



RWE Renewables UK Onshore Wind Limited

EREDINE WIND FARM FURTHER ENVIRONMENTAL INFORMATION

Technical Appendix 4A: Aviation Lighting Impact
Assessment Report 2025





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Technical Appendix 4A: Aviation Lighting Impact Assessment
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CONTENTS

1	INTRODUCTION	1
1.1	INTRODUCTION	1
1.2	METHODOLOGY	1
1.3	STEP 1: DEFINING THE LIGHTING PROPOSAL	5
1.4	STEP 2: UNDERSTANDING THE BASELINE	12
1.5	STEP 3: ASSESSING THE EFFECTS OF THE AVIATION LIGHTING	15
1.6	NIGHT-TIME LANDSCAPE EFFECTS	35
1.7	NIGHT-TIME VISUAL EFFECTS	43

TABLES

Table 4A.1	Night-time Viewpoint Selection
Table 4A.2	Intensity of turbine light shown in candelas (cd)
Table 4A.3	Annual and Night-time Operation of Aviation Warning Lights
Table 4A.4	Summary of Night-time Viewpoint Analysis
Table 4A.5	Night-time Viewpoint Analysis

PLATES

Plate 1	Diagram of aviation warning light operating with a narrow horizontal beam (not to scale).
Plate 2	View from the summit of Beinn Bhuidhe, near the boundary of the LLTNP looking south-west towards Inveraray and other dispersed settlement.
Plate 3	View from the summit of Beinn Bhuidhe, near the boundary of the LLTNP looking south towards Loch Fyne dotted with lights from dispersed settlement.

INTRODUCTION

INTRODUCTION

This report provides a Night-time Landscape and Visual Impact Assessment (LVIA) or 'Aviation Lighting Impact Assessment' of the revised Lighting Strategy for the Revised Development. The revised Lighting Strategy is detailed in the *Eredine Aviation Lighting and Mitigation Technical Appendix V1.0* (July 2025), produced by Wind Power Aviation Consultants Ltd. (**Appendix 8B** of the FEI Report) and illustrated in **Figure 4A-1**.

The revised Lighting Strategy has been approved by the CAA and requires a reduced number of eight of the 17 turbines within the Revised Development to be lit with aviation warning lights. Since the previous assessment, new guidance on Aviation Lighting Impact Assessment has been produced by NatureScot (NS), *Guidance on Aviation Lighting Impact Assessment*, November 2024.

This assessment is therefore a replacement of the previous Aviation Lighting Impact Assessment reported in the EIAR (**Appendix 8C** of the EIA Report).

The 'Proposed Development' refers to the Eredine Wind Farm design presented in the November 2024 application to ECU for consent. Following submission of the application and accompanying Environmental Impact Assessment (EIA) Report (2024), consultee responses were received in response to the Section 36 application. A design review was subsequently carried out, resulting in the removal of turbines 3, 5, 7, 11 and 20 and associated infrastructure from the Proposed Development. This amended design iteration is referred to as the 'Revised Development' and is the focus of the Further Environmental Information (FEI) Report which this appendix accompanies.

METHODOLOGY

The Aviation Lighting Impact Assessment assesses the landscape, visual and cumulative effects of the visible aviation warning lights during the operating period between dusk and dawn¹. This assessment accords with the NatureScot (NS) *Guidance on Aviation Lighting Impact Assessment*, November 2024 and their *General pre-application and scoping advice for onshore wind farms* Guidance, Annex 2.

The NS Guidance on Aviation Lighting Impact Assessment advises three steps as follows:

- Step 1: Defining the lighting proposal;
- Step 2: Understanding the baseline; and
- Step 3: Assessing the effects of the aviation lighting.

Importantly, the night-time assessment is not a technical lighting impact assessment based on quantitative measurement of light levels, although it takes account of technical factors related to the

¹ The visible aviation warning lights (as opposed to infra-red lights not visible to the human eye) would come on 30 minutes after sunset and switch off 30 minutes before sunrise.

proposed Aviation Lighting Strategy and a candidate light specification. Rather, the assessment relies on professional judgement and combines both qualitative analysis of what the human eye can reasonably perceive and quantitative analysis of the proposed light intensity at different distances and angles of elevation relative to the source, taking into account a range of factors such as meteorological conditions and the perception of darkness / darkness adaptation at the viewpoint or receptor location. As with the day-time landscape and visual assessment, the sensitivity of the receptor to the Revised Development (aviation warning lights) and the magnitude of change are combined to determine the level of effect likely to result from the aviation warning lights.

The sensitivity of the receptor and the magnitude of change are likely be different from the daytime assessment. For example, NS advise that people in settlements may be considered as of Low susceptibility to aviation warning lights, due to the number of light sources present in most settlements. This contrasts with High sensitivity of people in settlements to the daytime visibility of the wind farm.

The magnitude of change is restricted to the aviation warning lights alone and is not concerned with other unlit components of the Revised Development.

The evaluation of significance and the nature of these effects is also described following the methodology used for the assessment of landscape, visual and cumulative effects. Due to changes in sensitivity and magnitude the results of the assessment can be notably different from the daytime component of the LVIA.

DEFINING THE STUDY AREA

The NS *Guidance on Aviation Lighting Impact Assessment* advises a study area of between approximately 10-20km. Drawing from the receptor baseline a maximum study area of 20km has been selected.

Figure 4A-2 of the FEI Report provides a baseline of the night-time satellite imagery (sourced from NASA's Global Imagery Browse Services) within 20km of the Revised Development, indicating the broad areas of visible light. Further reference is made to this figure in **Section 1.4** 'Step 2: Understanding the Baseline'.

1.1.1 Production of ZTV Plots

Zones of Theoretical Visibility (ZTV) of the proposed aviation warning lights were calculated using ReSoft Wind Farm computer software to produce an area of potential visibility of the aviation warning lights, calculated at hub height. The ZTVs do not take account of intervening screening from localised landform, buildings or vegetation. The ZTVs therefore provide a starting point in the assessment process. Accordingly, they tend towards giving a 'worst-case' or over-estimated scenario of the potential visibility.

- **Figure 4A-3** provides a hub height ZTV for those eight turbines which would be lit by aviation warning lights positioned on their nacelles or hubs. The figure indicates the areas from which

these lights would be theoretically visible and the number of lights visible, although it does not take account of vegetation screening;

- **Figure 4A-4** provides the turbine lighting intensity and **4A-5** provides a light intensity ZTV which provides an indication of the variable light intensity likely to be perceived as a result of angle intensity mitigation, explained further **Section 1.3**; and
- **Figures 4A-6, 4A-7 and 4A-8** provide cumulative ZTVs indicating theoretical visibility of lit turbine hub heights which includes the Revised Development and other wind farms with existing, consented or proposed, visible aviation warning lights within 20km.

1.1.1.1 Consultation and Night-time Viewpoint Selection

The night-time viewpoint selection has been agreed with NS and Argyll and Bute Council (ABC) through consultation during the EIA Report and is consistent with the 26 day-time viewpoints. As such they represent a range of receptor groups, viewing from different directions over varying distances. Many of the viewpoints are located where people are most likely to be present at night, for example in settlements / residential properties or on roads.

In total five night-time viewpoints were selected for illustration as photomontages and more detailed assessment which is set out in Annex 1 and summarised in **Table 4A.1**. These night-time viewpoints are illustrated in **Figure 4A-3** and **Figures 4A-9a-d to 4A-13a-d**.

In response to the EIA Report, both NS and ABC concluded that there would be some significant night-time landscape and visual effects as a result of the Proposed Development. However, considering the Revised Development, the number of aviation warning lights has reduced from 13 in the EIA Report to eight in this assessment, as indicated by the revised Lighting Strategy (**Appendix 4B**). Responses to NS and ABC in relation to night-time effects are provided in **Chapter 4**.

Table 4A.1 Night-time Viewpoint Selection

Viewpoint Selection	Distance*	Comments
N3. Kilmaha	T18 @ 4.6km	Viewpoint from the promoted layby / carpark off the Minor roads along the western shores of Loch Awe.
N4. Dalavich	T9 @ 6km	Viewpoint from the eastern edge of the settlement of Dalavich.
N9. Strachur	T19 @ 8.5km	Viewpoint from the western edge of the settlement of Strachur.
N22. Cruach Mor Dunardry	T19 @ 20.2km	Viewpoint from the summit of Cruach Mor Dunardry within the Knapdale NSA.
N23. Beinn Bhuidhe	T2 @ 22.4km	Viewpoint from the summit of Beinn Bhuidhe (Munro) within the Ben Lui WLA and near the boundary of the LLTNP.

Note: *Distance to nearest visible, proposed lit turbine within the Revised Development as recorded in the night-time viewpoint analysis in Annex 1. This is different from the distance noted on the corresponding figures which records the distance to the nearest turbine regardless of whether this is visible / not visible or lit / unlit.

1.1.1.2 Photography and Photomontage Production

The methodology used for viewpoint photography and photomontage production accords with the NS guidance *Visual Representation of Wind Farms*². Further guidance is provided by the Landscape Institute's Technical Guidance Note, *Visual Representation of Development Proposals*³. The baseline photography is recorded to corresponds with periods when the turbines would be lit and people are more likely to be outside at night, whilst also providing a visible horizon which is required in order to correctly render the photomontages and assess any effect on landscape character.

To accord with NS *Guidance on Aviation Lighting Impact Assessment* the photomontage visualisations illustrate the maximum case lighting intensity scenario (e.g. 200cd where dimming of aviation lights proposed as embedded mitigation, and 2000cd only where this mitigation is not proposed). Therefore, in this case the photomontages for the five viewpoints show the reduced number of aviation warning lights, illustrated at 200cd only. The images do not attempt to show angle intensity mitigation and consequently may, in some cases of lower elevation relative to the aviation warning lights, over-estimate the light intensity.

²Scottish Natural Heritage (February 2017). *Visual Representation of Wind Farms*, Version 2.2.

- 1.1.2 The photomontages are considered useful when combined with objective data illustrated in the ZTV plots and wireline figures. However, whilst the aim is to provide a reasonably realistic image of the Revised Development, the NS guidance recognises the limitations of both night-time photography and photomontages. These limitations include multiple variables of distance, partial screening, atmospheric conditions, time of night and darkness for example. Therefore, the photomontage production has relied on professional judgement and an 'artistic impression' and has drawn from our experience, noting previous consultee comments and comparison of previous photomontages with other lit onshore wind turbines and site survey for prolonged periods at night.

STEP 1: DEFINING THE LIGHTING PROPOSAL

The proposed Aviation Lighting Strategy has been approved by the CAA and is illustrated in **Figure 4A-1**. It meets the mandatory requirements of civilian and military aviation whilst minimising the effects of the aviation warning lights on the surrounding environment and is summarised as follows:

- Reduced number of aviation warning lights to eight with no proposed mid-tower lights;
- Dimming of lights to 10% of peak intensity when visibility exceeds 5km; and
- Angle intensity mitigation.

Notably the developer is willing to accept a planning condition to secure angle intensity mitigation (equal or better than the specification examples in **Table 4A.2**) although this is not a mandatory requirement.

1.1.3 Aviation Lighting Requirements

The requirements for turbine lighting are dictated by Civil Aviation Authority (CAA) policy and the Ministry for Defence (MOD) to ensure aviation safety in accordance with Article 222 of the UK Air Navigation Order (ANO) 2016.

It should be noted that aviation warning lights provided for onshore wind farms are different from other lights and should not be compared to lights on other wind turbines, offshore turbines, buildings or masts as the specification and mitigation employed is likely to be different. For example, further guidance is provided in the CAA policy statement '*Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level*' which interprets the regulations in relation to wind turbines and the need for aviation warning lights. In addition, there may be other site-specific mitigation approved by the CAA and the local planning authority.

The CAA policy statement advises that steady medium intensity, 2000 candela (cd) red, aviation warning lights are fitted as close as possible to the top of all fixed structures which have a total height of ≥ 150 meters above ground level as follows:

- *"(a) The person in charge of the wind turbine generator must ensure that it is fitted with a medium intensity (2000 candela) red light, positioned as close as practicable to the top of the fixed*

structure. A second light serving as an alternative should be provided in case of failure of the operating light.

- (b) *The lights required by paragraph (a) must be so fitted to show when displayed in all directions without interruption.*
- (c) *Additionally, at least three (to provide 360 degree coverage) low-intensity Type B6 lights (32 candela) lights should be provided at an intermediate level of half the nacelle height.*
- (d) *Subject to sub-paragraphs (e) and (f), the person in charge of a wind turbine generator must ensure that any light required to be fitted by this article is displayed.*
- (e) *Lights should be operated by an acceptable control device (e.g., photocell, timer, etc.) adjusted so the lights will be turned on whenever illuminance reaching a vertical surface falls below 500 LUX. The control device should turn the lights off when the illuminance rises to a level of 500 LUX or more.*
- (f) *In the event of the failure of any light which is required by this policy statement to be displayed, the person in charge of a wind turbine generator must repair or replace the light as soon as practicable. For any outage that is expected to be or is greater than 12 hours, the operator shall request a NOTAM to be issued by informing the NOTAM section (operating 24 hours) of the UK Aeronautical Information Service (AIS) by telephoning +44(0) 1489 61 2488 / 2489 as soon as possible. This NOTAM is to specifically state (with justification) if the repair/replacement of the light will exceed 72 hours. AIS will copy the details of the NOTAM to the operator and to the CAA.*
- (g) *If the horizontal meteorological visibility in all directions from every wind turbine generator in a group is more than 5km, the intensity for the light positioned as close as practicable to the top of the fixed structure required to be fitted to any generator in the windfarm and displayed may be reduced to not less than 10% of the minimum peak intensity specified for a light of this type."*

The ANO also requires aviation warning lighting are fitted to cranes, which would be relevant to the construction period.

