

MGN 543 (M+F)

Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response.

Notice to Other UK Government Departments, Offshore Renewable Energy Developers, Offshore Transmission Owners, Port Authorities, Ship owners, Masters, Ships' Officers, Fishermen and Recreational Sailors.

This notice replaces MGN 371 and should be read in conjunction with the following MCA documents:

- *Marine Guidance Note "Offshore Renewable Energy Installations (OREIs) - Guidance to Mariners operating in the vicinity of UK OREIs", and*
- *"Methodology for Assessing the Marine Navigational Safety Risks & Emergency Response of Offshore Renewable Energy Installations".*

Note: References contained in this document can be accessed via the MCA website at www.gov.uk/mca

Other useful websites include:

- www.gov.uk/decc
- www.thecrownestate.co.uk
- www.legislation.gov.uk
- www.un.org/depts/los
- www.kis-orca.eu
- www.iala-aism.org
- www.gov.uk/mmo
- www.gov.scot/topics/marine
- www.naturalresourceswales.gov.uk
- www.doeni.gov.uk
- <http://infrastructure.planningportal.gov.uk>

Summary

This guidance note highlights issues that need to be taken into consideration when assessing the impact on navigational safety and emergency response (search and rescue, salvage and towing, and counter pollution) caused by offshore renewable energy installation developments. It applies to proposals in United Kingdom internal waters, Territorial Sea and Exclusive Economic Zone.

Key Points

- The recommendations in this guidance note should be used, primarily, by offshore renewable energy installation developers seeking consent to undertake marine works.
- Specific annexes address particular issues as follows:

Annex 1: Site position, structures and safety zones;
Annex 2: Navigation, collision avoidance and communications;
Annex 3: MCA's wind farm shipping template for assessing wind farm boundary distances from shipping routes;
Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning;
Annex 5: Search and Rescue (SAR) and emergency response matters.

1. Introduction:

- 1.1 Offshore Renewable Energy Installations (OREI) include offshore wind farms, tidal energy converters (including tidal range devices), wave energy converters and any associated infrastructure with the potential to affect marine navigation and emergency response, proposed in United Kingdom (UK) internal waters, Territorial Sea and Exclusive Economic Zone (EEZ).
- 1.2 Recommendations in this guidance note should be taken into account by OREI developers seeking formal consent for marine works. Failure by developers to give due regard to these recommendations may result in objections to their proposals on the grounds of navigational safety or emergency response preparedness. Additional information on the process for consenting OREIs and the regulatory framework is available from the Department of Energy & Climate Change (DECC), Marine Management Organisation (MMO), Natural Resources Wales (NRW), Marine Scotland and Department of the Environment Northern Ireland (DOENI) websites.
- 1.3 The considerations and criteria contained in the attached annexes are intended to address the navigational and emergency response impacts of OREIs proposed for UK sites. Their development necessitates the establishment of clear guidance to deal with potential adverse effects. The licensing and consent regimes must take account of local factors, national requirements and international standards which could influence the establishment of an OREI.
- 1.4 This guidance has been developed in consultation with DECC, the devolved Government authorities for England, Scotland, Wales and Northern Ireland, mariners in the commercial, military, fisheries and recreational sectors, relevant associations and port authority representatives, the General Lighthouse Authorities (GLA) and emergency response services.

2. Primary and Secondary Legislation with regard to OREIs and Navigation

- 2.1 The Energy Act 2004 (as amended) establishes a regulatory regime for OREIs beyond the Territorial Sea, in the UK's EEZ, and supplements the regime which already applies in the UK's internal and Territorial Sea. Sections 99 and 100 of the Act deal specifically with navigation and introduces a new section, 36B with the title "Duties in relation to navigation" into section 36 of the Electricity Act 1989 (as amended). Under section 36B, sub-section (1) consent cannot be granted for an OREI which is likely to interfere with the use of "recognised sea lanes essential to international navigation". This expression directly

refers to Article 60(7) of the United Nations Convention on the Law of the Sea, 1982 (UNCLOS).

