



MORAY EAST


OFFSHORE WINDFARM

Lighting and Marking Plan

**Moray East Offshore Wind Farm and
Associated Offshore Transmission Infrastructure**

January 2021

Moray Offshore Windfarm (East) Limited

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List of Abbreviations

AC	Alternating Current
AIS	Automatic Identification System
AtoN	Aids to Navigation
BEIS	The Department for Business, Energy and Industrial Strategy
BOWL	Beatrice Offshore Wind Ltd.
CAA	Civil Aviation Authority
CMS	Construction Method Statement
CoP	Construction Programme
DGC	Defence Geographic Centre
DIO	Defence Infrastructure Organisation
DSLp	Development Specification and Layout Plan
ERCoP	Emergency Response Cooperation Plan
ES	Environmental Statement
HHS	Helicopter Hoist Status
ID	Identification
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IPS	Intermediate Peripheral Structure
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LAToN	Local Aid to Navigation
LMP	Lighting and Marking Plan
MCA	Maritime and Coastguard Agency
Met Mast	Meteorological Mast
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
Moray East	Moray Offshore Windfarm (East) Limited
NLB	Northern Lighthouse Board
nm	Nautical mile
NOTAM	Notice to Airmen
NVIS	Night Vision Imaging System
O&M	Operation and Maintenance
OFCOM	Office of Communications
OfTI	Offshore Transmission Infrastructure
OFTO	Offshore Transmission Owners
OMP	Operation and Maintenance Programme

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OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
SAR	Search and Rescue
SCADA	Supervisory control and data acquisition
SNH	Scottish Natural Heritage
SPS	Significant Peripheral Structure
SRO	Search and Rescue Operations
TI	Transmission Infrastructure
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
VMP	Vessel Management Plan
WTG	Wind Turbine Generator

Definitions

The following definitions have been used throughout this document with respect to the company, the consented wind farms and how these definitions have changed since submission of the Moray East Environmental Statement (ES) in 2012 and the Moray East Modified Transmission Infrastructure ES in 2014.

- **Moray Offshore Windfarm (East) Limited (formerly known as Moray Offshore Renewables Limited)** – the legal entity submitting this Lighting and Marking Plan (LMP);
- **Moray East Offshore Wind Farm** - the wind farm to be developed in the Moray East site (also referred as the Wind Farm);
- **The Moray East site** - the area in which the Moray East Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licences to develop and operate up to three generating stations on the Moray East site were granted in March 2014. At that time the Moray East site was known as the “Eastern Development Area (EDA)” and was made up of three sites known as the Telford, Stevenson and MacColl offshore wind farm sites; The Section 36 Consents and Marine Licences were subsequently varied in March 2018; with the Marine Licences additionally varied in July 2019, April 2020, October 2020 (MacColl) and November 2020 (Telford and Stevenson).
- **Telford, Stevenson and MacColl wind farms** – these names refer to the three consented offshore wind farm sites located within the Moray East site;
- **Transmission Infrastructure (TI)** - includes both offshore and onshore electricity transmission infrastructure for the consented Telford, Stevenson and MacColl wind farms. Includes connection to the national electricity transmission system near New Deer in Aberdeenshire encompassing AC (alternating current) offshore substation platforms (OSPs), AC OSP interconnector cables, AC export cables offshore to landfall point at Inverboyndie continuing onshore to the AC collector station (onshore substation) and the additional regional Transmission Operator substation near New Deer. A Marine Licence for the offshore TI was granted in September 2014 and a further Marine Licence for two additional distributed OSPs was granted in September 2017. Both Licences were subsequently varied in July 2019 and the Licence for the offshore TI was additionally varied in December 2020. The onshore TI was awarded Planning Permission in Principle in September 2014 by Aberdeenshire Council and a Planning Permission in Principle under Section 42 in June 2015. In June 2018 Aberdeenshire Council granted Approval of Matters Specified in Conditions for both the Cable Route and the Substation;
- **Offshore Transmission Infrastructure (OfTI)** – the offshore elements of the transmission infrastructure, comprising AC OSPs, OSP inter-connector cables and AC export cables offshore to landfall (for the avoidance of doubts some elements of the OfTI will be installed in the Moray East site);
- **Moray East ES 2012** – The ES for the Telford, Stevenson and MacColl wind farms and Associated Transmission Infrastructure, submitted August 2012;
- **Moray East Modified TI ES 2014** – the ES for the TI works in respect to the Telford, Stevenson and MacColl wind farms, submitted June 2014;
- **The Development** – the Moray East Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI);
- **Design Envelope** – the range of design parameters used to inform the assessment of impacts;
- **OfTI Corridor** – the export cable route corridor, i.e. the OfTI area as assessed in the Moray East Modified TI ES 2014 excluding the Moray East site;

- **the Applications** – (1) the Application letter and ES submitted to the Scottish Ministers on behalf of Telford Offshore Windfarm Limited, on 2nd August 2012 and the Additional Ornithology Information submitted to the Scottish Ministers by Moray Offshore Renewables Limited on the 17th June 2013; (2) the Section 36 Consents Variation Application Report for Telford, Stevenson and MacColl Offshore Wind Farms dated December 2017 and (3) the Marine Licence Applications and associated documents submitted for the OfTI Licences and OSP Licences in June 2014 and May 2017 respectively;
- **Moray East Offshore Wind Farm Consents** – are comprised of the following:

Section 36 Consents:

- Section 36 consent for the Telford Offshore Wind Farm (as varied) – consent under Section 36 of the Electricity Act 1989 for the construction and operation of the Telford Offshore Wind Farm assigned to Moray East on 19 June 2018.
- Section 36 consent for the Stevenson Offshore Wind Farm (as varied) – consent under Section 36 of the Electricity Act 1989 for the construction and operation of the Stevenson Offshore Wind Farm assigned to Moray East on 19 June 2018.
- Section 36 consent for the MacColl Offshore Wind Farm (as varied) – consent under Section 36 of the Electricity Act 1989 for the construction and operation of the MacColl Offshore Wind Farm assigned to Moray East on 19 June 2018.

Marine Licences

- Marine Licence for the Telford Offshore Wind Farm (as varied) – Licence Number: MS-00009051 (formerly 04629/20/0) – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
 - Marine Licence for the Stevenson Offshore Wind Farm (as varied) – Licence Number: MS-00008985 (formerly 04627/20/0) – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
 - Marine Licence for the MacColl Offshore Wind Farm (as varied) – Licence Number: MS-00008972 (formerly 04628/20/0) – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
- **OfTI Licences** – are comprised of the following:
 - Marine Licence for the Offshore Transmission infrastructure (as varied) – Licence Number MS-00008919 (formerly 05340/19/0) – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the “OfTI Marine Licence”).
 - Marine Licence for two additional distributed OSPs (as varied) – Licence Number 06347/19/0 – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction, operation and maintenance works and the deposit of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the “OSP Marine Licence”).

Executive Summary

This LMP has been prepared to address the specific requirements of the relevant conditions attached to the Section 36 Consents and OfTI Licences issued to Moray Offshore Windfarm (East) Limited (Moray East). The overall aim of this LMP is to set out the marine and aviation navigational lighting and marking measures to be applied during the construction and operation of the Moray East site.

This LMP includes temporary marine navigation lighting and marking of Wind Turbine Generators (WTGs) and OSPs during construction of the Moray East site. Construction and operational lighting and marking have been developed in discussion with the Northern Lighthouse Board (NLB), Maritime and Coastguard Agency (MCA), Civil Aviation Authority (CAA) and the Ministry of Defence (MoD) and using relevant, standard policy and guidance which is up to date at the time of writing this LMP.

Aside from the Section 36 Consents and OfTI Licences conditions, compliance of this LMP with the Applications, Moray East ES 2012 and Moray East Modified TI ES 2014 has also been reviewed and discussed.

1 Introduction

1.1 Background

In March 2014, the Scottish Ministers granted consents under Section 36 of the Electricity Act 1989 and the associated Marine Licences for the construction and operation of the Moray East Offshore Wind Farm.

Moray East is a joint venture partnership between OceanWinds, Diamond Generating Europe and China Three Gorges and has been established to develop, finance, construct, operate, maintain and decommission the Moray East Offshore Wind Farm.

1.2 Objectives of this Document

The Section 36 Consents and OfTI Licences contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of offshore construction. One such requirement is the approval of a LMP, which is to provide the details of the lighting and marking of the Development, in accordance with relevant aviation and marine navigation guidance, during construction and operation.

The relevant conditions setting out the requirement for a LMP for approval, and which are to be discharged by this LMP, are set out in full in Table 1.1 below.

This document is intended to satisfy the requirements of the Section 36 Consents and Modified OfTI Licences conditions by providing a LMP that can be practically implemented during construction and operation to ensure safe navigation.

Table 1.1: Consent conditions to be discharged by this LMP

Consent Document	Condition Reference	Condition Text	Reference in this LMP
Section 36 Consents	19	The Company must, no later than 6 months prior to the Commencement of the Development, submit a LMP, in writing, to the Scottish Ministers for their written approval.	This document sets out the LMP approved by the Scottish Ministers
		Such approval may only be granted following consultation by the Scottish Ministers with MCA, NLB, CAA and Defence Infrastructure Organisation (DIO) and any such other advisors as may be required at the discretion of the Scottish Ministers.	Consultation undertaken by the Scottish Ministers
		The LMP must provide that the Development be lit and marked in accordance with the current CAA and DIO aviation lighting policy and guidance that is in place as at the date of the Scottish Ministers approval of the LMP, or any such other documents that may supersede said guidance prior to the approval of the LMP.	Section 5
		The LMP must also detail the navigational lighting requirements detailed in International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O-139 or any other documents that may supersede said guidance prior to approval of the LMP.	Section 6
		The Company must provide the LMP to the Highland Council, Moray Council, the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH) and any other bodies as may be required at the discretion of the Scottish Ministers.	A copy of the approved LMP was provided to these bodies.