- *"Away from the immediate vicinity of an aerodrome and where the maximum crane height is less than 150 meters aviation warning lighting is not a legal requirement. However, given the likelihood that such cranes will be amongst the tallest structures in any given location the CAA recommends that, in order to ensure that the crane operator fulfils his duty of care towards others, the crane user (contractor) considers using aviation warning lighting in line with the following: - Cranes that are between 90 meters and 150 meters (approximately 300 – 500 feet) high being equipped with medium intensity steady red lighting positioned at the highest point and both ends of the jib, such that the lighting will provide an indication of the height of the crane and the radius of the crane jib. Such lighting, which should be displayed at night, should be positioned so that when displayed it is visible from all directions. - Cranes that are 60 meters to 90 meters (approximately 200 – 300 feet) high being equipped with low intensity steady (generically 32 candela) red lighting positioned as close as possible to the highest point and, for tower cranes, to the top of the fixed structure. Such lighting, which should be displayed at night, should be positioned so that when displayed it is visible from all directions."*

1.1.4 Embedded Mitigation

All of the mitigation measures included within the Aviation Lighting Strategy have been embedded into the Revised Development and as such is termed ‘embedded mitigation’ as follows:

- Reduced number of aviation warning lights:
 - The number of lights has been reduced from 17 to eight (T1, T2, T6, T9, T12, T18, T19 and T22) and the need for mid-tower lights (three on each turbine to provide 360° coverage) has been removed.
 - A second medium intensity, steady red (2000 cd) light on the turbine nacelles will act as an alternate in the event of a failure of the main light (note that both lights would not be lit at the same time).
- Dimming of aviation warning lights to 10%:
 - The proposed lights will dim to 10% of the peak light intensity (2000cd reducing to 200cd) during periods of clear visibility (>5km from the wind farm), increasing to 2000cd when the visibility sensors detect poor visibility (<5km from the wind farm).
 - The lights are designed to accord with CAA SARG Policy Statement (g)⁴ *“If the horizontal meteorological visibility in all directions from every wind turbine generator in a group is more than 5km, the intensity for the light positioned as close as practicable to the top of the fixed structure required to be fitted to any generator in the windfarm and displayed may be reduced to not less than 10% of the minimum peak intensity specified for a light of this type.”*
 - NS *Guidance on Aviation Lighting Impact Assessment*, Appendix 3, November 2024, advises that the frequency of dimming will typically occur *“90% to 95% of the time”*. This observation is supported by the *Eredine Aviation Lighting and Mitigation Technical Appendix V1.0* (2025), prepared by WPAC Ltd. (**Appendix 8B** of the FEI Report) which also notes that:
 - *“When not obscured by cloud, the visibility in the area of the turbines can be expected to exceed 5km for up to 93% of the time. (Obstruction lights switched down to 200cd)”*
 - This embedded mitigation does not require CAA approval given it is covered by the UK ANO Guidance Note (2017) by the CAA.
- Angle intensity mitigation:
 - Also described as ‘vertical directional intensity mitigation’). The design of aviation warning lights must also comply with the International Civil Aviation Organisation (ICAO) specification as set out in Annex 14 Table 6-3. This limits the 2000 / 200cd light emission to a narrow ‘beam spread’ with a vertical angle of between 0° to +5° and creating a ‘horizontal beam of light’ that extends out in all (360°) directions. This form of mitigation can be very effective for those receptors located in valleys or low-lying areas relative to the elevation of the aviation warning lights as illustrated in **Plate 1** and explained further below.

⁴ CAA, Safety and Airspace Regulation Group (SARG) dated 1/6/2017, Policy Statement, Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level.

- This reduction in light intensity is illustrated via the ZTV shown in **Figure 4A-5**.

The aviation warning lights proposed as part of the Aviation Lighting Strategy are automated products (operating with visibility sensors, GPS / timers and / or light sensor combinations) that are designed to automatically control the light intensity between 2000 / 200 cd according to the meteorological conditions. These lights can also be operated remotely 'on' / 'off', 'emergency flash', 'maintenance off' and 'test on' for example. There are a range of manufacturers such as CEL, Luxsolar, Quantec, and Delta. The Lighting Strategy Report includes a candidate light by CEL - CEL-WT-MIC⁵.

1.1.4.1 Angle intensity mitigation

Angle intensity mitigation is further illustrated in **Plate 1**.

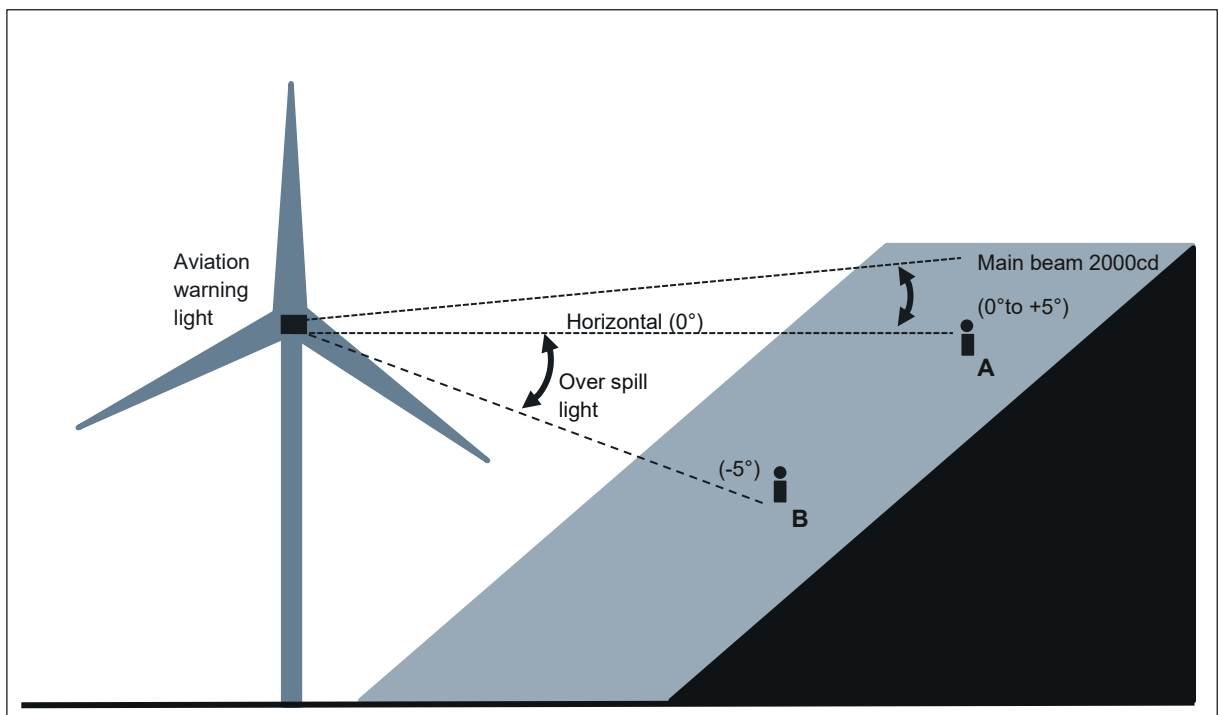


Plate 1: Diagram of aviation warning light operating with a narrow horizontal beam (not to scale).

The diagram shows an aviation warning light positioned on the turbine hub or nacelle and emitting a focused or narrow horizontal beam of light at between 0° (horizontal) and +5° in all directions (360°)

⁵ <https://www.contarnex.com/led-obstruction-lighting/datasheets/CEL-WT-MIC%20-%20rev1.pdf>

from the light position. The light intensity within the beam (0° to $+5^{\circ}$) is 2000 / 200 cd⁶. A small amount of over spill light is unavoidably emitted outwith this beam and has a lower intensity than the horizontal or 'direct beam' of light. The reduced angle intensity mitigation for angles below 0° (e.g. 0° to -5°) is set out in **Table 4A.2**.

Person 'A' standing on a hillside for example, Beinn Bhreac (with a summit of 526m AOD), would be almost level with the horizontal beam of light with the lit turbines. They would therefore see the full intensity of the lights at either 2,000cd (when the light sensors detect that visibility from the lit turbines is <5km) or more often (approximately 93% of the time) at 200cd (when the light sensors detect that the visibility in all directions is >5km from the lit turbines).

Person 'B' located lower down in the landscape, for example along the B840 at Durran would be below the horizontal beam of light (less than -5°) which would appear at a reduced intensity (over-spill light). **Figure 4A-5** indicates that the light intensity within parts of this area would range between 94 to 38cd (when the light sensors detect that visibility from the lit turbines is <5km) to as little as 9 to 4cd (when the light sensors detect that the visibility in all directions is >5km from the lit turbines).

People located outwith the ZTV (in the 'non-coloured' areas of the ZTV) shown in **Figure 4A-5**, for example Inveraray, Minard, Crinan and Kilmartin, would have no view of the lights.

Due to the horizontal nature of the aviation warning lights, they do not cause effects such as 'sky glow' or reflect off low cloud bases. Rather they appear as points of light against a dark sky. In this sense they may be regarded as 'Dark Sky Park friendly' and like the streetlights at Tomintoul which have been re-specified to direct down, towards the road, and avoid upward 'light spill'.

NS's *Guidance on Aviation Lighting Impact Assessment*, Appendix 3, November 2024, Table 4 provides an example of the range of light intensity according to the angle of light projected from the light source. It ranges from maximum light intensity within the horizontal beam ($+3^{\circ}$ to 0°) to the lower intensity or 'over spill' light outside the horizontal beam. The NS example in Table 4 of the guidance is based on light specification CEL MI-2KR. This model has since been superseded and equivalent or improved lights would be specified post consent as part of a planning condition.

By way of comparison, **Table 4A.2** sets out the specification for the angle intensity mitigation for the more recently available CEL-WT-MIC which has been specified in the *Eredine Aviation Lighting and Mitigation Technical Appendix V1.0* (July 2025), produced by Wind Power Aviation Consultants Ltd (**Appendix 8B**). This light has been used as the basis for this night-time LVIA of the aviation warning lights.

⁶ NS *Guidance on Aviation Lighting Impact Assessment*, Appendix 3, November 2024, paragraph 9 advises "In reality, 2000 cd branded lights are actually brighter in the middle of the beam (at $+1$ degree) than 2000 cd, as it is difficult to meet the average intensity requirement without exceeding it at some point in the beam spread. A modern light may for example be 2500 cd in the centre of the beam, and some older lights may be even brighter. For the sake of relative simplicity, however, and noting that there is also a degree of inaccuracy inherent when illustrating lighting, '2000 cd' is referred to as the worst case (or 200 cd where dimming is proposed)."

1.1.4.2 Table 4A.2 Intensity of turbine light shown in candelas (cd)

Angle of Light Light intensity:	Example light specification based on NS Guidance: CEL MI-2KR		Angle of Light Light intensity:	Example light specification: CEL-WT-MIC	
	2000 cd	Light intensity:		2000 cd	200 cd
Above 5°	N/A	N/A	Above 5°	147 to 34	15 to 3
4° to 5°	N/A	N/A	4° to 5°	247 to 134	25 to 13
3° to 4°	N/A	N/A	3° to 4°	481 to 237	48 to 24
0° to 3°	2500 / 2200	250 / 220	2° to 3°	1160 to 481	116 to 48
			1° to 2°	2119 to 1170	212 to 117
			0° to 1°	2206 to 1968	221 to 197
-1° to 0°	2200 to 980	220 to 98	-1° to 0°	2036 to 987	204 to 99
-2° to -1°	980 to 420	98 to 42	-2° to -1°	996 to 383	100 to 38
-3° to -2°	420 to 220	42 to 22	-3° to -2°	394 to 199	39 to 20
-4° to -3°	220 to 170	22 to 17	-4° to -3°	199 to 131	20 to 13
-5° to -4°	Below 170	Below 17	-5° to -4°	131 to 92	13 to 9
Below -5°	N/A	N/A	Below -5°	94 to 38	9 to 4

Further Mitigation Measures for Aviation Lighting

Other alternative forms of mitigation include the use of various forms of aircraft detection lighting systems (ADLS). However, although used in Europe and elsewhere, it is not currently permitted in the UK.

1.1.4.3 Annual and Night-time Operation of Aviation Warning Lights

The aviation warning lights will operate automatically via a light sensor or timer and will generally 'switch on' 30mins after sunset (when the disc of the sun has passed below the horizon) and 'switch off' 30m before sunrise. **Table 4A.3** sets out the annual and night-time operation of the aviation lights between dusk and dawn, which can be used to compare periods when people are most likely to be outdoors and coinciding with when the aviation lights would be switched on.

During the summer months, most people, including hill walkers are unlikely to experience the aviation warning lights. For example, during the summer solstice 2025 the aviation warning lights would switch on at 22.43 and switch off at 04.02 in the morning. Local residents and local road users are more likely to experience the aviation warning lights during the winter months. For example, during the winter solstice 2025 the lights would come on at 16.14 and switch off at 08.22 in the morning. It is also reasonable to expect that most people would be commuting or indoors during

these periods of colder weather, during the twilight and night, and would experience the aviation warning lights incidentally to their main activity.