- 2.2 The Merchant Shipping (Safety of Navigation) Regulations 2002 implements the Safety of Life At Sea (SOLAS) Convention Chapter V (Safety of Navigation) 2002. This applies to all vessels on all voyages, therefore for the purposes of this document “sea lanes” are considered to be IMO-adopted routeing measures and potentially other sea routes transited by all vessel types.
- 2.3 Section 36B, sub-section (2) of the Energy Act 2004 (as amended) provides that the decision to grant consent and any conditions placed on a consent must “have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the carrying on of the activities, or is likely to result from their having been carried on.”
- 2.4 In addition, both the Marine and Coastal Access Act 2009, Part 4, Section 69, sub-section (1)(c) and the Marine (Scotland) Act 2010, Part 4, Section 27, sub-section (1)(a)(iii), provide for marine licence decisions to “have regard to the need to prevent interference with legitimate uses of the sea”.
- 2.5 SI 2007 No 1948 “The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007” implements UNCLOS provisions for the establishment of safety zones during construction, extension, operation, maintenance and decommissioning of OREIs.

3. How and When the Recommendations Should be Used

- 3.1 This Marine Guidance Note, as the name implies, is intended for the guidance of developers and others. Whilst not mandatory, failure to accept the principles of the guidance may result in delays or objections from stakeholders within the licensing and consenting process. The recommendations should be taken into account by OREI developers and their contracted environmental and risk assessors in the preparation of Scoping Reports (SR), Environmental Impact Assessments (EIA) and resulting Environmental Statements (ES), and in any required post-consent documents.
- 3.2 These should evaluate all navigational possibilities, which could be reasonably foreseeable, by which the siting, construction, extension, operation and de-commissioning of an OREI could cause or contribute to an obstruction of, or danger to, navigation or marine emergency response. They should also be used to assess possible changes to traffic patterns and the most favourable options to be adopted, including those of operational site monitoring.
- 3.3 Potential navigational or communications impacts or difficulties caused to mariners or emergency response services, using the site area and its environs, should also be assessed. Issues that could contribute to a marine casualty leading to injury, death or loss of property, either at sea or amongst the population ashore, should be highlighted as well as those affecting emergency response. Consultation with national search and rescue authorities should be initiated as early as possible and consideration given to the types of aircraft, vessels and equipment which might be used in emergencies. This should include the possible use of OREI structures as emergency refuges and any matters that might affect emergency response within or close to the OREI.

- 3.4 Assessments should be made of the consequences of ships deviating from normal routes and recreational or fishing vessels entering shipping routes in order to avoid proposed sites. Special regard should be given to evaluating situations which could lead to safety of navigation being compromised e.g. an increase in 'end-on' or 'crossing' encounters, reduction in sea-room or water depth for manoeuvring, leading to choke points, etc.
- 3.5 In terms of navigational priority, these recommendations do not encourage a differentiation to be made between any types of seagoing water craft, operations, or mariners.
- 3.6 It is recognised that all OREI projects are at varying stages of planning and development, both pre-consent and post-consent, therefore proposals on meeting the principles of this guidance for undertaking marine works will be assessed on a 'case by case' basis.

4. Additional Relevant Information Covered in the Annexes

- 4.1 The recommendations contained therein apply to all sites, whether within the jurisdiction of port/harbour limits or in open sea areas. However, port/harbour authorities may require developers to comply with their own specific criteria and/or local regulations and directions. In addition, where proposals within port/harbour limits could affect navigation or emergency planning or response, the port/harbour authority will be under an obligation to review its safety management system following the issue of consent to the developer, in accordance with the Port Marine Safety Code. Evaluating the impact of OREI schemes on existing port/harbour activities should be carried out in consultation with the relevant port/harbour authority and the wider port community. Such reviews should be undertaken by the developer as part of the Environmental Impact Assessment and the outcome addressed in the resulting Environmental Statement.
- 4.2 OREI developers should evaluate the impacts of their projects and comply with the recommendations during all phases of:
- planning;
 - construction;
 - operation; and,
 - decommissioning.
- 4.3 Information concerning the navigational impact of OREIs during these four phases should be promulgated in ample time to all relevant mariners, organisations and authorities.
- 4.4 Contingency arrangements to deal with marine casualties and emergencies in or adjacent to OREI sites, including responses to environmental pollution should, in consultation with MCA Search and Rescue Branch, be planned and practised to test their efficiency.
- 4.5 Guidance and recommendations are set out in the following annexes:
- Annex 1: Considerations on site position, structures and safety zones.
- Annex 2: Navigation, collision avoidance and communications.

