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APPENDIX 5-9

LIGHTING AND MARKING PLAN



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1.

SCEIRDE ROCKS LIGHTING AND MARKING PLAN

1.1 Introduction

Anatec was commissioned by Fuinneamh Sceirde Teoranta (hereafter 'the Applicant') to undertake a Lighting and Marking Plan (LMP) for the proposed Sceirde Rocks Windfarm (hereafter 'the Project'), which consists of the Offshore Array Area and Offshore Export Cable Corridor.

The marine and aviation lighting and marking schemes are based on the relevant guidance and recognised industry standards as set out in Section 1.2. The construction and operations and maintenance phases are considered, noting that any requirements for the decommissioning phase will be determined in agreement with relevant stakeholders and based on the relevant guidance at the time of decommissioning.

11.1 **Project Description**

The Offshore Array Area is located approximately 2.6 nautical miles (nm) west of the Galway coast and covers an area of approximately 10.9 square nautical miles (nm²). Charted water depths within the site range from Skerd rocks to 55 metres (m) below Chart Datum (CD).

Up to 31 surface structures will be installed within the Offshore Array Area, consisting of up to 30 Wind Turbine Generators (WTGs) and one Offshore Substation (OSS).

The proposed layout has been considered in this LMP which represents the maximum spatial area and maximum number of structures noting further micro siting may be required. The proposed layout is presented in Figure 1.





Figure 1 Proposed Layout



1.2 **Guidance**

This section summarises guidance that has been adhered to in this LMP in relation to both marine and aviation aspects.

Primary guidance for marine lighting and marking is the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162 (IALA, 2021).

Primary guidance for aviation obstruction lighting is the Irish Aviation Authorities (IAA) Guidance Material on Off-Shore Wind Farms, Aeronautical Services Advisory Memorandum (ASAM) No 18. Issue 2 (IAA, 2015).

Consideration of relevant United Kingdom (UK) guidance where appropriate, notably Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 and Annexes (MCA, 2021) has also been made, noting that key stakeholders have indicated UK guidance should be applied in lieu of equivalent Irish guidance, which at the time of writing (May 2024) is undergoing public consultation with a final version to be published at a later date.

Industry standards of relevance to lighting and marking of offshore wind farms applied in the UK have also been considered and applied where necessary, noting the guidance detailed below has taken precedence.

1.2.1 Marine

The marine navigation lighting and marking detailed in Section 1.3.1 and Section 1.4.1 follows the following guidance documents:

- IALA Recommendations O-139 on the Marking of Man-Made Offshore Structures (IALA, 2021) and Guidance G1162 on the Marking of Man-Made Offshore Structures (IALA, 2021).
- The IALA Maritime Buoyage System R1001 (International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), 2018).
- MGN 654 Offshore Renewable Energy Installations (OREIs) Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021).

1.2.2 Aviation

The aviation lighting and marking including in relation to Search and Rescue (SAR) is detailed in Section 1.3.2 and 1.4.2 and follows the requirements set out in the following guidance documents:

- Civil Air Publication (CAP) 437 Standards for Offshore Helicopter Landing Areas (Civil Aviation Authority (CAA), 2021).
- > CAP 764 Policy and Guidelines on Wind Turbines (CAA, 2016).
- > IAA Guidance Material on Off-Shore Wind Farms (IAA, 2015).
- Statutory Instrument. (S.I.) No. 215/2005 IAA (Obstacles to Aircraft in Flight) Order, 2005 (IAA, 2005).
- MGN 654 Offshore Renewable Energy Installations (OREIs) Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021) in particular, SAR Annex 5: Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MCA, 2024).

UK Civil Aviation Authority (CAA) guidance has also been referenced where relevant noting it is referenced within MGN 654 (MCA, 2021); the IAA guidance is applied on a primary basis.



1.3 Construction Phase

This section describes the marine (Section 1.3.1) and aviation (Section 1.3.2) lighting and marking to be implemented during the construction phase.

1.3.1 Marine

The marine lighting and marking to be implemented during the construction phase is summarised in Table 1 which also includes a guidance column, listing the relevant guidance / stakeholder for each lighting and marking aspect where appropriate, noting that the guidance provides the full proposed technical specifications.