1.1.4.4 Table 4A.3 Annual and Night-time Operation of Aviation Warning Lights

Time periods between Sunset and Sunrise in Eredine	Spring Equinox 20 Mar 25	Summer Solstice 20 June 25	Autumn Equinox 22 Sept 25	Winter Solstice 21 Dec 25
Astronomical twilight begins (full darkness ends)	04:11	N/A	04:59	06:29
Nautical twilight begins (First light)	04:58	N/A	05:46	07:15
There is some lightening of the sky which may be pale or reddish at the eastern edge. Trees and buildings can be seen sharply against the sky, but it's still very dim on the ground - it would be easy to step into a hole, and pedestrians would be carrying torches / head torches. Cyclists would need lights.				
Dawn - Civil twilight begins (~1hour before sunrise)	05:43	03:28	06:30	08:04
At the start of civil twilight, the sky tends to be light blue and colours of objects are easier to detect. By the midpoint, you can read a newspaper outside under open sky. Pedestrians no longer need torches but would wear reflectors or bright clothing if they're near traffic, especially on an overcast day.				
Aviation warning lights switch off ~30m before sunrise.				
Sunrise (Sun disk passes above the horizon)	06:20	04:32	07:07	08:52
Daytime	-	-	-	-
Sunset (Sun disk passes below the horizon)	18:36	22:13	19:19	15:46
Aviation warning lights switch on ~30m after sunset, subject to visibility				
Dusk - Civil twilight ends (~1hour after sunset)	19:13	23:17	19:56	16:34
Reverse of the morning progression. Sky starts out pale but dusky, often pinkish. Streetlights come on. Good visibility for exercising outside, but towards the end of this period pedestrians may wear reflectors if near vehicle traffic.				
Nautical twilight ends (Nightfall)	19:57	N/A	20:40	17:23
Reverse of the morning progression. The brightest planets become visible, all but the most vibrant colours are muted to shades of grey. Walkers would need head torches, particularly in trees. By the end of nautical twilight, it is night for most purposes.				
Astronomical twilight ends (full darkness starts)	20:45	N/A	21:28	18:09

Time periods between Sunset and Sunrise in Eredine	Spring Equinox 20 Mar 25	Summer Solstice 20 June 25	Autumn Equinox 22 Sept 25	Winter Solstice 21 Dec 25
Midnight (darkest skies)	-	-	-	-

STEP 2: UNDERSTANDING THE BASELINE

The night-time assessment or ‘darkness survey’ is supported by baseline observation of the existing night-time environment or ‘darkness’ whilst on site and observation of existing lights / lit structures visible at night from the viewpoint locations and associated landscape and visual receptors. The night-time assessment is also supported by baseline photography, wirelines, and photomontages from selected viewpoints. These visualisations help to assess both the level of night-time visual impact for receptors and focus the assessment.

1.1.5 Perception of Aviation Warning Lights at Night

The night-time assessment involves visiting the viewpoint locations during periods of twilight and viewing visualisations prepared for each viewpoint location. The fieldwork is conducted in periods of fine weather with clear skies and considers seasonal changes such as reduced leaf cover or hedgerow maintenance. The NS 2024 *Guidance on Aviation Lighting Impact Assessment* provides advice on several factors that can affect perception of the aviation warning lights and the following have been considered as part of this observation process:

1.1.5.1 Darkness Adaptation

It can take 20-30 minutes for the observer’s eyes to become fully adaptive to the dark, when for example leaving a lit house. Drivers, although they are ‘outdoors’ may never be fully adapted to the dark, particularly if the road has streetlights and / or lights from other vehicles. In contrast, the vision of stargazers and night walkers who have been outside in the dark for longer periods will be adapted to the dark and they will generally be able to pick out landscape features and other fainter light sources in the baseline with greater clarity. For this reason, all observations of the baseline viewpoints were recorded from a safe stationary position with torches / car lights switched off. Consequently, receptors such as drivers and residents in settlements are generally not able to fully perceive the landscape and / or other light sources at night and have a lower susceptibility. People walking at night in an unlit or rural area with few distant or no lights (such as dog walkers or star gazers / visitors to the Cairngorms Dark Sky Park’s recommended viewpoints and occasional hill / night walkers) tend to be more adapted to the darkness as they spend time at that location and would have a higher susceptibility.

1.1.5.2 Weather Conditions / Moon sequence and Time of Night

The weather conditions, and whether there is a full moon, and the time of night and season, all affect level of darkness and the degree to which the observer can perceive the baseline landscape and other light sources at night. Observations and photography are typically conducted during clear weather conditions and during a period corresponding with the operation of the aviation warning lights as noted in **Table 4A.3**.

Night walking during the summer solstice in clear weather and with full moon conditions (between approximately 11pm and 3am) allows the walker to experience the night sky in near twilight conditions, whilst the opposite (winter solstice in poor weather with no moon) the night conditions will be very dark.

1.1.5.3 Practical health and safety consideration and numbers of people

Observation of / and evidence of typical numbers of people at the viewpoint locations at night and factors such as the condition of the path / ground underfoot, relative safety, access and public promotion / use of the viewpoint at night provides an indication of the likely use and presence of people viewing the night-sky at that location.

1.1.5.4 Distance

Intervening distance between the light source and the viewer has an attenuating effect on the observer's ability to perceive light. There is also an increased potential for atmospheric particles and unseen, seasonably bare branches of trees / woodland to obscure / reduce light intensity from some locations. These factors and the diminishment of light with increased distance is not reflected in the ZTVs illustrated in **Figures 4A-3 to 4A-8**.

1.1.5.5 Other light sources

Other light sources present in the baseline will tend to reduce the night-time visual effect of the proposed aviation warning lights as the landscape / view may be characterised as lit or unlit, and the intensity of existing lights may detract from the aviation warning lights or influence the observer darkness adaptation.

The following site observations are considered during the night-time assessment:

- Areas of darkness with no artificial light;
- Direct artificial lighting (where the light source is directly visible from the viewpoint);
- Indirect artificial lighting (where the light source is not visible but the light emanating from the light source is visible as in the case of 'sky glow');
- Static lighting, for example emanating from a residential property or streetlight; and
- Mobile or transient lighting, for example associated with moving vehicles, trains, or aircraft.

Baseline photographs at each of the Night-time Assessment viewpoints are recorded for each of the night-time visualisations.

Figure 4A-2 shows a night-time satellite image of the 20km study area (sourced from NASA) and provides an indication of the existing baseline, light sources broadly visible within the study area. However, not all existing light sources are included on this figure which are stated below following site visits and undertaking a darkness survey. The main existing light sources are located in the east, southeast, southwest and northwest of the study area and focused on the settlements of Inveraray, Lochgilphead, Oban and Garelochhead.

The site area and areas further to the west and northeast of the Study Area are generally unlit and dark. However, there are some areas which are partially lit due to existing light sources from scattered residential properties along Loch Awe and Loch Fyne, the settlements of Dalavich, Inverinan, Ford and Eredine on the Loch Awe side, settlements of St Catherines, Strachur, Ardnagowan and Otter Ferry on the Loch Fyne side and associated mobile lights along roads. There are also lights associated with Loch Fyne itself and from the Cruachan Power Station to the north.

There are five Dark Sky Discovery Sites (part of the Dark Sky Trail, illustrated in **Figure 4A-3**) located at Mòine Mhór car park, Crinan Basin, Kilmartin Glen, Dunardry Locks, Barnluasgan Car Park & Bellanoch Viewpoint and Taynish National Nature Reserve car park. None of these locations are located within the night-time ZTV of the Revised Development and three (Crinan Basin, Barnluasgan Car Park & Bellanoch Viewpoint and Taynish National Nature Reserve car park) are located beyond the 20km Study Area.

There are two consented wind farms and two application wind farms within the northeast and northern parts of the study area with aviation warning lights as follows:

- Consented Blarghour (seven aviation warning lights at 2000/200cd);
- Consented Ladyfield (nine aviation warning lights at 2000/200cd);
- An Carr Dubh Application (seven aviation warning lights at 2000/200cd); and
- Corr Chnoc Application (seven aviation warning lights at 2000/200cd).

1.1.6 Baseline Receptors

A complete list of baseline landscape and visual receptors, included in the LVIA are listed in **Chapter 8** in the EIA Report.

Landscape character has been included in the assessment and the sensitivity reconsidered for the operational period of the aviation warning lights, whilst the magnitude addresses the change likely to occur due to the aviation warning lights alone. Landscape planning designations have been considered in respect of their Special Landscape Quality (SLQ) as far as these relate to 'dark skies'.

The period within which the characteristics and SLQs of the landscape can be experienced at night are typically limited between the periods of dusk and dawn (during civil twilight) and may only occur for half an hour before the onset of nautical twilight and then astronomical twilight. This period is extended during the summer solstice in clear weather, and with full moon conditions (between

approximately 11pm and 3am) allowing the landscape or ‘nightscape’ to be experienced in near twilight conditions. However, whilst the shapes of hills, buildings and vegetation can be made out, many of the key characteristics discerned in daylight, including the colour, texture, pattern, depth / distance and detail of the landscape are muted or simply not be visible. In this sense, the baseline landscape character at night has a reduced relevance.

Visual receptors included in the assessment have also been reconsidered in terms of their sensitivity to the aviation warning lights, as opposed to the Revised Development under daytime conditions. The assessment includes views from settlement, transport and recreational routes, and recreation / tourist / visitor locations where an appreciation of the night sky / landscape at night is a key component of the activities of people at that location.

STEP 3: ASSESSING THE EFFECTS OF THE AVIATION LIGHTING

- 1.1.1 This part of the Night-time LVIA of Aviation Lights comprises ZTV and Viewpoint analysis and two further sections setting out the night-time assessment of landscape effects and the night-time assessment of visual effects.

1.1.2 Night-time ZTV Analysis

- 1.1.3 The Night-time Assessment is supported by ZTV plots that illustrate the areas from where in theory, the aviation warning lights would be visible as follows:

- **Figure 4A-3: Nacelle Lights ZTV (Zone of Theoretical Visibility) with Night-time Viewpoints**

Provides a hub height ZTV of the eight lit turbines within 20km. It indicates where the lit turbines would be theoretically visible (subject to the screening of landform, buildings and vegetation) but not the light intensity. It indicates that all eight of the lit turbines would tend to be most visible within 1-2km to the south / southwest and further around 9-10km after which there would be fragmented visibility, limited to elevated locations.

- **Figure 4A-5: Nacelle Light Intensity ZTV (Zone of Theoretical Visibility) with Landscape Planning Designations**

Provides a light intensity ZTV for both the 2000cd and 200cd scenarios across the study area, illustrated at 20km radius, overlaid with designated landscapes. The figure indicate where the lit turbines would be theoretically visible (subject to the screening of landform, buildings and vegetation) and the light intensity. The areas of lowest light intensity correspond with the low-lying areas to the northwest and southeast of the Revised Development. Some of these areas in the southeast coincide with the closest receptors within scattered residential properties, settlements and roads. Conversely hill summits (the closest being to the northeast) would experience the greatest light intensity.

- **Figure 4A-6 to 4A-8: Cumulative night-time ZTVs with Viewpoints**

Provides a cumulative ZTVs for other lit turbines associated with existing, consented wind farms and other wind farm applications within 20km of the Revised Development as follows:

- ▶ **Figure 4A-6** illustrates the cumulative ZTVs for the Revised Development and the consented schemes at Blarghour and Ladyfield.
- ▶ **Figure 4A-7** illustrates the cumulative ZTVs for the Revised Development and the applications at An Carr Dubh and Corr Chnoc.
- ▶ **Figure 4A-8** illustrates the cumulative ZTVs for the Revised Development and consented Blarghour and Ladyfield, and the application at An Carr Dubh.

1.1.4 The ZTVs do not take account of the screening effects of buildings, localised landform, and vegetation. As a result, there may be roads, tracks, and footpaths within the study area which, although shown as falling within the ZTV, are screened or filtered by built form and vegetation. It is also important to note that the light intensity ZTVs do not take account of distance or other factors such as atmospheric conditions, cloud obscuration or partial vegetation screening.

1.1.5 Night-time Viewpoint Analysis

1.1.6 Analysis of the number of aviation warning lights theoretically visible from each viewpoint in accordance with the NS advice (*General Pre-application and Scoping Advice for Onshore Wind Farms, Annex 2 – SNH, August 2022*) is provided in **Table 4A.4**.