Annex 3: MCA shipping template, assessing wind farm boundary distances from shipping routes.

Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning.

Annex 5: Standards, procedures and operational requirements in the event of a search and rescue, counter pollution or salvage and/or towing incident in or around an OREI, including generator/installation shutdown.

- 4.6 A [MGN checklist](#) is available on the MCA website as an aid for developers when completing and submitting their Navigation Risk Assessment to ensure all guidance has been considered and addressed.

5. New and Emerging Technologies

- 5.1 It is recognised that the OREI industry is constantly evolving and its associated technology and procedures are developing. This means that there is an increasing demand on the UK's territorial seas and the EEZ and the MCA wishes to ensure that the increased use of those resources is managed in such a way that any risks that might impact on safety and pollution of the marine environment is kept to as low as is reasonably practicable.
- 5.2 The MCA continues to work with other regulators, navigation stakeholders and developers in achieving this goal. Regular meetings are held under the auspices of the Nautical and Offshore Renewable Liaison Group (NOREL) at which technical and consenting issues are discussed, and if necessary referred to the Technical Working Group. Agreed recommendations and guidance is periodically agreed by NOREL and the MCA reserves the right to vary or modify the recommendations in this document on the basis of experience or in accordance with internationally recognised standards in the interest of safety of life at sea and protection of the marine environment.

More Information

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Annex 1 - Considerations on Site Position, Structures and Safety Zones

1. Site and Installation Co-ordinates

- a. Developers are responsible for ensuring that formally agreed co-ordinates and subsequent variations of site perimeters and individual OREI structures are made available, on request, to interested parties at relevant project stages, including application for consent, development, array variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners' use, appropriate data should also be provided with latitude and longitude coordinates in WGS84 (ETRS89) datum.

2. Traffic Survey

- a. An up to date, traffic survey of the area concerned should be undertaken within 12 months prior to submission of the Environmental Statement. This should include all the vessel types found in the area and total at least 28 days duration but also take account of seasonal variations in traffic patterns and fishing operations. (**Note:** AIS data alone will not constitute an appropriate traffic survey)
- b. However, if deemed necessary, to cover seasonal variations, peak times or perceived future traffic trends, the survey period may be extended to a maximum of 24 months. For all OREI developments, subject to the planning process, the survey may be undertaken within 24 months prior to submission. If the Environmental Statement is not submitted within 24 months an additional 14 days continuation survey data may be required for each subsequent 12 month period. Should there be a break in the continuation surveys, a new full traffic survey may be required and the time period starts from the completion of the initial 28 day survey period.
- c. In the event of location specific issues being identified by the existing traffic survey and/or through consultation, additional surveys beyond the minimum outlined above may be required in order to support assessment of such issues.
- d. These variations should be justified in consultation with the relevant GLA, Chamber of Shipping, representative recreational and fishing vessel organisations and, where appropriate, port/harbour and navigation authorities. While recognising that site-specific factors need to be taken into consideration any such survey should include but may not be limited to an assessment of the cumulative and individual effects of the following:
 - i. Proposed OREI site relative to areas used by any type of marine craft.
 - ii. Numbers, types and sizes of vessels presently using such areas.
 - iii. Non-transit uses of the areas, e.g. fishing, day cruising by leisure craft, commercial passenger vessels undertaking visits to the OREI, racing, aggregate dredging, etc.
 - iv. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.
 - v. Alignment and proximity of the site relative to adjacent shipping routes.
 - vi. Whether the nearby area contains prescribed routing schemes or precautionary areas.

