



Parc Ynni Calon y Gwynt

ENVIRONMENTAL STATEMENT

Appendix 14A: Reduced Lighting Scheme Proposal





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WSP

1 Capital Quarter

Tyndall Street

Cardiff

CF10 4BZ

Phone: +44 2920 769 200

WSP.com



Proposal

Windfarm Reduced Lighting Scheme Proposal

Parc Ynni Calon Y Gwynt

Prepared for: Parc Ynni Calon Y Gwynt Cyf

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Executive Summary

Straten Consulting Services Ltd (Straten CSL) has been commissioned by Parc Ynni Calon y Gwynt Cyf (PYCGC) to prepare a Reduced Lighting Scheme Proposal in support of the Development of National Significant (DNS) application for the Calon y Gwynt Energy Park. The proposed development comprises up to eleven wind turbines, ten with a maximum tip height of 200 m AGL and one with a maximum tip height of 180m AGL, located approximately 2.7 km north of Clatter in Powys, mid-Wales.

In accordance with Article 222 of the Air Navigation Order 2016 (ANO), wind turbines with a maximum blade tip height at or above 150 m above ground level are required to carry medium intensity (2,000 candela) steady red aviation warning lights. The purpose of this proposal is to seek UK Civil Aviation Authority (CAA) approval for a reduced lighting scheme that substitutes full perimeter lighting with a cardinal four-turbine configuration, supplemented by infrared (IR) lighting on all turbines in compliance with Ministry of Defence (MoD) specifications.

The proposed scheme designates turbines T1, T5, T7, and T10 as the cardinal lit turbines (east, south, west, and north respectively), each fitted with 2,000 candela medium intensity steady red lights capable of dimming to 10% of peak intensity (200 candela) when horizontal meteorological visibility exceeds 5 km. This is consistent with the provisions of DAP Policy 124 (Lighting of Onshore Wind Turbine Generators, June 2017). All eleven turbines will additionally carry IR lighting to the MoD Obstruction Lighting Guidance specification (January 2020), ensuring conspicuity for night-vision equipped military, police, HEMS, and SAR operations.

A safety assessment has been conducted comparing the baseline environment against the proposed lighting configuration. The assessment concludes that the risk to Visual Flight Rules (VFR) night operations is not materially altered by the reduced scheme. The site is located within the minimum altitude area of 4,100 ft (UK AIP ENR 6-81), requiring compliant VFR aircraft to operate at a minimum of 4,500 ft — well above the maximum turbine tip elevation of approximately 2,157 ft AMSL. The probability of VFR night flight over the site is assessed as low, given the remote, high-terrain environment adjacent to the Eryri (Snowdonia) Dark Sky Reserve, the limited density of general aviation operations, and the pre-planning requirements applicable to both civil and special mission flights.

The reduced lighting scheme is further supported by the site's proximity to visual receptors such as residential dwellings, settlements and the Eryri (Snowdonia) National Park Dark Sky designation. The proposed scheme would serve to reduce the level of adverse impact on the dark sky environment without increasing the risks to aviation safety.

Key Highlights

- Cardinal four-turbine lighting scheme (T1, T5, T7, T10) proposed in lieu of full perimeter lighting, reducing light intrusion whilst maintaining adequate obstacle conspicuity.
- Dimming provision to 200 candelas when visibility exceeds 5 km, consistent with CAA policy.
- IR lighting on all eleven turbines providing full conspicuity for NV-equipped special mission aircraft.

- Safety assessment confirms no material change to the risk environment for night VFR operations.
- Minimum VFR altitude of 4,500 ft provides vertical clearance of approximately 2,343 ft above the highest turbine tip.

Site adjacency to visual receptors supports the case for minimising unnecessary artificial lighting.

PYCGC respectfully requests that the CAA approve the Reduced Lighting Scheme as set out in this proposal.

1 Introduction

1.1 General

Parc Ynni Calon y Gwynt (the ‘Proposed Development’) is being developed by Parc Ynni Calon y Gwynt Cyf (PYCGC) and is located 2.7 km to the north of Clatter in mid-Wales and in the administrative area of Powys County Council.