Consent Document	Condition Reference	Condition Text	Reference in this LMP
		The Development must, at all times, be constructed and operated in accordance with the approved LMP (as updated and amended from time to time by the Company).	Section 2
		Any updates or amendments made to the LMP by the Company must be submitted, in writing, by the Company to the Scottish Ministers for their written approval.	Section 2.1
OfTI Marine Licence	3.2.2.14	Navigation and Aviation Safety and Charting [...] The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a LMP, in writing, to the Licensing Authority for their written approval.	This document sets out the LMP approved by the Scottish Ministers
		Such approval may only be granted following consultation by the Licensing Authority with MCA, NLB, CAA, the Defence Infrastructure Organisation ("DIO") and any such other advisors as may be required at the discretion of the Licensing Authority.	Consultation undertaken by the Scottish Ministers
		The LMP must provide that the Works be lit and marked in accordance with the current MCA, CAA and DIO navigational and aviation lighting policy and guidance that is in place as at the date of the Licensing Authority approval of the LMP, or any such other documents that may supersede said guidance prior to the approval of the LMP.	Section 5
		The LMP must also detail the navigational lighting requirements detailed in IALA Recommendations O-139 or any other documents that may supersede said guidance prior to approval of the LMP.	Section 6
		The LMP must make provision for amending the marking and lighting of the OSPs, as required by NLB and/or the CAA, in the event that any OSPs are constructed prior to the construction of WTGs within the Site, to ensure the marking and lighting of any OSP suits the layout of any surrounding WTGs that form part of any wind farm development located within the Site.	Section 6
		The Licensee must provide the LMP to the Highland Council, Moray Council, the JNCC, SNH and any other bodies as may be required at the discretion of the Licensing Authority.	A copy of the approved LMP was provided to these bodies.
		The Licensee must, prior to the Commencement of the Works, and following confirmation of the approved Development Specification and Layout Plan (DSLPP) by the Licensing Authority, provide the precise location and maximum heights of all OSPs and construction equipment over 150 m above lowest astronomical tide ("LAT"), and details of any lighting fitted to all OSPs, to the United Kingdom Hydrographic Office (UKHO) for aviation and nautical charting purposes.	Details were and are provided to the UKHO prior to the Commencement of the Works and following confirmation of the approved DSLPP.

Consent Document	Condition Reference	Condition Text	Reference in this LMP
OSP Marine Licence	3.2.2.5	The Licensee must, no later than 6 months prior to the Commencement of the Development, submit a “LMP”, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with MCA, NLB, Aberdeenshire Council, The Highland Council and Moray Council, and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	This document sets out the LMP approved by the Scottish Ministers
		The LMP must provide that the Development be lit and marked in accordance with the current CAA and MoD aviation lighting policy and guidance that is in place as at the date of the Licensing Authority approval of the LMP, or any such other documents that may supersede said guidance prior to the approval of the LMP.	Section 5
		The LMP must also detail the navigational lighting requirements detailed in IALA Recommendation O-139 or any other documents that may supersede said guidance prior to approval of the LMP.	Section 6
		The LMP must make provision for amending the marking and lighting of the OSPs, as required by the MCA, NLB and/or the CAA, in the event that any OSPs are constructed prior to the construction of WTGs within the Site, to ensure the marking and lighting of any OSP suits the layout of any surrounding WTGs that form part of any wind farm development located within the Site.	Section 6
		The Licensee must provide the LMP to Aberdeenshire Council, The Highland Council, Moray Council, SNH and any other bodies as may be required at the discretion of the Licensing Authority.	A copy of the approved LMP was provided to these bodies.
Wind Farm Marine Licences	3.2.2.4 of each Marine Licence	The Licensee must ensure that the Works are marked and lit in accordance with the requirements of the NLB and the CAA at all times and such marking and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 72 of the 2009 Act.	Section 5 and 6
		The Licensee must not display any marks and lights additional to those required by virtue of this licence and agreed in the LMP without the written approval of the Licensing Authority following consultation with the NLB, the CAA and the MCA.	Section 5 and 6
		The Licensee must ensure that the meteorological mast (Met Mast), should it be built in the Site, is marked and lit in accordance with IALA Recommendation O-139.	Section 6.2
		The Licensee must ensure the Site boundaries are marked by Cardinal Mark buoys (number to be determined when final layout is known). The Cardinal Mark buoys shall be a minimum of 3 metres (m) in diameter at the waterline, have a focal plane of at least 3 m above the waterline and be of suitable construction for the sea conditions commonly experienced in the outer Moray Firth. The light range on these buoys shall be 5 nautical miles. All required buoyage shall remain in place until completion of this phase, or otherwise notified by the Licensing Authority.	Section 6.1.2

Consent Document	Condition Reference	Condition Text	Reference in this LMP
		The Licensee must ensure that any Met Mast(s) within the Site area will have marking and lighting amended to suit the layout of the wind farm as it progresses should the Met Mast(s) be built prior to the WTGs.	Section 6.2

1.3 LMP Document Structure

In response to the specific requirements of the Section 36 Consents and OfTI Licences conditions, this LMP has been structured to clearly set out how each part of the specific requirements has been met and that the relevant information to allow the Scottish Ministers to approve the LMP has been provided. The document structure is set out in Table 1.2 below.

Table 1.2: LMP Document Structure

Section		Summary of Contents
1	Introduction	Background to consent requirements and overview of the LMP scope and structure; and
2	Statements of Compliance	Identifies those other consent plans relevant to the construction and operation of the Development and the linkage between those plans and the LMP.
3	Project Overview	Sets out the Moray East statements of compliance in relation to the LMP consent conditions.
4	Scope and Development of this LMP	Provides an overview of the project relevant to the LMP and describes roles and responsibilities in the delivery of the LMP during construction and operation.
5	Aviation Lighting and Marking	Describes the scope of the LMP and provides a summary of consultation undertaken to inform the development of the LMP.
6	Marine Navigation Lighting and Marking	Confirms the details of lighting and marking of the Development during construction and operation in line with aviation requirements.
7	Identification Marking	Confirms the details of lighting and marking of the Development during construction and operation in line with marine navigation requirements.
8	Compliance with the Application, ES and Modified TI ES	Confirms details of the identification marking required in line with marine and aviation requirements.

1.4 Linkages with other consent plans

This LMP document sets out the proposed lighting and marking specification for the Moray East Offshore Wind Farm and OfTI. However, ultimately it forms part of a suite of approved documents that provides the framework for the construction process and in some cases the operation of the scheme – namely the other consent plans required under the Section 36s Consent and OfTI Licences.

The consent conditions that require the development of an LMP do not explicitly identify linkages between this and other consent plans. However, other conditions require that several consent conditions plans be consistent with the LMP; these plans are identified in Table 1.3 below.

Table 1.3: LMP consistency and links to other consent plans

Condition	Consent Plan	Consistency with and linkage to LMP
Section 36: Condition 10; OfTI Licences: Condition 3.2.2.4	Construction Method Statement (CMS)	The purpose of the CMS is to detail the methods that are implemented during the construction of the Development. The CMS is consistent with the LMP.
Section 36: Condition 15; OfTI Marine Licence: Condition 3.2.2.8 & OSP Marine Licence: Condition 3.2.2.9	Vessel Management Plan (VMP)	The VMP considers the management and coordination of vessels. The VMP must be consistent with the LMP.
Section 36: Condition 16; OfTI Marine Licence: Condition 3.2.3.2 & OSP Marine Licence: Condition 3.2.3.1	Operation and Maintenance Programme (OMP)	The Operation and Maintenance Programme (OMP) sets out the procedures and good working practices for the operational and maintenance (O&M) phase of the Development. The OMP must be, consistent with the LMP.

2 Statements of Compliance

The following statements re-affirm Moray East's commitment to ensuring that the Development is constructed and operated in such a manner as to meet the relevant legislative requirements set out by the Section 36 Consents and OfTI Licences, but also broader legislative requirements.

2.1 Statements of Compliance

Moray East in undertaking the construction and operation of the Development will ensure compliance with this LMP as approved by the Scottish Ministers (and as updated or amended if required).

Where significant updates or amendments to this LMP are required, Moray East will ensure the Scottish Ministers (and relevant stakeholders) are informed as soon as reasonably practicable and where necessary the LMP will be updated and amended.

Moray East in undertaking the construction and operation of the Development will require compliance with other relevant consent condition plans as approved by the Scottish Ministers and identified in section 1.4 above.

Moray East in undertaking the construction and operation of the Development will ensure compliance with the limits defined by the original Applications (including the project descriptions defined in the Moray East ES 2012, Modified TI ES 2014 and OSP Marine Licence application documents) referred to in Annex 1 of the Section 36 Consents and Part 2 of the OfTI Licences and in so far as they apply to this LMP (unless otherwise approved in advance by the Scottish Ministers) (see section 8 below).

2.2 Consultees

This LMP has been consulted on with key stakeholders relevant to the lighting and marking of the Moray East site. They include:

- MCA who have a remit on the safety of navigation (including identification) and requirements for Search and Rescue (SAR);
- NLB who have a remit on buoyage, lights and marks;
- CAA who have remit on aviation warning lights; and
- The MoD who have general oversight depending on the area of development.