- vii. Whether the site lies on or near a prescribed or conventionally accepted separation zone between two opposing routes.
 - viii. Proximity of the site to areas used for anchorage, safe haven, port approaches and pilot boarding or landing areas.
 - ix. Whether the site lies within the limits of jurisdiction of a port and/or navigation authority.
 - x. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.
 - xi. Proximity of the site to offshore firing/bombing ranges or ordnance dumping grounds and areas used for any marine military purposes either presently or in the past.
 - xii. Proximity of the site to existing or proposed submarine cables and pipelines, offshore oil / gas platforms, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Area or other exploration/exploitation sites. This should include projects in the planning process, in addition to those consented.
 - xiii. Proximity of the site to existing or proposed OREI developments, in co-operation with other relevant developers, within each round of lease awards.
 - xiv. Proximity of the site relative to any designated areas for the disposal of dredging spoil.
 - xv. Proximity of the site to any types of aids to navigation and/or Vessel Traffic Services (VTS) in or adjacent to the area and any impact thereon.
 - xvi. Researched opinion using appropriate computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density and nearby planned or consented OREI sites not yet constructed.
 - xvii. With reference to xvi. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.
- e. A review of the Navigational Risk Assessment should be carried out post-consent and prior to construction commencing to validate the Environmental Statement. This may include additional traffic survey data or if there are any changes to plans that could impact navigation e.g. construction methodology.

Note: *The MCA's "Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)" should be closely followed through all stages of planning and development. The latest version is available on the MCA's [website](#).*

3. OREI Structures

- a. It should be determined whether any features of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling, could pose any type of difficulty or danger to vessels underway, performing normal operations, including fishing, anchoring and emergency response. Such dangers would include air clearances of wind turbine blades above the sea surface, changes to charted

depth due to tidal turbines, the burial depth of cabling, lateral movement of floating wind turbines etc.

- b. Recommended minimum safe (air) clearances between sea level conditions at mean high water springs (MHWS) and wind turbine rotors or auxiliary platforms stipulate that they should be suitable for the vessels types identified in the traffic survey but not less than 22 metres, unless developers are able to offer evidence that risks to any vessel type with air drafts greater than the requested minimum air drafts being provided are minimised. Depths, clearances and similar features of other OREI types which might affect marine safety should be determined on a case-by-case basis.
- c. There is no standard clearance figure that can be used to establish the safe clearance over underwater turbine devices. Rather, developers will need to demonstrate an evidence based, case-by-case approach which will include dynamic draught modelling in relation to charted water depth to ascertain the safe clearance over a device. The following approach should be adopted:
 - i. To establish a minimum clearance depth over devices, the developer needs to identify from the traffic survey the deepest draught of observed traffic. This will then require modelling to assess impacts of all external dynamic influences giving a calculated figure for dynamic draught. A 30% factor of safety for under keel clearance (UKC) should then be applied to the dynamic draught, giving an overall calculated safe clearance depth to be used in calculations.
 - ii. The Charted Depth reduced by safe clearance depth gives a maximum height above seabed available from which turbine design height including any design clearance requirements can be established.
 - iii. The MCA's "[Under Keel Clearance Policy](#)" paper, available on the MCA website, should be closely followed throughout the Environmental Impact Assessment.
- d. It should be determined at what depth below the seafloor export cables are buried to ensure there are no changes to charted depths. If burial is not possible, for example due to underwater features and/or seabed ground conditions export cables should be suitably protected such as by rocks or other such suitable mattress placements to mitigate the risks to vessels. Consequently, the MCA would be willing to accept up to 5% reduction in surrounding charted depths referenced to Chart Datum, unless developers are able to demonstrate evidence that any identified risks to any vessel type are satisfactorily mitigated.

4. Assessment of Access to and Navigation Within, or Close to, an OREI

It should be determined to what extent navigation would be feasible within or near to the OREI site itself by assessing whether:

- a. Navigation within and /or near the site would be safe :
 - i. for all vessels, or
 - ii. for specified vessel types, operations and/or sizes.
 - iii. in all directions or areas, or
 - iv. in specified directions or areas.
 - v. in specified tidal, weather or other conditions.
- b. Navigation in and/or near the site should be :
 - i. prohibited for specified vessels types, operations and/or sizes.