1.1.6.1 Table 4A.4 Summary of Night-time Viewpoint Analysis

Viewpoint No. and Title	T1	T2	T6	T9	T12	T18	T19	T22
1. B840 Durran	-	-	-	✓	-	✓	-	✓
2. Loch Awe Waters	-	-	-	✓	-	✓	✓	✓
3. Kilmaha	-	-	✓	✓	✓	✓	✓	✓
4. Dalavich	-	-	-	✓	-	✓	-	✓
5. Minor roads between Dalavich and Inverinan	-	-	-	✓	-	✓	✓	✓
6. B8000 Lachlan Bay	-	-	-	-	-	-	-	-
7. Ardnagowan	-	-	-	-	-	-	-	-
8. Leanach	-	-	✓	-	✓	-	✓	-
9. Strachur	-	-	-	-	-	-	✓	-
10. Dun na Cuaiche (Fort)	✓	-	✓	-	-	-	-	-
11. Ford	-	-	-	✓	-	-	-	-
12. Loch Fyne Waters	-	-	-	-	-	-	✓	-

Viewpoint No. and Title	T1	T2	T6	T9	T12	T18	T19	T22
13. A83 Old Military Road	-	-	-	-	-	-	-	-
14. St Catherine's	-	✓	✓	-	-	-	-	-
15. Beinn Bhan	-	✓	✓	✓	-	✓	-	✓
16. Minor roads at Fernoch Hill	-	-	-	✓	-	✓	-	✓
17. Tom Soilleir	-	-	✓	✓	✓	✓	✓	✓
18. Hell's Glen Road (B839) near A815	✓	✓	✓	✓	-	-	-	-
19. Beinn Lochain	✓	✓	✓	✓	✓	✓	✓	✓
20. Ardkinglas Woodland Garden	✓	✓	✓	-	-	-	-	-
21. Otter Ferry	-	-	✓	✓	✓	-	✓	-
22. Cruach Mor Dunardry Summit	✓	✓	✓	✓	✓	-	✓	✓
23. Beinn Bhuidhe	✓	✓	✓	✓	✓	✓	✓	✓
24. Beinn Ìme	✓	✓	✓	✓	✓	✓	✓	✓
25. Ben Cruachan	✓	✓	✓	✓	✓	✓	✓	✓
26. A83 South of Inverneil	-	-	-	✓	-	✓	✓	-

- 1.1.7 More detailed analysis of the viewpoints is provided in **Table 4A.5**. Each of the five night-time viewpoints are analysed further in **Annex 1**, which includes a darkness survey describing the baseline night-time environment, assessed on the Development Site. The remaining viewpoints have been subject to desk-based assessment only.
- 1.1.8 Allowing for the embedded mitigation (excepting angle intensity mitigation) and the influence of existing lights, the viewpoint analysis has determined that none of the viewpoints would be significantly affected by the proposed aviation warning lights operating at 200cd. This includes the five illustrated night-time viewpoints.
- 1.1.9 Allowing for the additional mitigating effects of angle intensity mitigation, the visibility of the lights would reduce further when viewed from low lying receptors as indicated in **Figure 4A-5** although this would not provide mitigation for elevated receptors for example hill walkers camping on summits.
- 1.1.10 The greatest effects at night are likely to be experienced largely by recreational users at elevated locations and hill summits, rather than those at lower elevations such as residents and road users. Whilst recreational users including hill walkers are less likely to be present on the hills at night for practical and safety reasons, occasional walkers may camp on the hill slopes and summits to view the night sky. They have been afforded higher value particularly those within NSAs and WLAs (and LLAs), although none of these hill summits / elevated locations are promoted night sky viewpoint locations and the assessment has been unable to find sufficient evidence of people visiting / or

camping out at a number of these hill summits at night⁷. The susceptibility has been reduced due to practical access difficulties at night (risks of trips and falls) and the very low or negligible numbers of people likely to visit these locations at night. The NS (2024) *Guidance on Aviation Lighting Impact Assessment* advises in relation to this type of receptor, there is a “*Balance to be struck between higher sensitivity and the relatively lower numbers of people undertaking formal or informal recreation outdoors at night*”.

⁷ Evidence has included observations on site visits and review of walker blogs and internet searches.

1.1.10.1

Table 4A.5 Night-time Viewpoint Analysis

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
1. B840 Durran	Figure 4-11(a-e)	2,820	Medium to Low (road users)	Low-Very Low	Minor to Negligible	The night-time sensitivity has been assessed as Medium to Low, due to the primary receptors being road users (low susceptibility) in accordance with the NS 2024 guidance. Although the area would be relatively dark with some lights from nearby residents at Durran, road users would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Nonetheless this is a largely dark area with occasional lights from properties and vehicle lights along the minor road. Up to three aviation warning lights would be visible, subject to intervening vegetation and forestry. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 9-4cd.
2. Loch Awe Waters	Figure 4-12(a-d)	3,420	Medium (recreational)	Low	Minor	The night-time sensitivity has been assessed as Medium for recreational users of the loch at night. Although it is possible the loch may occasionally be accessed by recreational users such as

⁸ Distance to nearest turbine as reported on the viewpoint figures – this refers to the nearest turbine to the viewpoint which may or may not be visible.

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
			users of the loch)			kayakers, canoeists, small boats or paddle boarders at night, this is unlikely due to practical and safety reasons. The area would be relatively dark with lights from scattered properties and occasional, intermittent vehicle lights along the shores of the loch. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Up to four aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 20-13cd.
3. Kilmaha	Figure 4-13(a-g)	4,602	Medium (tourists)	Medium-Low (Low	Moderate to Minor (Minor)	See Annex 1. The night-time sensitivity has been assessed as Medium for tourists such as star-gazers visiting this location at night. Whilst this is a promoted viewpoint for its day-time views, it is not a promoted night sky viewpoint location. The viewpoint is not located within a nationally or locally designated landscape, nor is the area designated for its dark skies. The existing landscape viewed in this direction is generally unlit, with the exception of residential lights from Durran across the loch. Further, occasional vehicle lights along the Minor roads on both sides of the loch would also pass by this viewpoint location. Up to six aviation warning lights would be visible subject to intervening forestry. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
4. Dalavich	Figure 4-14(a-h)	6,019	Medium (residents ⁹)	Low	Minor	See Annex 1. The night-time sensitivity has been assessed as Medium, due to the primary receptors being residents within settlements of low susceptibility in accordance with the NS 2024 guidance. However, the residents here are part of a small settlement rather than a larger settlement. The area is partially lit; and residents would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The existing landscape, viewed in this direction across the loch is generally unlit, with the exception of residential lights at Portinnisherrich and occasional, intermittent vehicle lights on the Minor roads along the loch. To the right of the view are lights associated with the settlement of Dalavich including houses, jetty and the camping pods / Social Club. The baseline level of light is assessed as dark, but not unlit. Although three lights would be visible, they would be experienced in the context of other lights from the settlement. Consequently, the effects would not be significant. The angle intensity mitigation would reduce the lights to between 20-13cd.

⁹ Residents are judged as of lower susceptibility as set out in Table 1 of the NS *Guidance on Aviation Lighting Impact Assessment*, November 2024.

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
5. Sustrans Cycle Route 78 between Dalavich and Inverinan	Figure 4-15(a-g)	7,496	Medium to Low (Cyclists and road users)	Low	Minor	The night-time sensitivity has been assessed as Medium to Low due to the lower susceptibility of cyclists and road users in accordance with the NS 2024 guidance. Although the area would be relatively dark, cyclists (likely with head torches) and road users would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Viewed from this route this is a largely dark area with occasional lights from properties and vehicle lights along the road and across the loch. Up to four aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.
6. B8000 Lachlan Bay	N/A	8,489	Medium (tourists)	Zero	No View	No aviation warning lights would be visible.
7. Ardnagowan	N/A	8,219	Medium (residents)	Zero	No View	No aviation warning lights would be visible.
8. Leanach	Figure 4-16(a-g)	8,827	Medium to Low (road users)	Low	Minor	The night-time sensitivity has been assessed as Medium to Low, due to the lower susceptibility of road users in accordance with the NS 2024 guidance. The area is partially lit; and road users would themselves be a source of light and the viewpoint is not

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						located within a Dark Sky Park or at a promoted night sky viewpoint location. The viewpoint is located within the East Loch Fyne (Coast) LLA. Although three lights would be visible, they would be experienced in the context of other light sources across the loch at Furnace, and occasional vehicle lights along roads. Consequently, the effects would not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.
9. Strachur	Figure 4-17(a-e)	8,551	Medium (residents)	Very Low	Negligible	See Annex 1. The night-time sensitivity has been assessed as Medium, due to the primary receptors being residents within settlements in accordance with the NS 2024 guidance. The area (a small settlement) is partially lit; and residents would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The viewpoint is located within the East Loch Fyne (Coast) LLA. Only one aviation warning light would be visible subject to intervening forestry. The effects would not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.
10. Dun na Cuaiche (Fort)	Figure 4-18(a-g)	9,361	Medium (walkers)	Very Low	Negligible	The night-time sensitivity has been assessed as Medium for recreational users potentially star-gazers and wild camping at the top of the fort. However, this is unlikely due to practical and safety

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						reasons, noting a long walk in, no overnight carparking and the main access, via the Castle is closed at night. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The viewpoint is located within the North Argyll LLA. This is a dark to partially lit area with lights visible from the settlement of Inveraray and scattered lights along Loch Fyne and occasional vehicle lights. Up to two aviation warning lights would be visible at 9.3km. The magnitude would be Very Low and the level of effect would not be significant. The angle intensity mitigation would reduce the lights to up to 99cd.
11. Ford	Figure 4-19(a-g)	9,400	Medium (residents)	Very Low	Negligible	The night-time sensitivity has been assessed as Medium, due to the primary receptors being residents of low susceptibility in accordance with the NS 2024 guidance. However, the residents here are part of a small settlement and the area would be relatively dark to partially lit. Residents would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Viewed from residential properties with other existing light sources, nonetheless this is a dark to partially lit area with occasional lights from scattered properties and occasional vehicle lights. Up to one aviation warning light would be visible. The level of effect would

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.
12. Loch Fyne Waters	Figure 4-20(a-c)	10,393	Medium (recreational users of the loch)	Very Low	Negligible	The night-time sensitivity has been assessed as Medium for recreational users of the loch at night. Although it is possible the loch may occasionally be accessed by recreational users such as yachts, kayakers, canoeists or paddle boarders, this is likely to be in small numbers. The area would be relatively dark with lights from scattered properties and vehicle lights along the shores of the loch. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Up to one aviation warning light would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.
13. A83 Old Military Road	N/A	10,260	Medium to Low (road users)	Zero	No View	No aviation warning lights would be visible.
14. St Catherine's	N/A	10,706	Medium (residents)	Low-Very Low	Negligible	The night-time sensitivity has been assessed as Medium due to the primary receptors being residents in accordance with the NS 2024 guidance. However, the residents here are part of a very small settlement and the area would be relatively dark to partially

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						lit. Residents would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The viewpoint is located within the East Loch Fyne (Coast) LLA. Viewed from residential properties with other existing light sources scattered along the loch, nonetheless this is a dark to partially lit area with occasional lights from scattered properties (including lights from Inveraray) and occasional vehicle lights. Up to two aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 39-20cd.
15. Beinn Bhan	Figure 4-21(a-e)	11,836	Medium (walkers)	Low	Minor	The night-time sensitivity has been assessed as Medium. The viewpoint is not located within a designated landscape or a Dark Sky Park or at a promoted night sky viewpoint location. The summit however would be difficult to navigate at night, and the walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. Viewing across the low dark hills in the foreground and mid-ground but with light sources in the far distance including lights from scattered settlements properties and vehicle lights. Up to five aviation warning lights would be visible on the skyline in the context of other light sources in the distance. The level of effect

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						would not be significant. The angle intensity mitigation would further reduce to up to 99cd.
16. Minor Road at Fernoch Hill	N/A	12,728	Medium to Low (road users)	Low-Very Low	Minor to Negligible	The night-time sensitivity has been assessed as Medium to Low due to the primary receptors being cyclists and road users in accordance with the NS 2024 guidance. Although the area would be relatively dark, cyclists (likely with head torches) and road users would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Viewed from this route this is a largely dark area with occasional lights from properties and vehicle lights along the road and across the loch. Up to three aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 100-38cd.
17. Tom Soilleir	N/A	13,492	Medium (walkers)	Low	Minor	The night-time sensitivity has been assessed as Medium. The viewpoint is located within the locally designated Knapdale / Melfort LLA, however, it is neither within a Dark Sky Park or at a promoted night sky viewpoint location or at a location that has been identified for its dark skies. The viewpoint is located within the Knapdale / Melfort LLA. The summit however would be difficult to navigate at night, and the walkers would themselves

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. Viewing across the low dark hills in the foreground and mid-ground but with light sources in the far distance including lights from scattered settlements properties and vehicle lights. Up to six aviation warning lights would be visible on the skyline in the context of other light sources in the distance. The level of effect would not be significant. The angle intensity mitigation would further reduce to up to 99cd.
18. Hell's Glen Road (B839) near A815	Figure 4-22(a-e)	14,588	Medium to Low (road users)	Low	Minor to Negligible	The night-time sensitivity has been assessed as Medium to Low due to the primary receptors being road users in accordance with the NS 2024 guidance. Although the area would be relatively dark, road users would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The viewpoint is located within the North Argyll LLA. Viewed from this route this is a largely dark area with occasional lights from properties and vehicle lights across the loch including the lights of Inveraray. Up to four aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 100-38cd.

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
19. Beinn Lochain	N/A	15,490	High-Medium (walkers)	Low-Very Low	Moderate to Minor	The night-time sensitivity has been assessed as High-Medium due to its location within the Loch Lomond and Trossachs National Park. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The summit would be difficult to navigate at night, and the walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. Viewing across the low dark hills in the foreground and mid-ground but with light sources in the distance including lights along Loch Fyne and scattered properties and occasional vehicle lights elsewhere in the far distance. Up to eight aviation warning lights would be visible in the distance. The level of effect would not be significant. The angle intensity mitigation would have limited effect at this elevated location.
20. Ardkinglas Woodland Garden	Figure 4-23(a-e)	15,950	Medium (visitors / tourists)	N/A	N/A	The gardens are closed to the public at night.