2.3 Legislative Requirements

Moray East will, in undertaking the construction and operation of the Development, ensure compliance with all relevant legislation and that all necessary licences and permissions (as detailed with the Section 36 Consent and Deemed Marine Licence¹) are obtained by the Key Contractors and Subcontractors prior to the commencement of work, through conditions of contract and by an appropriate auditing process. Further information on the Key Contractors and Subcontractors is provided in the Construction Programme (CoP) and CMS document.

Moray East will comply – and ensure that Moray East contractors comply – with the requirements of relevant environmental and maritime legislation as standard, including all relevant maritime safety related legislation regarding vessel certification, manning and safety requirements. A register of policy

¹ This includes transmission licences from OFCOM and statutory sanctions to exhibit from NLB.

and guidance with which this LMP complies is presented in Appendix 1. Survey, certification and inspection arrangements will be agreed with the relevant MCA Marine Office in advance of works commencing.

3 Project Overview

This section provides a brief overview of the Development relevant to the LMP and sets out the main roles and responsibilities in relation to Moray East and the key contractors.

3.1 Development Overview and Layout

The Development will consist of the following main components:

- A total generating capacity of approximately 950 MW, however the total generation capacities will be constrained by the transmission entry capacity of 900 MW (further details provided within the DSLP);
- 100 WTGs of no greater than 10 MW (further details provided in DSLP);
- Jacket substructures each installed on three pile foundations driven into the seabed;
- Three AC OSPs to collect the generated electricity and transform the electricity for transmission to shore;
- A network of inter-array, buried or (if burying is not possible) mechanically protected, subsea cable circuits to connect strings of turbines together and to connect the turbines to the OSPs;
- Two inter-connector cable circuits that link the OSPs to one another;
- Three buried or (if burying is not possible) mechanically protected, subsea export cable circuits, to transmit the electricity from the OSPs to the landfall at Inverboyndie Bay and connecting to the onshore buried export cable circuits for transmission to the onshore substation and connection to the national electricity transmission system; and
- Minor ancillary works such as the deployment of met buoys and permanent navigational marks as defined in this LMP.

The location of the Development in the Moray Firth is shown in Figure 3.1 below.

Moray Offshore Windfarm (East) Limited Lighting and Marking Plan

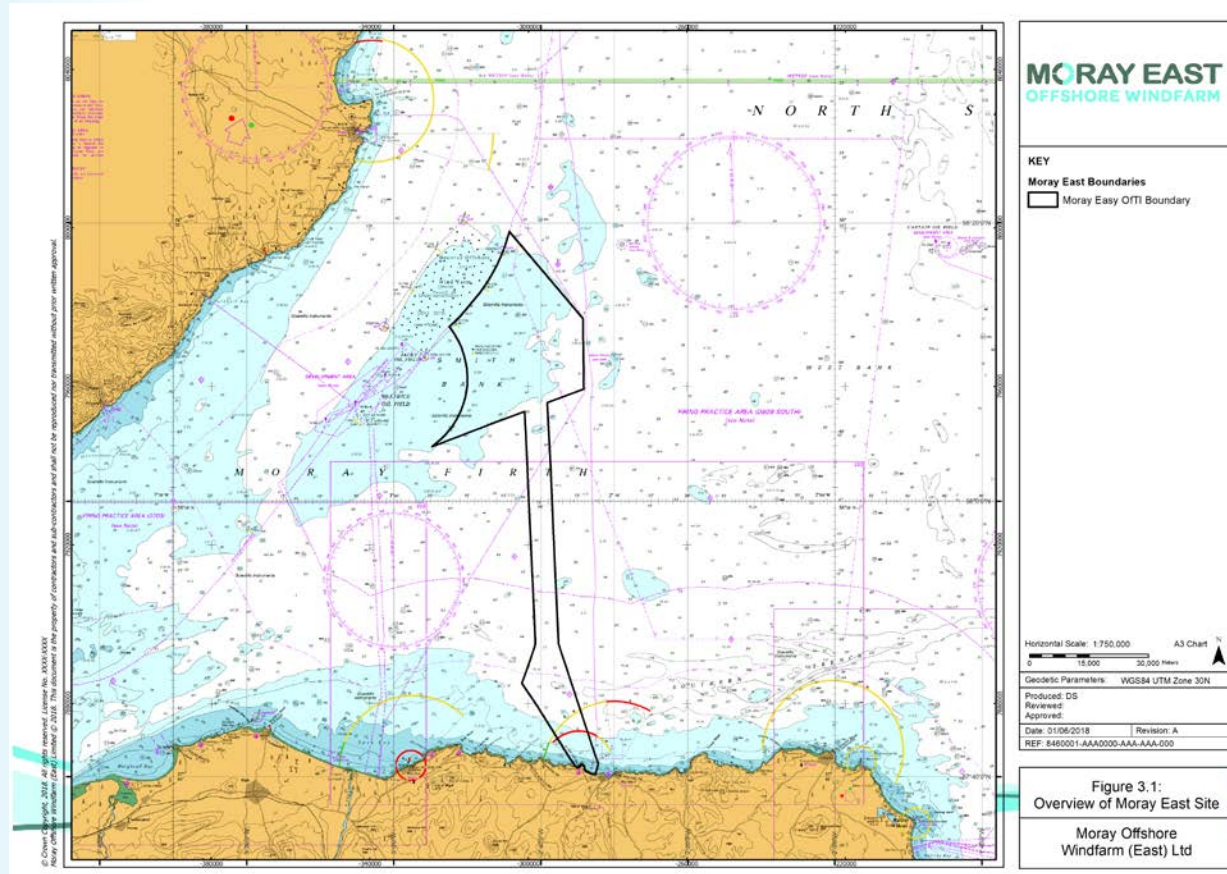


Figure 3.1: Overview of the Development

Figure 3.2 below shows the final layout of WTGs and OSPs across the Moray East site. Further information on the layout of the Moray East site, including the specifications of the WTGs and OSPs and the location coordinates of each structure, is provided in the DSLP.

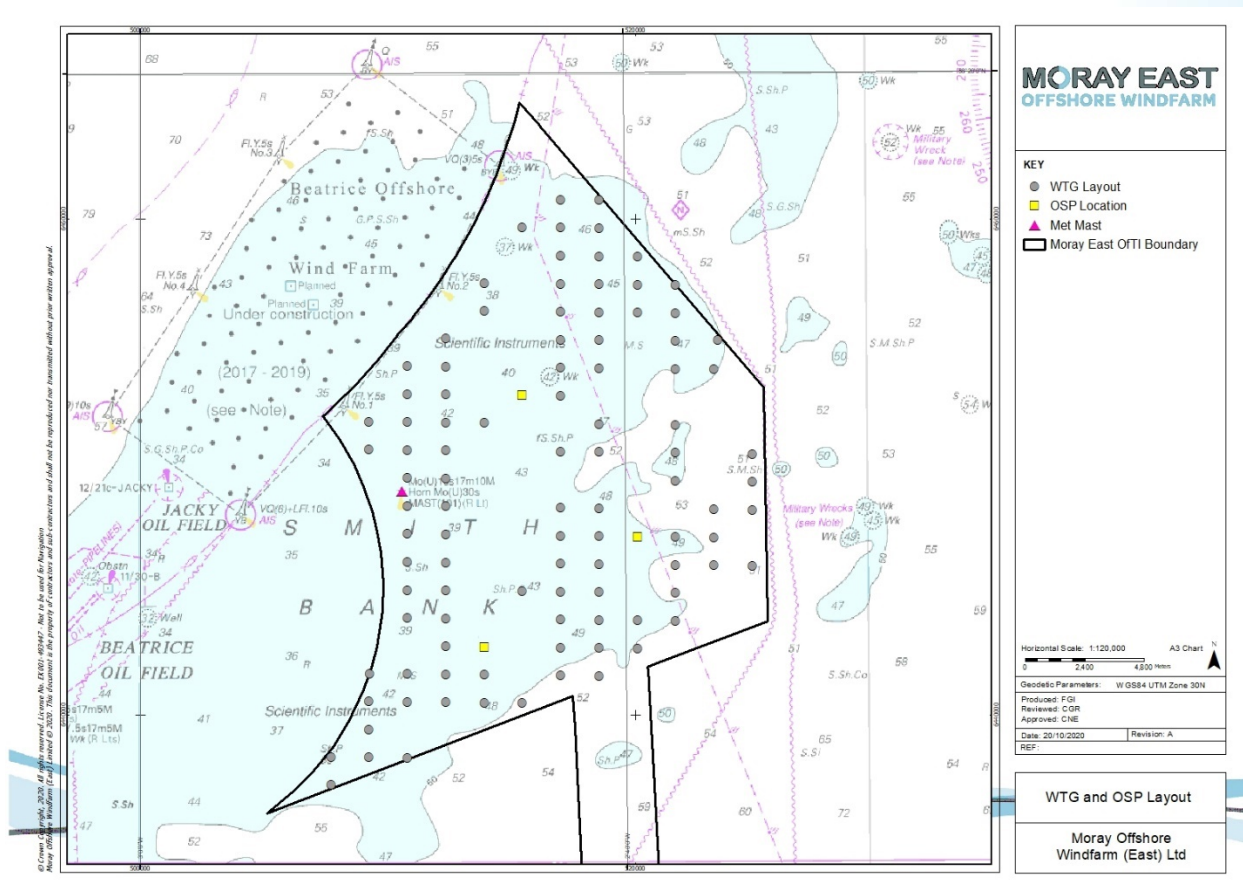


Figure 3.2 WTG and OSP Layout

3.2 Timing of Construction Works

Details of the programme for the construction works are provided in the CoP. It is currently anticipated that the offshore construction works will continue to be carried out year-round and around the clock (i.e. 24 hour working, 7 days a week unless noted otherwise).

