



Carn Fearna Wind Farm - Aviation Lighting

Presentation to Garve and District Community Council

4 March 2025





Context to night time aviation lighting

- **Civil aviation lighting – visible**
- **Military (MOD) aviation lighting – infrared and visible**



International framework

- **ICAO International Standards and Recommended Practices: Aerodromes Annex 14 Volume 1, 8th Edition, July 2018**

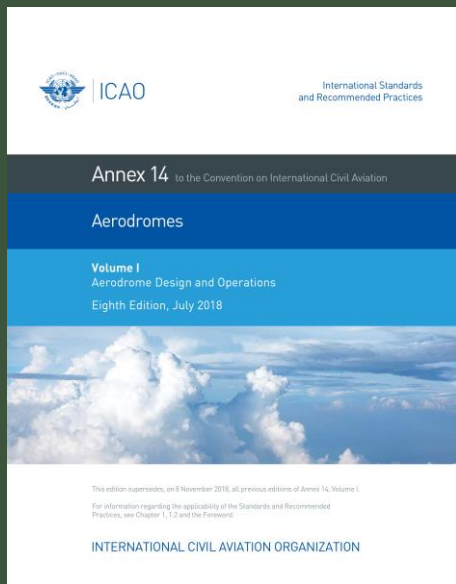


Table 6-3. Light distribution for medium- and high-intensity obstacle lights according to benchmark intensities of Table 6-1

Benchmark intensity	Minimum requirements					Recommendations				
	Vertical elevation angle (b)			Vertical beam spread (c)		Vertical elevation angle (b)			Vertical beam spread (c)	
	0°		-1°			0°	-1°	-10°		
	Minimum average intensity (a)	Minimum intensity (a)	Minimum intensity (a)	Minimum beam spread	Intensity (a)	Maximum intensity (a)	Maximum intensity (a)	Maximum intensity (a)	Maximum beam spread	Intensity (a)
200 000	200 000	150 000	75 000	3°	75 000	250 000	112 500	7 500	7°	75 000
100 000	100 000	75 000	37 500	3°	37 500	125 000	56 250	3 750	7°	37 500
20 000	20 000	15 000	7 500	3°	7 500	25 000	11 250	750	N/A	N/A
2 000	2 000	1 500	750	3°	750	2 500	1 125	75	N/A	N/A

Note.— This table does not include recommended horizontal beam spreads. 6.2.1.3 requires 360° coverage around an obstacle. Therefore, the number of lights needed to meet this requirement will depend on the horizontal beam spreads of each light as well as the shape of the obstacle. Thus, with narrower beam spreads, more lights will be required.

Note:

There is no requirement for any specified minimum or maximum light intensity at elevation angles lower than -1°, or above +2°. It is therefore open to lighting manufacturers to design lights that have intensities as close as possible to zero at angles of elevation lower than -1°, and above +2°.

CAA

Original published: 19/07/2016 at 10:00:00 AM
Amended by: 20/08/2016 at 10:00:00 AM

STATUTORY INSTRUMENTS

2016 No. 765

CIVIL AVIATION

The Air Navigation Order 2016

Made: 19 July 2016
Laid before Parliament: 20 July 2016
Coming into force: 25 August 2016

At the Court at Buckingham Palace, the 19th day of July 2016
Present,

The Queen's Most Excellent Majesty in Council

This Order is made in exercise of the powers conferred by sections 60(1)(a) and 60(1)(b) of the Civil Aviation Act 1982, section 1(1) of the European Communities Act 1972, and section 2(2) of, and paragraph 1(4) of Schedule 2 to, the European Communities Act 1972, and section 2(2) of, and paragraph 1(4) of Schedule 2 to, the European Communities Act 1972.

This Order makes provision for a purpose mentioned in section 2(2) of the European Communities Act 1972 and is made in Her Majesty's name in exercise of the powers conferred by section 2(2) of the European Communities Act 1972 and is made in Her Majesty's name in exercise of the powers conferred by section 2(2) of the European Communities Act 1972.

Enacted



Civil Aviation Authority
111, Southwark Street
London, SE1 1AA
Tel: 020 7426 6000
Fax: 020 7426 6001

