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1. Executive Summary

This document provides a description of the Maritime and Coastguard Agency’s (MCA) policy, and guidance, advice and specific requirements (where seen as necessary) to assist and enable Search and Rescue, and other emergency response e.g. Counter Pollution operations, to, within, and in the vicinity of offshore renewable energy installations (OREI) – wind farms and devices generating power from wave action and/or water-current (surface, sub-surface and seabed located) and tidal lagoons, etc.

The document also forms part of MGN 543 (Annex 5). Failure by developers to give due regard to the recommendations and mitigations proposed by the MCA in this document may result in objections to their proposals.

2. Scope

This document applies to any OREI within UK internal waters, territorial waters, the United Kingdom Search and Rescue Region and Exclusive Economic Zone (EEZ) or Renewable Energy Zone (REZ).

This document is not exhaustive. Developers may provide additional or alternative emergency response measures in their area of operations so long as they meet the fundamental requirements outlined in this document and the Regulator Expectations for Emergency Planning, written by the Health and Safety Executive and MCA. This is of particular relevance with developments being constructed far from shore.

3. Constraints

The EU sponsored ACCSEAS Project (http://www.accseas.eu/) made the following statement in its final report (May 2015):

Planned wind farms by various countries provide a simple introduction to the nature of growth in offshore renewable energy installations. It is apparent that large areas of the North Sea could be dedicated to this utilisation thereby reducing the sea space for ships to navigate and manoeuvre. When taken together with the trend in the growth in shipping – both in numbers and size of vessels – it is clear that higher density of ships may be forced to navigate in more restricted sea areas, which could correlate with greater risk of grounding and collision, hence impacting the safety and efficiency of access to the region’s ports.

The UK concurs with this assessment and notes that the consequences might be an increase in emergency response to vessels and/or persons in distress within, close to or around OREI.

An area of sea outside the UK territorial sea over which the UK claims exclusive rights for production of energy from water and wind under section 84 of the Energy Act 2004.
4. Strategic Environment

4.1 Maritime Search and Rescue

The MCA, through HM Coastguard, is responsible for UK civil maritime Search and Rescue (SAR) for the United Kingdom Search and Rescue Region (UKSRR), and for ensuring the effective provision of counter pollution response within the UK Exclusive Economic Zone. Offshore renewable energy installations are built within these zones and pose some risks to safety of navigation and SAR operations that may occur within or close to installations.

4.2 Aeronautical Rescue Coordination Centre

The MCA is also responsible for the provision of the United Kingdom Aeronautical Rescue Coordination Centre (ARCC) function to provide aeronautical SAR coordination for UK airspace, and control of the deployment and direction of SAR fixed wing aircraft and helicopters.

Additionally, the MCA is responsible for the management of all dedicated UK Search and Rescue helicopters. These helicopters operate as ‘HM Coastguard’ aircraft and provide rescue for land, air and sea incidents within the UK Search and Rescue Region.

4.3 Maritime Assistance Service

The MCA, is also responsible, through HM Coastguard, for the provision of Maritime Assistance Services (MAS) in accordance with IMO Resolution A.950 (23). IMO defines this service as when ‘the circumstances of a ship’s operation that involve a MAS are not those requiring rescue of persons’

Three situations can arise:

- the ship is involved in an incident (e.g., loss of cargo, accidental discharge of oil, etc.) that does not impair its seakeeping ability but nevertheless has to be reported;

- the ship, according to its master’s assessment, is in need of assistance but not in a distress situation (e.g., about to sink, fire developing, etc.) that requires the rescue of those on board; and

- the ship is found to be in a distress situation and those on board have already been rescued, with the possible exception of those who have remained aboard or have been placed on board to attempt to deal with the ship’s situation.

4.4 Business Need

The MCA has an obligation to provide SAR response in all of the sea area occupied by OREIs. Therefore, it has a significant interest in their development and operations. To this end it is necessary for OREIs to be located, constructed, equipped and operated in such a way as to minimise impacts and effects upon SAR and emergency response. Developers and operators may
also be required to provide suitable mitigations, as outlined in this document, to help alleviate these impacts.

4.5 Organisational Overview

The MCA is responsible for

- Setting maritime standards and regulation;
- Checking and verifying compliance of applicable international and national safety and environment protection standards by ships, and competence standards by seafarers;
- Providing services to seafarers; and
- Monitoring our coasts and seas and responding to emergencies.

We have two broad objectives:

- **Safety**: Through accident prevention and effective search and rescue coordination and response, improve the safety of ships and people at sea and at the coast; and
- **Environment**: Through our monitoring of ships and response to pollution incidents protect the marine environment.

The MCA’s vision is to be the leading maritime safety organisation in the world, driving progress towards safer lives, safer ships, and cleaner seas:

“**Safer Lives**” – The Sea can be an unforgiving environment and ships and seafarers are vulnerable to the elements, and particularly to extreme weather events that are likely to become more common as a result of climate change. Safety is our top priority and we provide a 24-hour a day, 365 days a year emergency response coordination service for the UK coast and surrounding waters.

Where people need help on the coast or at sea, we will provide the right rescue resource to reduce the severity of the incident.

Every year our Coastguard Operations Centres (CGOC) and the National Maritime Operations Centre (NMOC) respond to approximately 20,000+ incidents at sea and on the coast, assisting over 25,000 people. Our prompt actions prevent deaths and injuries and protects the environment.

Our CGOCs and the NMOC respond to calls for assistance initiated by voice radio (marine VHF and MF), semi-automatic ship distress-alerting systems (VHF, MF and HF DSC), satellite distress alerting beacons and systems and the 999/112 emergency telephone system. Our skilled Coastguard officers make decisions about the best way to deal with each incident. At sea this might mean sending an RNLI or other volunteer-crewed, independent lifeboat, a Search and
Rescue (SAR) helicopter, seagoing tugs, or requesting assistance from other vessels nearby that can help. Closer to shore, we might send one of our volunteer Coastguard Rescue Teams trained in the specialist skills of search, mud, water and cliff rescue.

“Safer Ships” – Shipping is vital to the UK economy which is dependent on ships and professional seafarers. A vibrant and safe shipping industry is an essential component in the supply chain for goods and services we use on a daily basis. We work closely with the maritime industry to enhance shipping safety and prevent pollution. We want ships to operate safely and we want seafarers to be properly qualified and competent to work on ships.

Commercial shipping is a global business with ownership, charterers, registration and crewing spread around the world. Ships operating internationally are regulated at the international level. Working in partnership with colleagues across Government, we play a major role in representing the UK view on the development of international maritime policies, regulations and technical standards, principally at the International Maritime Organization (IMO) and within the European Maritime Safety Agency (EMSA). This includes the UK policy and views on OREIs.

To prevent shipping incidents we carry out in-depth surveys of UK registered ships, and regular safety checks of foreign and UK vessels operating domestically. We investigate over 100 infringements of Merchant Shipping Legislation every year, taking proportionate enforcement actions where necessary. Inspections are carried out to check safety standards and living conditions on UK ships and fishing vessels, as well as Port State Control inspections of foreign ships visiting UK ports.

“Cleaner Seas” – We want to reduce pollution from shipping and minimise its effects on our waters, coastlines and economy. There are aspects of our Cleaner Seas policy that we pursue internationally through the IMO and in Europe, which is mostly in relation to standards setting and prevention activity. Our response activity is specific to the UK.

We have comprehensive emergency response procedures to deal with pollution from ships, or the threat of pollution, including:

- The Secretary of State’s Representative for Maritime Salvage and Intervention (SOSREP), supported by Counter Pollution and Salvage Officers;
- A dedicated support team of mariners, scientists and logistics experts;
- Surveillance and spraying aircraft; and
- Counter pollution equipment contractors.
4.6 Contribution to Key Objectives

The principal assumptions which have been made are that in pursuing its stated aims to enforce high standards of marine safety; minimise loss of life amongst seafarers; 24-hour response to maritime emergency; minimise pollution of the marine environment from ships, and where pollution occurs, minimise the impact on UK interests, the MCA:

- Will continue to operate all existing operational obligations and commitments, as determined by international agreement and conventions;
- Is committed to achieving greater flexibility in deployment and use of resources by a discrete and ongoing review of working practices leading to process improvement, by means of organisational rationalisation; and
- Will strive to meet its key objectives outlined within our Ministerial Targets and will continue to develop those areas highlighted within our three-Year Themes

5. Stakeholders in Offshore Renewable Energy SAR and Emergency Response

- Bristow SAR Helicopters
- Civil Aviation Authority
- Crown Estate Scotland
- Department for Transport (DfT)
- Department for Business, Energy and Industrial Strategy (BEIS)
- Department of Agriculture, Environment and Rural Affairs (DAERA), Northern Ireland
- Health and Safety Executive UK
- Independent Lifeboat and Rescue Boat Operators
- Marine Management Organisation, England (MMO)
- Marine Scotland
- Renewable UK (on behalf of UK offshore renewable energy developers, operators and suppliers)
- Royal National Lifeboat Institution (RNLI)
- The Crown Estate
- UK Ambulance Services
- UK Fire and Rescue Services
- UK Police Services
- UK SAR Strategic Committee
- Welsh Government Marine and Fisheries
6. **Existing Arrangements**

Search and Rescue requirements for OREIs have been developed and set by the MCA, since the early 2000s, in consultation and discussion with all relevant stakeholders. Current advice and guidance is contained within applicable Marine Guidance Notes (MGN) and on the GOV.UK website. This document replaces the document ‘Offshore Renewable Energy Installations, Emergency Response Cooperation Plans for Construction and Operations Phase, and Requirements for Emergency Response and SAR Helicopter Operations’.


6.1 **Access to OREI by SAR Helicopters and Rescue Boats / Lifeboats**

It is a policy requirement that SAR helicopters and rescue boats/lifeboats, as part of an effective national SAR response capability, be able to operate anywhere within the UK SRR and this includes amongst and around any structures, including OREI, without significant risk or restriction or degradation to their normal operation. SAR helicopters and in some cases rescue boats/lifeboats, will, unavoidably, suffer a degradation to their normal operations / performance simply due to the OREI’s presence.

6.2 **Restrictions on Vessels Assisting in SAR Operations**

MCA MGN 372 provides advice and guidance to ships regarding navigation around and within offshore renewable energy installations. It states, in particular:

> [Paragraph] 4.8 **Options**

4.8.1 *In taking account of this guidance there are, in simple terms, three options for mariners:*

(a) Avoid the OREI area completely
(b) Navigate around the edge of the OREI, or
(c) In the case of a wind farm, navigate, with caution, through the wind farm array.

4.8.2 *The choice will be influenced by a number of factors including the vessel’s characteristics (type, tonnage, draught, manœuvrability etc.), the weather and sea conditions.*

4.8.3 *Mariners should be aware that radar targets may be obscured when close to a wind turbine field.*

\(^2\) An ECROP is required for the Construction, Operations and Decommissioning phases of any OREI.
4.8.4 These notes do not provide guidance on a safe distance at which to pass an OREI, as this depends upon individual vessels and conditions. However where there is sufficient sea room it is prudent to avoid the area completely (option (a) above).

4.8.5 In some sea areas, additional information may be promulgated by Vessel Traffic Services. International practice for SAR response to persons in distress at sea includes alerting and notifying the nearest vessel(s) (this includes small vessels e.g. fishing vessels and leisure craft) to an incident location and asking them to render assistance in accordance with the SOLAS regulations. Wind farms and other OREI may cause a significant navigational and/or operational safety risk to the use of such vessels within OREIs. The person in charge or master of any vessel/craft can decline to assist if such a risk is considered by them to exist. A vessel operator’s company policy may also not allow a ship/craft to deliberately enter or make passage through any wind farm or OREI.

These factors will, in some cases, mean that wind farm and other OREI can only be entered by their dedicated operations support craft and specialist search and rescue boats/vessels and helicopters. This places a constraint on the options normally available to the SAR Mission Coordinator, and so SAR response to OREI may, unless well supported by developer/operator resources, be consequently limited or prevented.

If restrictions on SAR response to a particular OREI are considered by the MCA to be substantial, or particularly difficult, a marine licence condition may be placed on the developer or operator of the OREI to remove or otherwise alleviate the risk.