4 Scope and Development of this LMP

This document sets out the detail of the lighting and marking of the Moray East site, as required by the Moray East Offshore Wind Farm Consents conditions. Both the construction and operational phases are discussed, and include details on aviation (Section 5) and marine navigation (Section 6) lighting and marking.

This lighting and marking specification detailed in this LMP meets current marine and aviation navigation lighting policy and guidance, as set out in Appendix 1.

The lighting and marking of vessels during construction will be managed through marine regulations including the International Convention for the Prevention of Collisions at Sea (COLREGS) 1972 which all vessels, regardless of flag state, are required to comply with. The COLREGs include specific lighting and marking requirements to designate a vessel's purpose and current activity and/or status.

This LMP relates to the Moray East Offshore Wind Farm and associated OfTI only, but it also takes into consideration lighting and marking of the adjacent Beatrice Offshore Wind Ltd (BOWL) Wind Farm. This LMP does not take into consideration the adjacent Moray West Offshore Wind Farm as at the time of writing there is insufficient information regarding the layout or timescales of this wind farm to take account of it in this LMP. It is noted it may at a later date be necessary to revisit the lighting and marking requirements for the WTGs on the periphery of the Moray East site adjacent to the Moray West Offshore Wind Farm. Any such requirements will be discussed with NLB, CAA, MCA and MoD.

This LMP is intended to satisfy the requirements of the Section 36 Consents and the OfTI Licences conditions by providing a LMP that can be implemented practically during construction and operation of the Moray East site to ensure safe navigation.

5 Aviation Lighting and Marking

This section sets out the aviation lighting and marking arrangements for the Moray East site. It includes lighting and marking technical specifications. The requirements for aviation lighting are set out in the following guidance:

- Civil Aviation Publication (CAP) 393 – The Air Navigation Order 2016 and Regulations, Article 223 (CAA, amended 2019);
- – Standards for Offshore Helicopter Landing Areas (CAA, 2018);
- CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016);
- MCA Marine Guidance Notice (MGN) 543 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016); and
- MCA OREI Emergency Response Cooperation Plans (ERCoP) for Construction and Operation Phase, and Requirements for Emergency Response and SAR Helicopter Operations (MCA, 2016).

As per Article 223 of CAP 393, it is understood that the CAA will require all peripheral WTGs to be equipped with an aviation warning light. Due to the spacing of perimeter WTGs the longitudinal intervals between aviation warning lights exceeds 900 m (CAP 764 (CAA, 2016)); however, it should be noted the CAA state that the 900 m requirement is only required where achievable.

5.1 Aviation Awareness during Construction

There is an international civil aviation requirement for all structures (temporary or otherwise) of 300 feet (91.4 m) or more to be charted on aeronautical charts. Locations for Moray East will be reported to the Defence Geographic Centre (DGC) which maintains the UK's data base of tall structures (the Digital Vertical Obstruction File) at least 10 weeks prior to the construction of any such structure. The point of contact for the DGC is: 0208 818 2702, mail to dvof@mod.uk.

As per CAA requirements, Moray East provided the DGC with accurate location of the WTGs / existing Met Mast accurate maximum heights, and will provide the lighting status of the WTGs and the estimated start / end dates for construction together with the estimate of when the WTGs and / or Met Mast are scheduled to be removed.

In order to ensure that aviation stakeholders are aware of any structures or large construction vessels² that exceed 196 feet (60 m), stakeholders shall be notified through the means of a Notice to Airmen (NOTAM). To arrange an associated NOTAM, Moray East will contact CAA Airspace Regulation Operations (0207 453 6599, mail to AROps@caa.co.uk); providing the same information as required by the DGC at least 14 days prior to the start of construction (noting the differing 60 m requirement).

5.2 Aviation Lighting during Operation

5.2.1 General

Aviation lighting will be remotely controlled by the Supervisory Control and Data Acquisition (SCADA) system and will be visible day and night. Lights will be equipped with 8 hour uninterrupted power supplies in the event of power failure.

² This includes construction vessels that will remain on site, for example jack up barges and their construction cranes.

5.2.2 Aviation Warning lights

Two aviation warning lights will be installed on all periphery WTGs to mark the site during the operational phase as shown below in Figure 5.1, with a summary provided in Table 5.1.

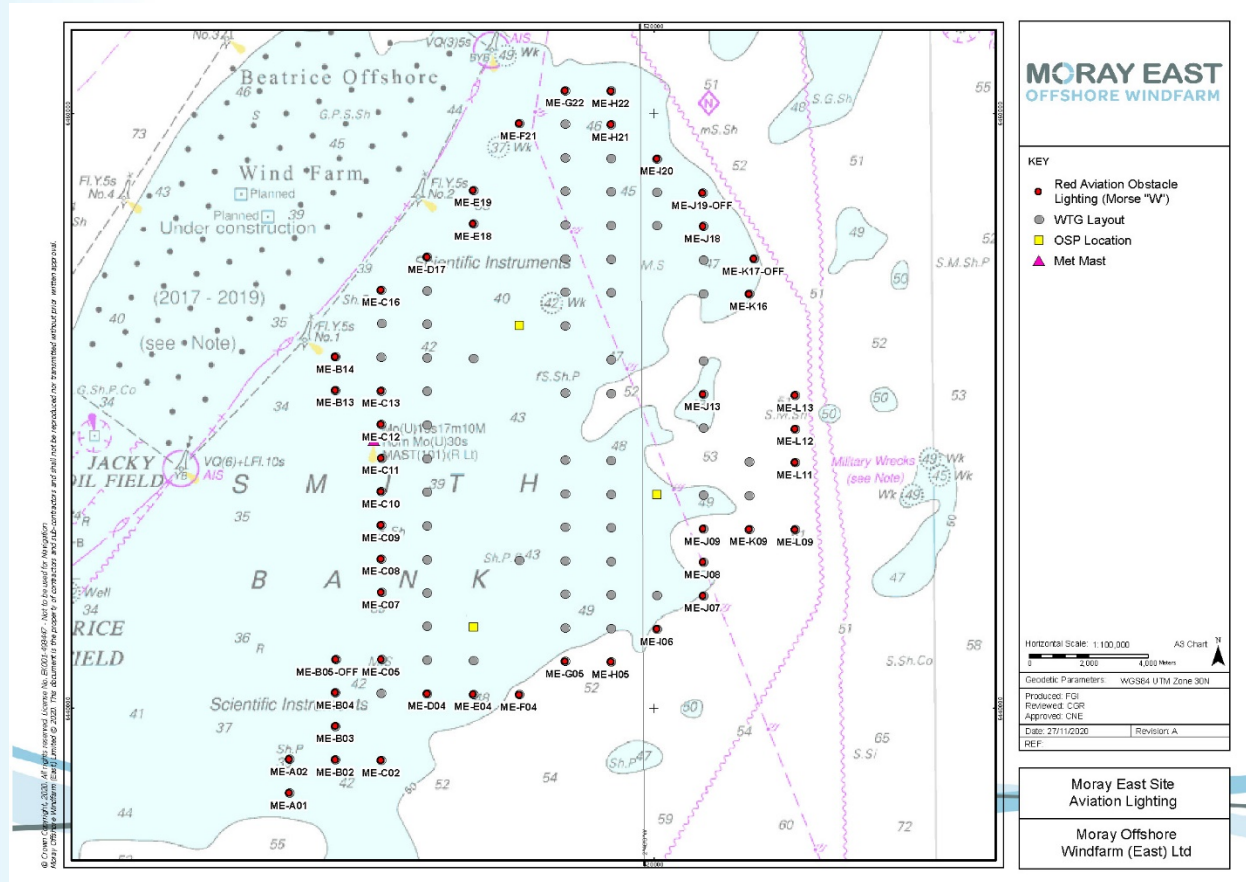


Figure 5.1: Moray East Site Aviation Lighting

Table 5.1: Aviation Lighting During Normal Operations

Category	Aviation Warning Light	
Colour	Red	
Coverage	360 Degrees	
Intensity	2000 Candela (when visibility is <=5km) 200 Candela (when visibility is >5km)	
Character	Flashing Morse Code "W" and Synchronised ³	
IR Functionality	Yes	
Structure Identification	ME-A01 ME-B02 ME-C02 ME-D04 ME-E04	ME-I20 ME-H21 ME-H22 ME-G22 ME-F21

³ Morse "W" is required to avoid confusion from the maritime community as non-synchronised, non-flashing lighting is difficult to distinguish from vessel navigation lights. It is also noted that this is in line with the construction of Beatrice Offshore Wind Farm and CAP 764 (CAA, 2016) guidance. Any difference in the specification could also give rise to confusion.

Category	Aviation Warning Light	
	ME-F04	ME-E18
	ME-G05	ME-E19
	ME-H05	ME-D17
	ME-I06	ME-C16
	ME-J07	ME-B14
	ME-J08	ME-B13
	ME-J09	ME-C13
	ME-K09	ME-C12
	ME-L09	ME-C11
	ME-L11	ME-C10
	ME-L12	ME-C09
	ME-L13	ME-C08
	ME-J13	ME-C07
	ME-K16	ME-C05
	ME-K17	ME-B05
	ME-J18	ME-B04
	ME-J19	ME-B03
		ME-A02

Visibility meters will be fitted to five WTGs (ME-H22, ME-A01, ME-L13, ME-B13 and ME-H05) around the periphery of the development with aviation lighting to detect when visibility is greater than 5km, in which case the light intensity will be automatically reduced from 100% to 10%. All peripheral WTGs reduce or increase intensity if one visibility meter picks up a change in conditions.