The Proposed Development comprises of up to eleven wind turbines each with an anticipated capacity of between 6.8 – 7.2 megawatts (MW), battery energy storage system (BESS) and associated infrastructure.

1.2 Location

The location of the proposed development is depicted in Figure 1.



Figure 1: Site Location

In terms of aviation infrastructure, the proposed development is located near the following airports (Figure 2):

- 75km southwest of Hawarden
- 60km west of RAF Shawbury
- 22km west of Welshpool
- 128km north of Cardiff
- 97km southeast of RAF Mona
- 89km east of West Wales



Figure 2: Site in Relation to Aerodromes

1.3 Background

The UK Civil Aviation Authority (CAA) has issued a Policy Statement regarding the lighting of onshore windfarms. This guidance specifically applies to wind turbine generators in the United Kingdom with a maximum blade tip height at or above 150 metres Above Ground Level, as outlined in DAP 124.

According to statutory requirements detailed in Article 222 of the UK Air Navigation Order 2016, the lighting of en-route obstacles must be implemented. In the context of the proposed development, the turbines are classified as en-route obstacles due to their location.^[3]

Article 222 of the Air Navigation Order requires medium intensity (2000 candela) steady red aviation warning lights to be mounted as close as possible to the top of the structures (at and above 150m). The Article expands further on the exact positioning in relation to turbines including intermediate lighting requirements, of lower intensity (32 candela).

The purpose of lighting of tall obstacles is for aviation safety; lit obstacles permit a pilot to identify tall structures from a distance and permit sufficient time to safely adjust direction and/or altitude of the aircraft.

The UK, in compliance with International Civil Aviation Organisation (ICAO) Standards and Recommended Practices (SARPS), sets out the Rules of the Air¹ contained in the Air Navigation Order (ANO).

The UK CAA sets out the requirements of Standardised Rules of the Air (SERA) which is contained in Commission Implementing Rule (EU) No 923/2012 as retained and amended in UK domestic law which applies to every aircraft operating in UK airspace regardless of type or state of registration.

Flights operate under Visual (VFR) or Instrument (IFR) flight rules. For the purpose of this document, only VFR applies. The minimum altitude for IFR aircraft, within the area of the proposed development, provides adequate vertical clearance of obstacles and is therefore not under consideration.

Section 5 of the SERA regulations contain the applicable requirements for VFR aircraft. The general rule for maintaining VFR is that the flight is flown “*clear of cloud and in sight of the surface.*” There are technical criteria contained within SERA.5005 with specific information to visibility and weather conditions.

VFR flights by night are not permitted by all ICAO Contracting States, provision is provided in the UK under SERA.5005 (c) as detailed below:

“(c) When so prescribed by the competent authority, VFR flights at night may be permitted under the following conditions:

- (1) if leaving the vicinity of an aerodrome, a flight plan shall be submitted in accordance with SERA.4001(b)(6);*
- (2) flights shall establish and maintain two-way radio communication on the appropriate ATS communication channel, when available;*
- (3) the VMC visibility and distance from cloud minima as specified in Table S5-1 shall apply except that:*
 - (i) the ceiling shall not be less than 450 m (1500 ft);*
 - (ii) the reduced flight visibility provisions specified in Table S5-1(a) and (b) shall not apply;*
 - (iii) in airspace classes B, C, D, E, F and G, at and below 900 m (3000 ft) AMSL or 300 m (1000 ft) above terrain, whichever is the higher, the pilot shall maintain continuous sight of the surface; and*
 - (iv) Provision repealed before document was retained.*
 - (v) for mountainous area, higher VMC visibility and distance from cloud minima may be prescribed by the competent authority.”*

In addition, SERA.5005 (c) (5) provides minimum altitude criteria as follows:

¹ ICAO Annex II, Rules of the Air (as amended).