This may necessitate an OREI developer/operator providing sufficient mitigations to ensure that SAR is possible – so far as it can be practically and technically undertaken given the presence of physical obstacles (wind turbines and tide and current devices, structures, etc.). These measures must be able to withstand public scrutiny.

6.3 Dependencies

There are no critical dependencies other than that new technologies, procedures or processes may be developed and/or marine traffic volumes and/or behaviours and/or practices may change, that reduce or increase the SAR demand and/or risks to SAR delivery. The MCA may be required to apply retrospective requirements if operational circumstances, within or around the site, or legislative changes create a new or previously unidentified risk to SAR operations. Conversely, if a change removes or reduces risk, then requirements may be removed or reduced. If this is required, the MCA will open a dialogue with the relevant developer(s)/operator(s) to work toward, wherever possible, a practical and cost-effective solution or alternative mitigations to any additional or increased requirement.
6.4 OREI Support to SAR and Emergency Response

The growth and expansion of the industry into active sea-spaces means that the probability of SAR operations occurring within or close to an OREI is likely to increase. Having offshore renewable energy installations that meet, as far as practically possible, UK SAR requirements, ensures that SAR operations can be conducted across the entire sea-space of the UKSRR. This is a public benefit in support of the MCA’s strategic mission.

However, the MCA also recognises that, by the nature of its operations and locations around the UK, the offshore renewable energy industry can offer valuable support to maritime search and rescue and emergency response. This can be through the provision of rescue response by OREI support vessels, and/or helicopters (when available), and by extending offshore radio communications and the enhancement and expansion of maritime surveillance by the establishment of AIS transceivers and radar (on some OREIs). The industry has also been instrumental in the development of an Integrated Offshore Emergency Response document, in cooperation and partnership with the HSE, the MCA, the police and other organisations and authorities with a stake in offshore maritime emergency response. Such documentation is of considerable benefit to the overall understanding and standardisation of emergency response in the offshore renewable environment.

6.5 Critical Success Factors

The implementation of the requirements outlined in this document, across the industry, will ensure increased likelihood of successful SAR operations within and around OREIs.
7. UK Maritime SAR and Emergency Response Co-ordination System

7.1 UK COASTGUARD

The MCA, provides maritime SAR and emergency response co-ordination through the national maritime emergency service, HM Coastguard (HMCG).

The co-ordination of maritime SAR, by HM Coastguard, is a statutory responsibility and was confirmed in a statement to parliament (recorded in Hansard) by the Secretary of State for Transport in March 1992. This statement said that:

"HM Coastguard is responsible for the initiation and coordination of civil maritime search and rescue within the UK search and rescue region. This includes the mobilisation, organisation and tasking of adequate resources to respond to persons either in distress at sea, or to persons at risk of injury or death on the cliffs or shoreline of the UK."

HM Coastguard carries out this role through a national network of nine Coastguard Operations Centres (CGOC) and the National Maritime Operations Centre (NMOC) which acts as the strategic command and control centre for HM Coastguard throughout the UK.

Each CGOC, and the NMOC, carries out a number of what is termed ‘Coast Guard Functions’ and this includes the co-ordination, direction and management of Search and Rescue operations at sea and on the coast.

For HMCG purposes, the United Kingdom coastline and sea areas are divided into 36 Operational Zones. Every zone is connected to a CGOC or the NMOC and all radio, distress alerting systems and telephone connections e.g. 999/112 calls, in that zone, are directed to the CGOC or NMOC team responsible for it.

The Operational Zones concept allows HMCG to assign a zone, or group of zones, to the CGOCs around the UK, and the NMOC, according to the predicted or actual workload and to share demand equitably around the Coastguard network. It also enables the handover or takeover of more or less zones according to operational demand, technical failures or other network-management requirements. In normal configuration, the CGOC geographically closest to the operational zones will be responsible for that area. The concept also allows less busy CGOCs to connect with and provide additional support to a CGOC that might, for example, be handling a complex incident, a major maritime incident or a large number of smaller incidents.

The size of an operational zone is based on the density of incidents and other maritime activity normally and historically expected within that zone.

OREI within a zone will be advised (in their ERCoP) how to make routine and emergency contact with the Coastguard. There are no special procedures required. The normal maritime distress, urgency and safety alerting systems e.g. VHF and MF DSC, VHF voice radio, satellite distress...
beacons, 999/112 telephone calls, will be received and handled by the appropriate 24 hour Coastguard centre.

7.2 UK Aeronautical Rescue Coordination Centre

The UK Aeronautical Rescue Coordination Centre (ARCC), based at HM Coastguard’s NMOC in Fareham is responsible for coordinating military and civil aeronautical search and rescue within the UK SRR under delegated authority from DfT. The ARCC meets the UKs commitment to ICAO Annex 12 (Search and Rescue) requirements.

It is also responsible for making requests for the use of SAR helicopters provided by the offshore energy industry or from neighbouring states.

UK ARCC is fitted with extensive radio and telecommunications equipment and is capable of providing a 24 hour immediate search and rescue response.

Figure 1 – HM Coastguard Operational Zones
8. MCA Search and Rescue Requirements and Guidance for Offshore Renewable Energy Installations

The text below contains information and guidance which, when followed, will significantly assist developers satisfy MCA requirements, relating to emergency response for at-sea renewable energy installations for wind, wave and tidal stream devices and similar such constructions/devices/vessels for generating electricity at sea or on the coast. There are also SAR implications for tidal lagoons, and information on specific requirements for these constructions is also contained in this document (section 10). Operators and developers are required to use this information in formulating their proposals to the MCA for layout, design, operations, emergency response planning, mitigations and Safety Management Systems.

8.1 Emergency Response Cooperation Plans

The MCA requires that Emergency Response Cooperation Plans (ERCoP) be developed and put in place for the construction, operation and decommissioning phases of any OREI. These plans are designed to ensure that HM Coastguard, SAR resources and the developer/operator have necessary information about the fundamental details of an OREI and that both the developer/operator and HMCG have access to emergency contact numbers to permit rapid contact, information sharing and effective cooperation during an emergency situation.

If an OREI changes ownership, is leased by another developer/operator, or any significant change, then an updated ERCoP for that site will be required to be submitted for approval by MCA SAR Operations. A template and instructions for completion of ERCoPs can be found on the GOV.UK website under offshore renewable energy.

An ERCoP must be in place ready for the start of construction operations and an Operations Phase ERCoP must be prepared for activation when the OREI becomes operational.

Only one ERCoP and one Emergency Response Plan (ERP) should be in operation at a development at any one time, as per guidance contained in the Integrated Offshore Emergency Response document. This illustrates how an ERP interfaces with the ERCoP, which ensures prompt support by the MCA and other organisations is possible.

To ensure compliance, regular checks of ERCoPs will be undertaken by MCA SAR Operations and emergency and alternative phone numbers for the OREI, held in the ERCoP, will be frequently tested. Operators should therefore ensure that regular checks of the validity of the ERCoP are carried out and that updated versions are sent to MCA SAR operations as necessary.

In addition, part of the ERCoP template includes the requirement for a summary document to be used by SAR resources responding to an incident or exercise within or in the vicinity of an offshore development.
8.2 Offshore Search and Rescue Management Courses – Renewables (OSARM-R)

The MCA provides offshore emergency management courses for the industry to enable marine coordinators, installation managers, senior management, CTV and operations support boat crew and any other company staff who may be involved in the management of and response to emergencies, to be trained and made aware of the correct procedures and processes to be followed in SAR situations and other emergencies.

The course provides an overview of the SAR system and how it operates, and course delegates will be involved in table top exercises to increase understanding and awareness of their role and contribution to emergency response and to increase cooperation with national SAR coordinators and responders.

These courses will be run throughout the year and it is highly recommended that every organisation involved in operating OREI should ensure appropriate competence is established by arranging attendance by a suitable number of staff and CTV crew to attend them. Those that attend should be directly or indirectly involved in operational activities, or the management of those activities. Deputy Operation Managers, Supervisors, and Marine Co-ordinators would find the course content directly applicable in their roles. Senior Managers and Health and Safety personnel would benefit from understanding the content, and so be in a better position to support those directly involved in and management of operations. Attending a refresher course every five years is encouraged.

Future course dates will be available at https://www.gov.uk/guidance/offshore-renewable-energy-installations-impact-on-shipping

8.3 Layouts – General Comments

The MCA requires earliest possible discussions with developers on proposed layout options for any OREI, before decisions are made on the final layout design. Failure to do this may result in the MCA formally objecting to a project. MGN 543 contains information on the MCAs requirements for layout.

To assist the MCA in evaluating the safety and effectiveness of SAR response within a proposed layout, developers are required to provide the MCA with detailed plans and drawings. In addition, to enable the fullest possible assessment of a layout proposal, developers are encouraged to offer computer models, artist impressions, computer generated images and animations of the layout, or scale models of the OREI, as soon as they have firm ideas for layout proposals and options. This will enable SAR unit operators, and SAR subject matter specialists at the MCA, to carefully consider a layout’s SAR implications and compliance.

If provided, computer modelling simulations, that can be controlled by the user, and which include the ability to ‘fly-through’ a layout and show SAR objects e.g. life rafts, persons in the water and vessels, and change the displayed environmental conditions to imitate e.g. reduced visibility, rough
sea states, low cloud (of varying coverage) and night time, are most useful. Such simulations should allow the MCA/SAR unit operator to move through a layout at surface level and at variable altitudes and speeds so as to simulate surface craft and aircraft operating amongst and through a layout. Turbine or device ‘model’ simulations should be as close to the type and size of turbine proposed to be built.

8.4 SAR Checklist

During pre-construction conversations with developers, the MCA will request a SAR checklist is completed. The SAR checklist is a record of discussions regarding the requirements, recommendations and considerations outlined in this document and should be agreed by the developer and MCA on a case by case basis.

The content of the SAR checklist will apply throughout the life-cycle of the development and will be used by the MCA to ensure actions agreed pre-construction, are correctly implemented.

There are no additional requirements contained within the checklist other than a reflection of this document, or those which are agreed at the time with the developer.

8.5 Points to Note

This document, and the Emergency Response Cooperation Plan (ERCoP) template, is subject to change in light of experience, lessons learned, the development of new technologies or procedures, or legal or regulatory requirements.

This document will be subject to review every 2 years.

Potential users should contact the MCA to ensure complete understanding before making use of the information. Reference should also be made to relevant Marine Guidance Notices and additional MCA information contained on the GOV.UK website and marine licensing requirements and consent processes. Questions about this document can be addressed to:

8.6 Routine Contact for HM Coastguard Maritime Operations

Offshore Energy Liaison Officer (OELO) T: +44 (0)203 817 2070

E: SAR.Response@mcga.gov.uk

NOTE: The above details are not for emergency notifications – if you have an emergency, please contact the relevant Coastguard Operations Centre directly.
9. General Requirements, Guidance, Advice and Mitigations for Search and Rescue Operations

The following sections contain guidance and/or advice and recommendations to developers and operators and specific requirements; where these have been assessed by MCA subject matter specialists as necessary. Guidance, advice and general information is offered so that developers and operators can understand the context and reasons for MCA requirements and to consider their residual risks and assess the need to provide solution(s) to mitigate or remove them.

Principal mitigation measures required for any OREI are:

- Linear layouts
- Clear and unique identification markings visible to surface craft and aircraft
- Hover reference marking of Wind Turbine blades
- Aviation Hazard and aviation SAR Lighting of wind turbines
- Lighting and marking of OREIs in accordance with the UK General Lighthouse Authorities requirements
- Rapid control and shutdown of individual and groups of OREI devices (wind turbines in particular)
- Provision of in-field Automatic Identification System (AIS) available for use by HM Coastguard
- Provision of in-field marine-band VHF DSC radio systems available for use by HM Coastguard

9.1 SAR Helicopters – General Issues

Search and Rescue helicopters have specific requirements to allow them to operate safely within and around OREIs particularly where there are multiple, tall structures, with moving blades.

SAR helicopters are a key tool for search and rescue. For example, it may be that surface rescue craft cannot conduct a rescue in the time available, cannot reach the site in a reasonable timescale, or that SAR helicopters are the best option or are needed to provide additional capability to a rescue operation. Also, in major rescue or search incidents, the greatest number of rescue units possible, surface and airborne, may be required. Where other vessels cannot enter an OREI for safety reasons, SAR helicopters may be the only resource available to conduct a rescue.