All the WTGs have Helicopter Hoist Status (HHS) and SAR light for SAR operations. The aviation warning can be independently controlled from the Moray East control room (as requested by the MCA or other SAR responder) – see section 5.6 below.

5.3 Operational Helicopter Hoist Lights

Moray East does not intend on having operational helicopter transits to WTGs or OSPs; therefore, no helicopter hoist operations to WTGs or OSPs will be carried out. This eliminates the requirement for green helicopter hoist lights on the WTGs and OSPs as per CAP 437. As above, all the WTGs have HHS and SAR light fitted for SAR operations.

5.4 WTG Hoist Locations

Although no helicopter operations to WTGs or OSPs are planned for the construction, operation or decommissioning phases of the wind farm, each turbine will have a helicopter hoist platform installed. The helicopter hoist platform has been designed for compliance with civil aviation regulations in the UK. The platform will include a 2 m high fence around its perimeter.

5.5 Failure of Aviation Warning Lights

It is accepted in the case of offshore wind farms that there may be occasions when meteorological or sea conditions prohibit the safe transport of staff for repair tasks. Furthermore, there may be fault conditions

which are wider ranging and would take longer to diagnose or repair. In such cases international standards and recommended practices require the issue of NOTAMs.

The CAA's Safety and Airspace Regulation Group considers the operator of an offshore wind farm as an appropriate person for the request of a NOTAM relating to the lighting of their wind farm. Should the outage be anticipated to be greater than 36 hours in duration, the operator (Moray East) will request a NOTAM to be issued by informing the NOTAM section of the UK Aeronautical Information Service as soon as possible by telephoning +44 (0) 20 8750 3773/3774 (Aeronautical Information Service will also copy the details of the NOTAM to the operator and to the CAA via email (Windfarms@caa.co.uk)).

The following information will be provided when requesting a NOTAM (for any structure or vessel over 196 feet / 60 m):

- Name of wind farm (as already recorded in the Aeronautical Information Publication (AIP);
- Identifiers of affected lights (as listed in the AIP) or region of wind farm if fault is extensive (e.g. north east quadrant/south west quadrant/ entire or 3 nautical mile (nm) centred on position 515151N 0010101W));
- Expected date of reinstatement; and
- Contact telephone number.

Upon completion of the remedial works, the Aeronautical Information Service will be notified as soon as possible to enable a cancellation to be issued. The party that originally requested the NOTAM will then issue such notification so that a NOTAM cancellation notice can be issued. Such notification will include the name of the wind farm and the reference of the original NOTAM.

If an outage is expected to last longer than 14 days, then the CAA will also be notified (at Windfarms@caa.co.uk) by the operator (Moray East) directly to discuss any issues that may arise and longer term strategies.

5.6 Emergency Response – Aviation Lighting and Marking and Reporting

All WTGs and OSPs will be fitted with one⁴ 200 candela SAR light, with both Search and Rescue Operations (SRO) and HHS mode, which will provide 360 degree coverage. It should be noted that the periphery WTGs will be fitted with operational 2000 candela aviation lights and their intensity can be reduced down to no less than 10% when visibility from each WTG is more than 5km.. The SAR light will be switched off during normal operations (it will only be illuminated during SAR operations). All lights will be operable remotely from the Moray East control room.

Table 5.2 provides details of lighting specifications during SAR operations.

Table 5.2: SAR Lighting Specifications

Category	SAR Light
Colour	Red (SRO mode) Green (HHS mode)
Coverage	360 Degrees

⁴ The requirement for one SAR light and two aviation warning lights on each turbine (when required) is due to the positioning of each of the lights on the structure. The position of the SAR light allows for 360 degree visibility whereas the position of the aviation warning light, lower down on the structure, means that two are required in order to achieve 360 degree visibility.

Category	SAR Light
Intensity	200 Candela
Character	Steady green (safe to operate) Flashy green (in preparation for hoist operations) Steady red (target turbines in emergency) No light (not safe to conduct helicopter works)
Structure Identification	All WTGs and OSPs
Night Vision Imaging System (NVIS) Functional ⁵	Yes

6 Marine Navigation Lighting and Marking

This section details the temporary marine Aids to Navigation (AtoN), including lighting and marking during the construction of the Development in line within the following relevant requirements of:

- IALA Recommendations O-139 – The Marking of Man-Made Offshore Structures (IALA, 2013);
- The Department for Business, Energy and Industrial Strategy (BEIS) Standard Marking Schedule for Offshore Installations (BEIS, 2011); and
- MCA Marine Guidance Note (MGN) 543 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA, 2016a).

6.1 Marine Navigation Lighting and Marking during Construction

6.1.1 Lighting and Marking of Structures

The NLB have confirmed that there is no lighting or marking requirements for each installed foundation, WTG, or OSP prior to commissioning; however, through consultation with NLB, it was recommended that the temporary structures have low range temporary lighting as per Table 6.1 below. The temporary lanterns from all locations will be switched off and removed at WTG Start-up commissioning, including the 17 locations where permanent lanterns are confirmed commissioned and operational. Jacket foundation structures will therefore have temporary lighting as per Table 6.1 below.

It is noted the OSPs will be installed and left in-situ prior to WTG installation. Lighting and marking of construction works remains the same for both the installation of OSPs and WTGs and temporary marking may need to be deployed.

The proposed construction marking and lighting set out in Table 6.1, therefore, sets out the principles of temporary lighting and marking, which may be refined during construction in agreement with NLB.

Table 6.1: Temporary Marking Specification during Construction

Structure	Specification
All WTG or OSP structures – To be confirmed with NLB	<ul style="list-style-type: none"> • All fixed structures marked with a flashing yellow 2.5s (Fl. Y. 2.5s) light (visible through 360°) with a 2 nm range. • NLB also noted that synchronisation of these lights will not be required.

⁵ No specific standard for the NVIS lights is available but the SAR lights used must be compatible with the NVIS equipment –IR functionality does meet this standard.

6.1.2 Construction Buoyage

The Moray East site is marked as a construction area during the construction phase. The construction buoyage has been developed in discussion with NLB and is based on the IALA Maritime Buoyage System (IALA, 2013) as shown in Figure 6.1 below.

Table 6.2 below details the construction buoyage established to mark the Moray East site throughout the construction phase. It is noted that construction buoyage is not required on the boundary of the Moray East site which borders the BOWL project. All buoyage is required to be a minimum of 1000 m from the peripheral WTGs.

No structures will carry sound signals during the construction phase.

AIS transceivers will be fitted on the North Cardinal, East Cardinal and the South Cardinal buoy at the western Moray East site boundary as requested by NLB.

Construction buoyage was deployed prior to construction commencing and will remain in place until the operational marking requirements have been inspected and passed by NLB.

Figure 6.1 presents the layout of the construction buoyage. Buoys have been placed so as to avoid existing cables and the Moray East export cable route located to the south of the development area.