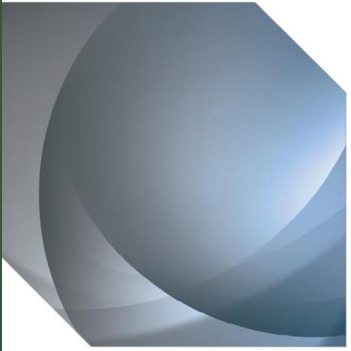
and Regulations Section Unit

001 000 000 on 25th August

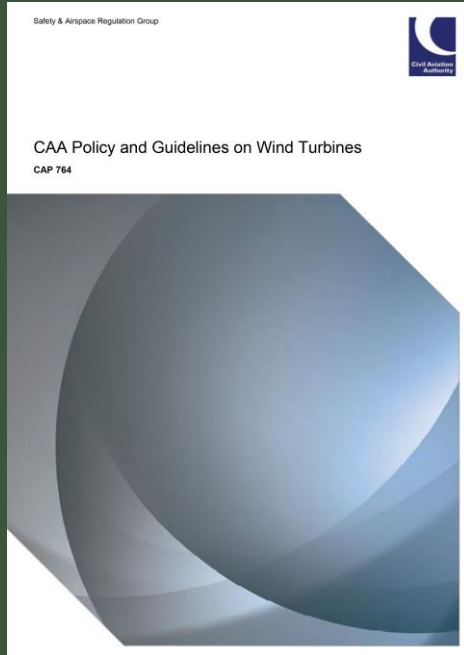
Safety & Airspace Regulation Group

CAA Policy and Guidelines on Wind Turbines

CAP 704



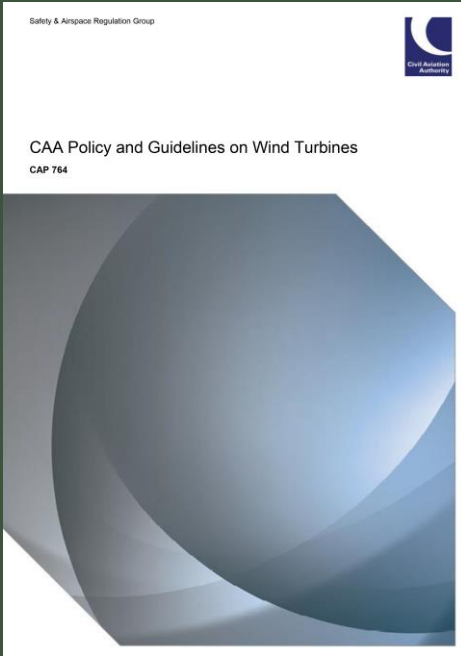
Within the UK, The Air Navigation Order 2016 ('ANO'), Article 222 and CAA publication CAP 764: "Policy and Guidelines on Wind Turbines" set out a legal requirement reflecting ICAO's Recommendations on the lighting of obstacles of 150m or more.



“Onshore Obstacle Lighting Requirement ICAO regulations (Annex 14 Chapter 6) and article 219 of the ANO 2009 require that structures away from the immediate vicinity of an aerodrome, which have a height of 150 m (492 ft) or more AGL are:

- 1. Fitted with medium intensity steady red lights positioned as close as possible to the top of the obstacle, and also equally spaced at intermediate levels, so far as practicable, between the top lights and ground level with an interval not exceeding 52 m;**
- 2. Illuminated at night, visible in all directions and any lighting failure is rectified as soon as is reasonably practicable;**
- 3. Painted appropriately: the rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines that are deemed to be an aviation obstruction should be painted white, unless otherwise indicated by an aeronautical study.”**

CAA



The UK goes further than ICAO Annex 14 in that the provision for lighting of obstacles 150m or more in height is established in law rather than as policy or guidance.

However, the law also makes provision for the Civil Aviation Authority ('CAA') to grant exemptions from the lighting requirements.

“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”

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

Scope and Definition

- In the UK, the need for aviation warning lights on 'tall' structures depends in the first instance upon any particular structure's location in relationship to an aerodrome. If a structure penetrates the obstacle limitation surfaces of an aerodrome, it is for the aerodrome operator to assess the need for warning lights¹.
- The UK statutory requirements for the lighting of en-route obstacles (i.e. those away from the vicinity of a licensed aerodrome) are set out in Article 222 of the UK Air Navigation Order (ANO) 2016.² This article requires medium intensity (2000 candela) steady red aviation warning lights to be mounted as close as possible to the top of all structures at or above 150 meters above ground level (AGL). In terms of requirement for lighting wind turbine generators in accordance with the ANO, the CAA considers the top of a wind turbine generator to be the maximum blade tip height. In terms of positioning of aviation obstruction lighting on wind turbine generators with a maximum height of 150m AGL or above onshore³, the CAA interprets⁴ 'as close as possible to the top of the obstacle' as the fitting of lights on the top of the supporting structure (the nacelle) rather than the blade tips.
- Taking into account the Recommendation in ICAO Annex 14 Vol 1 (Seventh edition 2016), this Policy Statement provides guidance as to the application of Article 222 with relation to onshore wind turbine generators with a maximum blade tip height at or above 150m AGL. It should be noted that:
 - Other onshore structures, including meteorological masts, at or above 150m AGL are not covered by this policy statement.
 - Individual wind turbine generators below 150m AGL are not routinely lit for civil aviation purposes; however, it is possible that aviation stakeholders, including the CAA, may make a case for aviation warning lighting where a structure is considered, by virtue of its location and nature, a significant navigational hazard. Further information is available within CAP 764.

Policy

- Under Article 222 (5), the CAA may direct that an en-route obstacle must be fitted with and must display such additional lights in such positions and at such times as it may specify. In addition, under Article 222 (6) a permission may be granted for the purposes of this article for a particular case or class of cases or generally. Accordingly, the following policy shall apply to all UK land based wind turbine generators which have a maximum blade tip height at or above 150m AGL:

¹ Commission Regulation EC No 139/2014 (B.080) and associated AMC/GM (Aerodrome Regulation).

² CAP 393 - Air Navigation, The Order and Regulations.

³ Requirements for offshore wind turbine generators differ from those onshore and are covered by ANO 2016 Article 223.

⁴ CAP 764 - CAA Policy and Guidelines on Wind Turbines – Chapter 3, Page 39, Footnote 26.