- ii. prohibited in respect of specific activities,
 - iii. prohibited in all areas or directions, or
 - iv. prohibited in specified areas or directions, or
 - v. prohibited in specified tidal or weather conditions, or simply
 - vi. recommended to be avoided.
- c. Exclusion from the site could cause navigational safety, emergency response or routing problems for vessels operating in the area, e.g. by causing a vessel or vessels to follow a less than optimum route or preventing vessels from responding to calls for assistance from persons in distress (as per SOLAS obligations).
- d. Guidance on the calculation of safe distances of wind farm boundaries from shipping routes can be found in Annex 3 “MCA Template for assessing distances between wind farm boundaries and shipping routes”.
- e. Advice on the safe distances of other OREI developments from shipping routes may be obtained from MCA’s Navigation Safety Branch.
- f. Relevant information concerning applications for safety zones under SI 2007 No 1948 “The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007” for a particular site during any point in its construction, extension, operation or decommissioning, should be specified in the Environmental Statement accompanying the development application. Specific DECC guidance is available for OREI applications. Information concerning retrospective applications for safety zones should be promulgated to MCA and other interested parties without delay.

Annex 2 - Navigation, collision avoidance and communications

1. The Effect of Tides and Tidal Streams

It should be determined whether:

- a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.
- b. The set and rate of the tidal stream, at any state of the tide, has a significant effect the handling of vessels in the area of the OREI site.
- c. The maximum rate tidal stream runs parallel to the major axis of the proposed OREI site layout, and if so, its effect on vessel handling and manoeuvring.
- d. The set is across the major axis of the OREI layout at any time, and, if so, at what rate.
- e. In general, whether engine and/or steering failure, or other circumstance could cause vessels to be set into danger by the tidal stream.
- f. The structures themselves could cause changes in the set and rate of the tidal stream.
- g. The structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the OREI area or adjacent to the area.

2. Weather

It should be determined whether:

- a. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to all vessels that might pass through or in close proximity to it.
- b. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.
- c. In general, taking into account the prevailing winds for the area, whether engine failure or other circumstances could cause vessels to drift into danger, particularly if in conjunction with a tidal set such as referred to above.

3. Collision Avoidance and Visual Navigation

In the UK all vessels have freedom to transit through OREIs, subject to any applied safety zones, and their own risk assessments, which should take account of factors such as vessel size, manoeuvrability, environmental factors and competency of the Master and crew. MGN 372 (or subsequent update) provides further guidance on navigation in and around OREIs.

- a. MCA has statutory obligations to provide Search and Rescue (SAR) services in and around OREIs in UK waters. Turbine layout designs must be designed to allow

safe transit through OREIs by SAR helicopters operating at low altitude in bad weather, and those vessels (including rescue craft) that decide to transit through them. Developers should therefore carry out further site specific assessment to build on previous assessments to assess the proposed locations of individual turbine devices, substations, platforms and any other structure within the wind farm or tidal/wave array. This assessment should include the potential impacts the proposed location may have on navigation and SAR activities. Liaison with the MCA is encouraged as early as possible following this assessment which should aim to show that risks to vessels and/or SAR helicopters are minimised and include proposed mitigation measures.

- b. Each OREI layout design will be assessed on a case-by-case basis and once agreed formal acceptance will be provided by both MCA's Navigation Safety Branch and Maritime Operations Branch.
- c. Risk assessments for proposed layouts should build on earlier work conducted as part of the Navigation Risk Assessment and the mitigations identified as part of that process. Where possible, this original assessment should be referenced to confirm where information or the assessment remains the same or can be further refined due to the later stages of project development. Risk assessments should present sufficient information to enable the MCA to adequately understand how the risks associated with the proposed layout have been reduced to ALARP. The MCA's "*Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)*" should be followed as part of this assessment.
- d. In order to minimise risks to surface vessels and/or SAR helicopters transiting through an OREI, structures (turbines, substations etc) should be aligned and in straight rows or columns. Multiple lines of orientation provide alternative options for passage planning and for vessels and aircraft to counter the environmental effects on handling i.e. sea state, tides, currents, weather, visibility etc. Developers should plan for at least two lines of orientation unless they can clearly demonstrate that fewer is acceptable.
- e. Packed boundaries will be considered on a case-by-case basis as part of the risk assessment process. For opposite boundaries of adjacent sites due consideration must be given to the requirement for lines of orientation which allow a continuous passage of vessels and/or SAR helicopters through both sites. Where there are packed boundaries this will affect layout decisions for any possible future adjacent sites. The definition of 'adjacent', as used in this section, will be assessed on a case-by-case basis.
- f. It should also be determined whether:
 - i. The structures could block or hinder the view of other vessels under way on any route.
 - ii. The structures could block or hinder the view of the coastline or of any other navigational feature such as aids to navigation, landmarks, promontories, etc.