SAR helicopters are, in many cases, the quickest means of delivering a rescue response to a location offshore and to recover survivors back to shore or a safe location and can usually cover search areas faster than surface rescue craft.

Emergency evacuation of persons directly from a Wind Turbine Generator (WTG) nacelle or other OREI device, using a SAR helicopter may, depending on the situation, be the best solution. It is likely to be considered where risk to life or limb or likelihood of permanent injury or ill health is such
that the speed of reaction to the incident and transfer of persons back to shore, or of injured persons directly to medical facilities, can best be achieved by use of a SAR helicopter.

If weather conditions are such that a SAR helicopter has to fly under Instrument Meteorological Conditions (IMC) flight rules, using instrument navigation techniques and electronic systems, the aircraft will not be able enter any wind turbine lane that is less than 500 metres wide (measured between blade tips, that are transverse to the turbine lanes, unless the blades can be rotated away from the lane to increase the spacing to 500 metres or more).

When faced with the prospect of long transits to a SAR area, the presence of Wind Farms along the direct transit route may present obstacles to SAR helicopters if weather conditions do not permit transits to be flown above maximum blade height of windfarms on the flight path.

9.2 Rescue Boats / Lifeboats – General Issues

Shore-based rescue boats or lifeboats may be used to conduct SAR operations within or around OREIs if they are within range and/or operational coverage. Such craft may be used either instead of or in addition to SAR helicopters.

Weather and sea state are major factors in any SAR operation and risks to rescue boats are exacerbated by the presence of structures. This may sometimes preclude the use of rescue boats/lifeboats.

Rescue boats or lifeboats may be used in cases such as where a shore-based boat is closer and may arrive at the scene of an emergency sooner than a SAR helicopter. They might also be used, for example, to recover survivors or take an injured or ill OREI worker from an installation to a location outside the OREI area where a SAR helicopter can winch them from the boat. This situation may be a preferred solution where an OREI poses a problem for SAR helicopter winching operations – either because of the weather and sea conditions at the time or because of a pre-existing restriction or risk. The decision on which type of rescue unit(s) to deploy will be taken by the SAR Mission Coordinator, at the time of the incident, in consultation with the rescue units and the OREI operations centre and/or incident manager/leader/controller.

9.3 Transport of Medical Cases using Commercial Air Transport Helicopters

RECOMMENDATION

9.3.1 Operators who use commercial helicopters should carefully consider the constraints set by UK aviation regulators for moving injured or ill personnel. If commercial helicopters are to be used for this purpose, then an explanation of the pre-planned procedures and processes should be included in the ERCoP.

9.3.2 All medical incidents should be reported to the Coastguard so that, if external assistance is required, a rapid response can be provided to ensure that the injured/ill person(s) are taken to medical facilities as soon as possible. A Radio Medical Advice Service is available from HM Coastguard’s CGOCs. See below for detail.
9.4 Rescue/Recovery of Medical Cases by Rescue Boat / Lifeboat

**RECOMMENDATION**

9.4.1 Developers/operators must ensure that they can recover injured/ill persons from within any structure to the transition piece platform, or other landing stage/platform (for floating wave/tide/sea current devices) ready for transfer to rescue boats/lifeboats.

9.4.2 Shore based, volunteer-crewed, rescue boats or lifeboats may be used to evacuate injured or ill persons from wind turbines or other OREI installations. They can normally only recover persons from the Transition Piece Platform or landing/docking stages of installations. Lifeboat crew *will not* climb wind turbines or enter other OREIs to carry injured/ill persons to the landing stage because the crews are not trained on the particular installation and its risks. There are also severe physiological demands in climbing a wind turbine.

9.5 Feathering, Braking and Orientation of Wind Turbine Blades for SAR Operations

**CONTEXTUAL REQUIREMENT**

9.5.1 The SAR Mission Co-ordinator (SMC) will need to know how WTGs in a particular windfarm are shut down, feathered, orientated and prepared for helicopter operations, and how long this process will take. This information must be included in the ERCoP. Failure to have control of turbines, as described below, may result in rescue not being possible in some situations.

9.5.2 If helicopter rescue is to take place from/to a WTG, the WTG blades will have to be feathered and the rotor brakes applied (and where feasible blades should be pinned). It may be possible for a SAR helicopter to winch from a nacelle with the blades in a variety of positions, however, the Retreating Blade Horizontal position (Figure 2 – single blade downwind) is preferred. The blades should be positioned before the SAR helicopter arrives and adjusted, if possible, as required by the SAR aircraft captain. It is also imperative that any automatic yaw control systems be disabled, where possible, or, that the SAR helicopter is informed that yaw control cannot be isolated, before it arrives over or near to a turbine. UK SAR helicopter rescue winches are located on the right-hand side of the helicopter. Therefore, the nacelle should normally be rotated so that the blades are at 90 degrees off the wind with the wind blowing on to the left side of the nacelle e.g. if wind is blowing from 270 degrees, the nacelle will need to be rotated to the right so that the hub is facing 360 degrees. Nacelles must be held in position so that downwash from the helicopter does not cause the nacelle to rotate.

9.5.3 The blades should be prepared and in position before the SAR aircraft arrives. Failure to do so may result in significant delay, particularly if repositioning the blades does not occur promptly. This could additionally require the aircraft to leave to refuel.

9.5.4 The feathering and braking of turbines may also be requested by rescue boats if e.g. turbulence, visual distraction or noise creates a problem for the boat and/or the rescue activities.
**Retreating Blade Horizontal Position:**

The retreating blade horizontal position provides good references with the blade in the pilot and winch operators 2 o’clock position whilst maintaining a clear area for the tail rotor should the crew wish to offset the aircraft for wind or to improve visual references or escape headings.

This is the preferred option for winch transfers to the turbine.

Figure 2: WTG blades set to Retreating Blade Horizontal position for winching

**Bunny Ears (Y Blade) Position:**

The Y blade position also offers good references with the blade in the pilot and winch operator’s 2 o’clock position. The retreating turbine blade aft of the helicopter in the winching position slightly compromises the tail rotor area.

This position is commonly referred to as “Bunny Ears” or possibly the “SAR Position”.

Figure 2.1: WTG blades set to the Bunny Ears or ‘Y’ position for winching
Advancing Blade Horizontal Position:

The advancing blade horizontal position is the poorest option for references with the retreating blade occupying the area closest to the tail rotor.

This position is also known as “Orientation Stop”, “Heli-Stop” or “Lazy Y”. This is the position usually selected for delivery/recovery of turbine technicians by wind farm helicopters.

Figure 2.2: WTG blades in Advancing Blade Horizontal position for winching

9.6 SAR Helicopter Winching Operations

9.6.1 If winching is to take place to/from a nacelle, wherever possible wind farm personnel should be in the nacelle to assist the winchman.

9.6.2 The significant risks associated with winch operations to a nacelle are being assessed as experience of the activity grows. This means that further work will need to be done to improve doctrine and technical requirements e.g. safety measures on nacelle roofs. Developers should consider ways to mitigate the risks associated with winching operations and discuss these with the MCA. Considerations may include helicopter winching baskets/areas, safety rails, helicopter winch platforms, non-slip surfaces and winching area working lights. It should be noted that a SAR helicopter will not carry out a winch operation to a turbine that does not have a safe area to winch from. Without the safety devices and equipment explained above, it is unlikely that a winch rescue can be undertaken from a WTG. CAA document CAP 437 contains information about winching area requirements for wind turbines.

9.6.3 Winching from the surface of the sea, amongst wind turbines or other OREIs, may be possible depending on the incident situation, cloud cover and height, visibility and sea conditions and at the SAR aircraft captain’s discretion on assessment of risk at the time of the incident. There is no guarantee that a SAR helicopter will be able to conduct a winch rescue from the sea surface or from a vessel that is operating amongst wind turbines or other OREIs.\(^3\)

\(^3\) When winching from a vessel, and where possible, the target vessel should maintain a course into wind and aligned as far as possible along a lane. If unable to maintain headway, the vessel should anchor such that the vessel is in a clear area amid the turbines or vacate the field by the quickest means.
9.6.4 Operations to, or in the direct vicinity of wind turbines, where no direct communications with the turbine operator exist and it is not possible to reposition the turbine blades, will be prohibited.

9.7 Wind Turbine Blade Hover-Reference Marking

**REQUIREMENT**

9.7.1 WTG blades need to be marked to provide a SAR helicopter pilot with a hover reference point when hovering over a nacelle during a rescue. This is necessary because SAR helicopters are large aircraft and the pilot (sitting on the right of the aircraft) may not be able to use objects or markings on the nacelle for reference because these are too far behind the pilot’s location to be easily seen. The WTG blades are in the pilot’s normal vision-arc and so are the best place for such markings.

9.7.2 Three marks are required on each blade - one each at the 10, 20 and 30 meter interval (starting from the hub end of the blade) and placed near the trailing edge of the blades so that, when they are feathered, and the blades are parked in the ‘bunny ears’ (‘Y’ position) or offset ‘Y’ (one or two blades angled forward into the wind), the marks lie upwards in view of the helicopter pilot.

9.7.3 The marks should be painted in a contrasting shade to the turbines overall colour - red is considered to be most suitable. The diameter of the marks (dots are preferred) should be at least **600 Millimetres** but may need to be larger according to the overall size and shape of the turbine and blades. *The precise location of the dots/stripes should be confirmed with MCA Search and Rescue Operations branch before placing them on blades.*

9.7.4 The blade tip should also be marked in a contrasting shade to the turbines overall colour - red is considered to be most suitable (the amount of tip paint is dependent on the size of blade, but approximately 2% of the blade length should be sufficient). See image below. Where blade tips cannot be painted because of e.g. lightning protection material on the tip, the developer is to offer alternative solutions for consideration by the MCA.

9.7.5 All markings on blades and nacelles must be maintained in operational condition throughout the life of the wind farm. This means that all markings and numbers must be legible and clearly visible.

![Figure 3: Example of Blade Hover-Reference and Tip Marks](image-url)
9.8 OREI Lighting – General Points

9.8.1 This section is concerned with lighting for SAR and emergency response purposes. Lighting for marine navigational safety is the responsibility of the General Lighthouse Authorities. Developers are strongly recommended to discuss and confirm the detail of navigational safety lighting and marking with the MCA and other relevant authorities before manufacture or installation.

9.8.2 In poor visibility and/or at night, any lighting, including working lights on the landing stages/decks of OREI is required to be controllable from shore so that it can be switched on or off - at the request of a SAR helicopter, rescue boat or the SAR Mission Co-ordinator. Working lights on OREI must not cause confusion or interfere with the lights from aids to navigation.

9.8.3 To assist rescue operations from WTG, wind turbine personnel may consider carrying strobe-torches or portable lights that could be placed on the roof of a nacelle to indicate the turbine which the helicopter should proceed to. Additionally, for those WTG with transparent roof hatches or hatches that can be opened, internal lighting might be requested to be switched on to enable the upward-spilling light to identify a specific turbine to SAR helicopters.

9.9 OREI Aviation Hazard Lighting

9.9.1 Aviation hazard lighting for OREI must be provided so that safe SAR aircraft operations can be conducted at night or in poor visibility.

9.9.2 The Civil Aviation Authority (CAA) and the MCA are in regular dialogue as to how much and what kind of lighting is required in wind farms (dependent on their size, location, shape and risk factors) and so no design decisions should be finalised for aviation lighting until developers have consulted with the CAA and MCA.

9.9.3 The aviation hazard lighting requirements for wind turbines fall outside of those contained in the Air Navigation Order (ANO). However, the CAA accepts the operational need for different lighting for offshore wind turbines. Developers are therefore requested to write to the CAA to request a derogation from the ANO. The CAA has outlined its position on offshore windfarm lighting in CAP 764 (published February 2016). This document includes MCA requirements for lighting of offshore windfarms. It is important that the developer communicates early-on with the MCA regarding lighting for offshore OREIs.

9.9.4 The lighting of offshore wind farms with aviation hazard lights is necessary for:

(a) Flight safety of aircraft passing by or over wind farms (hazard avoidance);
(b) Flight safety of Search and Rescue aircraft (helicopters and/or fixed wing) operating over, around or within a wind farm, often at low altitude, to conduct SAR operations to save life; and
9.9.5 In (b) above, the lighting is necessary to ensure that aircraft operating at night and/or in poor visibility, close to OREIs, can identify (1) the shape and layout of a field and (2) locate and monitor each OREI (as an individual hazard).