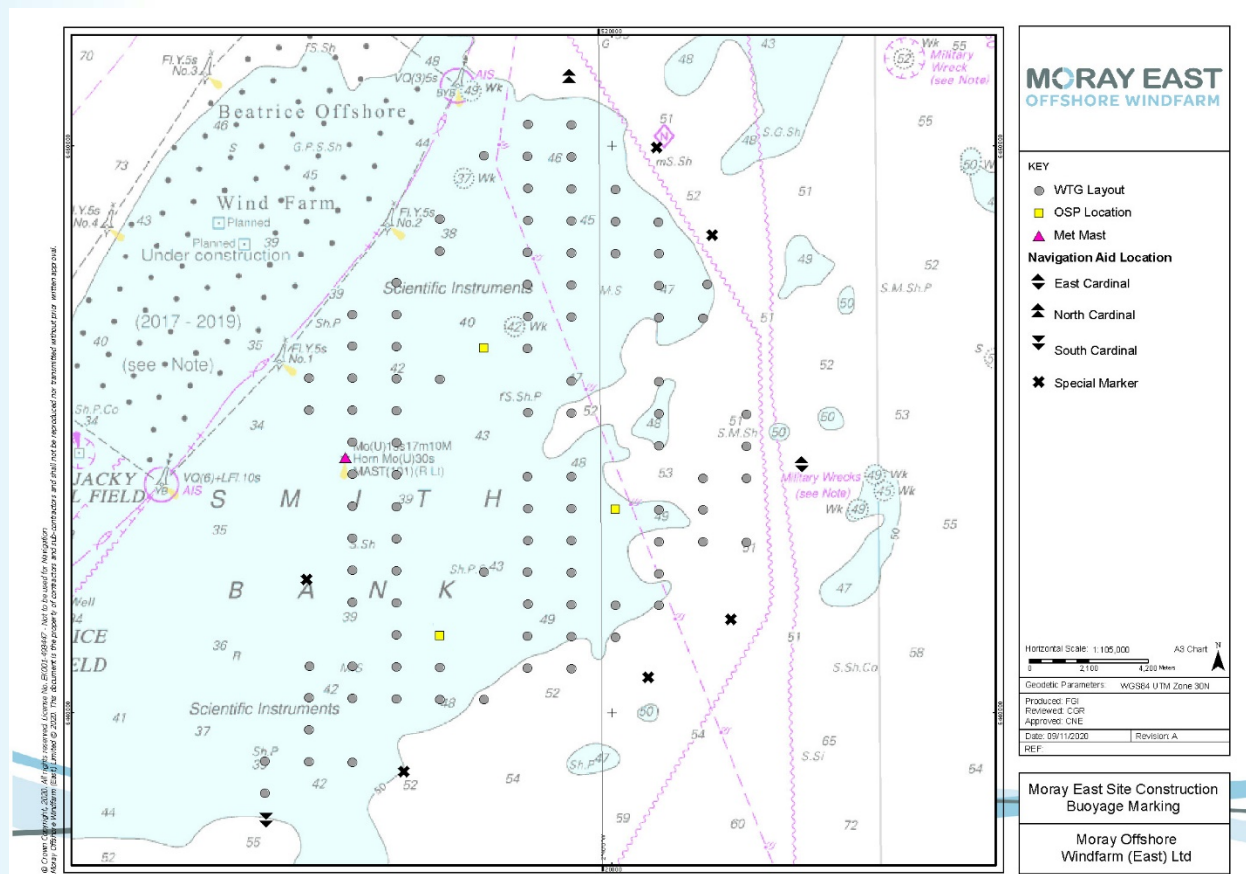


Figure 6.1: Moray East Site Construction Buoyage Marking

Table 6.2: Construction Buoyage Coordinates and Specification

Structure	Specification	Latitude (UTM30 N (WGS 84))	Longitude (UTM30 N (WGS 84))
North Cardinal	<ul style="list-style-type: none"> With a focal plane of at least 3 m and range of 5 nm. Minimum of 3 m in diameter at waterline. Pillar shaped with a north cardinal shaped top mark, exhibiting a Quick (Q) White (W) light character. Category 1 Availability - 99.8% (IALA 2011). Radar Reflector AIS AtoN transmitter (Category 3 Availability - 97.0%). 	58° 18' 6.600" N	2° 41' 4.800" W
East Cardinal	<ul style="list-style-type: none"> With a focal plane of at least 3 m and range of 5 nm. Minimum of 3 m in diameter at waterline. Pillar shaped with an east cardinal shaped top mark, exhibiting a Very (V) Q (3) 5 second (s) W light character. Category 1 Availability - 99.8% (IALA 2011). Radar Reflector. AIS AtoN transmitter (Category 3 Availability - 97.0%) 	58° 10' 44.10" N	2° 32' 45.85" W
South Cardinal	<ul style="list-style-type: none"> With a focal plane of at least 3 m and range of 5 nm. Minimum of 3 m in diameter at waterline. Pillar shaped with a south cardinal shaped top mark, exhibiting a V Q (6) + L Fl 10s W light character. Category 1 Availability - 99.8% (IALA 2011). Radar Reflector AIS AtoN transmitter (Category 3 Availability - 97.0%) 	58° 4' 1.140" N	2° 52' 6.660 W
Six Special Marks	<ul style="list-style-type: none"> With a focal plane of at least 3 m and range of 5 nm. Minimum of 3 m in diameter at waterline. Pillar shaped with a yellow 'x' shaped top mark, exhibiting a Fl Y 5s light character. Category 2 Availability – 99% Radar Reflector 	58° 16' 48.300" N	2° 37' 55.380" W
		58° 15' 8.460" N	2° 35' 57.300" W
		58° 7' 49.680" N	2° 35' 20.640" W
		58° 6' 43.980" N	2° 38' 19.860" W
		58° 4' 57.240" N	2° 47' 9.360" W
		58° 8' 37.080" N	2° 50' 37.080" W
DEME Waverider	<ul style="list-style-type: none"> Height of light above MHWS of 2.5m Spherical yellow buoy of 0.7m diameter, exhibiting a Fl(5)Y 20s light sector Y360 Category 3 - Availability - 97.0% 	58° 13' 55.600"N	2° 44' 59.700" W

6.2 Marine Navigation Lighting and Marking during Operation

This section details the marine AtoN including lighting and marking during the operation of the Moray East site.

6.2.1 *Marine Aids to Navigation*

Table 6.3 below details the navigation lights and sound signals which will be established throughout the operation phase. It is not intended to install any navigational buoyage during the operational phase.

Table 6.3: Navigation Lighting and Sound Signal Specification during Operation

Structure	WTG	Specification
Significant Peripheral Structure (SPS)	ME-A01 ME-F04 ME-H05 ME-L09 ME-L13 ME-K17 ME-H22 ME-B13 ME-C09 ME-B05	<ul style="list-style-type: none"> Located on a corner or other significant point Each SPS will have 360° visibility, with flashing IALA special mark characteristics (yellow (Y) 5 second flash (FL) – Fl.Y.5second (s)) and with a range of not less than 5 nm IALA Category 1 (> 99.0% availability) All SPS lights shall be synchronized Lights shall be located not less than 6 m and not more than 30 m above HAT
Intermediate Peripheral Structure (IPS)	ME-C02 ME-J07 ME-L11 ME-J19 ME-E19 ME-C16 ME-C07 ST-A01 (Met Mast)	<ul style="list-style-type: none"> Structures on the periphery of the layout other than SPS considered to require additional lighting 360° visibility with a flashing yellow light different to the SPS (2.5 second – Fl.Y.2.5s) and with a range of not less than 2 nm IALA Category 2 (> 99.0% availability) All IPS lights shall be synchronized Lights shall be located not less than 6 m and not more than 30 m above HAT
Sound (Fog) Signals	ME-A01 ME-H05 ME-L09 ME-L13 ME-K17 ME-H22 ME-B13 ME-B05	<ul style="list-style-type: none"> Foghorns on transition piece must face outward into open sea and sound signals must be unimpeded by the tower; IALA Category 3 (at least 97% availability) over a rolling three year period; Each WTG fitted with a sound signal will also have a visibility meter. Sound signals will turn on when visibility is detected to be less than 2 nm. Foghorns can be disabled via SCADA to enable access to WTGs during maintenance.

AIS transmitters will be located on locations ME- A01, ME-L09 and ME-H22. Naming of the transmitters shall be agreed with NLB and appropriate licences will be sourced from Office of Communications (OFCOM). The AIS may use a virtual system.

Moray Offshore Windfarm (East) Limited Lighting and Marking Plan

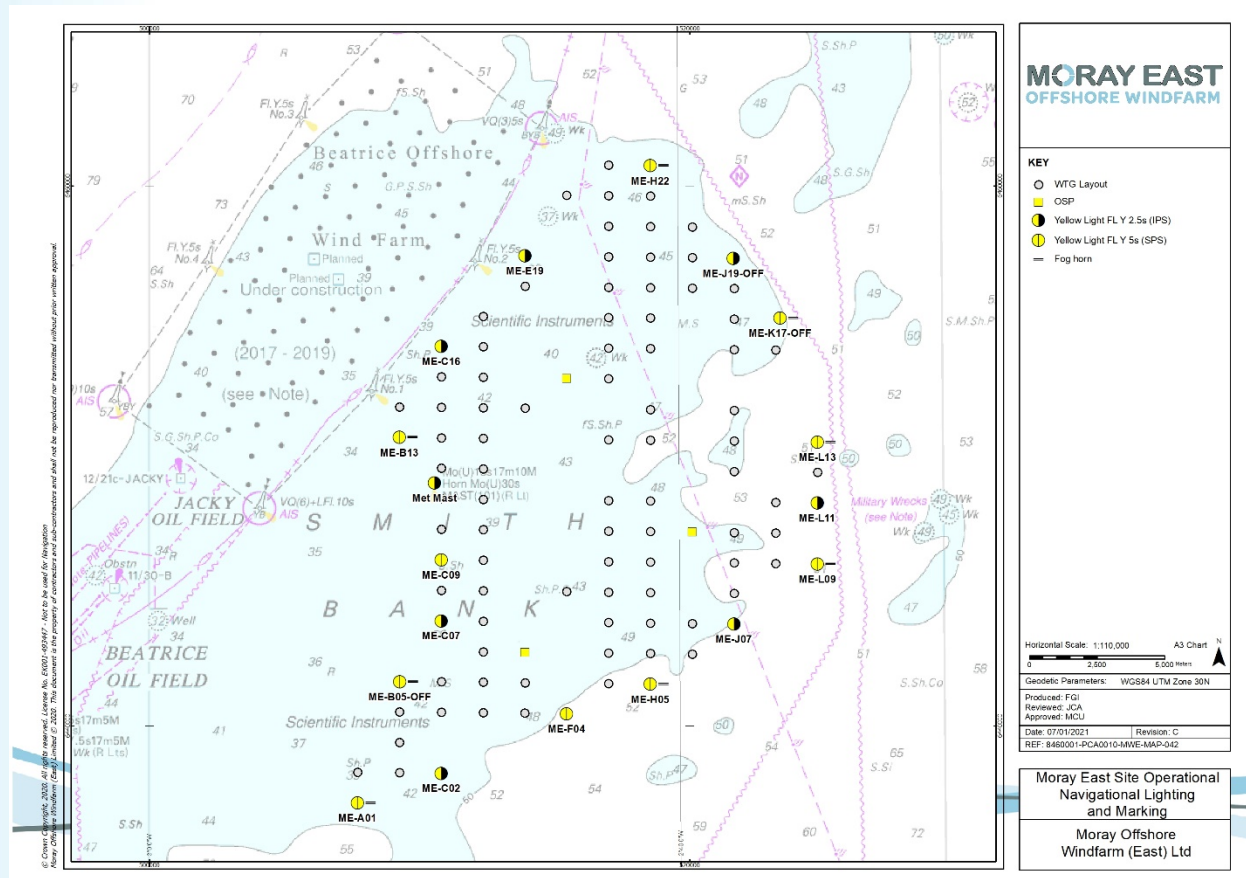


Figure 6.2: Moray East Site Operational Navigational Lighting and Marking

No marine navigation lighting is required for the OSPs apart from identification marking as further described in section 7 below as they are located within the array therefore considered a composite part of the wind farm.