(5) except when necessary for take-off or landing, or except when specifically authorised by the competent authority, a VFR flight at night shall be flown at a level which is not below the minimum flight altitude established by the State whose territory is overflown, or, where no such minimum flight altitude has been established:

- (i) over high terrain or in mountainous areas, at a level which is at least 600 m (2000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft;*
- (ii) elsewhere than as specified in i), at a level which is at least 300 m (1000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft.*

In summary, an aircraft may not fly low-level, and in close proximity of a windfarm. CAP1535, The Skyway Code², published by the CAA provides further guidance to pilots in terms of pre-flight preparation and planning routes for selecting the appropriate cruising altitude.

In summary, aviation regulations contained within SERA and guidance material contained with the Skyway Code ensure that an aircraft will remain clear of obstacles and terrain (as published) to reduce the risk of an airborne conflict. Obstacles, 150m and above, are lit to enhance safety, in addition they are required to be published in the Aeronautical Information Publication (AIP) and on aeronautical charts.

² CAP1535, The Skyway Code, version 4, dated November 2023.

2 Environmental Assessment

2.1 Wind Turbine Layout

The proposed development consists of 11 wind turbines, coordinates set out in Table 1 and the layout depicted in Figure 3.

Turbine	Tip Height	Lat.	Long.
T1	200m	52.568777	-3.4563463
T2	200m	52.569434	-3.4635687
T3	200m	52.568483	-3.4721539
T4	200m	52.571996	-3.4737177
T5	200m	52.56768	-3.4845948
T6	200m	52.571045	-3.4864939
T7	180m	52.575306	-3.4880400
T8	200m	52.577465	-3.4792583
T9	200m	52.577964	-3.4716894
T10	200m	52.583343	-3.4715154
T11	200m	52.577571	-3.4620393

Table 1: Wind Turbine Coordinates



Figure 3: Wind Turbine Layout

2.2 Proposed Layout

The proposed lighting scheme is a 'Cardinal' format of lighting turbines to the north, south, east and west of the windfarm layout. Turbines T1, T5, T7, and T10 will be lit with aviation lighting as depicted in Figure 4.