9.9.6 The CAA has discussed lighting requirements in detail with the MCA and the General Lighthouse Authorities (GLA) of the United Kingdom and, in particular, that which is necessary to assist SAR operations. It was agreed with the MCA that lights are required on OREI as follows:

(a) Whenever boundary turbines are equal to or greater than 900 metres apart, all boundary turbines shall be lit (at night and in poor visibility) with a single, 2,000 candela, red aviation hazard light, flashing Morse ‘W’ in unison with all other turbines so lit. The 2,000 candela light should be automatically adjustable in intensity to not less than 200 candela whenever the visibility is greater than 5 Km. This requirement is also necessary where the SAR coordinating authority and/or the SAR helicopter or aircraft requests a reduction in light intensity. Then the light needs to have fixed illumination (no flashing required). Where boundary turbines are less than 900 metres apart, the number and location of those lit shall be in accordance with discussion with the MCA and the CAA.

(b) All other OREI of a wind farm (OREI within the boundaries and those OREI on the boundary that are not lit because they are less than 900 metres apart) shall be fitted with a single, 200 candela, red aviation hazard light, with fixed illumination (no flashing required). During routine operations i.e. no SAR operations are underway in or around the windfarm, these lights shall be switched off. The lights may be required to be switched on at the request of the SAR coordination authority and/or a SAR helicopter or aircraft.

(c) The SAR lights mentioned in b) above, should be visible by a SAR helicopter operating below nacelle level as well as from all directions above. The SAR lights, should be at least 30 cd from -20° below nacelle level up to nacelle level and 200 cd from nacelle level up to 90° above nacelle level.

(d) All aviation hazard lights shall be visible through 360°. Where this is not achievable via a single light due to the design of the OREI, an additional light or lights may be required to ensure 360° visibility is maintained.

(e) All OREI aviation hazard lights throughout a field shall be individually controllable (from the windfarm operators control centre or through a remote operations and control

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(c) Flight safety of low flying military aircraft using conventional techniques or night vision devices.

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4 Any questions on technical specification should be directed to the MCA’s OELO in the first instance. Further information may be updated in due course following discussions with the CAA.
(f) All OREI hazard lights throughout a field shall be compatible with Night Vision Imaging Systems (NVIS)

For the light defined in a) the MCA require it to emit IR light in Morse code W, according to the specifications of the Ministry of Defense (MOD). This IR light shall remain flashing Morse code W when the hazard light is dimmed according to a). Upon request, this IR light should be switched off in case of distraction to the SAR crew.

For the light defined in b), the light shall emit at least 4mW/sr over the light output angles as defined in c) and d). The infrared wavelength shall be between 800-850nm. Once deployed, in case 4 mW/sr deems not to be sufficient in the field, it should be possible to increase the output power by a factor of 2.

(g) All lighting components should be tested by an independent test house. The photometrical and colour measurements performed in the optical department of this test house should be accredited according to the version of EN ISO/IEC 17025 current at the time of the testing. The angular sampling intervals should be: every 10° in azimuth; every 1° in elevation.

9.9.7 Like maritime navigation lighting, aviation lighting is an aid to safe flight at low altitude and the avoidance of hazardous obstacles. The turbine field aviation hazard lighting (internal and external) must relate to the physical layout of OREI, regardless of operator and/or date of construction such that if OREI are built adjacent to or as extensions of existing wind farms, the disposition of lights will have to be modified accordingly to provide a contiguous and unconfusing pattern to aircraft. If the wind farms have different operators, then a common lighting pattern and control methodology will be required. Flight safety is as important as vessel safety. Early conversations should be initiated with the MCA, GLA and the CAA to understand the requirements and to develop appropriate solutions.

9.9.8 SAR helicopters requesting lighting to be switched on or off shall normally do so through the relevant CGOC or directly with the operator via radio, if this option exists.

9.9.9 Aviation lighting must be properly maintained throughout the life of the wind farm and response to lighting failures must be in accordance with CAA requirements.

9.9.10 It is not currently considered necessary for surface-located wave and tide devices to have any aviation lighting fitted.

5 The SAR coordinating authority is the SAR Mission Coordinator (SMC) at the relevant HM Coastguard Operations Centre (CGOC) conducting rescue co-ordination.
9.10 Rescue Boat Lighting Requirements

CONSIDERATION

Rescue boats/Lifeboats will not normally require lighting other than that which is installed to meet the requirements of navigational safety and for the identification of individual OREIs e.g. ID-number lights on all wind turbine towers. If there are deck/working lights on the turbine or device, these may be required to be switched on, or off, during rescue or search operations.

The MCA, and rescue boat/lifeboat operators may request additional lighting requirements if a particular OREI proves to need such lighting to enable the safer operation of rescue boats/lifeboats. Any such additional lighting would not routinely be illuminated but only used during a SAR situation and on request of the rescue unit(s) or the SAR Mission Coordinator.

9.11 Control of OREIs

REQUIREMENT

9.11.1 Control of all OREI devices must be available from a 24-hour contact point which has immediate access to control of the devices, and that can be quickly communicated with by the SAR Mission Co-ordinator and/or rescue unit.

9.11.2 Any request for shut down or position change of OREI must be actioned within a reasonable amount of time i.e. within 10 minutes. Any delays or failure to carry out the instruction will likely have an adverse impact on SAR operations with SAR helicopters and/or rescue boats potentially being unable to operate within or in the vicinity of the OREI.

9.12 Wind Turbine Control for SAR Helicopter and Rescue Boat Operations

REQUIREMENT

9.12.1 Wind farms may be required to be shut down (individual turbines, a row or rows of turbines or part or whole field) to reduce visual distraction, physical collision and turbulence risk to SAR helicopters and/or rescue boats during SAR operations e.g. during searches conducted within or passing through the wind farm or when winching persons from nacelles, boats or the water. There may also be a requirement for turbines to be yawed to a favourable position for SAR operations e.g. all hubs in adjacent rows rotated outwards, maximising the available space between blades.6

9.12.2 The MCA will need to be aware of any constraints associated with control of turbines in the context of weather limitations, time delays for shut down, manoeuvring of turbine nacelles and the reliability of control and indication circuits. This information must be included in the ERCoP.

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6 Developers should consider how they ensure that the turbines/devices specified and ordered are capable of being controlled to meet the MCA requirements.
9.13 Control of Other OREI Devices for SAR Operations

**REQUIREMENT**

9.13.1 Surface, sub surface or seabed OREIs, excluding cable arrays unless these are compromised by the incident, may be required to be shut down or de-powered during surface rescue-boat/lifeboat operations to reduce the risks to these craft. Where a surface OREI is to be approached by a SAR helicopter, it may be that the device must be shut down or otherwise stopped (if they can be) to enable an effective or safer rescue to be conducted e.g. to rescue a person from the water near to or on a device.

9.13.2 ERCoPs will need to include details of hazards and mitigations to minimize the risk to personnel in the water, with particular emphasis on those risks that may not be apparent from the surface. These will need to be included in the ERCoP and control-room staff will be expected to be familiar with the content and be able to brief the SAR Mission Co-ordinator accordingly.

9.14 SAR Helicopters Radar and Electro Optical Systems

**CONSIDERATION**

9.14.1 For SAR helicopter operations, radar is a key tool for aiding flight safety when navigating amongst or around WTGs (obstacle detection) and is a rescue-object location tool - especially at night, in bad weather and poor visibility. It is therefore fundamental to the safe operation of SAR helicopters within and around wind farms that WTGs and other structures are detectable to airborne radars (at a safe range) and that the aircraft crew, using radar, can discriminate between individual turbines. Evaluation work may need to be conducted by developers to determine if there are any particular difficulties that may be encountered by SAR helicopters using radar close to or within a wind farm. Such evaluations will allow the creation of relevant procedures for the use of radar for SAR purposes in this environment. Outcomes from such trials and evaluations may lead to a post-construction requirement to mitigate any serious interference or other radar degradation – if that is technically possible. The MCA will advise, during the consultation process on layouts, if they consider that testing and trials may be necessary.

9.14.2 If an OREI is considered by the MCA to be problematic for use of SAR camera/imaging systems, the MCA may request the developer to undertake evaluation work to assess effects on electro-optical (Infra-red, night vision imaging systems and low light TV cameras, etc.). Mitigation requirements may then need to be placed on an OREI if such systems are found to be degraded when used amongst those OREIs. MCA will advise during the consultation process on layouts and turbine types.

9.15 Rescue Boats/Lifeboat Radar and Electro Optical Systems

**CONSIDERATION**

9.15.1 Radar is an important safety of navigation and rescue-object location tool during rescue boat/lifeboat operations at night and/or in poor visibility. It is therefore important that OREIs are
detectable to marine navigation radars in accordance with MCA requirements contained in relevant MGNs and that, subject to inherent target range and bearing discrimination performance of the marine radars, individual OREIs can be differentiated from others i.e. each OREI's radar image should not merge with a nearby device when a surface rescue craft is close e.g. within 1 Nautical Mile. If radar clutter, propagation and/or degradation is found to be unacceptable, developers may be required to provide mitigations and/or other solutions, if these are physically possible.

9.15.2 Some rescue boats/lifeboats may use electro-optical devices e.g. night vision imaging systems, to aid location of SAR objects or to navigate safely in the dark. Mitigations may need to be required from developers if such systems are found to be degraded when used amongst an OREI.

9.16 Radar Reflectors – Wave, Tide and Sea Current Devices

9.16.1 Surface, and surface piercing wave and tide devices must also be marked with radar reflectors so that each device can be located on radar by aircraft and surface craft operating over, around or within an array. These reflectors may also assist radar location of any devices if they should break-away from an array. The radar reflector and supporting structure may also provide better visual acquisition properties for devices when viewed by eye, particularly from surface craft. Current evidence indicates that wind turbines do not normally require additional radar-signal enhancement. However, there may be unusual circumstances where the MCA, or other organisations, require the fitting of devices to increase the conspicuousness of a radar image from a turbine or turbines.

9.16.2 All OREIs must be marked and lit in accordance with the relevant General Lighthouse Authority requirements.

9.17 OREI Layout Numbering

9.17.1 OREI devices and layouts are required to be numbered so that surface craft and aircraft can identify and locate individual devices and can navigate easily around and amongst an array. Installation numbers can also be used by craft in an emergency to report their position by reference to a nearby device number, and position fixing can be enhanced if more than one turbine can be used to fix a position by the taking of bearings. The numbering of layouts also contributes to the situational awareness of SAR craft and to enable them to navigate visually to a device or location in an array to conduct rescue operations. It also assists with safety of navigation of craft passing close by or through an array. Out of sequence and/or complicated numbering schemes are potentially confusing and will not be accepted. MCA MGN 543 provides complementary information about numbering of turbines.

9.17.2 OREI layout numbering schemes are required to follow a 'spreadsheet' format whereby an array is numbered in a navigationally logical and sequential manner, using a combined alphabetical and numerical order. This must commence with a wind farm name designator-code
(normally 2 or 3 letters) and then row/column numbering starting with letter ‘A’ and then a turbine number e.g. 01, etc. The numbering and orientation of the scheme must be determined in discussion with the MCA; from a SAR perspective the numbering and orientation should be aligned with the ‘SAR Access Lanes’ such that progression through the windfarm is indicated by increment/decrement of turbines in a logical fashion. Letters ‘O’ and ‘I’ should not be used to avoid confusion or misunderstanding with numbers 0 and 1.

9.17.3 Where a developer/operator must have turbine electrical-connection identifiers included on the outside of turbines/devices, the MCA can accept this but these designator letters/numbers must be placed in brackets beneath the other number and letter combinations. For SAR purposes, the MCA would prefer there be only one reference system used for identification of structures.

