, the DECC study (2011) confirms that there are limited differences between outputs of the various packages. For Shadow Flicker assessments, SLR Consulting use one of the industry standard software packages, ReSoft Wind Farm software (version 5.0.1.2).

9.37 The calculations from this assessment process assume a worst-case scenario based on the sun shining during all daylight hours over the course of a year, no obscuring features (such as trees, hedges, other buildings) being present, the face of the rotor always being aligned towards the dwelling, and that the rotor is always turning (i.e. the wind is always blowing between 4m/s and 25m/s, and no account is taken of shut down periods for maintenance). This methodology yields a theoretical maximum indication of potential shadow flicker incidence, together with the times of day, and dates during the year when potential incidence may occur.

9.38 The software performs calculations to determine the position of the sun throughout the year, and thus during what times of day it will theoretically cast a shadow across the windows of nearby houses within 11 rotor diameters (plus 50m micrositing). Data input into the model where shadow flicker assessment is required is as follows:

- the locations of all properties within 11 times the rotor diameter (including an allowance of 50m for micrositing) and 130 degrees either side of north of any turbine;
- the dimensions and orientations of windows facing the Proposed Development;
- the surrounding topography (Ordnance Survey Digital Terrain Model); and
- the locations and dimensions of the turbines.

9.39 In practice it is likely that shadow flicker effects would occur for considerably less time than the worst-case predictions, for the following reasons:

- in the UK, sunshine typically occurs for approximately 30% of daylight hours. At other times, the wind turbines are unlikely to cast shadows sufficiently pronounced to cause shadow flicker effects to occur; and
- at times when the wind turbine rotor is not oriented directly towards the property, the duration of shadow flicker effects would be reduced due to the elliptical shape of the shadow cast.

9.40 Only those properties within 1,568m of the proposed turbines have been included in the calculations (in this case only one property). The model has been run using OS terrain 5 DTM data which is the most accurate digital terrain data available for the site.

9.41 The assessment has been undertaken assuming a worst-case scenario which does not take into consideration the screening effect of anything located between the wind turbines and the property and as such the actual effect would likely be even less.

9.42 As confirmed by the DECC study (2011), there is no standard Scottish or UK guidance relating to a limit for shadow flicker. The only guidance providing additional recommendations is the Northern Irish PPS 18 (2009) guidance which recommends that for properties within 500m of the turbines, shadow flicker should not exceed 30 hours per year or 30 minutes per day. Therefore, the assessment adopts a criterion of 30 hours of shadow flicker in one year as a significance threshold. Where less than 30 hours of shadow flicker is predicted to occur in one year at a particular property, this is considered to be a minor effect (not significant), with significance increasing in relation to the number of hours (over 30) of shadow flicker per year, in accordance with best practice guidance.

Limitations to the Assessment

9.43 There are several additional factors that can influence the amount of shadow flicker actually experienced and these cannot be readily included in a computer-based assessment.

9.44 Climatic conditions dictate that the sun is not always shining. Cloud cover during other times may obscure the sun and prevent shadow flicker occurrence. While some shadows may be cast under slightly overcast conditions, no shadow at all would be cast when heavy cloud cover prevails.

9.45 During calm periods, or very high winds, the wind turbine blades would not rotate and shadow flicker would not occur. Turbines would also be periodically shut-down for maintenance or repair work.

9.46 Wind turbines automatically orientate themselves to face the prevailing wind direction. This means that the turbine rotors would not always face directly towards the occupied buildings. Under some wind conditions, the proposed turbines would face ‘side-on’ to properties, and in these conditions only a very small area of blade movement would be visible.

9.47 Any screening provided by vegetation or structures has not been incorporated as the analysis has been run on bare ground terrain data.

Assessment

9.48 **Figure 9.1** shows the potential zone of shadow flicker effects. Based on the predictive modelling technique outlined above, assuming the worst-case scenario, no shadow flicker effects are likely to occur at Upperglen (the only property within the study area) due to its location, orientation and distance from the prosed turbines. Full results are detailed in **Table 9-1**.

Table 9-1: Shadow Flicker Assessment – Summary of Shadow Times on Each Window for all 9 Proposed Turbines

Property/ Window	Easting	Northing	Width (m)	Depth (m)	Height (m)	Degrees from North	Tilt Angle	Days per Year	Max Hours per Day	Max Hours per Day	Total Houts
Upperglen Window 1	131984	851173	1.0	1.0	2.0	116.0	0.0	0.0	0.0	0.0	0.0
Upperglen Window 2	131983	851169	1.0	1.0	2.0	116.0	0.0	0.0	0.0	0.0	0.0

9.49 It is therefore considered that no significant shadow flicker effects from the Proposed Development would be experienced by residential receptors and as such do not need to be considered further. This conclusion is in accordance with the previous conclusions of the consented development.

Telecommunications and Other Infrastructure

9.50 Wind turbines can potentially cause interference to telecommunication links through reflection and shadowing to electro-magnetically propagated signals including terrestrial fixed microwave links managed by telecommunications operators; and have potential to adversely affect analogue television reception through either physical blocking of the transmitted signal or, more commonly, by introducing multi-path interference where some of the signal is reflected through different routes.