In both cases, the impact must form part of the risk assessment.

4. Communications, Radar and Positioning Systems

To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:

- a. The structures could produce radio frequency interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications including Global Maritime Distress Safety System (GMDSS) and Automatic Identification Systems (AIS), whether ship borne, ashore or fitted to any of the proposed structures. Consideration should be given to three scenarios:
 - i. Vessels operating at a safe navigational distance (see Annex 3),
 - ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g. support vessels, survey vessels, SAR assets.
 - iii. Vessels by the nature of their work necessarily operating within the OREI.

Note: *GMDSS frequencies may not be subject to harmful interference, but for other frequencies, cases (ii) and (iii) may rely on agreed special measures where necessary.*

- b. The structures could produce radar reflections, blind spots, shadow areas or other adverse effects, amongst others:
 - i. Vessel to shore;
 - ii. Vessel to vessel
 - iii. VTS radar to vessel;
 - iv. Anomalous radar beacon (Racon) reception by vessel; and,
 - v. Search and Rescue and maritime surveillance aircraft to vessels and/or OREI structures
- c. The structures and generators might produce sonar interference affecting fishing, industrial or military systems used in the area.
- d. The site might produce acoustic noise which could mask prescribed sound signals.
- e. The generators and the seabed cabling within the site and onshore might produce electromagnetic fields affecting compasses and other navigation systems.

5. Marine Navigational Marking

It should be determined:

- a. How the overall site would be marked by day and by night throughout construction, operation and decommissioning phases, taking into account that there may be an ongoing requirement for marking on completion of decommissioning, depending on individual circumstances. Aids to Navigation (AtoN) will be determined (and sanctioned) by the relevant General Lighthouse Authority (GLA) (Trinity House Lighthouse Service, Northern Lighthouse Board or Commissioners of Irish Lights).
- b. How individual structures and fittings on the perimeter of and within the site, both above and below the sea surface, would be marked by day and by night.
- c. If the specific OREI structure would be inherently radar conspicuous from all seaward directions (and for SAR and maritime surveillance aviation purposes) or would require special radar reflectors or target enhancers.

- d. If the site would be marked by additional electronic means e.g. Racons.
- e. If the site would be marked by an Automatic Identification System (AIS) transceiver, and if so, the data it would transmit.
- f. If the site would be fitted with audible hazard warning in accordance with IALA recommendations.
- g. If the structure(s) would be fitted with aviation lighting, and, if so, how these would be screened from mariners or guarded against potential confusion with other surface navigational marks and lights (see Annex 5).
- h. The proposed site and/or its individual generators must comply in general with markings for such structures, as required by the relevant GLA in consideration of IALA guidelines and recommendations.
- i. The aids to navigation specified by the GLAs are being maintained such that the 'availability criteria', as laid down and applied by the GLAs, is met at all times. Separate detailed guidance is available from the GLAs on this matter.
- j. The procedures that need to be put in place to respond to casualties to the aids to navigation specified by the GLAs, within the timescales laid down and specified by the GLAs.
- k. Individual ID markings should conform to a "spreadsheet" layout, i.e. lettered on the horizontal axis, and numbered on the vertical axis. The ID marking should be sequential, aligned with 'SAR lanes' (line of orientation for search and rescue purposes) and to avoid confusion, the letters 'O' and 'I' should not be used. The detail of this will depend on the shape, geographical orientation and potential future expansion of each OREI development. MCA will advise on the specific requirements for each development.
- l. There is an expectation that working lights will not interfere with AtoN or create confusion for the Mariner navigating in or near the OREI.

6. Hydrography

In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are required of the development at the following stages:

- i. Pre-consent: The site and its immediate environs extending to 500m outside of the development area shall be undertaken as part of the licence and/or consent application. The survey shall include all proposed cable route(s).
 - ii. Post-construction: Cable route(s).
 - iii. Post-decommissioning of all or part of the development: Cable route(s) and the area extending to 500m from the installed generating assets area.
- a. Any additional hydrographic survey undertaken for any other purposes should be carried out to the standard described in section 6.c.
 - b. The development may result in an alteration to maritime traffic patterns as vessels seek alternative passage around the installed generating assets area. Where this is the case, it may be considered necessary that a hydrographic survey of these alternate passages

and their immediate environs extending to 500m be undertaken. MCA can provide guidance here if required.