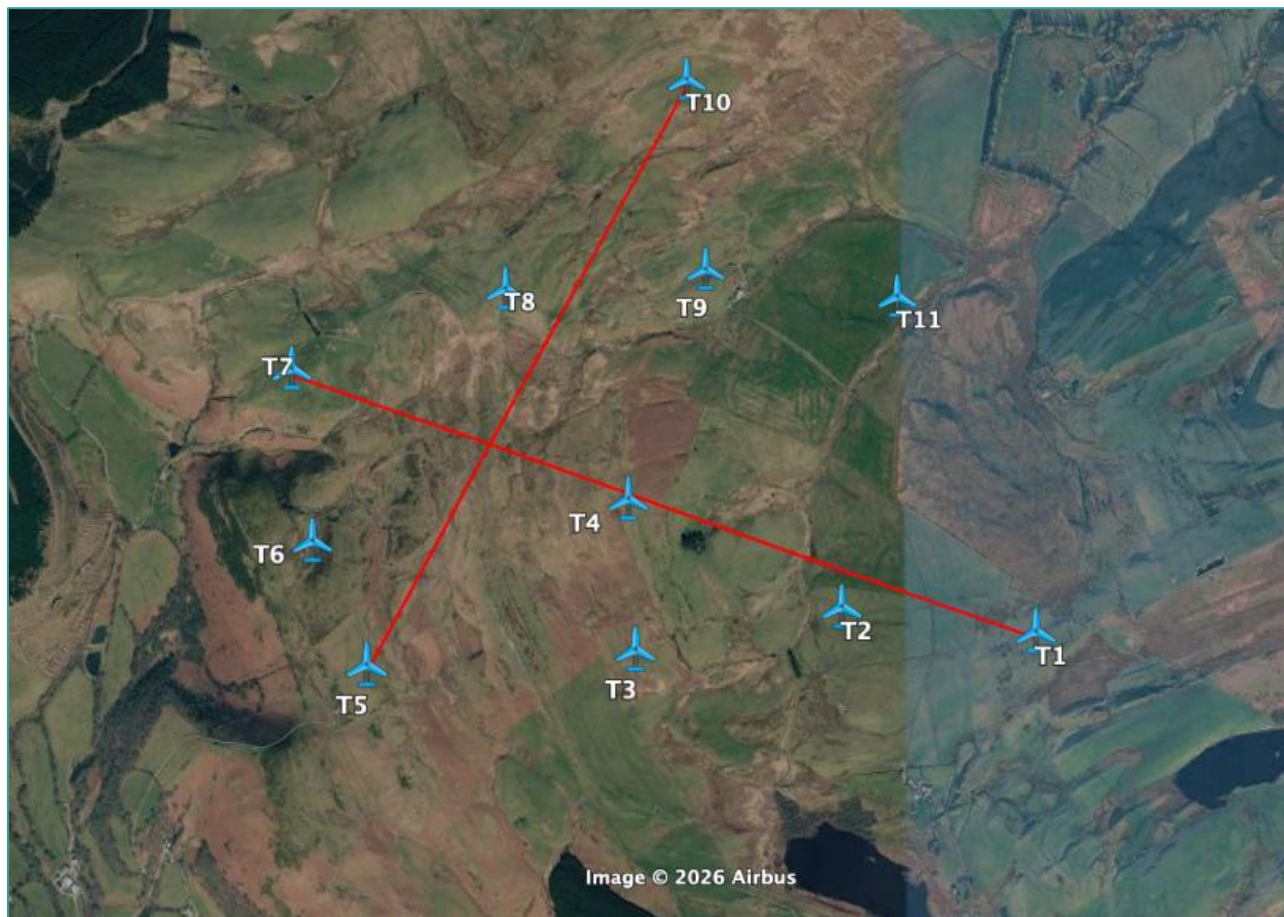


Figure 4: Proposed Cardinal Lighting Scheme

The four turbines will be lit with medium intensity (2000 candela (cd)) red lights positioned as close as practicable to the top of the fixed structure and fitted to show when displayed in all directions without interruption.

It is further proposed, and requested, that the lighting scheme is reduced to no less than 10% of the minimum peak intensity, i.e., 200cd, when the horizontal meteorological visibility in all directions, from each turbine generator, exceeds 5km. This request is in line with DAP Policy 124: Lighting of Onshore Wind Turbine Generators, issued 01 June 2017.

In addition to the CAA lighting for onshore wind turbines, each turbine will be fitted with infrared lighting as per the MoD's [guidance](#) issued 01 January 2020 under Appendix 1.

The reason for this request is that the area consists of high terrain, which could be considered mountainous, and it is in proximity to visual receptors such as residential dwellings, settlements and the Eryri (Snowdonia) National Park Dark Sky Reserve.

As this affects VFR flights at night, the ability for an aircraft to “*remain within sight of ground*” and therefore remain in compliance with VFR would be challenging, and it is highly unlikely for a pilot to reasonably fly in a safe manner and in accordance with the law.

The lowest available altitude, as published in the UK Aeronautical Information Publication³ (AIP), is 4,100ft. Figure 5 provides the proposed development (red circle) contained within an area depicted with 41, this indicates a minimum altitude of 4,100ft.

As aircraft fly at intervals of 500ft, and in accordance with the UK noted cruising levels⁴, the lowest available altitude for VFR flight (day and night), in the area of the proposed development, shall be conducted at 4,500ft.