9.51 Consultation with link operators was undertaken for the consented Ben Sca Wind Farm and reported in Chapter 15: Other Issues of the EIA Report (SLR, 2020). Additionally, no issues were identified by any of the operators during the determination of the application. Further consultation exercises were undertaken in September 2021 for the Ben Sca Wind Farm Extension and again in 2023 for the proposed Balmeanach Wind Farm which confirmed that no fixed links pass through the site.

9.52 No new links have been identified and therefore there is not anticipated to be any interference with telecommunications links.

9.53 Additionally, the Proposed Development is located in an area that is now served by a digital television transmitter and, therefore, television reception is unlikely to be affected by the Proposed Development as digital signals are rarely affected. In the unlikely event that television signals are affected by the Proposed Development, reasonable mitigation measures would be considered by the applicant.

Aviation

9.54 The consented development was the subject of discussion with NATS Safeguarding regarding the potential visibility of the wind turbines to their radar on Tiree; as they believed that without suitable mitigation an adverse impact would result on their air traffic operations. An agreement has been entered into between NATS (En-Route) Plc, NATS (Services) Ltd (NATS) and Ben Sca Wind Farm Limited (the Applicant) dated 19 October 2020 for the design and implementation of an identified and defined mitigation solution in relation to the consented development that will be completed under agreement. NATS has further confirmed that this agreement would cover the Proposed Development and therefore no significant adverse effects on their air traffic operations are predicted.

9.55 It is accepted that the planning conditions relating to aviation and infra-red lighting for the consented development would be employed for the Proposed Development. Consultation with the Ministry of Defence (MoD) through the scoping process has highlighted the potential for the proposed turbines to create a physical obstruction to low flying aircraft operating within Low Flying Area 14 (LFA 14), an area within which fixed wing aircraft may operate as low as 250 feet or 76.2 metres above ground level to conduct low level flight training. The MoD has confirmed that this potential for physical obstruction can be addressed by fitting turbines with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction.

9.56 In their consultation response of 27 October 2023, Highlands and Islands Airports Limited (HIAL) initially requested that an Aviation Impact Feasibility Study was undertaken to understand any impact on the Instrument Flight Procedures (IFPs) of Benbecula Airport.

Through consultation with the HIAL Aerodrome Safeguarding and Operations Support Officer, it was confirmed on 02 February 2024, by email, that there is no impact to the Benbecula Instrument Flight Procedures and no objection to the Proposed Development by HIAL.

Risk of Accidents and Other Disasters

9.57 The vulnerability of the Proposed Development to major accidents and natural disasters, such as flooding, sea level rise, or earthquakes, is considered to be low due to its geographical location and the fact that its purpose is to ameliorate some of these issues.

9.58 As noted in Chapter 15: Other Issues of the Ben Sca Wind Farm EIA Report (SLR, 2020), despite the risk of major accidents and natural disasters being considered as low, the vegetation and openness of the site does present a potential, albeit remote, fire risk. In March 2018 a large part of the open area of the site was damaged by an uncontrolled fire originating from a contractor working on the Ben Aketil Wind Farm. The Outline Construction Environmental Management Plan (CEMP) (**Technical Appendix 1.1**) contains measures for reducing the risk of fires occurring during construction and these measures are considered to be appropriate to the level of potential risk at the site.

9.59 As noted in Chapter 15: Other Issues of the Ben Sca Wind Farm EIA Report (SLR, 2020), in the winter months it is possible that ice formation could occur on the turbine blades. Ice throw is the term used where ice has formed on a turbine blade and subsequently is shed from the turbine due to both gravity and the mechanical forces on the rotating blades. To mitigate the risk of ice throw occurring, the wind turbines would be equipped with an ice detection system. This detection system shuts down the turbine if ice is detected on the blades. Once the ice has thawed, the wind turbine would restart. The system would ensure that turbines that have been stationary during icing conditions are restarted in a controlled manner to ensure public safety. The risk to public safety is considered to be very low due to the few likely occurrences of these conditions along with the particular circumstances that can cause ice throw.

Population and Human Health

9.60 No significant effects on population or human health were identified in Chapter 15: Other Issues of the Ben Sca Wind Farm EIA Report (SLR, 2020) or the Chapter 3: Other Considerations of the Ben Sca Wind Farm Extension EIA Report (SLR, 2021). No additional effects are anticipated from the Proposed Development and, therefore, this topic is not considered further.

Waste and Environmental Management

9.61 The outline CEMP for the Proposed Development (**Technical Appendix 1.1**) provides a general overview on how waste and other environmental issues would be managed during the construction phase. Additionally, the Peat Management Plan (**Technical Appendix 6.1**) details how excavated peat will be controlled, stored, re-used and disposed of during the construction phase of the Proposed Development. A full CEMP is currently required by condition of the planning permission for the consented development, and this would also be the case for the Proposed Development.

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Figures

Appendices