- c. All hydrographic surveys listed above should fulfil the requirements of the MCA's 'Hydrography Guidelines for Offshore Developers' and 'Post-Construction Hydrographic Guidelines for Offshore Developers', which are both available on the MCA website.

Annex 3: MCA Template for assessing distances between OREI boundaries and shipping routes

“SHIPPING ROUTE” TEMPLATE - NOTES

Background

1. In late 2004 the Greater Wash wind farm developers group sought guidance from the Maritime and Coastguard Agency on the inter-relationship of wind farms to shipping routes so that they could take early recognition of the factors involved when planning a turbine layout within their allocated water space. The template below is the result.
2. The template combines the simulated radar reception results of the North Hoyle electromagnetic trials with published ship domain theory so as to better interpret the inter-relationship of marine wind farms and shipping routes. The resultant template also informs the assessments made as part of the consenting process.

Use

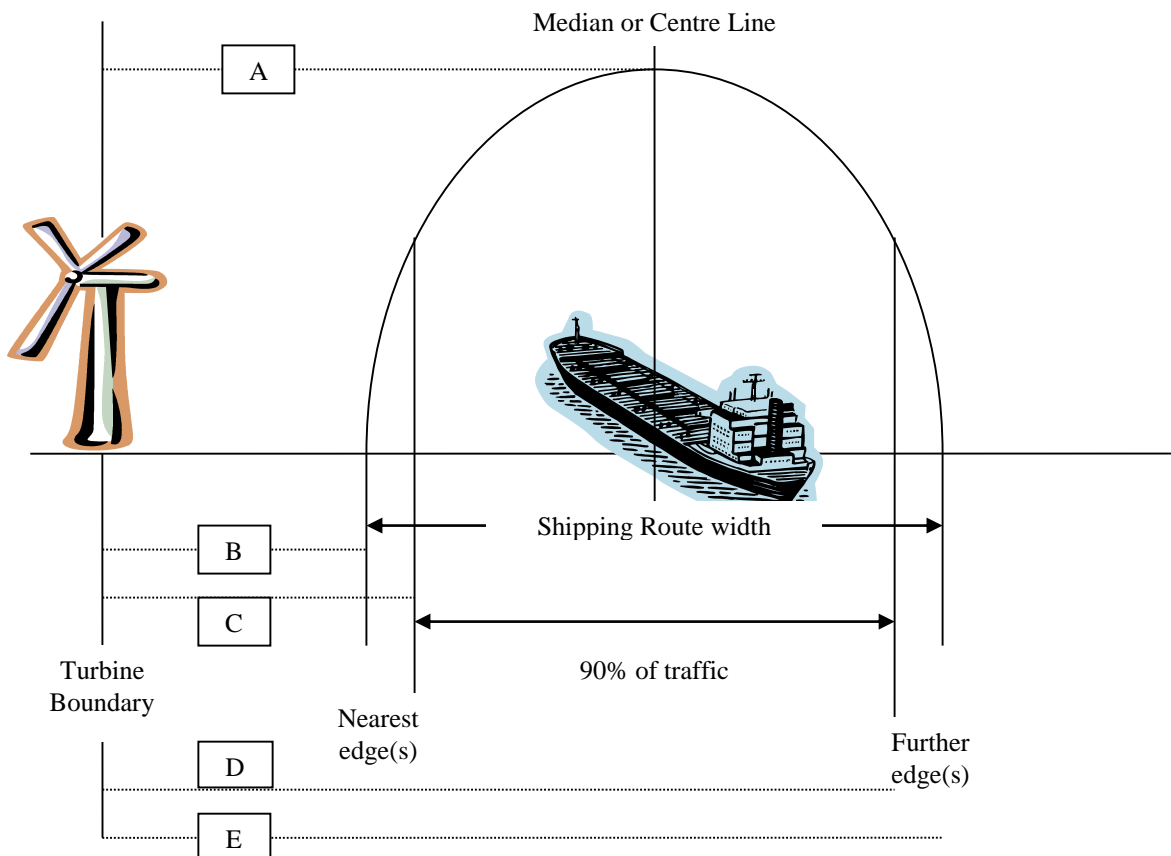
3. It is important to recognise that the template is not a prescriptive tool but needs intelligent application and advice will be provided on a case-by-case basis.
4. There may be opportunities for the interactive boundaries to be flexible where, again, for example, vessels may be able to distance themselves from turbines to provide more comfort without significant penalty, or where turbines could be distanced from shipping nodal points. Domains have been derived from a statistical study of ship domains based on radar simulator performance, and traffic surveys in the North Sea, but it is recognised that larger, high speed, hazardous cargo and passenger carrying vessels may have larger domains.
5. Traffic surveys would also establish any route traffic bias where mariners may naturally turn to starboard to facilitate passing encounters in accordance with the IMO International Regulations for Preventing Collisions at Sea, 1972 (COLREG). Additionally, marine traffic surveys would identify vessel type or category which may consequently require larger domains to ensure that the following factors can be taken into consideration in determining corridor widths:
 - a. Compliance with the best practices of seamanship and principles to be observed in keeping a navigational watch including the composition of the watch,
 - b. The manoeuvrability of vessels with special reference to stopping distance and turning ability in the prevailing conditions,
 - c. Provisions that may be required with mechanical failure of vessels involved and level of support services,
 - d. The state of visibility, wind, sea and tidal stream, and the proximity of navigational hazards,
 - e. The traffic density including concentrations of fishing vessels or any other vessels,
 - f. The draught in relation to the available depth of water and the existence of submarine cables and obstructions,