The Met Mast is downgraded to an IPS and a marine licence has been obtained to allow it's decommissioning.

6.3 Location of Lights

The Marine Navigation lights will be placed on the transition piece around the height of the yellow paint. There are three separate lights on all structures to allow 360 degree coverage as presented in Figure 6.3.

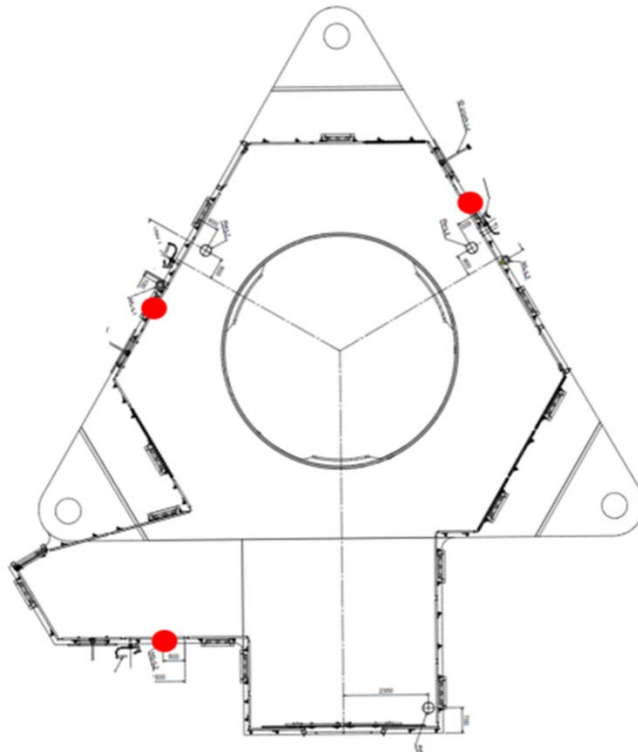


Figure 6.3: Schematic Showing Locations of Marine Lights on Transition Piece

6.4 Paint Colourings

The foundation transition piece of every WTG, OSP and substructure structure will be painted yellow (RAL 1023 Traffic Yellow) all around from the level of HAT to 18.9 m. The tower of WTG structures and the OSPs will be painted grey (RAL 7035 Light Grey for the WTG and RAL 7038 for the OSPs).

Ladders and hand rails are not considered to be part of the marking requirements, and although may be painted initially there is no requirement for the paint colouring to be maintained.

6.5 Export Cable Marker Boards

There will be no cable marker board installed for the Development.

Given environmental sensitivities associated with the shoreline and the cable depth of burial, NLB have waived the requirement for a cable marker board in this instance.

6.6 Availability of Lights

Statutory sanctions to exhibit lights will be issued and agreed with NLB.

6.7 Failure of Construction Buoyage or Operational Marine Navigation Lighting and Marking

A requirement of the management of AtoN within UK waters is to report navigation failures to NLB. This is done through an Aid to Navigation Availability Reporting database (LAToNs). The system is administered by NLB in order to assist wind farm operators to fulfil their responsibility to maintain records of AtoN availability and to provide summaries of these to NLB. This should be undertaken in the event of any

failure or loss of availability and should be carried out during both the construction and operational phases as per the required availability standards.

The relevant operator (Moray East) will have overall responsibility to provide records of AtoN associated with the Moray East site to NLB and provide details of failures or losses to NLB. The Offshore Transmission Owners (OFTO) will have responsibility of recording records of AtoN and details of failures or losses associated with the TI assets to NLB.

It is noted that in the rare event of a significant loss of an AtoN such that a significant risk to navigation is considered likely to occur, a guard vessel may be required to maintain navigational safety until such time as the AtoN is repaired or replaced. Consultation would be undertaken with the NLB and MCA in such an instance.

Note: temporary lighting during construction is excluded from reporting requirements.

6.8 Additional Lighting not required by the Conditions

When using or installing working lights, such as down lighting on ladders, boat landings and access platforms, they will not compromise the conspicuousness of navigational marking lights.

Access deck lighting will be extinguished when not in use.

7 Identification Marking

Each wind farm structure (WTGs and OSPs) will be painted with black letters and numbers on a yellow background. The ID markings will be placed towards the top of the yellow paint and on the outside of the transition piece railings so as to provide sufficient visual coverage from all directions as shown in Figure 7.1 below

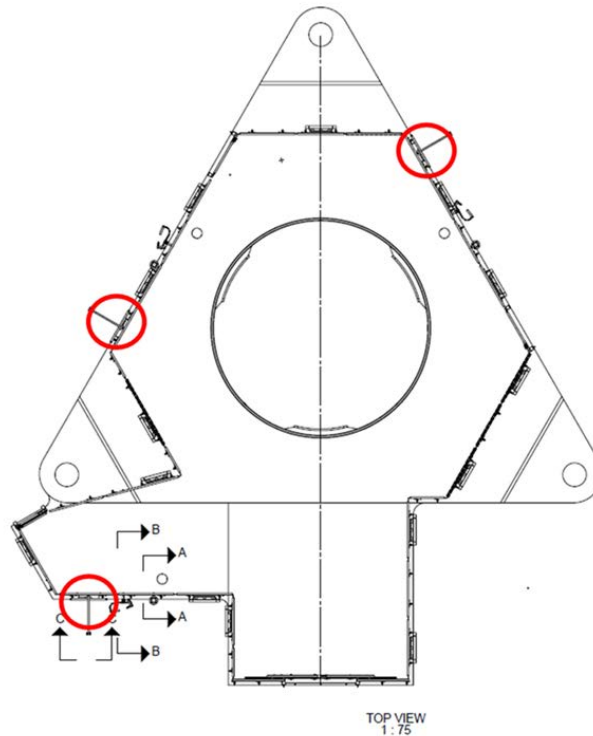


Figure 7.1: Schematic Showing Locations of ID marking on Transition Piece

The identification (ID) markings will be illuminated by a low-intensity baffled white light which should be visible from a vessel, thus enabling structures to be detected at a suitable distance to avoid an allision. The size of the ID markings will, in combination with the lighting, be such that, under normal conditions of visibility and all known tidal conditions, they are clearly readable by an observer stationed 3 m above sea levels, and at a distance of no less than 150 m from the structure.

The ID marking is compliant with the requirements of MGN 543 (MCA, 2016a) and follow the SAR corridors approved by the MCA. In summary, the requirements are as follows:

- Each WTG is given a unique alphanumeric ID consisting of the letters “ME”, followed by a single letter on the next line identifying the column then a two digit number identifying the row (for example “ME A01” is the first WTG in the first column (A) and first row (01));
- The font is Arial Monospace821 BT, with numbers 85% the size of letters, e.g.



- The letter “O” has been omitted from the ID system, to avoid confusion with the number zero. *It is noted that use of the letter ‘I’ was accepted following careful consideration by the MCA, ensuring a font that minimised confusion was used, and that guidance for future projects remains that it (the letter ‘I’) should not be used in identification marking to avoid confusion with the number one;*
- Consideration has been given to the need for SAR Lanes;
- The three OSPs have similar physical ID markings, showing “ME-OSP1”, “ME-OSP2” and “ME-OSP3”; and
- The existing Met Mast ID marking was changed to have similar physical ID markings, showing “ST-A01” and will have IPS lighting.

7.1 WTG Nacelle Roof and OSP Roof Identification Numbers

WTG nacelle roof and OSP identification numbering will be provided and will comply with section 7 (excluding electrical string marking).

Individual ID numbers will be marked on the WTG nacelle or OSP roof deck so that SAR helicopters and/or other low flying aircraft can locate and/or reference a particular structure visually.

ID numbers will be recognisable from an aircraft flying 500 feet (152 m) above the highest part of the fixed structure. The ID number will be as large as practicable but not less than 1.5 m in height and of proportionate width.

WTG nacelle roof and OSP roof identification numbers will be carried out in accordance with MGN 543, as agreed with the MCA.

7.2 Blade Hover Reference Marking

Blade hover reference marks will be provided in a contrasting red colour on both sides of the WTG blades to provide a SAR helicopter with a reference mark when hovering over a nacelle during a rescue as shown in Figure 7.2 and 7.3 below.