Example of a turbine layout tower numbering ID plate/panel acceptable to the MCA:

ABZ  (OREI site-designator code letters)
A01  (first turbine in row ‘A’)
(J8)  (Electrical connection identifier letter/number if required by operator)

9.18  Wind Turbine Tower and Nacelle-Roof ID Numbers

9.18.1 Individual wind turbines are marked for safety of navigation\(^7\) and SAR situational awareness purposes with ID number plates, set at 120 degree intervals around the tower base or the railings of the transition piece walkways, usually somewhere close to the level of the entrance door area. These ID numbers must be clearly readable by an observer stationed 3 metres above sea level at a distance of at least 150 metres from the turbine. Each ID number plate shall be illuminated by a low intensity light visible from a vessel thus enabling the structure to be detected at a suitable distance to avoid a collision. Lighting for this purpose must be hooded or baffled so as to avoid unnecessary light pollution or confusion with navigation marks.

9.18.2 Individual ID numbers are also to be painted on the nacelle roof, or other OREI (e.g. substation) so that SAR helicopters and/or other low flying aircraft (Search and Rescue, Counter Pollution, Fisheries patrol or Military) can locate and/or reference an OREI visually. These ID numbers should be recognisable from an aircraft flying 500 feet (152 metres) above the highest part of the structure, which for wind farms would be the blades at their vertical point. Advice from the CAA (October 2013), following discussion with the MCA, is that such numbers should be as large as practicable but not less than 1.5 metres in height and of proportionate width. This implies that ID numbers should be more than 1.5 metres in height where there is space to achieve this. It is expected that developers will make ID numbers as large as can be sensibly fitted on a nacelle roof.

\(^7\) As per IALA guidelines
9.18.3 ID numbers should be placed on the roof in a logical manner so that the OREI can be easily distinguished.

9.18.4 Tide and wave devices, which are on the surface at any time of their operation, shall also be marked with ID numbers on the most appropriate vertical and horizontal surfaces.

Figure 4: Example of ID Numbers on wind turbine nacelle roof, acceptable to MCA

Figure 5: Suggested alternative orientation and size of air-viewable ID numbers on WTG nacelle roof.

9.19 Emergency Response Capabilities Provided by OREI Developers and Operators

RECOMMENDATION

9.19.1 The HSE and MCA has released ‘Regulatory Expectations for Emergency Response Arrangements in the Offshore Wind Industry’\(^8\) which outlines what Duty Holders responsibilities are for the prevention of major hazard accidents and protecting persons from the effects of any which do occur; and securing effective response to emergencies affecting persons on any offshore

\(^8\) Due to be released shortly after the release of version 2 of this document
renewable energy installation or engaged in activities in connection with it (including marine and aviation) and which have the potential to require evacuation, escape and rescue from the installation.

9.19.2 OREI developers and operators should consider in-house provision of relevant equipment, resources, training, personnel and procedures to provide a good prospect of initial rescue and recovery for their own, and contractor, personnel in an emergency situation. This should include a relevant level of medical response capability. Additional resources may also be useful for routine operations (e.g. transfers) and developers should consider all options which may be available. This may include platform/SOV launched rescue vessels, dedicated SAR helicopters and/or refuelling facilities, some of which may be more feasible/reaslistic as more windfarms are constructed far offshore.

9.19.3 National SAR resources may be available to provide assistance to and/or recovery of survivors/injured/ill persons but are necessarily some time from the scene and so must not be factored in to emergency plans as a first response. Any incident under the co-ordination of the ERP or incidents to personnel and/or assets, on or around OREIs, must always be immediately reported to HM Coastguard and a dialogue established to determine and agree what response, if any, is required.

9.19.4 Such in-house capabilities can also provide assistance to vessels and persons in danger at sea but who are not connected with the work or operations of the OREI. This in-field capability provides a response in accordance with the general principles of the Safety of Life at Sea (SOLAS) Convention as they apply to any marine support or other craft engaged in the work of an OREI.

9.19.5 Developers and operators are recommended to consider the following when assessing their choice of support vessels/installations/aircraft. Notwithstanding the requirements of a Duty Holder detailed in the document mentioned above, if the MCA deem a dedicated rescue capability to be necessary for the development, these would be a requirement for the chosen vessel(s).

9.19.6 The following are over and above that which is required in “The Workboat Code: Industry Working Group Technical Standard” and would apply to the Operations and Maintenance phase as well as during Construction.

9.19.7 The developer or operator should ensure that, during operational hours there is at least one vessel available, and that it can be mobilised (unless sea state is outside of vessel operating limits) to respond to vessels, aircraft or persons in distress, within or near to the windfarm.

9.19.8 The developer or operator to provide the MCA (to be included in the ERCoP) the sea state and weather operating limitations of its support vessels. This should include both the personnel transfer and general operating limitations of the craft, if these are different. The MCA would require the developer or operator to provide vessels which are capable of operating in conditions of at

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9 Operational hours means the hours by which the vessel would normally be working, even if there is no offshore activity.
least 95% of the average annual maximum significant wave height for the area which they are operating\textsuperscript{10}.

9.19.9 The developer or operator to provide the MCA the normal operating hours or working time-periods for the support vessels and how long it would take a support vessel to respond from its shore base to the windfarm, if it is able to do so.

9.19.10 The developer or operator should consider whether a crew for a support vessel can be mobilised outside of normal working hours to assist with an emergency response, if requested by HM Coastguard. Support vessels will often be the most effective and appropriate vessels to respond to any emergency nearby or within a windfarm and may be able to assist from their base port or harbour. Developers should consider this response time when choosing their operational base/port.

9.19.11 The developer or operator must ensure that any support vessel has sufficient crew to enable it to successfully respond to a search and/or rescue situation or incident, and that all the crew are fully trained in the use of any on board rescue equipment and in Search techniques and Rescue techniques.

9.19.12 In addition to the above, to ensure effective SAR capability is provided, the MCA \textit{may}\textsuperscript{11} require the following equipment to be fitted to the vessels:

- Visual search enhancement equipment (e.g. fixed or hand held image enhancers e.g. thermal imaging/night vision imaging systems – at least two available on board vessels offshore at any time that vessels are operating).
- Searchlights (at least two for redundancy).
- Radio frequency homing equipment (VHF Direction Finding) to enable a support vessel to locate EPIRB, PLB and ELT homing signals (121.5MHz radio signal) and general marine band VHF transmissions.
- Additionally, vessels will need to carry homing equipment for any non-GMDSS personal locator beacons or devices that the windfarm personnel carry.
- Vessel radar (marine type) and appropriate for the type of vessel and sea environment of the area of operation.
- Vessel AIS display (enables location and monitoring of other vessels and the detection and location of AIS-equipped man overboard/personal locator beacons (using the 972-prefix MMSI number) and future AIS-EPIRB beacons (fitted with AIS as a homing signal)).

\textsuperscript{10} Based on information from “Guidelines for the Management of Emergency Response for Offshore Installations (Appendix 4, 78)” and extracts from “Wind and Wave Frequency Distributions Around the UKCS”.

\textsuperscript{11} These requirements will be assessed on a case by case basis depending on the e.g. OREI location, size, shape, layout, distance from and availability of shore based SAR resources, availability and capability of support craft or other in-field facilities, context, adjacency to other OREI, navigational risks, sea traffic density and routes, etc.
• At least two VHF DSC radios, to enable the vessel to act as On Scene Coordinator (OSC) to simultaneously listen-for and communicate with vessels and aircraft on scene, and the SAR Mission Coordinator at the coordinating Coastguard centre (CGOC).
• A single MF DSC Radio to enable communications to take place in the absence of VHF radio availability or coverage or as a backup means of communication with other vessels and/or the coordinating Coastguard centre (CGOC).
• A secure means of voice communication e.g. satellite and mobile telephone, to enable confidential conversations to be held.
• Sufficient and effective rescue equipment capable of recovering persons from the water, using a horizontal lift (hypothermic lift technique), in all conditions the vessel would be expected to operate.
• Suitable equipment and consumable items to protect and manage survivors until they are delivered to a place of safety or passed to another rescue unit.
• High level of first aid and casualty care capability, and appropriate equipment and materials. The MCA recommends at least one member of the crew holds STCW Proficiency in Medical Care.
• Ability to provide emergency towing capability up to similar sized vessels.
• Carriage by the vessel of an up to date copy of IAMSAR Volume III (Mobile Facilities).

9.19.13 All the above requirements must be recorded within the relevant Emergency Response Cooperation Plan (ERCoP) within the section covering support vessel details.

9.20 Far offshore and Service Operations Vessels

CONTEXTUAL REQUIREMENT

9.20.1 As developments are constructed further from shore, it is likely that specific additional Emergency Response Arrangements are required. As detailed in this document, these arrangements must include a response plan utilising operator resources and not be purely reliant on SAR.

9.20.2 Far from shore developments are also likely to utilise more helicopter operations and may include Service Operations Vessels (SOV) or other accommodation vessels or installations. These resources will have to provide some form of emergency response to ensure safe operations.

9.20.3 SOVs can provide an excellent source of support e.g. medical, accommodation, communications during SAR and full details of capabilities must be included in the ERCoP.

9.20.4 If there are attendant vessels also operating within far offshore developments, they must be capable of operating in conditions normally expected in the area and where forming part of the emergency arrangements, be able to reach casualties within the development as per the requirements of the regulator document mentioned in 9.19.1.
9.20.5 Where these vessels/installations do form an integral part of the emergency arrangements, operators must consider alternative plans should the vessels/installations be away from the development e.g. bad weather or planned rotation.

9.20.6 Consideration must also be given to circumstances when an SOV or other installation has an emergency and it is integral to the emergency arrangements e.g. collision, propulsion failure.

9.20.7 Given the complexities of Emergency Response far from shore, developers should discuss their plans with the MCA at an early stage.

9.21 Walk to Work

**CONTEXTUAL REQUIREMENT**

9.21.1 Walk to Work is becoming more popular with the increased number of SOVs operating and planned. The MCA welcomes the use of these vessels/installations however consideration must be given to the emergency arrangements utilising walk to work.

9.21.2 Where walk to work is used as the primary means of transfer to and from a turbine, there must be a separate and independent way of evacuating the installation in an emergency.

9.21.3 Consideration should be given to a situation where the walk to work vessel/installation has an emergency of their own which may impact the recovery of personnel.

9.22 Beacon registration

**RECOMMENDATION**

9.22.1 Emergency radio beacons are a vital resource to aid search and rescue, should a person or persons find themselves in distress. There are many different varieties of beacon available.

9.22.2 Good practice would suggest operators provide 406MHz Personal Locator Beacons (PLB’s) as all modern beacons are dual frequency and transmit on a ‘homing frequency of 121.5MHz’.

9.22.3 AIS beacons (Automatic Identification System) primarily serve as a man-over-board device and do not send an alert to HM Coastguard, while those which also transmit on 121.5MHz is only a homing frequency. AIS, if activated, would only work to around a 2 - 5mile vicinity/range of other receiving vessels and would require the ships to be monitoring their AIS. There is also no requirement for them to respond to an AIS alert although other signals may be utilised simultaneously e.g. radio broadcast.

9.22.4 PLBs transmitting on AIS transmit using a 972-prefix Maritime Mobile Service Identity (MMSI) number. Practice has found that many AIS receivers do not trigger an alarm / alert on
receiving this signal and alternatively displaying as any other vessel. This may not be recognised as an emergency signal therefore windfarm vessels must be able to trigger a MOB alert upon receiving an AIS MOB signal (using the 972-prefix MMSI number).

9.22.5 Multiple AIS beacons activated in a small area may ‘mask’ each other or provide clutter on an AIS display. Operators should consider this fully before any decision is made on their use.

9.22.6 All beacons should be registered with the MCA. Companies should assign responsibility for registrations to one person, or team, and to list a 24/7 telephone contact. This will save time and effort and avoid the need to change records when a person moves on. Ideally, the company should advise the MCA that they own the beacons, but they should keep the logistics internal to save having to regularly update MCA records simply to change details of the employee currently using the beacon.

9.22.7 Beacon records should include the Hex IDs and beacon manufacturers serial numbers, the person they are allocated to and that person’s whereabouts. The beacons battery expiry dates should also be listed as a reminder when to service and replace batteries at regular intervals.

9.23 Wind Farm and other OREI Devices Effects on SAR Operations

9.23.1 The early generation of wind farms were small in both overall size, number of installed turbines and geographical coverage, and so SAR helicopters had little apparent difficulty in responding to incidents within or around them e.g. they could fly around or overfly the turbines (normally well below any cloud cover) looking down for objects and then let-down, in a controlled manner, into the field to conduct a rescue.