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
21. Otter Ferry	N/A	19,133	Medium (residents / tourists)	Low-Very Low	Negligible	The night-time sensitivity has been assessed as Medium, due to the primary receptors being residents and visitors in accordance with the NS 2024 guidance. However, the residents here are part of a small settlement and the area would be relatively dark to partially lit. Residents would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The viewpoint is located within the East Loch Fyne (Coast) LLA. Viewed from the pier with other existing light sources scattered along and on the loch, nonetheless this is a dark to partially lit area with occasional lights from scattered properties and occasional vehicle lights. Up to four aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 100-38cd.
22. Cruach Mor Dunardry Summit	N/A	20,180	High-Medium (walkers)	Low-Very Low	Minor	See Annex 1. The night-time sensitivity has been assessed as High-Medium due to its location within the Knapdale NSA. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. It is located 1.5km distance from the

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						Bellanoch viewpoint, part of the Dark Sky Trail ¹⁰ which is a promoted location for stargazing but is outwith the ZTV. The summit of Cruach Mor Dunardry is accessed via a short track and walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. The existing landscape, viewed in this direction includes lights from the settlements of Bridgend and Kilmichael Glassary in the mid-ground, and dispersed residential properties throughout the view. There would also be occasional vehicle lights on roads on the low-lying landscape. Up to seven aviation warning lights would be visible in the distance. The level of effect would not be significant. The angle intensity mitigation would reduce to up to 99cd.
23. Beinn Bhuidhe	N/A	22,424	High-Medium (walkers)	Very Low	Minor	Note this viewpoint is beyond the 20km Study Area. See Annex 1. The night-time sensitivity has been assessed as High-Medium due to its location within the North Argyll LLA and Ben Lui WLA. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The summit would

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						be difficult to navigate at night, and the walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. The existing landscape, viewed in this direction includes lights from the settlement of Inveraray in the mid-ground, and dispersed residential properties beyond. There would also be occasional vehicle lights on roads, particularly the A83 on the low-lying landscape. Up to eight aviation warning lights would be visible in the distance. The level of effect would not be significant. The angle intensity mitigation would have limited effect at this elevated location.
24. Beinn Ìme	N/A	24,099	High-Medium (walkers)	Very Low	Minor	Note this viewpoint is beyond the 20km Study Area. The night-time sensitivity has been assessed as High-Medium due to its location within the Loch Lomond and Trossachs National Park. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The summit however would be difficult to navigate at night, and the walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. The existing landscape, viewed in this direction includes lights from the settlement of Inveraray in the mid-ground, and dispersed residential properties beyond. There

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
						would also be occasional vehicle lights on roads, particularly the A83 on the low-lying landscape, and lights along Loch Fyne. Up to eight aviation warning lights would be visible in the distance. The level of effect would not be significant. The angle intensity mitigation would have limited effect at this elevated location.
25. Ben Cruachan	N/A	24,106	High-Medium (walkers)	Very Low	Minor	Note this viewpoint is beyond the 20km Study Area. The night-time sensitivity has been assessed as High-Medium due to its location within the North Argyll LLA and Loch Etive Mountains WLA. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The summit however would be difficult to navigate at night, and the walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers. Viewing across the low dark hills in the foreground and mid-ground but with light sources in the distance including scattered properties and occasional vehicle lights elsewhere in the far distance. Up to eight aviation warning lights would be visible in the distance. The level of effect would not be significant. The angle intensity mitigation would have limited effect at this elevated location.

Viewpoint No. and Title	FEI Report Figure Reference	Distance (m) ⁸	Sensitivity	200cd Intensity		Comments
				Magnitude	Level of Effect	
26. A83 South of Inverneill	N/A	27,077	Medium to Low (road users including tourists)	Very Low	Negligible	Note this viewpoint is beyond the 20km Study Area. The night-time sensitivity has been assessed as Medium to Low due to the primary receptors being road users in accordance with the NS 2024 guidance. Although the area would be relatively dark, road users would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. Viewed from this route this is a largely dark area with occasional lights from properties with the greatest visibility of lights associated with Lochgilphead and vehicle lights across Loch Fyne. Up to three aviation warning lights would be visible. The level of effect would not be significant. The angle intensity mitigation would reduce the lights to between 100-38cd.

NIGHT-TIME LANDSCAPE EFFECTS

Drawing from the night-time ZTV and viewpoint analysis (which identifies no significant effects) the night-time LVIA has focused on the following landscape receptors within the study area:

- Craggy Upland LCT (see **EIA Report Figure 8.7**);
- Surrounding LCTs (see **EIA Report Figure 8.7**);
- Loch Lomond and Trossachs National Park (LLTNP) (see **FEI Report Figure 4A-5**);
- Knapdale NSA (see **FEI Report Figure 4A-5**).

All of the Local landscape Areas (LLA) within the 20km Study Area (including Knapdale / Melfort LLA, North Argyll LLA, East Loch Fyne (Coast) LLA and West Loch Fyne (Coast) LLA) have been excluded from this assessment due to the reduced number of turbines in the Revised Development and the revised Aviation Lighting Strategy which has resulted in very limited visibility of the lights from these LLAs, as illustrated by the ZTV's and Viewpoint N9. Similarly, there is very little ZTV overlap of the Ben Lui Wild Land Area (WLA) within the 20km Study Area and other WLAs are all outwith the 20km Study Area. WLAs have therefore, also been excluded from this assessment.

There are limited periods when the night-time landscape character can be reasonably discerned, perhaps on a full moon, or for short periods of twilight just after sunset or prior to sunrise, the result being that any effects on the discernment of night-time landscape character are unlikely to be material.

In summary, the Revised Development would have **no significant** effects on landscape character or nightscape including the perceptual qualities of "*seclusion and naturalness*" or the special landscape qualities (SLQ) and integrity of the LLTNP, NSA or LLA designation. However, there would be **significant combined** cumulative effects on the 'host' *Craggy Upland* LCT as a result of three schemes including the consented Blarghour, the An Carr Dubh application and the Revised Development.

1.1.11 Night-time Landscape Effects: During Construction / Decommissioning

During the construction and decommissioning periods some limited health and safety lighting would be required at the Development Site entrance, temporary construction compounds and substation. There would also be lights from vehicles moving around the site during periods of darkened daylight hours such as heavy rain / dark skies. Cranes (up to two have been assumed) may also carry unmitigated safety and aviation warning lights. As a result, small areas of the landscape may be significantly characterised by pockets of periodic and transient construction lighting. The nature of these effects would be localised and temporary according to the construction program.

1.1.12 Night-time Landscape Effects: During Operation

1.1.12.1 Craggy Upland LCT

The Revised Development would be located within an undesignated area of the *Craggy Upland* LCT. The *Craggy Upland* LCT within 10km shares several similar qualities to the adjacent *Loch Fyne Upland Forest-Moor Mosaic* LCT (AGC 6a on **Figure 8.8** of the EIA Report) to the west of Loch Fyne. Together they occupy a large proportion of the landscape within 10km and expand the upland nature of the host LCT to form an extensive upland landscape.

In terms of landscape sensitivity, the area is not designated for its dark skies indicating a Medium to Low value. The landscape also includes some utility and commercial land uses (forestry, overhead line and grid development). This is however a largely dark area, as indicated by the satellite image in **Figure 4A-2**, although it is also forested and relatively unpopulated, indicating a Medium susceptibility to the introduction of aviation warning lights. The sensitivity of the site, located within the *Craggy Upland* LCT is therefore assessed as *Medium*.

The period within which landscape character can be discerned and experienced at night is limited between the periods of dusk and dawn (during civil twilight) and may only occur for half an hour before the onset of nautical twilight and then astronomical twilight when any discernment of the landscape or 'nightscape' would be limited to the shapes of hills, buildings and vegetation, subject to the availability of moonlight. Many of the key characteristics discerned in daylight, including the colour, texture, pattern and detail of the landscape would not be visible. In this sense, the baseline landscape character at night has a reduced relevance and the perception of naturalness is further limited by existing forestry covering the eastern and southeastern parts of the LCT. It is worth noting that there is no mention of night-time characteristics in relation to this LCT. The 2024 NatureScot guidance notes *"Some characteristics are weakened by darkness and are ultimately no longer present, as they are less visible, such as evidence of cultural settlement, variations in landcover and habitats, or an appreciation of key vistas. Other perceptual characteristics can however be strengthened, such as the apparent absence of development, or the profile of an important skyline... a frequently valued characteristic of many parts of the UK, and particularly Scottish countryside, is its dark skies and a general absence of visible lighting"*.

During periods of twilight the landscape and the turbines themselves would still be visible in the fading light and the aviation warning lights would appear faint (because the sky would not be completely dark). During the night (beyond twilight when the sky is at its darkest) the lights would appear most visible but the landscape character itself would not be visible although the horizon may be discernible with moonlight (increasing in full moon conditions) and the shapes of objects may also just be visible. The area would appear as a relatively dark area but not completely unlit with occasional lights from residential properties / farms in the southeastern parts of the LCT, and in clear / cloud free conditions, 'starry nights' would be experienced.

The eight directional and reduced intensity aviation warning lights would not be sufficient in number and spread to create a new key characteristic or element of this LCT. According to the ZTVs there

are limited locations where all of these lights would be visible at once and much of this area overlaps with forestry. Where visible within this LCT, the 200 cd lights (dimmed to 10% of peak intensity when visibility in all directions from the turbines is >5 km) would extend across the Development Site. In some instances, within 500m - 1km of the turbines, reflected light may be visible as the turbine blades pass behind the light source. This effect is subject to the wind direction but generally occurs at locations upwind of the turbines. The lights may also appear intermittently when viewed from downwind locations as the turbine blades pass in front of the lights (between the light source and the viewer).

The light intensity would vary relative to the vertical angle as indicated by **Figure 4A-5**. From most areas closest to the proposed turbines, the light intensity would be relatively low, owing to the vertical angle being a few degrees below zero (extending below -5°). From areas of higher ground, the vertical angle would be closer to zero and the light intensity would be correspondingly higher. However, the pattern of visibility where the lighting is seen at increased intensity is more intermittent in nature and the lighting would generally be viewed from a greater distance.

Due to the intervening forestry, the presence of other light sources in the adjacent LCTs (associated with residents along the shores of Loch Awe and Loch Fyne) as well as the reduced light intensity, the magnitude of change perceived from the Development Site and within 2km is likely to range between Medium to Zero. The level of effect would be **Moderate** and **Not Significant** on the night-time landscape character due to the limited number of lights proposed and the context of the forestry land use which includes high levels of screening overall, and limited receptors. Perceptions of a 'secluded' landscape character would remain strong. The nature of these effects would be direct, long-term (reversible) and negative. Angle intensity mitigation would reduce the light intensity to between 221 to <4 cd as indicated in **Figure 4A-5**. This may further reduce the level of effect in some areas.

Within the wider *Craggy Upland* LCT, beyond approximately 2km from the Revised Development, the lighting effects would be perceived as visual effects, viewing in one direction, rather than affecting the wider landscape character at night. In addition, the level of perceived light would dissipate with increased distance and the light brilliance or luminosity would reduce further. Therefore, any wider effects on landscape character or the perception of darkness would **not be significant**.

In terms of the cumulative assessment, the consented Blarghour is located within this LCT (seven turbines would be lit). The consented Ladyfield Wind Farm (nine lit turbines) is located further to the north-east in an adjacent LCT. The cumulative ZTV in **Figure 4AF** reveals that there are some areas within the central parts of the LCT where Blarghour and the Revised Development would be visible. Both schemes (up to 15 aviation warning lights) would be theoretically visible from some central parts of this large LCT, and the combined magnitude of change would be Medium resulting in a **Moderate** and **Significant** effect as a result of both schemes. The additional effect of the Revised Development would reduce slightly to **Moderate to Minor** and **Not Significant**, reducing further with increased distance. The nature of this effect would be cumulative, long term (reversible), direct, and negative.

The application An Carr Dubh Wind Farm (seven lit turbines) is also located within this LCT. The cumulative ZTV in **Figure 4A-8** reveals that there are some areas within the central parts of the LCT where An Carr Dubh, Blarghour and the Revised Development would be visible. All three schemes (up to 22 aviation warning lights) would be theoretically visible from some central parts of this large LCT, and the combined magnitude of change would be High-Medium resulting in a **Major to Moderate** and **Significant** effect as a result of all three schemes. The additional effect of the Revised Development would slightly reduce to **Moderate to Minor** and **Not Significant**, reducing further with increased distance. The nature of this effect would be cumulative, long term (reversible), direct, and negative.

1.1.12.2 Other Landscape Character Types

There would be no significant effects on other areas of landscape character in the study area. This is due to either the lack of or limited theoretical visibility from within these areas (as indicated in Figure 4A-5) and the reduced light intensity that would be experienced in locations, particularly from lower lying areas such as the Rocky Mosaic LCT and Loch Fyne Upland Forest-Moor Mosaic LCT.

Due to their higher elevation, the light intensity from some of the unforested hills within the wider LCTs, located at a greater distance from the Revised Development, would vary between ≤ 200 / 150cd during periods of good visibility (>5 km). Meteorological observations suggest that good visibility is likely to occur for approximately 93% of the time. Combined with distance and the limited number of lights limited to viewing in one direction, the proposed aviation warning lights would not be sufficient in number or intensity to significantly affect the landscape character of these areas. The aviation warning lights would appear as small features in the distant landscape often viewed in combination with other light sources in the intervening valleys and appearing as visual effects.

1.1.13 Loch Lomond and Trossachs National Park

Darkness surveys for this area indicate a medium to low level of night-time lighting is present, coming from settlements at Lochgoilhead, Arrochar, Benmore, Kilmun (plus those just outside the boundary including Strachur and Inveraray), vehicle lights on the A83 and A815, and scattered properties on the low-lying land within the LLTNP.



Plate 2: View from the summit of Beinn Bhuidhe, near the boundary of the LLTNP looking south-west towards Inveraray and other dispersed settlement.