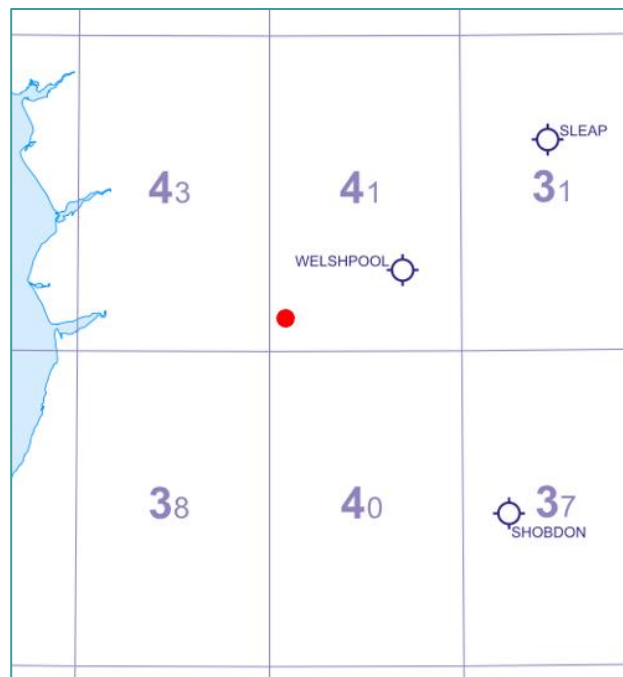


Figure 5: ENR 6-81 UK Area Minimum Altitudes (AMA) with Site Location

The addition of 200m (657ft) turbines results in the highest tip elevation of 2,157ft (based on highest wind turbine T8). The minimum flying altitude, at night, for a VFR would be 2,157ft + 2,000ft = 4,157ft.

Therefore, there is no impact to the first available minimum VFR altitude by day or night of 4,500ft.

For aircraft operating below SERA levels, where permitted, all turbines will be fitted with IR lighting.

Further examination of the layout is examined further and includes additional diagrams to support this proposal.

The distances⁵ between the proposed lit cardinal points are as follows:

North (T10) to West (T7) = 1,458m

West (T7) to South (T5) = 885m

³ UK AIP, ENR 6-81 UK Area Minimum Altitudes (AMA)

⁴ UK AIP, ENR 1.2 Visual Flight Rules, Section 6 Tables of Cruising levels.

⁵ Distances are estimates and rounded up.

South (T5) to East (T1) = 1,918m

East (T1) to North (T10) = 1,911m

The distances between the perimeter turbines are as follows:

Turbine A	Turbine B	Distance (metres)
T1	T11	1,034
T11	T10	905
T10	T8	837
T8	T7	673
T7	T6	505
T6	T5	395
T5	T3	768
T3	T1	1,148

Table 2: Wind Turbine Distances

To provide some perspective of the windfarm layout and expected visibility of the turbines, indicative visualisation diagrams are provided with approaches from the North, South, East and West. The purpose of this exercise is to demonstrate that terrain is not causing any obstruction to the windfarm.

The diagrams provide turbines extending to the tip height of 200m above ground level with views taken at approximately 500ft above ground level at a distance of one mile from the nearest wind turbine. It should be noted that these elevated, indicative viewpoints have been produced to support the understanding of proposed Reduced Lighting Scheme, and do not represent formal Landscape and Visual Impact Assessment (LVIA) visualisations.

The red dot represents the cardinal lit wind turbines. The remaining wind turbines will be lit with infra-red lighting only but not represented in the diagrams. The red dots shown are included for clarity to indicate those turbines proposed to be fitted with aviation lighting under the proposed Reduced Lighting Scheme. These markers are for illustration purposes only, and do not represent the appearance, intensity, colour, visibility or operational characteristics of aviation lighting in practice.