Figure 2 sets out the extent of the construction buoyage area for the Project. Construction buoyage shall be established eight weeks prior to the Project commencing construction to allow time for passing traffic to familiarise with the buoyed construction area, noting this is in accordance with best practice.

It is anticipated there will be no more than 10 buoys deployed to mark the indicative construction buoyage area. The buoyage shall remain in place until the operational marking requirements have been installed, then inspected and passed by Irish Lights. Precise buoyage locations will be as directed by Irish Lights.

The Applicant will seek statutory sanction from Irish Lights in advance of the establishment, alteration, or removal of any Aid to Navigation (AtoN).



Table 1 Construction Phase Marine Lighting and Marking

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Temporary construction lighting	All structures	All surface piercing structures will be marked with a temporary light during construction and until operational lighting is commissioned. The temporary construction lights will have the following specification: Yellow 2.5 second (s) flash At least 2 nautical mile (nm) range 360° visibility	Industry Standard
Construction buoyage	Marking periphery of Offshore Array Area (anticipated no more than 10 buoys required)	 The Offshore Array Area construction area will be marked with a mixture of cardinal and special marks, as directed by Irish Lights. The construction buoyage will have the following specification: Lighting colour and sequence as per standard buoy requirements At least 5nm range Some buoys may require Automatic Identification System (AIS) transmitters Buoys will be located no closer than 500 metres (m) to a surface piecing structure 	UK industry standard IALA R1001 – The IALA Maritime Buoyage System (IALA, 2017)





Figure 2 Overview of Construction Buoyage Area



1.3.2 Aviation

There will be no specific aviation lighting and marking implemented during the construction phase; however, relevant information on the Project will be provided to aviation stakeholders. In particular, as required under S.I.215 (IAA, 2005), the IAA will be notified of any enroute obstacles (including mobile cranes) above 45m in height, giving at least 30 days' notice.

The following details will be provided:

- > Geographic latitude;
- > Geographic longitude;
- > Elevation; and
- > Height.

In line with ASAM No 18 (IAA, 2015), at least three months in advance of the installation of structures, the following information will be supplied to the IAA:

Positional data representing the estimated position of each machine or structure (WTGs and OSS) to be erected. The geodetic datum to which all obstructions shall be referred is the World Geodetic System 1984 (WGS84). Coordinates will be provided in degrees, minutes, seconds and decimals of a second, as appropriate;

- > The estimated maximum elevation of each structure (WTG and OSS) in feet and metres;
- > Proposed lighting details for each structure;
- Proposed marking details for each structure;
- > Whether it is proposed that a Radar enhancer/ transponder/ reflector or Radar/ AIS is fitted;
- Minimum and maximum spacing between structures (WTGs and OSS);
- > Planned earliest date of erection; and
- Any other information considered relevant for air navigation.

1.4 Operations and Maintenance Phase

This section presents the marine (Section 1.4.1) and aviation (Section 1.4.2) lighting and marking to be implemented during the operation and maintenance (O&M) phase.

1.4.1 Marine

The marine operational lighting and marking to be implemented are summarised in Table 2. These include a guidance column listing the relevant guidance/stakeholder for each lighting and marking aspect where appropriate, noting that this guidance provides the full technical specifications required by the relevant stakeholders. The proposed marine lighting and marking is then illustrated in Figure 3.

The Applicant will seek statutory sanction from Irish Lights in advance of the establishment, alteration, or removal of any AtoN. It was raised during consultation with Irish Lights that a cardinal mark may be necessary during the operations and maintenance phase to assist with navigation for nearby routeing vessels. Again, any requirements for this will be agreed with Irish Lights prior to commissioning.

1.4.1.1 Failure of Marine Lighting

The Applicant will ensure that appropriate redundancy and / or back up capability is utilised to ensure the appropriate IALA availability categories as set out in Table 2 are met. In the event of a significant



loss of an AtoN such that a significant risk to navigation is considered likely to occur, consultation shall be undertaken with Irish Lights, Irish Coast Guard (IRCG), and the Marine Survey Office (MSO) to determine the need for any additional mitigation which may include promulgation of navigational warnings, deployment of temporary AtoNs or use of a guard vessel.