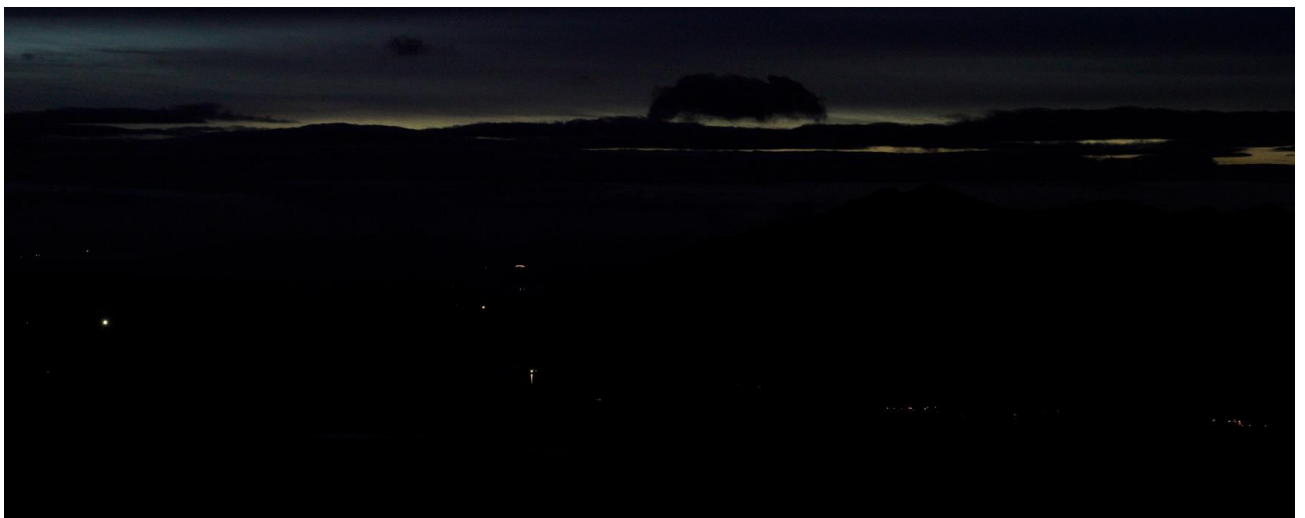


Plate 3: View from the summit of Beinn Bhuidhe, near the boundary of the LLTNP looking south towards Loch Fyne dotted with lights from dispersed settlement.

None of the SLQs refer specifically to 'dark skies' or the importance of views between dusk and dawn however, the scenic quality of the views at all times of the day, including sunset and sunrise are of high value which is reflected by the National Park designation.

As set out in **Appendix 8D** of the EIA Report, five SLQs have been included in the day-time assessment. Whilst none of these relate specifically to 'dark skies' they have been assumed to encompass an appreciation of night-time views and dark skies.

In generally terms the sensitivity of the LLTNP is noted to be inherently of High sensitivity due to its high value designation. The related views would be experienced by local residents, tourists, walkers and road-users, and whilst there are medium to low levels of lighting within the baseline (darkness

survey) the visual susceptibility of local residents, walkers and tourists, is considered to be High. Exceptions to this assessment in relation to the landscape susceptibility of specific SLQ's is noted below, otherwise the LLTNP is assessed as of *High* sensitivity.

LLTNP Assessment - SLQ 1.a: “A world-renowned landscape famed for its rural beauty”

Viewing the same day-time area at night, the “world-renowned landscape famed for its rural beauty” is only perceptible during limited periods between dusk and dawn (during civil twilight) and may only occur for half an hour before the onset of nautical twilight and then astronomical twilight when any discernment of the landscape or ‘nightscape’ would be limited to the shapes of hills, subject to the availability of moonlight or other light sources. Artificial lights are visible as noted above. The aviation warning lights of the Revised Development would not be visible when viewed from loch side and low-lying locations. The aviation warning lights, however, would be visible from elevated areas and hill summits, west of Loch Lomond, by a small number of walkers / stargazers / wild campers, looking beyond the National Park boundary beyond 15km distance. Viewing from Viewpoints 19 (Beinn Lochain) and 24 (Ben Ime), both within the LLTNP the night-time visual effects would not be significant. Viewing from Viewpoint N23 (**Figure 4AM**) near the boundary of the LLTNP, the level of night-time visual effect would be **Minor** (Very Low magnitude) and **Not Significant**. The nature of this effect would be cumulative, long term (reversible), indirect, and neutral.

Taking account of the cumulative developments, the Revised Development would introduce further aviation warning lights in addition to two consented and two application wind farms. The additional effect of the Revised Development would remain **Minor** and **Not Significant**, whilst the combined cumulative effect would increase with more lights visible. Due to the embedded mitigation, the resulting level of effect would be **Moderate to Minor** and **Not Significant**. The nature of this effect would be cumulative, long term (reversible), indirect, and negative to neutral.

LLTNP Assessment - SLQ 1.g: “Tranquillity”

Considering the sense of tranquillity, or ‘quietude’ at night the visibility of aviation warning lights would be limited to hill summits and elevated west facing slopes close to the western boundary of the LLTNP. These locations are seldom likely to be visited at night except by occasional walkers camping on the slopes and summits. They would contribute further to lighting visible to the south-west / west such as lights associated with Inveraray and other dispersed settlement and residential properties, and vehicle lights along roads and would have a Very Low magnitude of change resulting in a **Minor** and **Not Significant** effect this SLQ. The nature of this effect would be indirect, long term (reversible) and negative to neutral.

Taking account of the cumulative developments, the Revised Development would introduce further aviation warning lights in addition to two consented and two application wind farms. The additional effect of the Revised Development would remain **Minor** and **Not Significant**, whilst the combined cumulative effect would increase with more lights visible affecting the perceived sense of tranquillity. Due to the embedded mitigation, the resulting level of effect would be **Moderate to Minor** and **Not**

Significant. The nature of this effect would be cumulative, long term (reversible), indirect, and negative to neutral.

LLTNP Assessment - SLQ 2.a: “A remote area of high hills and deep glens”

The aviation warning lights of the Revised Development would not be visible from the sea lochs, lochs or flat-bottomed glens within the LLTNP. Ferries crossing the Firth of Clyde to Holy Loch, Loch Goil and Loch Long are located beyond the Study Area. The aviation warning lights, however, would be visible from hill summits and elevated west facing slopes close to the western boundary of the LLTNP by a small number of walkers / wild campers, looking beyond the National Park boundary. Artificial lights are visible as noted above. Viewing from Viewpoint N23 (**Figure 4A-13**) near the boundary of the LLTNP, the level of night-time visual effect would be **Minor** (Very Low magnitude) and **Not Significant**. Whilst the Revised Development would introduce more lights into an area with artificial lights in the distance, it would **Not Significantly** alter the “sense of remoteness” or “isolation” from the distinctive hill summits. The nature of this effect would be cumulative, long term (reversible), indirect, and neutral.

Taking account of the cumulative developments, the Revised Development would introduce further aviation warning lights in addition to two consented and two application wind farms. The additional effect of the Revised Development would remain **Minor** and **Not Significant**, whilst the combined cumulative effect would increase with more lights visible. Due to the embedded mitigation, the resulting level of effect would be **Moderate to Minor** and **Not Significant**. The nature of this effect would be cumulative, long term (reversible), indirect, and negative to neutral.

LLTNP Assessment - SLQ 2.c: “Arrochar’s mountainous and distinctive peaks”

The aviation warning lights would be visible from the summits and very upper slopes of the Arrochar Alps of Beinn Ime, Beinn Narnain, Ben Vane, The Cobbler and Ben Donich, for example, by a small number of walkers / wild campers, looking beyond the National Park boundary beyond 20km distance. Viewing from Viewpoints 19 (Beinn Lochain) and 24 (Ben Ime), both within the LLTNP the night-time visual effects would not be significant. Viewing from Viewpoint N23 (**Figure 4A-13**) near the boundary of the LLTNP, the level of night-time visual effect would be **Minor** (Very Low magnitude) and **Not Significant**. The lights would be visible in the context of other artificial lights visible in this direction and would occupy a limited proportion of the “*spectacular panoramas*” from these summits, visible for limited twilight periods. The nature of this effect would be cumulative, long term (reversible), indirect, and neutral.

Taking account of the cumulative developments, the Revised Development would introduce further aviation warning lights in addition to two consented and two application wind farms. The additional effect of the Revised Development would remain **Minor** and **Not Significant**, whilst the combined cumulative effect would increase with more lights visible. Due to the embedded mitigation, the resulting level of effect would be **Moderate to Minor** and **Not Significant**. The nature of this effect would be cumulative, long term (reversible), indirect, and negative to neutral.

LLTNP Assessment - SLQ 3.d: “Distinctive Mountain groups”

The aviation warning lights would not be visible from the “*U-shaped valleys and deeply incised glens*” of the Arrochar Alps. Furthermore, the lights would not be visible in views towards the distinctive mountain groups which surround Loch Lomond (Arrochar Alps, Luss Hills and East Lomond Uplands), in views from the Loch Lomond area. There would be no effect on views of the distinctive mountain groups (Arrochar Alps, Luss Hills and East Lomond Uplands) from Loch Lomond. There would be **no effects** on this SLQ.

In conclusion, and taking account of all of the SLQs, the aviation warning lights would not have a significant night-time effect on the LLTNP or its objectives. There would be **no significant** effects on the ‘grand’ and ‘expansive’ panoramas, including sunset and sunrise views, the ‘distinctive peaks’ associated with Arrochar, Argyll Forest and Loch Lomond, the ‘world-renowned landscape’ or the strong sense of tranquillity for which the LLTNP is valued.

1.1.14 Knapdale NSA

Darkness surveys for this area indicate a medium to low level of night-time lighting is present, coming from settlements at Bridgend, Kilmichael Glassary, Kilmartin, Crinan, Cairnbaan, Tayvallich and Lochgilphead, vehicle lights on the A83, A816, B814 and B8025, and scattered properties on the low-lying land. Viewpoint N22 (**Figure 4AL**) is illustrative of views from the elevated, northern part of the NSA looking towards the Revised Development.

None of the SLQs refer specifically to ‘dark skies’ or the importance of views between dusk and dawn however, the scenic quality of the views at all times of the day, including sunset and sunrise are of high value which is reflected by the NSA designation.

As set out in **Appendix 8E** of the EIA Report, four SLQs have been included in the assessment.

In generally terms the sensitivity of the NSA is noted to be inherently of High sensitivity due to its high value designation. The related views would be experienced by local residents, tourists and road-users, and whilst there are medium to low levels of lighting within the baseline (darkness survey) the visual susceptibility of local residents and tourists, is considered to be High. Exceptions to this assessment in relation to the landscape susceptibility of specific SLQ’s is noted below, otherwise the NSA is assessed as of *High* sensitivity.

NSA Assessment - SLQ 2: “A landscape of skylines”

Viewing the same day-time area at night, the “*landscape of skylines*” is only perceptible during limited periods between dusk and dawn (during civil twilight) and may only occur for half an hour before the onset of nautical twilight and then astronomical twilight when any discernment of the landscape or ‘nightscape’ would be limited to the shapes of hills, subject to the availability of moonlight or other light sources. Artificial lights are visible at Bridgend, Kilmichael Glassary, Kilmartin and Lochgilphead. The aviation warning lights associated with the Revised Development would be visible along the skyline and could be said to potentially alter the landscape of skylines

from the upper, forested parts of the northern NSA. Viewing from Viewpoint N22 (**Figure 4A-12**), the level of night-time visual effect would range from **Moderate to Minor** (Low-Very Low magnitude) and **Not Significant**. The aviation warning lights would be visible beyond the dark shapes of the low-lying hills that form the distant skyline, in the context of other lighting sources as noted above. The nature of this effect would be cumulative, long term (reversible), indirect, and negative to neutral.

In terms of cumulative effects, none of the other wind farm lights would be visible, as illustrated in Viewpoint N22, and the Revised Development would not contribute to any significant cumulative effects.

NSA Assessment - SLQ 4: “A profoundly evocative, ancient place”

The aviation warning lights associated with the Revised Development would not be visible from Kilmichael Glen, Hill of Dunadd and Carnasserie Castle which define this SLQ and therefore there would be **no effect** on this SLQ.

NSA Assessment - SLQ 6: “In the north, dramatic juxtaposition of ridges and volcanic plugs arising from the flat expanse of Mòine Mhòr bog”

The aviation warning lights associated with the Revised Development would not be visible from the Mòine Mhòr bog and the double bay at Crinan. There would be **no effects** on this SLQ.

NSA Assessment - SLQ 10: “The Crinan Canal”

The aviation warning lights associated with the Revised Development would not be visible from the Crinan Canal and therefore there would be **no effect** on this SLQ.

In conclusion, and taking account of all of the SLQs, the aviation warning lights would not have a significant night-time effect on the NSA or its objectives. There would be **no significant** effects on SLQ2, the ‘landscape of skylines’, including sunset and sunrise views, and no effects on SLQ 4 the ‘ancient place’ associated with Kilmartin Glen, SLQ 6 the ‘dramatic juxtaposition of ridges and volcanic plugs arising from the flat expanse of Mòine Mhòr bog’ or SLQ 10 the ‘Crinan Canal’ for which the NSA is valued.

NIGHT-TIME VISUAL EFFECTS

The night-time visual assessment considers the likely effects of the proposed aviation warning lights on the views and visual amenity experienced by people in the landscape between the periods of dusk and dawn. Drawing from the night-time viewpoint analysis in **Table 4A.5** and detailed assessment in **Annex 1** which identifies **no significant effects**, there is no further assessment on the visual receptors assessed in **Chapter 4** as none of them would be significantly affected by the proposed aviation warning lights. This includes the five Dark Sky Discovery Sites (part of the Dark Sky Trail) which are all out with the ZTV. There would, however, be **significant combined**

cumulative visual effects as a result of the consented Blarghour, application An Carr Dubh and the Revised Development from a small number of locations in the Loch Awe area including part of Dalavich, a minor road along the western shore of Loch Awe, and recreational users of the waters of Loch Awe although it is unlikely that kayakers, canoeists, small boats or paddle boarders would be present at night due to practical and safety reasons.