Figure 6: One Mile East of T1

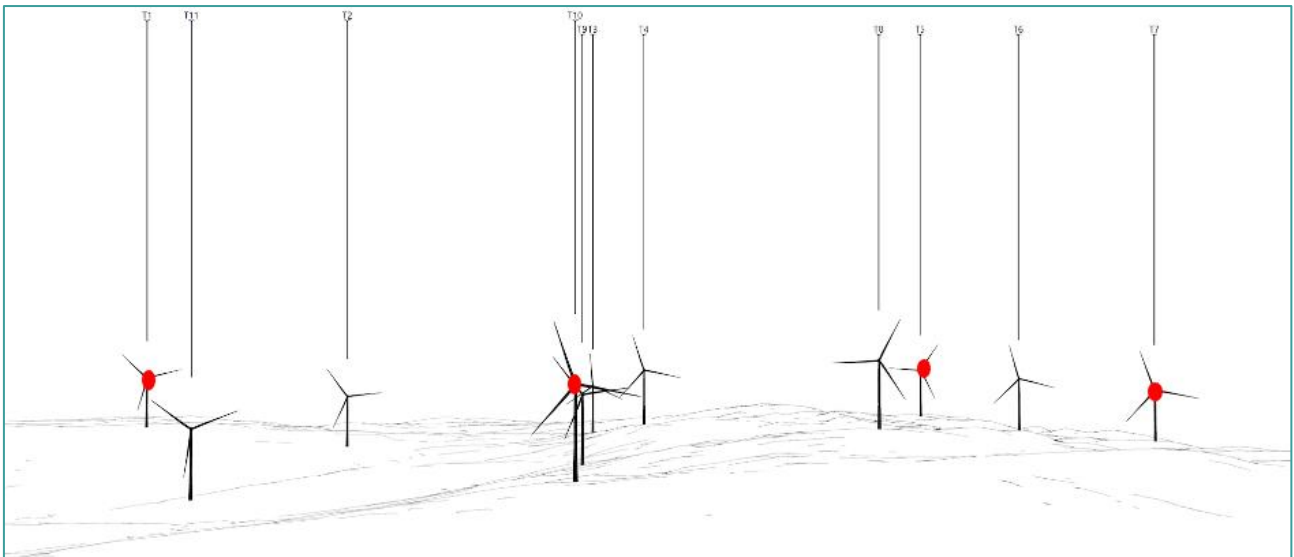


Figure 7: One Mile North of T10

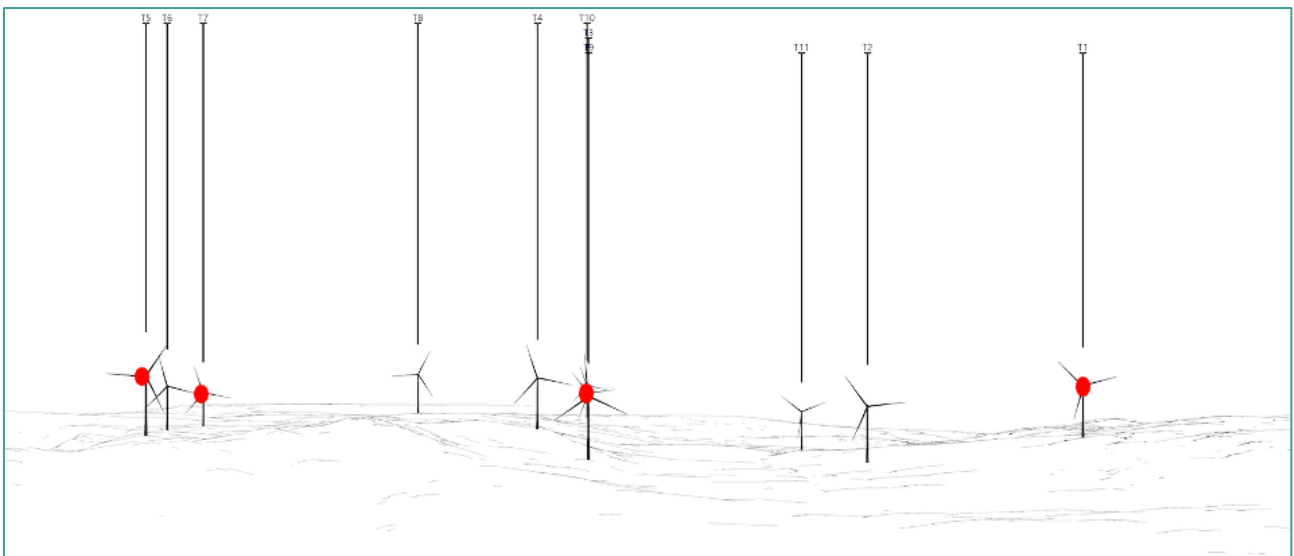


Figure 8: One Mile South of T3

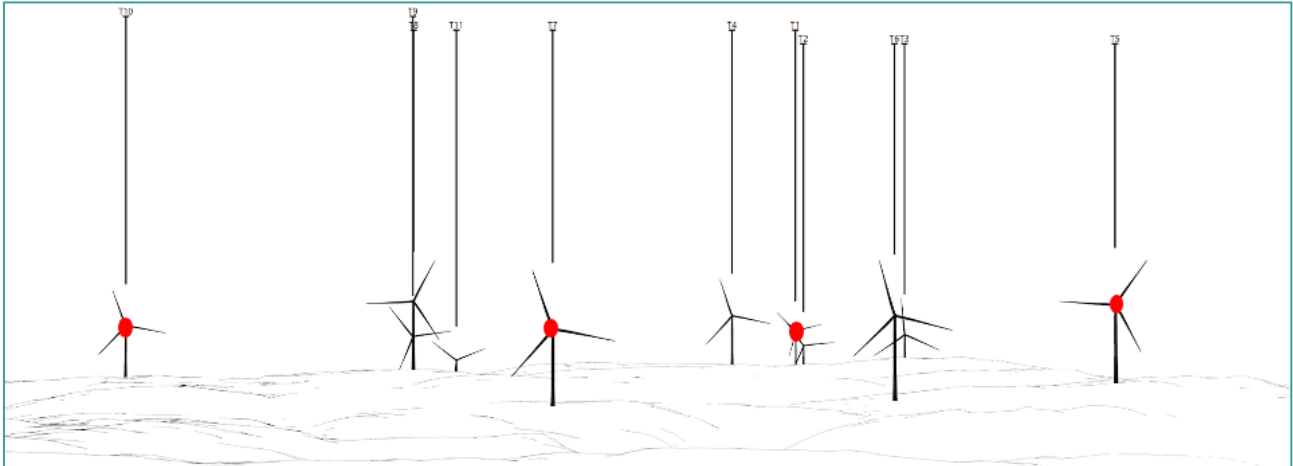


Figure 9: One Mile West of T7

2.3 Proposed Lighting Scheme

Following the assessment of the environment with the proposed lighting scheme layout, PYCGC requests the following:

- Medium intensity steady red (2000 candela) lights on the nacelles of turbines T1, T5, T7 and T10 forming a cardinal layout;
- 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 noting that both lights will not be lit at the same time;
- The lights on these turbines to be capable of being dimmed to 10% of peak intensity when the lowest visibility as measured at a suitable point around the wind farm by one or more visibility measuring devices exceeds 5km;
- Removal of the requirement for intermediate level 32 candela lights; and
- All turbines will be fitted with Infra-Red as per MOD specification.

3 Safety Assessment

A basic safety assessment has been undertaken to best understand the safety implications of the current environment (baseline) versus the environment with the windfarm lit to a cardinal layout and reduced lighting.

Scenario	Risk Severity	Risk Likelihood	Result
Baseline (No wind turbines)	Flight conducted with no emergency at minimum altitude – risk = negligible. Controlled Flight into Terrain (CFIT) is unlikely due to compliance with minimum altitude. Flight experiencing an emergency – risk = Catastrophic. Police/MOD/HEMS/SAR	Based on average incident rates, the likelihood of an emergency event occurring is remote. However, the likelihood of a catastrophic event occurring as a result of an emergency requiring a successful landing in the undulating environment in a dark environment is Frequent. These flights are flown with Night Vision (NV) capability.	Non-emergency Acceptable risk Emergency Unacceptable
Proposal (With wind turbines – reduced lighting)	Flight conducted with no emergency at minimum altitude – risk = negligible. Controlled Flight into Terrain (CFIT) is unlikely due to compliance with minimum altitude. Flight experiencing an emergency – risk = Catastrophic. Since the risk is at maximum risk severity, an aircraft accident as an uncontrolled flight into terrain environment with or without turbines remains the same. Police/MOD/HEMS/SAR	Based on average incident rates, the likelihood of an emergency event occurring is remote. However, the likelihood of a catastrophic event occurring as a result of an emergency requiring a successful landing in the undulating environment in a dark environment is Frequent. The only additional consideration is the likelihood of an aircraft accident into terrain versus the likelihood of colliding with turbines. In this case, there are very few reported incidents in relation to flights into turbines versus terrain. It is therefore considered the likelihood can be no more likely than for flight into terrain. The turbines are published and lit with Infra-Red lights on all turbines with additional visible lighting on four turbines. This will result in highlighted visibility for NV flights.	Non-emergency Acceptable risk Emergency Unacceptable

Table 3: Risk Severity Matrix

The application of safety principles to risk related to probability and severity of an event as no change to the existing environment. Application of the UK CAA Hazard Log template⁶ Risk Tolerability table results in the review in Table 3.