- 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.
- The lights required by paragraph (a) must be so fitted to show when displayed in all directions without interruption⁵.
- 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.
- 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.
- Lights should be operated by an acceptable control device (e.g., photocell, timer, etc.) adjusted so the lights will be turned on whenever illumination reaching a vertical surface falls below 500 LUX. The control device should turn the lights off when the illumination rises to a level of 500 LUX or more.
- 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.
- If the horizontal meteorological visibility in all directions from every wind turbine generator in a group is more than 5 km, 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.

SARG Point of Contact

CAA Windfarms
Safety and Airspace Regulation Group
CAA House
45-59 Kingsway
London
WC2B 6TE

Telephone: 0207 453 6534

windfarms@caa.co.uk

⁵ The term 'without interruption', does not take into account blade flicker.

⁶ As specified in ICAO Annex 14 Aerodromes Vol 1 - Aerodrome Design and Operations, Chapter 6 Paragraph 6.2

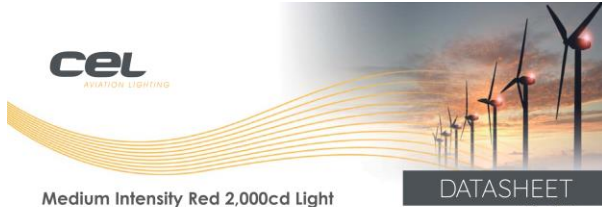
Summary of standard lighting requirements

- a 2000 cd steady red light on top of the nacelle of each turbine
- a second light serving as an alternative in case of failure of the operating light
- at least three 32 cd steady red lights (to provide 360° horizontal coverage) positioned on the turbine tower at half the nacelle height
- lights should be operated by an acceptable control device, such as a photocell, adjusted so that the lights will be turned on when illuminance falls below 500 LUX, and so that they will turn off when the illuminance rises to a level of 500 LUX or more, or a timer which switches the lights on at the start of official night and off at the end of official night
- failed lights are to be repaired or replaced as soon as practicable; if outages exceed 12 hours, a Notice to Airmen (NOTAM) is to be issued
- the 2000 cd lights may be dimmed to 10% of the minimum peak intensity when horizontal meteorological visibility exceeds 5km from the wind turbines

In practice...



In practice...



Medium Intensity Red 2,000cd Light 230VAC - LED Aircraft Warning Light CEL-WT-MIC - StandAlone / Modbus

Medium intensity stand-alone 2,000cd red model is designed for Wind Turbine installations. This intelligent light offers unique features such as incorporated fault monitoring, photocell, GPS synchronization, adjustable luminosity and supports both stand-alone and Modbus operation as a part of a larger CEL aviation light system network.

Key features

- 2,000cd (effective) RED fixed or flashing modes
- Extremely reliable - long lifetime
- Supports both stand-alone and Modbus operations
- Suitable for Offsh or environment
- Incorporated GPS synchronization
- Adjustable luminous output levels 10%, 30%, and 100%
- Incorporated photocell and fault monitoring
- WiFi interface
- Design lifetime more than 20 years
- 5yr warranty- the longest in the industry

Specifications met

- ICAO International Standards and Recommended Practices: Aerodromes Annex 14 Volume 1, 8th Edition, July 2018,
- Chapter 6: Medium-intensity Type B-C Flashobstacle Light
- European Aviation Safety Agency - Chapter Q – Visual Aids for Denoting Obstacles CS-ADR-DSN-Q.848
- FAA Advisory Circular 150/345437-09/12/06 L-864 and L-885
- CEL-WT-MIC - light measurement chart table - DEC2024

Optical characteristics

- 2,000cd (effective)
- Colour aviation RED
- NVG compliant infrared (850nm)
- Horizontal beam 360°
- Vertical beam 3°
- Maximum intensity at 1° is less than 1110cd
- Maximum intensity at 40° is less than 56cd

Electrical characteristics

- Operating voltage 90-265VAC
- Constant power input at 95% by active PFC
- Flash rates: 20/30/40/60rpm
- Meets standards
- EMC (Emissions) EN 61000-6-4
- EMC (Immunity) EN 61000-6-2



DATASHEET

05 Dec 2024



Electrical characteristics - continued

- Power consumption
 - 17W @Night (RED, 40rpm)
 - 20W @Night (RED+IR, 40rpm)
 - 23W @Night (RED, fixed)
 - 30W @Night (RED+IR, fixed)
- Recommended cables (Outdoor)
 - Power (L+N-PE): 3x1,5mm²or 3x2,5mm²
 - Data: CAT 7
 - Alarm: CAT 7, 3x1,5mm or 3x2,5mm²
 - Power + Data: 6x1,5mm²or 6x2,5mm²
- Input/Output terminals can be used to daisy chain power and data to additional lightheads

Mechanical characteristics

- Painted marine grade aluminium body (CSM41g)
- Glass Cover
- Degree of protection IP66
- Operating temperature range -40...+55°C
- Mounting 240x240mm
- Height 335mm, diameter 270mm
- Weight 11kg

Additional Factory-Installed Options

- Cold-climate version (CCV)
- NVG compliant infrared (IR)