Other locations including settlements, roads and recreational routes generally have visibility of varying levels of artificial light present in most of these locations and / or associated with the activity of travelling through the landscape such that the visual effects would **not be significant**.

The greatest effects at night are likely to be experienced largely by occasional recreational users at elevated locations and hill summits, rather than those at lower elevations such as residents and road users. Whilst recreational users including hill walkers are less likely to be present on the hills at night for practical and safety reasons, occasional walkers may camp on the hill slopes and summits to view the night sky. They have been afforded higher value particularly those within NSAs, WLAs, and LLAs, although none of these hill summits /elevated locations are promoted night sky viewpoint locations and the assessment has been unable to find sufficient evidence of people visiting / or camping out at a number of these hill summits at night¹¹. The susceptibility has been reduced due to practical access difficulties at night (risks of trips and falls) and the very low or negligible numbers of people likely to visit these locations at night. The NS (2024) *Guidance on Aviation Lighting Impact Assessment* advises in relation to this type of receptor, there is a “*Balance to be struck between higher sensitivity and the relatively lower numbers of people undertaking formal or informal recreation outdoors at night*”.

In summary, there would be no significant night-time effects on the views experienced by people within this area at night, including those who maybe star-gazing and appreciating the night sky (with the exception of significant cumulative effects of all three schemes as noted above).

During the summer months, most people, including hill walkers are unlikely to experience the aviation warning lights. For example, during the summer solstice 2025 the aviation warning lights would switch on at 22.43 and switch off at 04.02 in the morning. Local residents and local road users are more likely to experience the aviation warning lights during the winter months. For example, during the winter solstice 2025 the lights would come on at 16.14 and switch off at 08.22 in the morning. It is also reasonable to expect that most people would be commuting or indoors during these periods of colder weather, during the twilight and night, and would experience the aviation warning lights incidentally to their main activity.

Operation of the aviation warning lights would have no adverse effect on periods of sunrise (when the sun disk passes above the horizon and the period just after this) and sunset (the period just before the sun disk passes below the horizon) as the operation is programmed to switch off 30 mins before sunrise and switch on 30 mins after sunset, respectively.

Evidence has included observations on site visits and review of walker blogs and internet searches.

CONCLUSIONS

The revised Lighting Strategy requires eight of the 17 turbines to be lit (T1, T2, T6, T9, T12, T18, T19 and T22) all of which would be dimmed to 10% for approximately 93 of the time. This represents the greatest level of mitigation currently available and approved by the CAA. In addition, angle intensity mitigation will be provided. This would benefit those receptors within low lying areas relative to the elevation of the lights, reducing the intensity to a low as <4-39 cd in some cases.

The night-time assessment concluded that there would be **no significant** effects on landscape character or nightscape including the perceptual qualities of “*seclusion and naturalness*” or the special landscape qualities (SLQ) and integrity of the LLTNP or the Knapdale NSA.. The Ben Lui WLA and all of the locally designated LLAs were excluded from this assessment due to limited ZTV coverage and the likelihood of very limited visibility of aviation warning lights from these areas. There would be **no significant** night-time effects on the views from any visual receptors. This is due to the varying levels of artificial light present in most of these locations and / or associated with the activity of travelling through the landscape, the screening effects of vegetation and other mitigating factors including the direction of view and the intervening distance. Allowing for the additional mitigating effects of angle intensity mitigation, the visibility of the lights would reduce further when viewed from low lying receptors although this would not provide mitigation for elevated receptors for example hill walkers camping on summits.

The greatest visual effects at night are likely to be experienced by recreational users at elevated locations and hill summits, rather than those at lower elevations such as residents and road users. Whilst recreational users including hill walkers are less likely to be present on the hills at night for practical and safety reasons, occasional walkers may camp on the hill slopes and summits to view the night sky. They have been afforded higher value particularly those within NSAs and WLAs (and LLAs), although none of these hill summits /elevated locations are promoted night sky viewpoint locations and the assessment has been unable to find sufficient evidence of people visiting / or camping out at a number of these hill summits at night.

There would, however, be **significant combined** cumulative night-time landscape and visual effects as a result of the consented Blarghour, application An Carr Dubh and the Revised Development on the ‘host’ *Craggy Upland* LCT and from a small number of visual receptors in the Loch Awe area including parts of Dalavich, a minor road along the western shore of Loch Awe and and recreational users of the waters of Loch Awe although it is unlikely that kayakers, canoeists, small boats or paddle boarders would be present at night due to practical and safety reasons.

During the summer months, most people, including hill walkers are unlikely to experience the aviation warning lights. For example, during the summer solstice 2025 the aviation warning lights would switch on at 22.43 and switch off at 04.02 in the morning. Local residents and local road users are more likely to experience the aviation warning lights during the winter months. For example, during the winter solstice 2025 the lights would come on at 16.14 and switch off at 08.22 in the morning. It is also reasonable to expect that most people would be commuting or indoors during

these periods of colder weather, during the twilight and night, and would experience the aviation warning lights incidentally to their main activity.

Operation of the aviation warning lights would have no adverse effect on periods of sunrise (when the sun disk passes above the horizon and the period just after this) and sunset (the period just before the sun disk passes below the horizon) as the operation is programmed to switch off 30 mins before sunrise and switch on 30 mins after sunset, respectively.

Annex 1: Night-time Viewpoint Analysis

Figure 4A-9(a-d)	Viewpoint N3: Kilmaha	
Description and Darkness Survey	This viewpoint is located at the promoted Kilmaha Viewpoint, which is identified on OS maps. It is a picnic area and stopping place at an elevated location above the loch and off the minor roads along the western shores of Loch Awe. The view towards the Revised Development is orientated southeast across Loch Awe towards the eastern edge of the loch and the rising landform and ridgeline forming the skyline beyond. The overall views are limited by the forested hillslope. The existing unlit turbines at An Suidhe Wind Farm are partially visible on the skyline (subject to screening from vegetation). The existing landscape viewed in this direction is generally unlit, with the exception of residential lights from Durran across the loch. Further, occasional vehicle lights along the minor roads on both sides of the loch would also pass by this viewpoint location. The baseline level of light is assessed as dark, but not unlit.	
Summary of Day-time Assessment	Sensitivity	High
	Magnitude	High-Medium, reducing to Medium as foreground forestry gradually mature through the operational period of the Revised Development and partially screen some of the turbines.
	Level of Effect	Substantial to Major and Significant , reducing to Major and Significant as foreground forestry gradually mature through the operational period of the Revised Development and partially screen some of the turbines.
	Type of Effect	Long term (reversible), direct and negative.
Night-time Sensitivity	The viewpoint is not located within a nationally or locally designated landscape neither is it located within a Dark Sky Park (Medium to Low value). The baseline is assessed as ‘dark’ but not unlit. The viewpoint is promoted for its day-time views and <u>not</u> night-time views. The view would be experienced by visitors / tourists (and potentially wild campers) between dusk and dawn (Medium susceptibility). The sensitivity has been conservatively assessed as <i>Medium</i>.	
Magnitude of Change (Revised Development only)	Whilst in Operation: The nearest visible lit turbines are Turbines 18 and 22 at 4.6km distance and the aviation warning lights would extend across approximately 50° of the horizontal Field of Vision (FoV). Up to six aviation warning lights (positioned on the turbine nacelles) would be visible subject to intervening forestry. Other residential light sources and occasional car lights would also affect the perception of darkness. When visibility is >5km in all directions from the wind farm, the aviation warning lights would be dimmed to 10% and the visible light intensity would reduce to 200cd (Medium-Low magnitude). This is likely to occur >93% of the time. Allowing for the angle intensity mitigation the intensity of these lights would reduce to between 39-20cd. Turbine rotation may cause lights to appear intermittently (turning ‘on’/ ‘off’) subject to a prevailing south westerly wind direction. The magnitude of change would be <i>Medium-Low</i>. This would gradually reduce over time to <i>Low</i> and <i>Low-Very Low</i> as foreground forestry matures.	

Figure 4A-9(a-d) Viewpoint N3: Kilmaha

Whilst Under Construction and Decommissioning:

Lights from construction vehicles along a small section of the access track (subject to forestry) and a lit crane may be visible. The magnitude of change would range from *Zero to Medium-Low*.

Assessment	Light Intensity	200cd Lighting with angle attenuation mitigation
	Sensitivity	Medium
	Magnitude	Medium-Low (Low / Low-Very Low)
	Level of Effect	Moderate to Minor (Minor) and Not Significant
	Type of Effect	Long term (reversible), direct and negative.

Cumulative Assessment (Scenario 1):

Existing + Consented wind farms + Revised Development

Cumulative Magnitude	Consented Wind Farms: Aviation warning lights from Blarghour would be theoretically visible in the wider view subject to intervening forestry (Low magnitude).	
Cumulative Assessment (Scenario 1)	Effect	200cd Lighting
	Additional	Moderate to Minor (Minor) and Not Significant
	Combined	Moderate to Minor (Minor) and Not Significant

Cumulative Assessment (Scenario 2):

Existing + Consented + Application wind farms and the Revised Development

Cumulative Magnitude	Applications: Aviation warning lights from An Carr Dubh would be theoretically visible in the wider view subject to intervening forestry (Low magnitude).	
Cumulative Assessment (Scenario 2)	Effect	200cd Lighting
	Additional	Moderate to Minor (Minor) and Not Significant
	Combined	Moderate to Minor (Minor) and Not Significant

Figure 4A-10(a-d) Viewpoint N4: Dalavich

Description and Darkness Survey

This viewpoint is located at the small settlement of Dalavich, on the beach by lochside adjacent to Dalavich Social Club and camping pods. The view toward the Revised Development is across the waters of Loch Awe and is medium to long range and includes the flat expanse of the loch, distant treelined shoreline and the rising landform culminating in an undulating skyline formed from low-lying forested and moorland hills. The existing landscape, viewed in this direction across the loch is generally unlit, with the exception of residential lights at Portinnisherrick and vehicle lights on the Minor roads along the loch. To the right of the view are lights associated with the settlement of Dalavich including houses, jetty and the camping pods / Social Club (see photograph below). The baseline level of light is assessed as dark, but not unlit across the loch but partially lit on the edge of the settlement.

Figure 4A-10(a-d) Viewpoint N4: Dalavich



Summary of Day-time Assessment	Sensitivity	High
	Magnitude	Medium
	Level of Effect	Major and Significant
	Type of Effect	Long term (reversible), direct and negative.

Night-time Sensitivity The night-time sensitivity has been assessed as *Medium*, due to the primary receptors being residents within settlements in accordance with the NS 2024 guidance. This is a smaller settlement with some baseline lighting compared to a large settlement with many lights. The area is partially lit; and residents would themselves be a source of light and the viewpoint is not located within a designated landscape, Dark Sky Park or at a promoted night sky viewpoint location (Medium to Low susceptibility and High value).

Magnitude of Change (Revised Development only)

Whilst in Operation:
The nearest visible lit turbine is Turbine 9 at 6km distance, and the aviation warning lights would extend across approximately 25° of the horizontal FoV. Theoretically three aviation warning lights would be visible. There would also be some attenuation due to the intervening distance between the lights and the viewpoint. Other light sources would also affect the perception of darkness. When visibility is >5km in all directions from the wind farm, the aviation warning lights would be dimmed to 10% and the visible light intensity would reduce to 200cd (Low magnitude). This is likely to occur >93% of the time. Allowing for the angle intensity mitigation the intensity of these lights would reduce to between 20-13cd.

Turbine rotation may cause lights to appear intermittently (turning 'on' / 'off') subject to a prevailing south westerly wind direction.

The magnitude of change would be *Low*.

Whilst Under Construction and Decommissioning:
Lights from ground-based construction activities would not be visible due to the screening effects of vegetation and landform, although a lit crane may be visible. The magnitude of change would range from *Zero to Low*.

Assessment	Light Intensity	200cd Lighting with angle attenuation mitigation
	Sensitivity	Medium
	Magnitude	Low
	Level of Effect	Minor and Not Significant
	Type of Effect	Long term (reversible), direct and negative.