9.23.2 Later generations of wind farms are of greater scope in terms of size and number of turbines in use, and the turbine height, the geographical space occupied by them e.g. tens of miles in width and breadth and the size of the ‘box’ of low-altitude airspace that they also affect. This presents new problems in particular for SAR helicopters because of the increased possibility of having to fly amongst turbines to conduct searches and/or rescues from the sea surface, and with SAR helicopters possibly unable to operate safely above tall turbines due to the presence of low cloud and/or where blades and/or nacelles may also be covered wholly or partially by cloud.

9.23.3 Search patterns used by HM Coastguard are in accordance with international standard practice contained in the International Aviation and Maritime SAR Manual (IAMSAR). All search patterns are essentially linear in that they are composed of patterns of (normally parallel) straight lines to ensure that a search-area is covered to a consistent ‘coverage factor’. Therefore, non-linear OREI layouts may not necessarily provide an effective and ‘safe’ search-unit environment if SAR helicopters have to operate at low altitude e.g. because straight-line paths cannot be flown without encountering physical obstacles on a desired track. This also degrades the effectiveness of a search due to crews needing to focus more of their visual attention on flight safety and

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12 Ref: IMCA M234 Research on personal locator beacons
13 A hexadecimal string of 15 characters used to identify each beacon
manoeuvring around obstacles (which also changes the coverage factor), rather than looking out for SAR objects and survivors.

9.23.4 If SAR helicopters are required to conduct a search and/or rescue inside non-linear wind-farm layouts, there is a likelihood that these layouts will also significantly reduce the overall Probability of Detection (POD) of a search because helicopters may not be able to conduct a search at the optimum Sweep Width and Track Spacing for a particular SAR object. The presence of turbines may also reduce the searchable space and may expand or otherwise vary the distances between ‘sweeps’ through a wind farm and so may affect the desired sweep width and increase the likelihood of not sighting a SAR object. In addition, non-uniform layouts present a flight safety hazard that may detract from the mission and/or preclude the use of SAR helicopters altogether.

9.23.5 There is also a significant visual-distraction effect caused by the presence of the turbines, rotating blades and the relative movement of a SAR helicopter or rescue boat/lifeboat moving through the array.

9.23.6 Wind turbines may also cause the temporary blocking of SAR objects from sighting by SAR units i.e. the turbine, or group of turbines, may come between the SAR unit and a SAR object at the moment that it might be sighted. This is more likely in rough sea states where SAR objects might also be temporarily hidden by sea swell and waves whilst a SAR unit passes and has a ‘detection opportunity’.

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14 SAR targets, optimum Sweep Width values, are to be found in the IAMSAR Manual.
9.23.7 A ‘non-linear’ or ‘non-uniform’ layout is one where there are no or few consistent lines of orientation, i.e. ‘straight’ rows and/or columns of turbines on at least two axes through, and on the periphery of, a wind-farm.

9.23.8 The layout and shape of wave and tidal stream device ‘fields’ may impact on the use of rescue boats. Therefore, the layout of any array must allow SAR response by boat to take place safely and enable the operation of such boats amongst the devices. If the devices are on the surface or close to the surface, there should be consistent lines of orientation of such devices throughout the whole array area.

9.23.9 It should be noted that, upon notification of a person, vessel or aircraft in difficulty, a search is always required until they are located and rescued, regardless if the causality has activated an emergency beacon.

Figure 7. SAR objects may be temporarily hidden behind wind turbines at a critical ‘detection opportunity’. Rough sea state may exacerbate this.

9.24 Sub Surface and Seabed Devices

Sub-surface or seabed energy devices must provide a minimum water depth over the highest part of any device (above the seabed) so that rescue boats and other vessels can operate safely over them for SAR purposes. Underkeel clearance requirements for sea bed OREIs are published by the MCA on the GOV.UK website.
9.25 SAR Lanes/Single Line of Orientation, Requirement for SAR helicopters and Rescue Boats

**REQUIREMENT**

9.25.1 With the previous paragraphs in mind, for wind farms and surface-located OREIs, developers should plan for two lines of orientation unless they can clearly demonstrate that fewer is acceptable and safe for SAR helicopter and rescue boat operations. The layout of a wind farm or other OREI should also be as regular as possible e.g. a grid pattern. This regularity will also benefit the safer navigation of surface rescue craft both within and outside a wind farm. Where a developer wishes to use ‘packed boundaries’ (turbines/other OREI closer together on the boundary of a wind farm than in the interior) the MCA will need to discuss each proposal on its individual merits. Developers are urged to communicate their proposal to the MCA as early as possible. (MGN 543, Annex II section 3(e) refers).

9.25.2 For windfarms, the SAR access requirement is so that a SAR helicopter can fly from one side of a windfarm to the other, or Helicopter Refuge Area in the case of larger windfarms, entering from outside the windfarm at altitudes below 500 feet, to either conduct searches amongst turbines or to access a location or turbine within the field, from low altitude e.g. in bad weather where cloud base and/or visibility is poor. SAR aircraft would be highly unlikely to descend into a windfarm from above. The lanes also provide safer and more predictable paths through a windfarm for surface rescue vessels. These paths through an OREI will be termed ‘SAR access lanes’. For practical purposes this means that, depending on type and size of turbine used, the overall shape, size and geographical coverage of a wind farm, and any proximity to other wind farms, there shall be no OREIs, or other structures, in the wind farm or on the boundary that present an obstacle or risk to SAR helicopters flying along such ‘SAR access lanes’. The spacing between internal turbines, and those on the boundary at the end of ‘SAR access lanes’, must be discussed with the MCA prior to final design of a layout.

9.25.3 In situations where an aircraft captain is solely reliant on instruments to navigate through a windfarm, the aircraft will not enter the windfarm where turbines are located less than 500m apart (between blade tips, transverse to the turbine lanes unless nacelles can be rotated away from the lane to increase the distance to more than 500 metres).

9.25.4 For surface located and surface-piercing devices, the requirement is to allow a SAR surface craft to enter the array area from outside and to proceed on a consistent track to exit the array without encountering any devices or structures on or close to that track. Minimum spacing between devices will depend on the type and size of devices used, the overall shape, size and geographical coverage of the array and any proximity to other wave/tide arrays. The spacing between devices will therefore need to be discussed with the MCA before final design approval of a layout.
Figure 8. SAR Access Lane concept.

Figure 9. SAR Access Lanes effect on search Sweep Width and reduced Probability of Detection
9.25.5 Floating wind turbines (anchored to the sea bed) may ‘swing’ on their moorings and some mooring system design proposals can permit an operator to adjust tension and therefore move a turbine a small distance, which may decrease the spacing between rows/columns of turbines. Such adjustments or swing-tolerances must be advised to the MCA and discussed in detail during the design and layout planning process, before construction decisions are made, so that SAR access is not overly restricted.

9.25.6 If a wind turbine or turbines are being decommissioned, and new turbines are being installed nearby or close to the original foundations or locations, the developer must discuss this with the MCA before design approval is completed to ensure that SAR response and/or navigational safety is not overly degraded or prevented, both during construction and following completion of works.

9.26 Wind Farm Helicopter Refuge Areas

9.26.1 Where wind farms are proposed to become very large e.g. more than c.10 NM in any direction, a requirement may be imposed for helicopter refuge areas to be built in to the design within the wind farm area. This requirement will have to be assessed during discussion with the MCA on layout design. The minimum helicopter refuge distance required will be evaluated on a case by case basis and will depend on the context of the development, but distances less than 1nm are unlikely to be considered acceptable.

9.26.2 The required distance for the helicopter refuge area has been calculated by trials conducted by SAR helicopters based on their turning radius at set speeds, exercises within windfarms and training in simulators15.

9.26.3 Helicopter refuge areas are to allow SAR helicopters access to a defined area of safe airspace to: manoeuvre in preparation to enter or when exiting wind farms, to safely turn within a windfarm or, in the event of an emergency requiring the helicopter to escape from the wind farm.

9.26.4 SAR helicopters will not normally be requested, or attempt, to turn within a windfarm, however, they may do so if the spacing and conditions allow.

9.26.5 Where a wind farm cannot meet the requirements described above, the MCA reserves the right to object to a wind farm layout, on the basis that the likelihood of a rescue not being effected / possible will be increased.

15 Live trial undertaken by the Inverness based S92 SAR helicopter over Loch Ness in January 2018. Simulator trials undertaken over a period of months and concluded in April 2018. Exercises conducted in 2016, 2017 & 2018
9.27 Adjacent developments and extensions

9.27.1 Windfarms which are extended, or adjacent developments which are constructed close to each other, could be perceived by an external observer as one windfarm. It is important therefore that all mitigations outlined in this document are carefully considered and discussed with the MCA.

9.27.2 All developers involved must undertake to ensure that layouts are harmonised and of the same general orientation so that they meet the requirements above.

9.27.3 It is highly likely that a helicopter refuge area will be required between adjacent developments. Consideration should be given to boundaries which are not parallel as this may require a greater spacing should the MCA assess this as a limiting factor.

9.27.4 Adjacent developments may create anomalies in both orientation and numbering, which might create confusion or distraction during SAR operations. The MCA will expect developers to provide mitigation or a solution for such occurrences.

9.27.5 Navigation and aviation lighting must meet the requirements detailed above ensuring, where required, the developments are lit as one windfarm.

9.27.6 Developments should consider the sharing of resources for emergency response. Having awareness of available resources and relevant contact telephone numbers may provide an invaluable support and this response should be tested during emergency exercises.

9.28 Wave/Tide Devices Safeguard Zone

Where wave/tide devices are close to other such arrays, the MCA will wish to assess the available space between each array to determine if this creates any SAR response difficulties. This may require that a minimum safeguard zone spacing will have to be set.

9.29 Chart and Position Information

9.29.1 Accurate charts and positions (in WGS84 standard in Decimal format latitude and longitude of degrees, minutes and decimal minutes e.g. DD MM.M) of all turbines/devices and structures within an OREI are vital to safe SAR response. Developers/operators are required to provide HM Coastguard, the UK SAR helicopter service and lifeboat/rescue boat providers with accurate charts of the OREI, and its immediate area, with all turbines/devices clearly marked and with critical distances e.g. between turbines/devices and structures, and heights/depth of structures, marked.

9.29.2 Positional information must also be shared by the developer/operator in a format that is compatible with the Flight Management System (FMS) of all aircraft of the UK SAR helicopter
service, and the lifeboat/rescue boat service providers’ electronic chart plotting systems, so that turbines’/devices and structures’ coordinates can be programmed in to the FMS/Nav Plotter for use during SAR operations. MCA can advise on requirements.

9.29.3 Such data should also be provided, where required, to any aviation and maritime charting service that HM Coastguard and/or the UK SAR helicopter and rescue boat/lifeboat service providers require and to the UK aeronautical and maritime charting services if requested.

9.29.4 Specific positional information required is:

(a) WGS84 Latitude and Longitude positions (in Decimal format latitude and longitude of degrees, minutes and decimal minutes e.g. DD MM.MM) for SAR helicopter and lifeboat/rescue boat entry and exit locations, outside wind farm/OREI (0.5nm from the nearest turbine) on each SAR lane centre-line (see diagram at annex).

(b) Clear indications on paper and electronic charts of the spacing between turbines/OREI devices in lateral and vertical planes and turbine and other structures heights/depths.

   (i) For WTG two minimum distances must be shown: (i) between turbine towers and (ii) between blade tips, when the blades are transverse to a lane.

   (ii) For tide, wave, sea current devices and floating wind turbines, the minimum distance shown should be the narrowest distance expected between devices (depending on their size and shape and their likely movement by wave and tide forces). The ‘swinging’ radius of each device should also be shown (if this changes at various stages of the tide, this should also be indicated).

(c) Supply of accurate drawings showing the SAR access lanes ‘through wind farms/OREI devices agreed with the MCA, including position of access points (on the centre line of the SAR lane, 0.5nm from the boundary), bearings of the lanes and distance of the lane (between access points) and minimum width.

(d) Accurate positions, in WGS84 standard, of all turbines/devices and other structures in the wind farm/OREI, supplied as both paper chart and electronic format according to the data-standard requirements of the Flight Management Systems (FMS) of the SAR helicopter provider and the electronic chart plotter system of the rescue boat/lifeboat service providers.