In each case, a flight at night in an area characterised by conspicuous peaks and ridges. No natural light permitting identification of high and low ground, vegetation and outcrop areas.

In summary, there is no change to the safe operation of night flights in this environment.

⁶ Available on the UK CAA website, Safety Management Systems at <https://www.caa.co.uk/safety-initiatives-and-resources/working-with-industry/safety-management-systems/safety-management-systems/>.

Descending to low altitudes, below the published minimum safe altitudes, in an undulating/mountainous area at night requires some form of pre-planning and detailed knowledge of the area.

In the case of the MOD, tactical training events are not ad-hoc, these are planned with briefings prior to getting airborne.

In the same manner, search and rescue also undertakes extensive planning of search areas before flights are undertaken, this is to ensure search time is used effectively as time is critical to rescue missions.

The area is not densely populated, and not an extreme mountainous area therefore unlikely to lend itself in an area where rescue operations are frequently required.

4 Conclusion

By implementing this reduced lighting scheme, PYCGC ensures aviation safety, reduces impacts on visual receptors and designations, and sets the standard for sustainable wind farm developments. PYCGC respectfully requests that the CAA to approve this proposal, which prioritises both public safety and environmental stewardship.

The justification for the proposal is as stated under the requirements of SERA.5005 whereby there are sufficient fail-safes within the planning and operating of a flight at night in clear weather conditions.

VFR flights may not operate in reduced weather conditions; however, the proposal considers the potential situation whereby the weather environment closes in quickly on a pilot thereby enhancing safety with the proposed lighting scheme proposal.

The proposed development falls adjacent to the Eryri (Snowdonia) National Park Dark Sky Reserve, an officially designated Dark Sky place.

Flying at night, in a Dark Sky environment would make complying with VFR by Night very difficult if not impossible to achieve. Pilots wishing to fly VFR by night should plan the flight with safety as the primary concern, flying over a mountainous and remote area by night does not provide a pilot with the appropriate fail-safes in the event of an emergency.

CAA policy and guidelines set out the minimum requirements for VFR flight by night together with minimum safe altitudes. It remains the pilot's responsibility to comply with policy and adhere to guidelines. A small, single engine aircraft should consider the possibility of a single-engine failure requiring a safe landing. Flying over the area of the Proposed Development, in proximity to the Eryri (Snowdonia) National Park Dark Sky Reserve at night, a Dark Sky place, does not provide a pilot any possibility to carry out a safe emergency landing.

In addition, the review of airfields in the area indicates a very little in terms of available airfields or in fact a high volume of general aviation flying. All indications are that it is a remote area, which may at the most attract flights from the nearest, established airports. Operations from these airports, nearest being Welshpool (22km) and Shobdon (55km), would require significant flight pre-planning given the distance to fly, number of available diversion airfields and the inclement weather conditions this area is known for.

Therefore, the probability of VFR nighttime flight taking place over the proposed development is highly unlikely.

The consideration of Police, MOD, HEMS and SAR includes the operation of Infra-Red lighting as these flights operate with NV capability.

The safety review has indicated that the risk presented to aircraft operations would be no different than what is experienced today without the turbines.

A pilot undertaking a risk assessment for any type of flight (VFR, emergency or training) at night over a dark sky area without opportunity for an emergency landing must consider the undertaking of such a flight as

unacceptable in the first instance. The publication and lighting of the turbines provide sufficient mitigation to maintain the risk environment to no less than what is experienced today.

Notwithstanding the decision for civilian lighting requirements, it is the intention of PYCGC to install MOD infra-red lighting requirements as per the required specification.



1 Capital Quarter
Tyndall Street
Cardiff
CF10 4BZ

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