Table 2 Operation and Maintenance Phase Marine Lighting and Marking

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Marine AtoN - Significant Peripheral Structures (SPS)	Selected peripheral structures, noting not all peripheral structures will carry marine AtoN	 Marine lights marking selected periphery WTGs as required under IALA. The SPSs will have the following specification: Yellow 5s flash *Not specified in IALA but UK best practice At least 5nm range 360° visibility Synchronised Located not less than 6m and not more than 30m above Highest Astronomical Tide (HAT) At least IALA Category 2 Selected structures may require AIS transmitters 	IALA G1162 (IALA, 2021) Industry Standard
Marine AtoN - Intermediate Peripheral Structures (IPS)	Selected peripheral structures not already marked as SPSs, noting not all peripheral structures will carry marine AtoN	 Marine lights marking selected periphery WTGs as required under IALA. The IPSs will have the following specification: Yellow 2.5s flash *Not specified in IALA but UK best practice At least a 2nm range 360° visibility Synchronised Located not less than 6m and not more than 30m above HAT and below the lowest point of any arc of rotor blades IALA Category 2 At least 96 hours back up/ UPS capability. 	IALA G1162 (IALA, 2021) Industry Standard
Sound signals	Selected SPSs	The sound signals will have the following specification: Blast every 30s lasting 2s At least 2nm range 	IALA G1162 (IALA, 2021) Use as directed by Irish Lights.





Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
		 360° audibility Each WTG with a sound signal installed will also have to have a visibility meter / detector Located not less than 6m and not more than 30m above HAT IALA Category 3 	
AIS	Selected SPSs	At least IALA Category 3. To be defined by Irish Lights.	IALA G1162 (IALA, 2021).
ID marker boards	All structures	 ID system will be agreed with Irish Lights and IRCG, under IALA requirements: ID panels with black letters on yellow background Letters 1m high Visibility in all directions Use of either illumination or retroreflective material, noting any illumination will be hooded/ baffled to avoid confusion with AtoN 	IALA G1162 (IALA, 2021). Industry Standard
WTG paint	All WTGs	Foundations painted yellow (RAL 1023) all round from HAT to a height of at least 15m above HAT Remainder of structures painted light grey (RAL 7035)	IALA G1162 (IALA, 2021) Industry standard
OSS Paint	OSS	Foundations painted yellow (RAL 1023 or similar) all round from HAT to a height of at least 15m above HAT Remainder of structures painted light grey (RAL 7035 or similar) excluding topside structures such as work cabins, cranes, etc	IALA G1162 (IALA, 2021) Industry standard





Figure 3 Operational Marine Lighting



1.4.2 **Aviation**

The aviation operational lighting and marking to be implemented are summarised in Table 3. These include a guidance column listing the relevant guidance/stakeholder for each lighting and marking aspect where appropriate, noting that this guidance provides the full technical specifications required by the relevant stakeholders. The proposed aviation lighting and marking is then illustrated in Figure 4.

The key applicable IAA guidance is ASAM No 18 (IAA, 2015) which provides aviation lighting requirements for offshore wind farms.

1.4.2.1 Failure of Aviation Lighting

ASAM No 18 (IAA, 2015) states that "any light which fails shall be repaired or replaced as soon as is reasonably practicable. An alerting system for light failure will be put in place, such as remote monitoring or other suitable method agreeable to the IAA". Appropriate maintenance and reporting procedures will therefore be discussed and agreed with the IAA.



Table 3 Operation and Maintenance Phase Aviation Lighting and Marking

Lighting and Marking Aspect	Relevant Structures	Specification	Relevant Guidance or Stakeholders Requirements
Hazard warning lights	All peripheral structures	 In accordance with the International Civil Aviation Organisation Annex 14 standards, on a 24-hour basis, for High Intensity Type A lighting will be required. The hazard warning lights will have the following specification: Mounted on the highest point practicable of the structure White with flash rate of 40-60 flashes per minute Effective intensity of: 200,000 candela (cd) ± 25% when background luminance above 500cd per square metre (m²) 20,000cd ± 25% when background luminance between 50 and 500cd/m² At least 2,000 cd when background luminance below 50cd/m² Light fittings baffled so that practically no light will be emitted below the horizontal, or as otherwise agreed with the IAA All lights across the Offshore Array Area should flash in synchronisation and reductions in light intensity should occur simultaneously if practicable Visible through 360° in azimuth 	ASAM No 18 (IAA, 2015) IAA have indicated that there are potential intentions to align with the approach taken in the wider European Union (EU) or in the UK. Given that the upcoming guidance is understood to closely resemble MGN 654 (MCA, 2021) as detailed in Section 2, UK requirements for aviation lighting under Civil Aviation Authority (CAA) Civil Aviation Publication (CAP) 764 (CAA, 2016) are provided for reference in Appendix A.
SAR Lights	All Structures	 SAR lighting is an MCA requirement for UK projects under MGN 654. Specifications shown as per MGN 654: 200cd red light, steady when in use off otherwise 360° visibility 	MGN 654 (MCA, 2021) Industry Standard