(e) Supply of position and other relevant information to Kingfisher Information Services for their navigational awareness chart service.
9.30 In-Field Weather Information

9.30.1 Accurate information about weather conditions at an OREI is extremely important for the planning and execution of SAR missions. SAR helicopter aircrew will base their response decisions on accurate weather data, and the coordinating SAR Mission Co-ordinator will need to determine if a SAR helicopter is able to conduct a rescue. If the actual weather is out of limits for a SAR helicopter response, then the SMC will have to plan for and provide an alternative response solution. Immediate and accurate weather data, from the site, enables such decisions to be made rapidly and reduces delay. Wind farms are therefore required by the MCA to provide the following, real time weather information, in accordance with CAP 437, from the wind farm site\textsuperscript{16}:

- Wind Speed & Direction
- Atmospheric Pressure
- Air Temperature
- Dew Point

\textsuperscript{16} This requirement is irrespective of whether or not an OREI operates helicopters.
• Present Weather & Visibility
• Cloud Height
• Wave Height (CAP1145)

9.30.2 Such information could be provided from equipment which meets UK helideck weather observation standards, in accordance with CAA and ICAO requirements, or from other systems and equipment that provide the same information and to the same standard as required by CAP 437. The information shall be from a location that is, as far as practicable, fully exposed to wind and sky from any direction and not subject to any anomalous effects from nearby equipment or structure which might cause inaccurate readings or results. The weather information must be provided in a readily accessible way to HM Coastguard’s CGOC network and the UK SAR helicopter service, preferably through a website (with username and password protected access).

9.31 In-Field VHF Radio Communications and Communications with the Coastguard

9.31.1 The coordination of SAR operations is significantly enhanced whenever the SAR Mission Co-ordinator, the vessel(s)/person(s) in distress and responding rescue units and/or other vessels/craft, are able to communicate directly with each other. Marine band (FM) VHF DSC radio is the most common form of radio communications in use and is likely to be fitted to and used by all types of craft, SAR aircraft, vessels and personnel involved in an emergency situation.

9.31.2 Given that SAR units (air and surface) may often be operating in dangerous sea and weather conditions, and that SAR helicopters may often be operating outside of Air Traffic Service communications coverage, marine band VHF radio is a means by which SAR units can make immediate emergency calls, if they get into difficulty, and know that someone is able to hear them.

9.31.3 A SAR helicopter will only enter, or operate in the close vicinity of, an OREI if they have direct communications with the windfarm operator.

9.31.4 Wherever a wind farm or OREI is wholly or partially outside of effective, shore-based VHF radio coverage (MCA can advise), developers/operators are required to discuss with the MCA the need for provision of in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC\(^{17}\))) that can cover the entire wind farm site and its surrounding area. Such VHF radio communications should be connected to both the wind farm control centre and an additional radio available to HM Coastguard’s Maritime Operations communications network. Detail of how this can be achieved should be discussed with the MCA.

9.31.5 It must be noted that the minimum requirement is for an OREI to be fitted with marine band VHF DSC radio. Other communications systems and radio frequency bands are not suitable because they cannot be used or heard by the Coastguard and vessels or aircraft responding to an

\(^{17}\) Digital Selective Calling allows users to transmit Distress and Urgency Alerts and, for Coastguard use, the transmission of Distress and Urgency Relay alerts to all ships (in effect, all other DSC radio stations in range). The transmission of DSC alerts is a vital part of the process of distress alerting and SAR coordination within the GMDSS.
emergency situation. In the event of an emergency situation, the SMC at the coordinating CGOC, will need to be able to communicate with all units involved throughout the emergency (and perhaps at the same time). Marine band VHF enables this to be achieved.

9.31.6 It may also be necessary for the operators of existing windfarms/OREI and, in some cases, future OREI, to ensure that work and support boats/craft/vessels, have effective and consistent radio communications with HM Coastguard’s shore-based radio aerial network. Therefore, all new OREIs, and some existing ones, may be requested to conduct a communications trial to confirm that the work and support craft can reliably communicate with the Coastguard whenever those craft are operating offshore and around or amongst the OREI.

9.31.7 In addition, all new OREIs will be required to conduct a communications trial in their development area, prior to any construction work beginning. The MCA will assess the results of these trials as part of initial discussions with the developer, contributing to decisions on requirements for VHF aerials. A subsequent test following the completion of the construction phase would also enable a comparison to be made, to ascertain whether the OREIs cause any degradation to the reception. Further detail is included in 9.32 below.

9.31.8 Whenever there are reports of or doubts about the reliability of radio communications to and from the work and support craft working in or around an OREI, the MCA may require that a communications test be carried out to verify any weaknesses in communications. If weaknesses are identified, the operator will be required to work with the MCA and to put in place measures to resolve the problem.

9.32 Radio Survey Requirements

9.32.1 In order to satisfy requirement 9.31, all new windfarm developments are required to carry out a radio reception survey in order to ascertain what level of mitigation may be required and to allow for a comparison once construction has completed.

9.32.2 As a result, developers are required to carry out a survey based on the criteria below, which the MCA suggests is completed during surveys already being carried out (e.g. traffic, UXO). The radio survey results should be made available to the MCA for discussion along with other SAR and Emergency Response considerations.

9.32.3 The survey should be completed on a vessel with an aerial height comparable to that which will be used during normal operations (i.e. the height of aerials used by windfarm support vessels). The survey should test the communications relevant to the area to which the vessel is operating (e.g. VHF or MF). In addition, a post construction survey must be able to demonstrate that there is adequate VHF coverage to the Coastguard operational network within the development area, and if there is not, additional radio mitigations may be required.
9.32.4 Before each survey, the relevant Coastguard Operations Centre (CGOC) should be contacted by telephone to provide notification of the intended survey and to confirm it is an appropriate time to do so.

9.32.5 Each radio survey should record the following, ensuring a reasonable coverage around the boundary, and at several points throughout the area, preferably with no two points more than 5km apart:

(a) Vessel details: type, name, callsign, size, radios on board, height of aerials
(b) Environmental (record for each position tested, or if no marked change, reference to a previous position): sea state, wind speed and direction, QNH (pressure at sea level), general weather (rain/snow/sun/haze), night/day
(c) For each position: Lat/Long (DD°MM.MM), time test undertaken, radios used (make, model, type (VHF/MF)), shore contact (Coastguard/Marine Coordinator (if one available)), position and name of receiving aerial, range and bearing to receiving aerial (or at least to a point on land), channels/frequencies used, signal strength and readability (1-5 for each) at the vessel + signal strength and readability of receiving aerial, notes.
(d) A test between survey vessel and another vessel nearby would be useful, in which case, details of the receiving vessel would also be required.
(e) Once the windfarm moves into Operations and Maintenance, a further survey should be conducted. In all cases out with normal VHF range to shore, where the coastguard has access to an offshore radio, VHF tests should be carried out.

9.32.6 A further survey will be required once construction has been completed, to compare the results against the pre-construction survey. Any areas of poor coverage will require further discussion with the MCA and could result in additional mitigations being required e.g. additional radios or repeater stations.

9.33 Automatic Identification Systems (AIS)

9.33.1 AIS is fitted, with a few exceptions, to all vessels over 300 Gross Tonnes, fishing vessels of 15 metres or more, and voluntarily to other types of vessels e.g. pleasure craft, smaller fishing boats. AIS receivers, fitted to OREIs, enable developers/operators to monitor AIS equipped vessel activity around and within the OREI.

9.33.2 AIS may also assist in locating vessels in distress and identifying and tracking those that could be of assistance in the event of a SAR incident or other emergency in or around an OREI. It can also provide early warning of any vessels that may be on a collision course with an OREI.

9.33.3 In addition, the installation of AIS receivers by a developer or operator is of considerable benefit to HM Coastguard because it enables the continuous tracking of responding vessels and SAR units, and the monitoring and management of SAR operations e.g. search area coverage.
9.33.4 Wherever a wind farm/OREI is wholly or partially outside of shore-based AIS coverage (MCA can advise on this), developers/operators are required to discuss the need to fit AIS receivers with the MCA and to providing such AIS data feeds to HM Coastguard.

9.33.5 Any AIS fitted to OREIs must not routinely broadcast the position of the OREI structures i.e. by transmission of Virtual Aids to Navigation (VAToN). However, there may be a requirement, in an emergency situation, and only on request of the relevant GLA, to broadcast a VAToN message if there is navigational and/or safety risk caused by the emergency.

9.34 Radar Surveillance

9.34.1 The population of OREIs is increasing and the size and scale of developments (and their adjacency and cumulative effects) is significantly different from that in the past. There are a large number of non-AIS boat movements in UK and European waters and this activity effects the navigational decisions and manoeuvring of larger vessels. It also creates different SAR and navigational safety challenges e.g. small craft can normally safely pass through wind farms (thus increasing their presence within them and, possibly, the chance of SAR occurring), and are not easily located or tracked because they are not mandated to use AIS. In the latter case, the inability of the SAR service to locate and monitor a target, which requires SAR response, may cause prolonged SAR operations due to the need to conduct a large-scale search for a distressed craft that is, for whatever reason, unable to report its position. Active surveillance systems may lessen this risk because ‘targets’ can be directly investigated by SAR units, which lessens the area which needs to be systematically and laboriously searched and, consequently, diminishes SAR units’ exposure to risk when operating amongst the OREIs.

9.34.2 Also, the concentration and channelling of shipping traffic caused by the presence of wind farms in the UK sea space will inevitably mean that there will be, in some areas, more vessel interactions and traffic compression and this may increase the need for continuous, effective surveillance for safety of navigation, emergency response and SAR purposes.

9.34.3 Annex 4 of MGN 543, states that ‘Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the Environmental Impact Assessment (EIA). The specific measures to be employed will be selected in consultation with the Maritime and Coastguard Agency’s Navigation Safety Branch and will be listed in the developer’s Environmental Statement (ES)’. This may include a requirement on a developer/operator to provide radar surveillance (Annex 4 (vii)) of a windfarm.

9.34.4 The MCA and/or developers and operators *may* therefore consider that an OREI risk profile, and/or navigational safety and/or SAR response would be improved by provision of marine radar surveillance of the area within and around the wind farm by enabling:

(a) Location, monitoring, tracking and prediction of the movement of any craft or vessels that are not transmitting AIS signals;
(b) timely location of a non-AIS craft or vessels that is, for example, on a collision course with the OREI and/or to alert HM Coastguard to an emerging threat of collision/interaction to allow an early response;

(c) monitoring the passage of such vessels through the OREI (so far as the radar is physically able to monitor a vessel passing through an OREI);

(d) surveillance around the OREI to identify craft or vessels acting suspiciously (which are unlikely to be transmitting on AIS) and to monitor the activity, predict movement and track and report to relevant authorities and support any intervention activities;

(e) early warning and tracking of any craft or vessel that is or appears to be attempting to board or go alongside OREIs;

(f) SAR-surveillance to enable the location and tracking of a distressed craft or vessel that is not transmitting, or unable to transmit, AIS signals and/or that cannot report or update its position by other means;

(g) SAR-Surveillance to attempt to locate overdue or missing craft that have been predicted, on information available, to possibly be within the radar coverage of the OREI;

(h) Locating SAR targets within or close to a wind farm to enable SAR units to be sent directly to them to reduce the risk to and the need for SAR units to conduct searches amongst or close to turbines to locate such targets;

(i) monitoring of the progress and safety of SAR helicopters operating at low altitude in and around OREI;

(j) monitoring of the progress and safety of surface SAR units during a SAR operation;

(k) monitoring of vessel traffic-density around and through any OREI to contribute to ongoing risk assessments and any relevant measures required to improve maritime safety around or within renewable energy sites;

(l) Locating and tracking of drifting objects e.g. containers, which may cause a maritime safety risk to boats working within the OREI.

9.34.5 If developers/operators are intending to fit radar, or the MCA sets a specific requirement for radar to be fitted, developers are requested to discuss the provision of the radar information to HM Coastguard and processes and procedures for management of the radar monitoring activity.

9.34.6 If developers/operators decide to fit radar they would not be expected to provide any form of formal radar service e.g. VTS. Any use of radar would only be to provide active surveillance of vessel activity within, around and approaching the OREI.