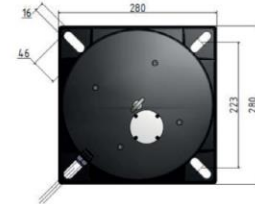
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www.aircraftwarninglights.co.uk



www.contarrex.com

Medium Intensity Red 2,000cd Light 230VAC - LED Aircraft Warning Light CEL-WT-MIC - StandAlone / Modbus

CEL-WT-MIC Light unit with mounting dimensions



CEL-WT Versions

- | | |
|---------------|--|
| CEL-WT-MB | Medium-intensity Type B (flashing) obstruction light, 2,000cd Red, GPS sync, Photocell, Alarm, 100-240VAC Supports stand-alone and Modbus Network operation. |
| CEL-WT-MIC | Medium-intensity Type C (steady burn) obstruction light, 2,000cd Red, infrared, GPS sync, Photocell, Alarm, 100-240VAC. Supports stand-alone and Modbus Network operation. |
| CEL-WT-MB-IR | Medium-intensity Type B (flashing) obstruction light, 2,000cd Red, Infrared 850nm, GPS sync, Photocell, Alarm, 100-240VAC. Supports stand-alone and Modbus Network operation. |
| CEL-WT-MIC-IR | Medium-intensity Type C (steady burn) obstruction light, 2,000cd Red, Infrared 850nm, GPS sync, Photocell, Alarm, 100-240VAC. Supports stand-alone and Modbus Network operation. |

Contarrex Europe Limited, 252 North Way, Horden, Surrey SM4 4BW, UK
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In practice...



2,000 candela (cd)



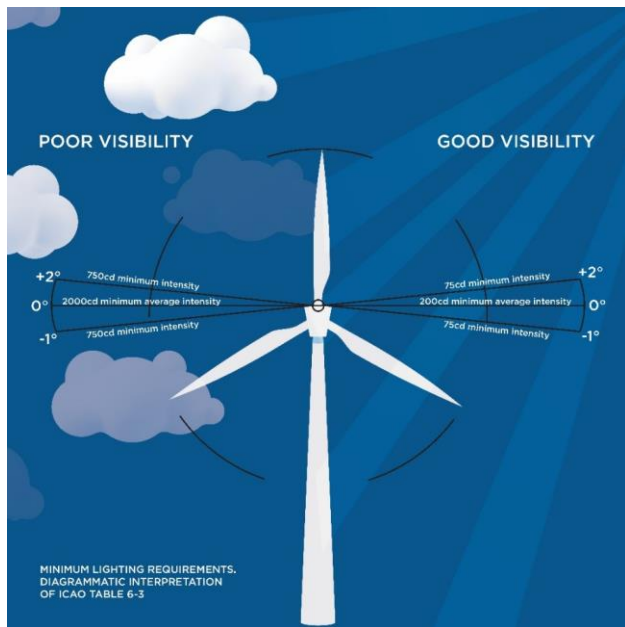
200 candela (cd)

Lighting mitigation options

- **Automatic Dimming** - typically be triggered for around 90% to 95% of the time
- **Vertical directional intensity mitigation** (sometimes called 'narrow vertical beam spread' or 'angle intensity mitigation') – reduces intensity at negative and positive angles
- **Reduced Lighting Scheme** – fewer lights, including removal of mid-tower lights
- **Aircraft detection lighting systems (ADLS)** - primary and secondary radar (need for change in UK Law) – Transponders and TMZs



In practice...



Automatic dimming

Intensity of Turbine Light shown in Candelas (cd)		
Vertical angle	Turbine Lighting Intensity	
	2000cd scenario	200cd scenario
Above 4°	<236 cd	<24cd
3° to 4°	464 to 236 cd	46 to 24 cd
2° to 3°	1113 to 464 cd	111 to 46 cd
1° to 2°	2054 to 1113 cd	205 to 111 cd
0° to 1°	2028 to 2054 cd	203 to 205 cd
0° to -1°	2028 to 1055 cd	203 to 106 cd
-1° to -2°	1055 to 409 cd	106 to 41 cd
-2° to -3°	409 to 206 cd	41 to 21 cd
-3° to -4°	206 to 133 cd	21 to 13 cd
Below -4°	<133 cd	<13 cd

Vertical directional intensity mitigation



In practice...