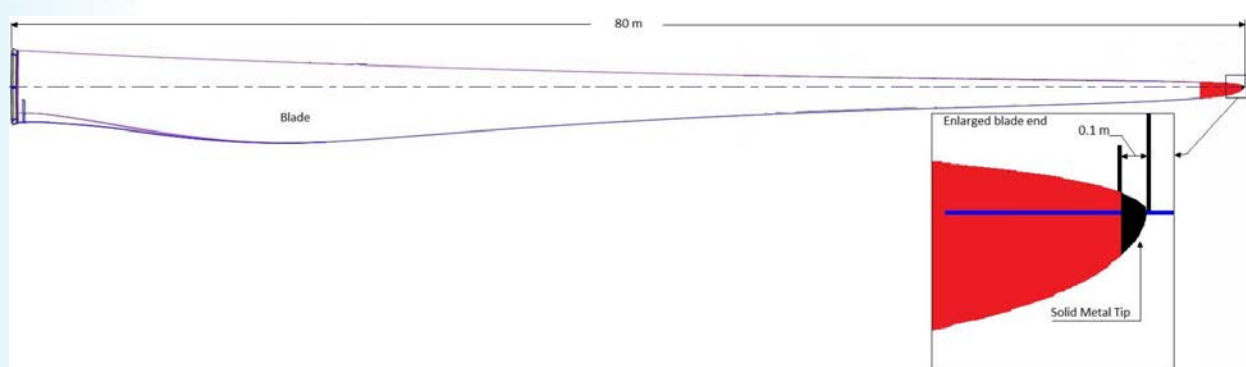


Figure 7.2: Example of Blade Tip Marking (hover marks are not shown in this image)

Three marks (dots of minimum 600 millimetres (ml)) will be added – one each at the 10, 20 and 30 m interval (starting from the blade collar) and placed near the trailing edge of the blades so that when they are feathered the marks lie upwards in view of the helicopter pilot when the blades are parked in the ‘Y’ position or offset ‘Y’ (i.e. one blade or two angled forward into the wind) as indicated on Figure 7.3. The blade tip will also be marked in red to 2 metres from the edge (approximately 2.5% of total blade length) band from the edge of the lightning protection (approximately 10 centimetres (cm) in length).

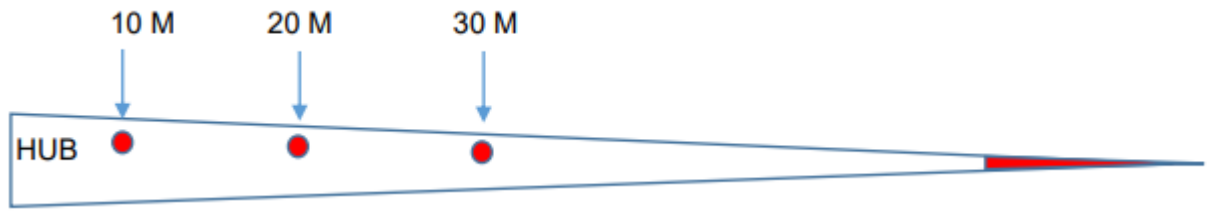


Figure 7.3: Indicative Blade Hover Marks

8 Compliance with the Applications, Moray East ES 2012 and Modified TI ES 2014

8.1 Introduction

In addition to the conditions presented in Table 1.1, Condition 7 of the Section 36 Consent states:

“The Development [Wind Farm] must be constructed and operated in accordance with the terms of the Application and related documents, including the accompanying ES, the Additional Ornithological Information and Annex 1 of this letter, except in so far as amended by the terms of this section 36 consent.”

Sections 8.2 and 8.3 below set out information from the Moray East ES 2012 and Modified TI ES 2014 (the ESs) with regard to:

- Compliance with the lighting and marking scheme assessed; and
- Delivery of the stated lighting and marking-related mitigation.

8.2 Compliance with the Moray East ES 2012/ Modified TI ES 2014

The Moray East ES 2012 and Modified TI ES 2014 described a range of specification and layout options that could be applied during the construction of the Development. This took the form of a broad ‘Rochdale Envelope’ incorporating a variety of options. The ESs defined likely lighting and marking requirements for the Development, based upon these broad options and which adhered to marine navigation and aviation standard guidance.

Since the Moray East Offshore Wind Farm Consents were granted, the lighting and marking of the Development has been substantially refined. In order to demonstrate continued compliance of this refined design, Appendix 2 provides a tabulated comparison of lighting and marking specifications as presented in the ESs and this LMP.

8.3 Delivery of Mitigation Proposed in the Moray East ES 2012 / Modified TI ES 2014

The ESs detailed a number of lighting and marking commitments specific to the design of the Development. Measures relevant to lighting and marking are presented in Appendix 2 which also identifies where each commitment has been addressed within this LMP (or within other relevant Moray East consent condition plans).

9 References

BEIS, 2011, *Standard Marking Schedule for Offshore Installations*.

CAA, 2018, *CAP 437 – Standards for Offshore Helicopter Landing Areas*.

CAA, 2019, *CAP 393 Air Navigation: The Order and Regulations Article 222*.

CAA, 2016, *CAP 764 – Policy and Guidelines on Wind Turbines*.

IALA, 2013, *IALA Recommendations O-139 – The Marking of Man-Made Offshore Structures*.

MCA, 2016a, *Marine Guidance Note MGN 543 – Offshore Renewable Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response*.

MCA, 2018, *OREI: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response. Annex 5 of MGN 543 (Version 2)*.

MCA, 2016b, *OREI ERCoP for Construction and Operation Phase, and Requirements for Emergency Response and SAR Helicopter Operations*.

Legislation, Policy and Guidance

The following relevant legislation, policy and guidance are in place at the time of completing this LMP, and have informed its preparation.

Marine Navigation:

- Appendix 1**
- IALA Recommendations O-139 (The Marking of Man-Made Offshore Structures, Edition 2) (IALA, 2013);
 - BEIS Standard Marking Schedule for Offshore Installations (BEIS, 2011); and
 - MCA MGN 543 and Annexes –OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016).

Aviation Navigation:

- CAA CAP 393 - The Air Navigation Order 2016 and Regulations Article 223 (CAA, amended 2019);
- CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2018);
- CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016);
- MCA MGN 543 and Annexes – OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016); and
- MCA, OREI ERCoP for Construction and Operation Phase, and Requirements for Emergency Response and SAR Helicopter Operations (MCA, 2016).

Compliance with lighting and marking assessed in the Moray East ES 2012 /Modified TI ES 2014

Source	Lighting and Marking Element	ES/ Modified TI ES	LMP
Appendix 2 Moray East ES 2012	General	Marine AtoNs will be provided in accordance with NLB requirements, which will comply with IALA standard O-139 on the Marking of Offshore Wind Farms (IALA, 2008).	This LMP complies with IALA Standard O-139 on the Marking of Offshore Windfarms (IALA, 2013) which is the up to date version.
		The colouring, markings, lighting and foghorn requirements for the wind turbines within the sites will be agreed with the appropriate authorities (e.g. NLB, CAA).	Consultation with appropriate authorities has been carried out as detailed in Sections 4, 5 and 6.
	Turbine Markings	The proposed wind farm sites will be designed to satisfy the following requirements for emergency response in the event of a SAR, operation in or around the wind farms (as per MGN 371 ⁶ guidance – MCA, 2008): <ul style="list-style-type: none"> The turbine shall have high contrast markings (dots or stripes) placed at 10 m intervals on both side of the blades to provide helicopter pilots with a hover-reference point. 	This LMP is compliant with MGN 543 (MCA, 2016a) which is the up to date version. Blade hover reference marking is detailed in Section 7.2
		The foundation substructures will be painted yellow for navigational marking.	The LMP confirms that every WTG substructure will be painted yellow (section 6.3).
		Offshore structures will be marked in order to meet the requirements of navigation and aviation standards. Specific requirements for aviation and navigational lighting will be agreed with the relevant stakeholders post-consent and prior to construction.	Marine navigation and aviation policy and guidance followed in the LMP are detailed in Appendix 1. Consultation with appropriate authorities has been carried out as detailed in Sections 4, 5 and 6.
	Turbine Lighting	In poor visibility or at night, any lighting on turbines may be required to be switched on or off – at the discretion of the helicopter pilot.	Aviation lighting is discussed in 5 of the LMP.

⁶ MGN 543 is now in place instead of MGN 371

Source	Lighting and Marking Element	ES/ Modified TI ES	LMP
		Lighting of obstacles will be in accordance with Article 220 of CAP 393 Air Navigation: The Order and the Regulations.	Aviation lighting of the LMP follows CAA CAP 393 Air Navigation: The Order and Regulations Article 222 (CAA, 2019) which is the up to date version.
		The significant peripheral structures (SPS) are required to be fitted with lights visible from all directions in the horizontal plane, and selected IPS on the periphery of the three proposed wind farms, other than the SPSSs, are also recommended to be lit. The MCA, through recent guidance notes, also requires that all turbines are marked and fitted with short range lighting, as an active safety management system.	This LMP is compliant with MGN 543 (MCA, 2016a) which is the up to guidance note. SPS and IPS lighting on the periphery of the Moray East site is discussed in section 6.2.1 of the LMP.
		The CAA guidance on offshore wind turbine lighting (CAA, 2010) requires offshore wind turbine SPS to be lit with 'medium intensity' (2000 candela) steady red light, positioned as close as possible to the top of the nacelle. The red CAA lights are assumed to be a steady lighting, but there is a future possibility that the CAA requirement will be interpreted to reflect the use of flashing red lighting. It is likely that, if flashing lighting is deemed appropriate, the flash sequence on each turbine within the same wind farm development would be required to be synchronized.	Section 5.2.2 of the LMP presents the red aviation lighting as per CAA requirements. Note: CAA Guidance (CAP 764 – Policy and Guidelines on Wind Turbines) updated in 2016
Moray East Modified TI ES 2014	General	The lighting and marking of the offshore OSPs will be agreed with Marine Scotland in consultation with the NLB, the MCA, CAA and the MoD.	Consultation with appropriate authorities has been carried out as detailed in Sections 4, 5 and 6.
		Any marine AtoNs required to mark the structures, land falls and/or subsea features will be provided in accordance with the NLB requirements	NLB have been consulted on the marine navigation lighting and marking of the LMP (section 6.1.1).



MORAY EAST

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