9.34.7 Where radar is fitted, and a feed is supplied, HM Coastguard will not provide any form of radar service to an OREI or to traffic operating around or passing through, except where a service has been agreed as necessary e.g. to cover a Traffic Separation Scheme (TSS) or routing measure. It will normally only make use of radar imagery to provide surveillance information in support of search and rescue and emergency response operations when required.

9.34.8 Radar for surveillance of an OREI and its approaches must be able to detect a target of at least the size of a small inshore fishing boat/yacht (Radar Cross Section of c.3M²). IALA Guideline 1111 provides relevant information and guidance on this subject.
9.35 Aircraft Flight Simulator Data

9.35.1 UK SAR helicopters have associated flight simulators where aircrew can practice flight manoeuvres and emergency procedures, etc. Such simulations can also provide variable weather, visibility, sea states and vessel targets and search and rescue objects which conform to the weather and sea conditions being simulated. The provision, by developers/operators, of accurate, flight-simulator compatible, visual imagery of a proposed or existing wind farm, would be highly beneficial in enabling SAR helicopter aircrews to assess proposed layouts, become familiar with particular windfarms and practise or develop techniques and procedures for operating within and around wind turbines. This comment links to section 5.4, Layouts.

9.35.2 The above is also supported by desk-top computers, whereby visual imagery allows flight crews to familiarise themselves with a wind farm by simulating a ‘fly-through’ of the field and by the use of different viewing angles of turbines and layouts, etc. As with flight simulator imagery, these computer programmes should provide moving imagery with variable weather, visibility, sea states and SAR and other vessel targets and objects.

9.35.3 If developers have such data and computer programmes, this should be offered for use by the MCA and UK SAR helicopter service provider.

9.36 Differential Global Positioning System (DGPS)

CONSIDERATION

Provision of DGPS transmitters on wind farms may provide more accurate positioning to SAR helicopters and rescue boats and increase the confidence that these craft could operate more effectively and safely in poor weather. DGPS may also have the added benefit of improving the navigational accuracy of vessels operating within an OREI e.g. work boats. Vessel passing by an OREI may also benefit from increased navigational accuracy.

9.37 CCTV

RECOMMENDATION

Developers/Operators may decide to fit CCTV to their OREI for safety and/or security reasons. CCTV has significant benefits in providing OREI control rooms with visual indications of weather and sea state and can contribute to decision making for deployment of maintenance personnel and CTV. Such systems may also be of operational benefit to HM Coastguard and so developers/operators should consider offering data feeds. Such information might be provided by e.g. webcam access through a website link (which could be username and password protected).
9.38 Operator-Provided Rescue Boats

9.38.1 OREI developers and operators may consider that the risks posed to their own personnel and operations and to those vessels and aircraft passing through, over or by the OREI, are such that they could assist in moderating them by provision of in-field surface rescue craft.

9.38.2 Such rescue craft should be suitable for the sea and weather conditions likely to be encountered throughout the year at the location and in the area of the OREI, should conform at least to the UK Rescue Boat Code, national and international regulations and relevant Health and Safety Executive guidance. Vessels should also provide adequate equipment, systems and trained crew to conduct effective search and rescue operations.

9.38.3 Rescue boats would need to provide a high level of readiness to ensure that rescue cover within and around the OREI was maintained continuously during the period of declared operational availability. Where a developer/operator provides rescue boat capabilities to mitigate the wider risks posed by their OREI, they may need to consider 24-hour availability. Rescue boat response would need to be capable of reaching any part of the OREI, and areas around it, in the shortest time possible. This calculation would help to determine the number and types of craft required and may imply the positioning/basing of such rescue boats within or close to the OREI.

9.38.4 If rescue craft are provided by an operator, they should be made available to respond to emergencies, if requested by HM Coastguard, in accordance with operational requirements agreed with the MCA. Any changes to the declared capability and availability must be passed to the relevant Coastguard Operations Centre.

9.39 Commercial Crew-Transport Helicopters

Developers/operators might make use of commercial helicopters for the transport of personnel to and from shore, OREI hotel vessels and/or offshore accommodation platforms and/or to conduct commercial air transport hoisting of personnel between OREIs for operations and maintenance. If such aircraft are used, they may be useful in the event of an emergency, within the bounds of their normal operational constraints. If intended to be used, the capabilities and restrictions of the aircraft and its crew should be included in the ERCoP. If a SAR helicopter is tasked to the scene it will normally assume control of air operations (as Aircraft Coordinator – ACO) and the developers’ aircraft should be prepared to act as directed.

9.40 Crew Transport Vessels

Developers/operators may use crew transport vessels or boats to take personnel to OREIs from shore, or offshore accommodation platforms/vessels. These craft should be considered for use as a secondary means of providing emergency response for OREI personnel or for other vessels or
a aircraft in distress within or near to the OREI. Such vessels should be able to communicate with any SAR helicopters, aircraft or surface craft dispatched or diverted to the incident and should also be able to communicate directly with HM Coastguard’s CGOCs on VHF DSC radio and (where required by distance from land and/or assessed risk) MF radio, satellite and/or mobile telephone. The MCA can advise on the appropriate communications equipment fit to achieve this.

9.41 Unexploded Ordnance (UXO) and Wreck Materials

REQUIREMENT

9.41.1 During construction or other seabed operations it is possible that unexploded ordnance or materials from uncharted wrecks could be located on or near to OREIs, exposed, disturbed or inadvertently lifted from the seabed.

9.41.2 OREI developers may have commercial contractors in place to respond to such occurrences in which case detailed procedures should be developed and circulated to all relevant parties.

9.41.3 If commercial contractors are not available, the following procedures should be followed:

(a) The object should not be moved (or removed if it is lodged in dredging buckets, pipes or conveyor systems, etc). The situation should be immediately reported to HM Coastguard who will alert the relevant military ordnance disposal organisation. All personnel should be evacuated as far as practicable away from the UXO.

(b) Further information and advice to mariners on the handling of UXO can be found in UK MGN 323 (M+F)

(c) A military Explosive Ordnance Disposal (EOD) team may be sent and they will take the lead in advising the contractors on response to the UXO. If necessary, telephone advice can be given directly from the EOD team either via mobile phone or by radio to telephone link-call via the Coastguard CGOC.

9.41.4 In all cases, HM Coastguard must be informed of every ordnance discovery as international reports (OSPAR) are required to be completed.

9.41.5 Uncharted wrecks, (aircraft or vessels) or materials from wrecks may be located, disturbed or inadvertently lifted from the seabed during subsea operations. All such finds MUST be reported by law to the UK Receiver of Wreck.

9.41.6 Information on reporting wreck or wreck materials can be found at: https://www.gov.uk/government/groups/receiver-of-wreck

9.41.7 The procedures and related information must be included in the ERCoP.
9.42 Offshore Transmission Owner Structures

REQUIREMENT

9.42.1 It is important for effective Integrated Emergency Response that prior arrangements are agreed between the developer/operator and the Offshore Transmission Owner (OFTO).

9.42.2 In an emergency involving facilities belonging to the OFTO, or to which the OFTO is responsible, a clear and concise plan should be in place to show who is responsible for the Emergency Response.

9.42.3 This detail must be included in the ERCoP

10. Tidal Lagoons

REQUIREMENT

Tidal energy lagoons present some SAR response challenges. These primarily affect rescue boat operations within the lagoon / holding pond area and land-based SAR response by Coastguard Rescue Teams and/or other land emergency services. Unless there are tall structures present on the lagoon walls, buildings, etc. then SAR helicopter operations should not, normally, be much affected. The following general emergency response mitigation measures are necessary for tidal lagoons or other tidal energy structures:

(a) If the lagoon wall has a road, then turning bays will be required for vehicles to turn around without hazard and passing places along the lagoon wall road.
(b) Access across any locks for vehicles.
(c) Safety line anchoring/strong points at lock edges to enable rope-rescue of persons from the water if necessary;
(d) helicopter landing places/winching areas to allow SAR helicopters to winch people from the ground and smaller Emergency Medical Service helicopters to land to load casualties;
(e) No tall lamp or light structures that would affect helicopter operations;
(f) Steps down to the water's edge in some locations: wide enough for a stretcher to be carried by people walking alongside a stretcher (approx. 3 metres wide);
(g) Working spaces/platforms to allow access from above to the tidal lagoons turbine inlet and outlet areas;
(h) Anchor points along the lagoon walls to enable safety lines to be attached (this could be street furniture that is strong enough to achieve this function) to allow safe rope access to persons in the water;
(i) Access bollards and gates to allow emergency services to gain access 24 hours;
(j) Public safety equipment and signage along the lagoon structure;
(k) Location-reference signs to allow the public to report their precise location to the emergency services. This may also be needed during the construction phase to allow workers to do this;
(l) Ability to close the barrage to public access in stormy weather conditions and warning lights if required;
(m) Storm shelters (with location number information) in case people become cut off by bad weather/rough seas so they can wait for rescue;
(n) Emergency phones at some locations along the wall;
(o) Slipway access to the lagoon area for launching of trailer-borne rescue boats must be available 24 hours without restriction and allow rescue boats to be launched at any state of the lagoon tide;
(p) Holding area for rendezvous of emergency services vehicles – at the entry area of the lagoons.

11. Requirements for Counter Pollution Operations within and Around OREIs

11.1 Counter Pollution

11.1.1 Counter Pollution (CP) operations within and around wind farms and OREIs are likely to be restricted by the physical obstacles that the installations and devices pose to airborne and/or seaborne counter pollution response craft. Some response operations may not be possible within OREIs.

11.1.2 The Bonn Agreement Counter Pollution Manual chapter 8 contains information regarding offshore windfarms.

11.1.3 In addition, the MCA recommends that developers/operators consider their response to environmental incidents by the development or support vessels or identified by a third-party that may impact on the development.

11.1.4 The developer/operator will be required to compile a Marine Pollution Contingency Plan (MPCP) as part of their license conditions, which should be an operational document designed to facilitate the response to an oil pollution incident. As such, it should be constructed in a manner which enables all users, including external stakeholders, to promptly gather the key information required to identify and implement the most effective response strategy. (Guidance included in Appendix A for what the MCA considers relevant detail)

11.1.5 The developer/operator should ensure relevant staff have adequate awareness of environmental response and consider additional training where required.

11.1.6 It may be beneficial for the development to provide packs for use in an environmental response which may include elements such as pollution categorisation sheets and sample kits. The MCA can provide additional advice on this.

11.1.7 The ERCoP should include relevant high-level information and contact information relating to an environmental response and reference the MPCP.
Appendix A – MCA suggested information to contain within a Marine Pollution Contingency Plan

The plan should clearly define the command and control structure that will be in place during an incident. The Marine Pollution Contingency Plan should state the position of the person authorised to initiate emergency response procedures. Vessels involved in activities relating to the windfarm will already possess a Shipboard Oil Pollution Emergency Plan (SOPEP), so it should be clear what the relationship is between the SOPEP and this Marine Pollution Contingency Plan.

The plan should take account of the following requirements regarding availability:
- The response system should cover 24 hrs / 365 days a year
- A clear method of authorising a response
- Call out procedures for response personnel
- Mobilisation of appropriate equipment and travel time to the spill location should be realistically achievable

It should contain details of the organisation responsible for the Marine Pollution Contingency Plan
- Details of all infrastructure to which the plan relates
- Details of operations to which the plan relates (this should include any future operations which may be undertaken)

The Plan should contain a list of all relevant emergency contact details, which include:
- Regulatory Authorities and Statutory Bodies (including relevant Conservation Agencies)
- Relevant Local Authorities
- Oil Spill / Emergency Response Contractor(s)
- All relevant onshore and offshore emergency contact details (note that a permanently manned onshore contact number should be provided to allow communication regardless of time or date)
- Contact details for neighbouring installations (if appropriate)

All pollution incidents should be notified to the Coastguard, and other bodies identified above, by telephone - notifications should must be made without delay.

It is envisaged that many pollution incidents will be handled entirely adequately by implementing the SOPEP and/or the Marine Pollution Contingency Plan. Sometimes an incident, which at the outset lies within the scope of the SOPEP/Marine Pollution Contingency Plan, may escalate to the extent where the incident may outstrip the experience and expertise of those in command and control at the local level. The plan must summarise the activation process and interface arrangements relating to any accredited response organisation/contractor employed (if appropriate).