Turbines with 2000/200cd ANO Visible Red Lights: T1, T4, T7 and T9

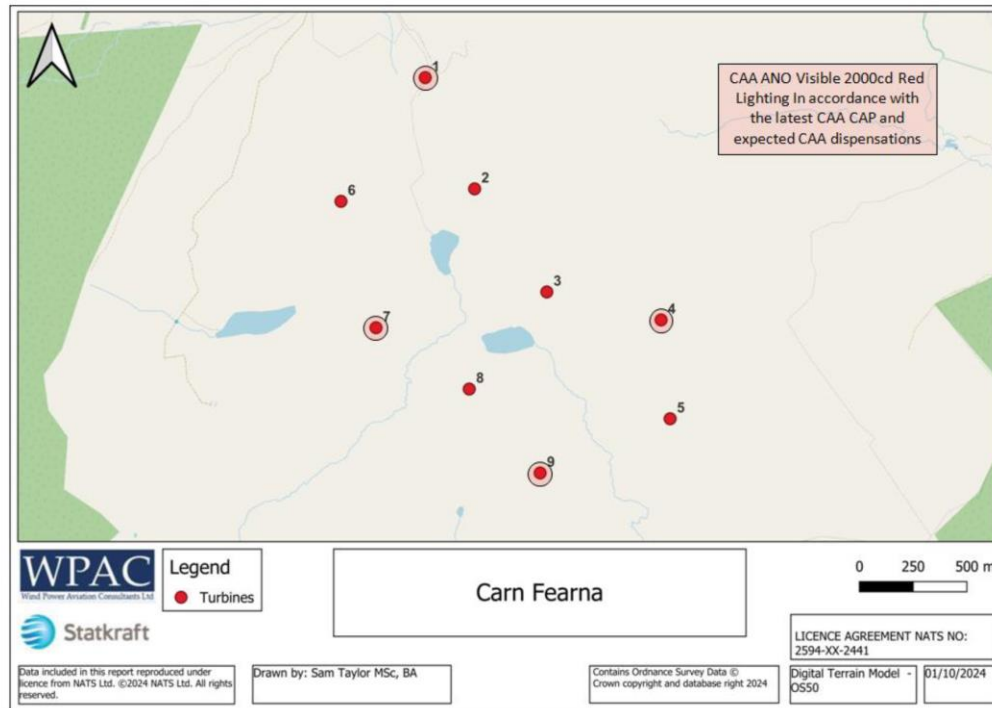


Figure 4 Lighting Layout with CAA Dispensations

Reduced lighting scheme

Strategy and Policy Group Windfarm Policy



Mike Hale
Aviation Consultant
Wind Power Aviation Consultants Ltd.
38 Hadrian Way
Chilworth
Southampton
SO16 7HX

2 January 2025
Ref Windfarms / Carn Fearna

Dear Mike,

Proposed Obstacle Lighting Scheme for Carn Fearna Wind Farm

Reference: Carn Fearna Wind Farm Lighting report dated 2 October 2024

1. Thank you for the lighting brief at reference. The report discusses the proposed obstacle lighting plan for the Carn Fearna Wind Farm, located approximately 12km WNW of Dingwall.
2. The proposed Carn Fearna Wind Farm consists of 9 turbines, with heights over 150m ground to tip. This brings the turbines within scope of the Air Navigation Order (ANO) Article 222 obstacle lighting requirements.
3. We have considered the report carefully and take note of the intent to address concerns relating to adverse visual impacts of aviation lighting on non-aviation receptors while ensuring that the lighting installed on the turbines meets air safety requirements.
4. We note the proposed lighting scheme identifies the perimeter outline and that some mitigation is proposed to be provided by the provision of infra-red lighting for those operators who carry Night Vision Device capability.
5. Under provisions given in the Air Navigation Order (ANO) Article 222 section 6, the CAA provides for the following variation:
 - medium intensity steady red (2000 candela) lights on the nacelles of turbines T01, T04, T07 and T09;
 - a second 2000 candela light on the nacelles of the above turbines to act as alternates in the event of a failure of the main light (note that both lights should not be lit at the same time);

Civil Aviation Authority
2E Aviation House, Beehive Ring Road, Crawley, West Sussex, RH6 0YR, www.caa.co.uk
Telephone 0330 138 3166 andy.wells@caa.co.uk