Lighting and Marking Aspect	Relevant Structures	Specification	Relevant Guidance or Stakeholders Requirements
		 Compatible with Night Vision Imaging System (NVIS) 	
SAR Blade Markings	All Structures	 Specification under MGN 654: Red marks (preferably dots) at 10, 20 and 30m from hub end Displayed near trailing edge of blades Contrasting colour to blades, recommended red (RAL 3020) Minimum 600 millimetres (mm) in diameter however may need to be larger dependent on overall size, shape of WTG and blades Blade tip also marked in red (RAL 3020), approximately 2% of blade length 	MGN 654 (MCA, 2021) Industry Standard
Marine Identification Panels	All Structures	 Specification under MGN 654: Identification (ID) numbers will be marked on the WTG nacelle roofs ID system will be agreed with Irish Lights and IRCG Not less than 1.5m height, with proportional width 	MGN 654 (MCA, 2021) Industry Standard
Hoist area markings	Intended that standards under O	CAP 437 (CAA, 2023) will be applied, if agreed with IAA	





Figure 4 Operational Aviation Lighting



1.5 **Exclusions**

Other elements requiring consultation and not included within these principles include light locations and handrail/ladder painting. Additional lighting and marking such as down lighting on ladders and access platforms should not compromise the conspicuousness of AtoN.

Such additional lighting is not currently covered within this LMP.

2. **REFERENCES**

CAA (2016). The Air Navigation Order.

CAA (2016). CAP 764: Policy and Guidelines on Wind Turbines.

CAA (2023). CAP 437. Standards for Offshore Helicopter Landing Areas.

IAA (2005). S.I. No. 215/2005 - IAA (Obstacles To Aircraft in Flight) Order, 2005.

IAA (2015). IAA Guidance Material on Off-Shore Wind Farms, ASAM No 18, Issue 2.

IALA (2017). IALA R1001 - The IALA Maritime Buoyage System. Edition One.

IALA (2021). Recommendations O-139 on the Marking of Man-Made Offshore Structures.

IALA (2021). Guidance G1162 on the Marking of Man-Made Offshore Structures.

MCA (2021). MGN 654 (M+F) Offshore Renewable Energy Installations safety response. Southampton: MCA.

MCA (2024). MGN 654 SAR Annex 5: Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response. Southampton: MCA.



APPENDIX A - UK CAA AVIATION HAZARD LIGHTING REQUIREMENTS

Given that Irish offshore wind farm guidance closely resembles MGN 654 (MCA, 2021) but is not yet finalised, a summary of UK requirements for aviation hazard lighting under CAA CAP 764 (CAA, 2016) is detailed as follows:

- > Red 2,000cd light displayed at night¹.
- Dimmable to 200cd when visibility is greater than 5km at night.
- > Off during the day.
- > Synchronised flashing Morse 'W'².
- \rightarrow 360° visibility.
- > Compatibility with NVIS.
- > If agreed with CAA, lights located only on periphery structures. Such lighting, where achievable, shall be spaced at longitudinal intervals not exceeding 900m.
- > UPS of eight hours required to maintain all aviation warning lights³.

¹ Definition of night/day as per Air Navigation Order (CAA, 2016).

² Industry standard, from CAP 764: "To resolve concerns from the maritime community, work has been undertaken to develop an aviation warning lighting standard which is clearly distinguishable from maritime lighting. Where it is evident that the default aviation warning lighting standard (article 220) may generate issues for the maritime community, a developer can make a case, that is likely to receive CAA approval, for the use of a flashing red Morse Code Letter 'W' instead". ³ Not specified in CAP 764, but recognised as the industry standard and a CAA requirement.