Cumulative Assessment (Scenario 1):

Existing + Consented wind farms + Revised Development

Cumulative Magnitude	Consented Wind Farms: Aviation warning lights from Blarghour would be visible in the wider view and closer to the viewpoint (Medium magnitude).
Effect	200cd Lighting

Figure 4A-10(a-d) Viewpoint N4: Dalavich

Cumulative Assessment (Scenario 1)	Additional	Minor and Not Significant
	Combined	Moderate and Significant (due to Blarghour and to a lesser degree, the Revised Development)

Cumulative Assessment (Scenario 2):

Existing + Consented + Application wind farms and the Revised Development

Cumulative Magnitude	Applications: Aviation warning lights from An Carr Dubh would be theoretically visible in the wider view and closer to the viewpoint (Medium magnitude).	
Cumulative Assessment (Scenario 2)	Effect	200cd Lighting
	Additional	Minor and Not Significant
	Combined	Moderate and Significant (due to Blarghour and An Carr Dubh and to a lesser degree, the Revised Development)

Figure 4A -11(a-d) Viewpoint N9: Strachur

Description and Darkness Survey	This viewpoint is located at public parking at Strachur pontoon and moorings along the A886, to the east of Loch Fyne. The view is representative of residential properties within Strachur along this section of the A886. The view towards the Revised Development is orientated west-northwest across the flat expanse of water towards low-lying hills beyond the eastern shore of the loch. The existing landscape, viewed in this direction is generally unlit with the exception of lights associated with Furnace and Inveraray in the wider view. Further, occasional vehicle lights on the A886 and residential properties at Strachur behind the viewpoint would be seen from this location. The baseline level of light is assessed as a combination of dark and partially lit.		
Summary of Day-time Assessment	Sensitivity	High	
	Magnitude	Very Low	
	Level of Effect	Minor and Not Significant	
	Type of Effect	Long term (reversible), direct, and negative to neutral.	
Night-time Sensitivity	The night-time sensitivity has been assessed as Medium, due to the primary receptors being residents within settlements in accordance with the NS 2024 guidance. This is a smaller settlement with some baseline lighting compared to a large settlement with many lights. The area is partially lit; and residents would themselves be a source of light and the viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. It is however located within the East Loch Fyne LLA, although there are no dark sky qualities noted in the special qualities of the LLA (Medium to Low susceptibility and High value).		
Magnitude of Change (Revised Development only)	Whilst in Operation:	One aviation warning light (T19) would be visible at 8.5km from this location subject to intervening forestry. When visibility is >5km in all directions from the wind farm, the aviation warning light would be dimmed to 10% and the visible light intensity would reduce to 200cd (Very Low magnitude). This is likely to occur >93% of the time. Allowing for the angle intensity mitigation the intensity of these lights would reduce to between 39-20cd.	

Figure 4A -11(a-d)

Viewpoint N9: Strachur

Turbine rotation may cause lights to appear intermittently (turning 'on'/'off') subject to a prevailing south westerly wind direction.

The magnitude of change would be *Very Low*.

Assessment	Light Intensity	200cd Lighting with angle attenuation mitigation
	Sensitivity	Medium
	Magnitude	Very Low
	Level of Effect	Negligible and Not Significant
	Type of Effect	Long term (reversible), direct and neutral.

Cumulative Assessment (Scenario 1):

Existing + Consented wind farms + Revised Development

Cumulative Magnitude	Consented Wind Farms: Aviation warning lights from Ladyfield would be visible in the wider view (Low magnitude).	
Cumulative Assessment (Scenario 1)	Effect	200cd Lighting
	Additional	Negligible and Not Significant
	Combined	Minor and Not Significant (due to Ladyfield)

Cumulative Assessment (Scenario 2):

Existing + Consented + Application wind farms and the Revised Development

Cumulative Magnitude	Applications: No other lit applications would be visible.	
Cumulative Assessment (Scenario 2)	Effect	200cd Lighting
	Additional	N/A
	Combined	N/A

Figure 4A-12(a-d)

Viewpoint N22: Cruach Mor Dunardry

Description and Darkness Survey

This viewpoint is located near the summit of Cruach Mor Dunardry (214m AOD) within the Knapdale NSA and affords 360° panoramic views of the surrounding landscape. The view towards the Revised Development is orientated northeast across low-lying undulating landform towards the River Add in the middle distance (not visible) and low hills beyond. The existing landscape, viewed in this direction includes lights from the settlements of Bridgend and Kilmichael Glassary in the mid-ground, and dispersed residential properties throughout the view. There would also be occasional vehicle lights on roads on the low-lying landscape.

The baseline level of light is assessed as dark, but not unlit.

Summary of Day-time Assessment	Sensitivity	High
	Magnitude	Very Low
	Level of Effect	Minor and Not Significant
	Type of Effect	Long term (reversible), direct and neutral.

Night-time Sensitivity

The night-time sensitivity has been assessed as *High-Medium* due to its location within the Knapdale NSA. The viewpoint is not located within a Dark Sky Park or at

Figure 4A -11(a-d)

Viewpoint N9: Strachur

Magnitude of Change (Revised Development only)

a promoted night sky viewpoint location, however, it is located 1.5km distance from the Bellanoch viewpoint, part of the Dark Sky Trail¹² which is a promoted for stargazing but is outwith the ZTV. The summit of Cruach Mor Dunardry is accessed via a short track and walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers.

Whilst in Operation:

The nearest visible lit turbine is Turbine 19 at 20.2km distance and aviation warning lights would extend across approximately 8° of the horizontal FoV. Theoretically up to seven proposed aviation warning lights would be visible subject to some intervening forestry. There would also be notable attenuation due to the intervening distance between the lights and the viewpoint. Other light sources from Bridgend and Kilmichael Glassary would also affect the perception of darkness. When visibility is >5km in all directions from the wind farm, the aviation warning light would be dimmed to 10% and the visible light intensity would reduce to 200cd (Low-Very Low magnitude). This is likely to occur >93% of the time. Allowing for the angle intensity mitigation the intensity of these lights would reduce up to 99cd. Turbine rotation may cause lights to appear intermittently (turning 'on'/'off') subject to a prevailing south westerly wind direction.

The magnitude of change would be *Low-Very Low*.

Whilst Under Construction and Decommissioning:

Lights from ground-based construction activities would not be visible due to the screening effects of vegetation and landform, although a lit crane may be visible. The magnitude of change would range from *Zero to Low – Very Low*.

Assessment	Light Intensity	200cd Lighting with angle attenuation mitigation
	Sensitivity	High-Medium
	Magnitude	Low-Very Low
	Level of Effect	Minor and Not Significant
	Type of Effect	Long term (reversible), direct and negative to neutral.

Cumulative Assessment (Scenarios 1 and 2):

Existing + Consented + Application wind farms and the Revised Development

Existing: No existing lit turbines are visible.

Consented: No consented lit turbines would be visible.

Application: Lit turbines at application stage would not be visible.

Figure 4A-13(a-d)

Viewpoint N23: Beinn Bhuidhe

Description and Darkness Survey

This viewpoint is located next to the summit of Beinn Bhuidhe (948m AOD) and affords 360° panoramic views of the surrounding landscape. The view towards the Revised Development is orientated southwest along a spine of hills in the foreground towards lower-lying hills beyond. The existing landscape, viewed in this direction includes lights from the settlement of Inveraray in the mid-ground, and dispersed residential properties

Figure 4A-13(a-d)	Viewpoint N23: Beinn Bhuidhe	
Summary of Day-time Assessment	Sensitivity	High
	Magnitude	Very Low
	Level of Effect	Minor and Not Significant
	Type of Effect	Long term (reversible), direct and neutral.
Night-time Sensitivity	The night-time sensitivity has been assessed as <i>High-Medium</i> due to its location within the North Argyll LLA and Ben Lui WLA. The viewpoint is not located within a Dark Sky Park or at a promoted night sky viewpoint location. The summit would be difficult to navigate at night, and the walkers would themselves have torches. Although it is possible the summit may occasionally be accessed by walkers camping overnight in small numbers.	
Magnitude of Change (Revised Development only)	Whilst in Operation:	
	The nearest visible lit turbine is Turbine 2 at 22.4km distance and aviation warning lights would extend across approximately 8° of the horizontal FoV. All eight aviation warning lights would be visible. There would also be notable attenuation due to the intervening distance between the lights and the viewpoint. Other light sources from Inveraray would also affect the perception of darkness. When visibility is >5km in all directions from the wind farm, the aviation warning light would be dimmed to 10% and the visible light intensity would reduce to 200cd (Very Low magnitude). This is likely to occur >93% of the time. Allowing for the angle intensity mitigation would have limited effect at this viewpoint location.	
	Turbine rotation may cause lights to appear intermittently (turning 'on' / 'off') subject to a prevailing south westerly wind direction.	
	The magnitude of change would be <i>Very Low</i> .	
Assessment	Whilst Under Construction and Decommissioning:	
	Lights from ground-based construction activities would not be visible due to the screening effects of vegetation and landform, although a lit crane may be visible.	
	The magnitude of change would range from <i>Zero to Very Low</i> .	
	Light Intensity	200cd Lighting with angle attenuation mitigation
	Sensitivity	High-Medium
Assessment	Magnitude	Very Low
	Level of Effect	Minor and Not Significant
	Type of Effect	Long term (reversible), direct and neutral.
Cumulative Assessment (Scenario 1):		
Existing + Consented wind farms + Revised Development		
Cumulative Magnitude	Consented Wind Farms: Aviation warning lights from Blarghour (Low-Very Low magnitude) and Ladyfield (Medium-Low magnitude) would be visible in the wider view.	
	Effect	200cd Lighting
	Additional	Minor and Not Significant

Figure 4A-13(a-d) Viewpoint N23: Beinn Bhuidhe

Cumulative Assessment (Scenario 1)	Combined	Moderate and Significant (due to Ladyfield and <u>not</u> the Revised Development)
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Cumulative Assessment (Scenario 2):

Existing + Consented + Application wind farms and the Revised Development

Cumulative Magnitude	Applications: Aviation warning lights from An Carr Dubh and other more distant wind farms would be theoretically visible in the wider view (Low to Very Low magnitude).	
Cumulative Assessment (Scenario 2)	Effect	200cd Lighting
	Additional	Minor and Not Significant
	Combined	Moderate and Significant (due to Ladyfield and <u>not</u> the Revised Development)

Annex 2: Night-time LVIA Checklist

The NS *Guidance on Aviation Lighting Impact Assessment*, Appendix 1, November 2024 recommends that the assessment should include the following information / considerations as set out in the Application Submission Checklist:

Aviation Lighting Proposals and Mitigation Information to be provided: ☒ Plan showing the wind farm layout with numbered turbines and a corresponding schedule of visible lights (both nacelle and mid-tower lights where required). ☒ Information on proposed visible aviation lighting scheme, including a clear listing of all proposed mitigation measures. ☒ Information on any project-specific mitigation approvals that have been obtained or are still required from CAA. Recommendations: ☒ Developers are encouraged to combine available mitigation measures into wind farm design to mitigate the lighting impacts as far as is reasonably practicable, whilst maintaining a proportionate approach.
Night-time Aviation Lighting Impact Assessment Information to be provided: ☒ Plan showing the extent of the night time Study Area. ☒ Assessment of night-time effects for each relevant receptor, in particular where qualities of wildness, darkness, remoteness and lack of man-made elements are features or characteristics of the landscape. ☒ An appraisal of all viewpoints within the study area should be included where there may be significant effects and can be informed by wireline visualisations. ☒ Detailed assessment of, in most instances, two or three representative viewpoints accompanied by photomontage visualisations to adequately represent the key impacts. ☒ Assessment of any likely significant cumulative effects from visible aviation lighting, where appropriate. Recommendations: ☒ Ensure that both daytime and nighttime assessments are proportionate, appropriate, comprehensive, and transparent. ☒ A proportionate approach, with a focus on significant effects, is required when scoping the relevant landscape and visual receptors and how they may be affected. It is worth noting that receptors and their sensitivity will not always be the same during the day and night. ☒ The assessment should take into account the baseline darkness / artificial lighting characteristics and people's likely use of different areas during darkness and low light (dusk / dawn) conditions.

☒ The extent of the lighting assessment study area for the LVIA should be informed by a hub height ZTV (to indicate the extents of aviation lighting visibility), and an understanding of the nature of the likely effects. Experience suggests a study area of 10km - 20km should be sufficient for the night-time Aviation Lighting Impact Assessment, to ensure significant effects are captured, depending on the sensitivities.
Night-time Aviation Lighting Impact Assessment cont.
☒ Viewpoint assessment should provide commentary cross referenced to lighting wirelines and photomontages.
Wireline visualisations
Information to be provided: ☒ Identification of turbine lighting on wireline visualisations. The turbine lighting may either be marked at the appropriate positions on the wirelines or provided as a separate note at the foot of the wirelines. This should apply to all the LVIA 53.5° (degree) wirelines (i.e. indication of visible lighting should not just be shown for the night-time photomontages).
Photomontage visualisations
Information to be provided: ☒ Night-time photomontage visualisations from a proportionate number of representative viewpoints (two or three should be appropriate for most projects), selected based on sensitivity of potential receptors and frequency of visitors at night or dusk/dawn, and to be agreed with the Planning Authority (in consultation with NatureScot where appropriate). ☒ Photomontage visualisations should illustrate the maximum case lighting intensity scenario (e.g. 200 cd where dimming of aviation lights proposed as embedded mitigation, and 2000 cd only where this mitigation is not proposed). Recommendations: ☒ Whilst it is expected that two or three representative viewpoints will require a photomontage visualisation, an appraisal of all viewpoints where there may be significant effects should be included. ☒ In some cases, there may be the need to select night-time assessment viewpoints based on the turbine lighting impacts as opposed to the day-time visual effects, therefore the viewpoints may vary from the suite of day-time assessment viewpoints. Edge of settlement locations are likely to be better lighting assessment viewpoints, compared with locations within towns/ villages (given the influence of existing street lighting, etc.). ☒ Health and safety concerns exist over taking dusk/dawn photography, and associated assessment fieldwork from remote viewpoints. This should be a key consideration for all involved in agreeing the scope and undertaking aviation lighting photography/ assessment. In some cases, a more accessible proxy viewpoint may be the proportionate, alternative safe location to capture viewpoint photography at dusk/night. ☒ Moreover, sometimes the approach route to and from a remote hill summit is where receptors will experience a total absence of existing visible lights and may be more representative than the hill summit /ridge (where receptors are perhaps less likely to camp). ☒ This Guidance advises against use of manipulated day-time photography due to the risk of misrepresenting the baseline (photographs should capture the baseline situation, i.e. any other lights in the view), however, there may be instances where the approach could be used for remote locations where it can be verified that no other sources of artificial light are present in the baseline.

Annex 3: References

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