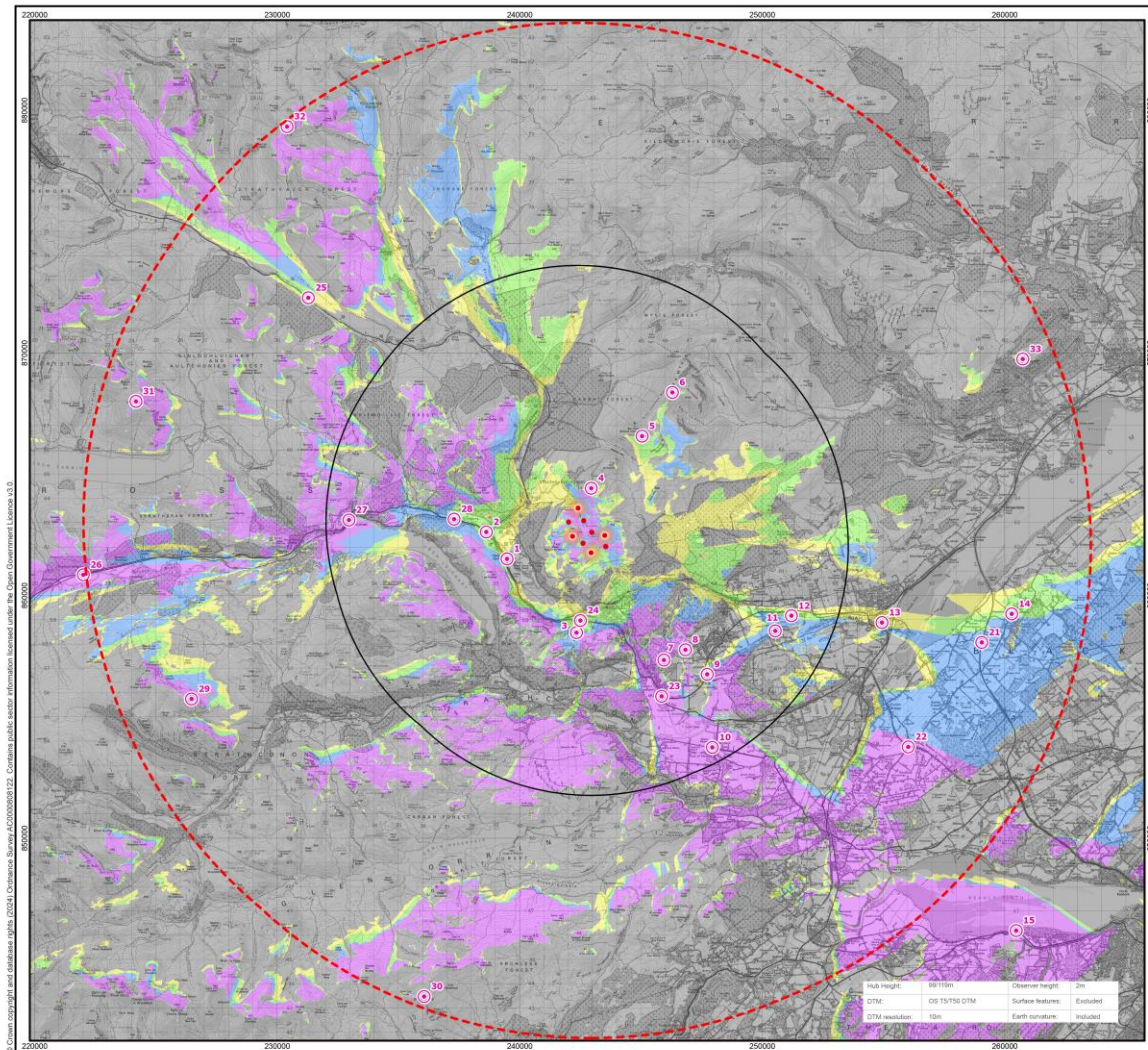
- the lights on these turbines to be capable of being dimmed to 10% of peak intensity when the lowest visibility as measured at suitable points around the wind farm by visibility measuring devices exceeds 5km;
- infra-red lights to MoD specification installed on the nacelles of turbines T01, T02, T03, T04, T05, T06, T07, T08 and T09 (note that dimming permission is applicable only to visible lights, not infra-red lighting).

6. Intermediate level 32 candela lights are not required to be fitted on the turbine towers.

7. If the proposed design of the wind farm changes (other than variations due to micro-siting etc.) this is likely to require a revision to this aviation obstacle lighting variation.

Yours sincerely,

Andy Wells
Manager Aviation and Wind Turbine Policy



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- Proposed Turbine Location
 - Proposed Turbine Lighting
 - 10km Radius
 - 20km Study Area
 - Viewpoint
1. Garve
 2. Gorstan
 3. Tarvie
 4. Little Wyvis
 5. An Cabar
 6. Glas Leathad Mor (Ben Wyvis)
 7. View Rock
 8. Loch Kinellan
 9. A834, Jamestown
 10. Marybank
 11. Knockfarrel
 12. Peffery Way at Fodderty Cemetery
 13. Tesco Dingwall
 14. Cubokie
 15. A862, west of Inverness
 21. A9, Black Isle
 22. A835/89169 Crossroads
 23. A835, Contin
 24. A835, south end of Loch Garve
 25. A835, Loch Glascarnoch
 26. A832, Strath Bran
 27. A832, Lochluichart
 28. A832 near Torriegerrie
 29. Sgùrr a' Mhuilinn
 30. Beinn a' Bha'ach Ard
 31. An Colleachan
 32. Am Faochagach
 33. Cnoc Fyrish monument
- Aviation Lighting ZTV
- Number of Lights Theoretically Visible
- No Visibility
 - 1
 - 2
 - 3
 - 4

1:150,000 on A3



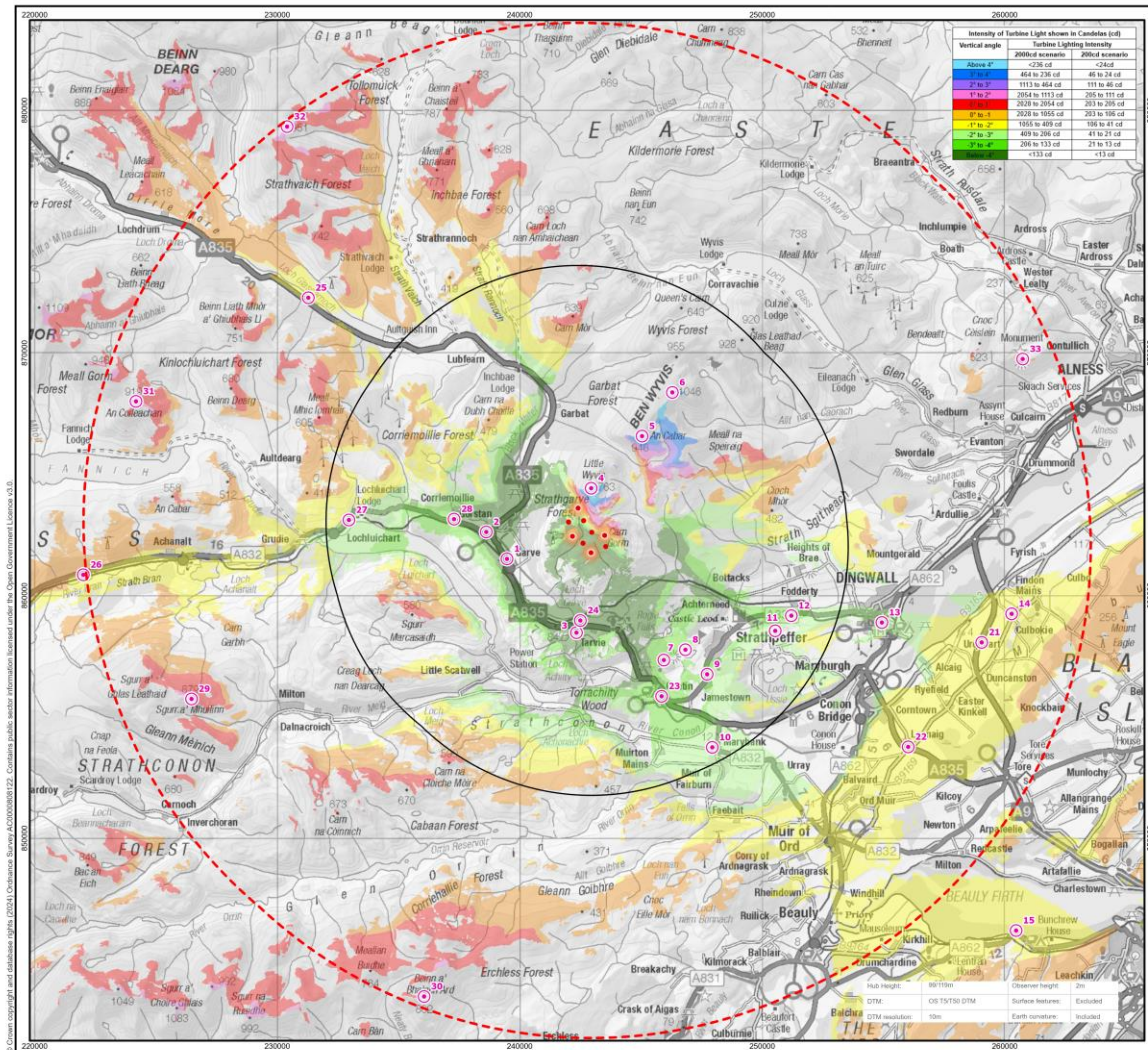
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Checked By: AW	Date: 26/11/2024

Figure 7.9b

Turbine Lighting ZTV

Carn Fearn Wind Farm

Environmental Impact Assessment Report



Statkraft

- Proposed Turbine Location
- 10km Radius
- 20km Study Area
- Proposed Turbine Lighting
- Viewpoint

- Garve
- Garston
- Tarvie
- Little Wyvis
- An Cabar
- Glas Leathad Mor (Ben Wyvis)
- View Rock
- Loch Kinellan
- AB34, Jamestown
- Marybank
- Knockfarrel
- Peffery Way at Fodderty Cemetery
- Tesco Dingwall
- Culbokie
- AB62, west of Inverness
- AB9, Black Isle
- AB35/B9169 Crossroads
- AB35, Contin
- AB35, south end of Loch Garve
- AB35, Loch Glasarnoch
- AB62, Strath Bran
- AB32, Lochluichart
- AB32 near Torriegorie
- Sgùrr a' Mhuilinn
- Beinn a' Bha'ach Ard
- An Colleachan
- Am Faoghagach
- Cnoc Fyris monument

Notes

- The lighting intensity for each of the vertical angles shown is based on the CEL-WT/MC aviation warning light. The candela values are provided by Contames, the manufacturer of the CEL-WT/MC aviation warning light, and represent the average values calculated for each angle of light shown.
- The highest candela value calculated by Contames for the CEL-WT/MC aviation warning light was 2206cd. This occurs at a vertical angle of 0.6° and so may occur in the 0° to 1° range shown on this figure.
- Reduced intensity turbine lighting (200cd) based on 'Air Navigation Order 2016 (CAP395) Article 223 (8)' which allows the 2000cd turbine light to be reduced to not less than 10% of the minimum peak intensity specified i.e. 200cd if visibility in all directions from every wind turbine generator in a group is more than 5km.
- Perception of theoretical candela intensity does not take account of distance.
- ZTV calculations do not take into account surface features such as forestry or buildings.
- ZTV calculations for turbine lighting intensity are based on visible aviation lighting mounted on the turbine nacelle.
- The ZTV calculates the degree of vertical angle from the study area shown to each of the Proposed Development turbines.
- ZTV calculations represent a worst case situation where predicted lighting intensity may be as a result of only one turbine in the layout.

1:150,000 on A3

0 5 10 Kilometres

Produced By: RH Version: 2

Checked By: AW Date: 22/01/2025

Figure 7.9c

Lighting Intensity ZTV

Carn Farna Wind Farm

Environmental Impact Assessment Report

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In practice...



Photomontage: Proposed Development Lighting Assessment (200cd Intensity) Nacelle lighting for turbines 1, 4, 7 and 9

View flat at a comfortable arm's length

OS reference:	239475 E 861514 N	Horizontal field of view:	53.5° (planar projection)	Camera:	Canon EOS 80
Eye level:	72.7 m AOD	Principal distance:	812.5 mm	Lens:	EFS50mm f/1.4 USM
Direction of view:	68.97°	Paper size:	641 x 297 mm (half A1)	Camera height:	1.5 m
Nearest turbine:	2.86 km	Correct printed image size:	820 x 260 mm	Date and time:	06.03.2024 18:34

DRAFT

Figure: 7.16
Viewpoint 1: Garve
Carn Fearna Wind Farm
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In practice...



Photomontage: Proposed Development Lighting Assessment (200cd Intensity). Nacelle lighting for turbines 1, 4, 7 and 9

View flat at a comfortable arm's length

OS reference:	23821 E 862623 N	Horizontal field of view:	53.5° (planar projection)	Camera:	Canon EOS 80
Eye level:	88.5 m AOD	Principal distance:	812.5 mm	Lens:	EF50mm f/1.4 USM
Direction of view:	88.81°	Paper size:	641 x 297 mm (half A1)	Camera height:	1.5 m
Nearest turbine:	3.42 km	Correct printed image size:	820 x 260 mm	Date and time:	06.03.2024 18:41

DRAFT

Figure: 7.17i
Viewpoint 2: Gorstan
Carn Fawr Wind Farm
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In practice...



Photomontage: Proposed Development Lighting Assessment (200cd Intensity) Nacelle lighting for turbines 1, 4, 7 and 9

View flat at a comfortable arm's length

OS reference:	296019 E 853765 N	Horizontal field of view:	53.5° (planar projection)	Camera:	Canon EOS 80
Eye level:	111.9 m AOD	Principal distance:	812.5 mm	Lens:	EF50mm f/1.4 USM
Direction of view:	302.86°	Paper size:	641 x 297 mm (half A1)	Camera height:	1.5 m
Nearest turbine:	14.96 km	Correct printed image size:	820 x 260 mm	Date and time:	22.10.2024 18:29

DRAFT

Figure: 7.37
 Viewpoint 22: A835/9169 Crossroads
 Carrn Fawrta Wind Farm
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In practice...



Photomontage: Proposed Development Lighting Assessment (200cd Intensity) Nacelle lighting for turbines 1, 4, 7 and 9

View flat at a comfortable arm's length

OS reference:	242500 E 858873 N	Horizontal field of view:	53.5° (planar projection)	Camera:	Canon EOS 80
Eye level:	92.9 m AOD	Principal distance:	812.5 mm	Lens:	EFS50mm F1.4 USM
Direction of view:	9.96°	Paper size:	641 x 297 mm (half A1)	Camera height:	1.5 m
Nearest turbine:	2.83 km	Correct printed image size:	820 x 260 mm	Date and time:	07.03.2024 18:38

DRAFT

Figure 7.30
Viewpoint 24: A835, south end of Loch Garve
Cairn Fàilinn Wind Farm

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In practice...



Photomontage: Proposed Development Lighting Assessment (200cd Intensity). Proposed Development with current baseline (not including Kirkan). Nacelle lighting for turbines 1, 4, 7 and 9

OS reference:	231283 E 872275 N	Horizontal field of view:	53.5° (planar projection)	Camera:	Canon EOS 80
Eye level:	261.2 m AOD	Principal distance:	812.5 mm	Lens:	EF50mm f/1.4 USM
Direction of view:	129.31°	Paper size:	641 x 297 mm (half A1)	Camera height:	1.5 m
Nearest turbine:	14.10 km	Correct printed image size:	820 x 260 mm	Date and time:	04.12.2024 8:05

View flat at a comfortable arm's length

DRAFT

Figure: 7.40h
Viewpoint 25: A835, Loch Glasarnoch
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In practice...



Photomontage: Proposed Development Lighting Assessment (200cd Intensity). Proposed Development with predicted baseline (including Kirkan). Nacelle lighting for turbines 1, 4, 7 and 9.

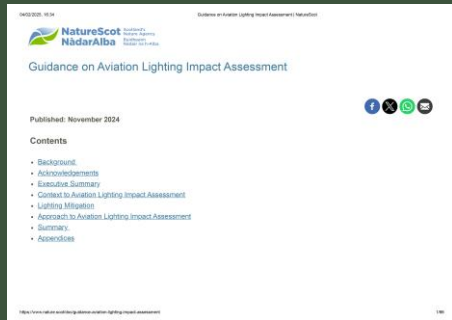
OS reference:	231283 E 972275 N	Horizontal field of view:	53.5° (planar projection)	Camera:	Canon EOS 80
Eye level:	261.2 m AOD	Principal distance:	812.5 mm	Lens:	EF50mm f/1.4 USM
Direction of view:	129.31°	Paper size:	641 x 297 mm (half A1)	Camera height:	1.5 m
Nearest turbine:	14.10 km	Correct printed image size:	820 x 260 mm	Date and time:	04.12.2024 8:05

View flat at a comfortable arm's length

DRAFT

Figure: 7.40
Viewpoint 25: A835, Loch Glasarnoch
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Checklist



- Understanding and applying the Guidance
- Applying a mitigation hierarchy approach to eliminate unnecessary lighting
- Working with Aviation Consultant to achieve reduced lighting scheme
- Applying best technology/ products that minimise unwanted light – benefits of dimming/ vertical mitigation
- Committing to retrofit ADLS in circumstances that justify it.



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