- g. The effect on radar detection of the sea state, weather and other OREI sources of interference.

In the approaches to ports and harbours this is particularly relevant. This additional information would influence where boundaries need to be established.

6. Mitigation measures are not specifically identified by the template, which necessarily takes a generic approach rather than site specific view. Separate papers may address potential measures, but those envisaged by this template include, but are not necessarily limited to:
 - a. UNCLOS Safety Zones
 - b. IALA Aids to Navigation
 - c. SOLAS Vessel Traffic Services
 - d. The IMO General Provisions on Ships Routeing (GPSR)
 - e. The IMO International Regulations for Preventing Collisions at Sea, 1972 (COLREG)
 - f. The Permanent International Commission of Navigation Congresses (PIANC) Harbour Approach Channels – Design Guidelines
7. The mention of the IMO/UNCLOS safety zone limited to 500 metres does not imply a direct parallel to be applied to OREIs. The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 provides the regulatory framework for establishing safety zones to OREIs in the UK. It allows for 500m safety zones around wind turbines during construction, extension, maintenance or decommissioning and 50m safety zones during operation. If developers wish to submit an application to either DECC or the appropriate licensing authority where applicable, it must be accompanied with safety case and supporting evidence showing justification for the safety zone(s) and how it will be managed. The decision whether the safety zone(s) is granted will be made following a consultation with relevant stakeholders. For further guidance, please see DECC's document titled "Applying for Safety Zones Around Offshore Renewable Energy Installations".
8. Where larger developments have to provide corridors between sites to allow safe passage of shipping a detailed assessment will be required to establish the minimum width of the corridor. The assessment of the required sea room (corridor width) will be undertaken on a case-by-case basis and should take into account not only the requirements of the traffic survey but also the general location and sea area involved. It will not always be possible to make a course that is planned and experience shows that in heavy sea conditions it is much harder to stop or turn the vessel around. Deviations from track by as much as 20°, or more, are common and must be considered. This deviation is used as the baseline for calculating corridor widths contained in the windfarm shipping route template.

INTERACTIVE BOUNDARIES



9. Precisely where an interactive boundary should lie requires similarly flexible definition and agreement. See diagram above where:

A = Turbine boundary to the shipping route median or centre line

B = Turbine boundary to nearest shipping route edge

C = Turbine boundary to nearest shipping 90% traffic level*

D = Turbine boundary to further shipping 90% traffic level*

E = Turbine boundary to further shipping route edge

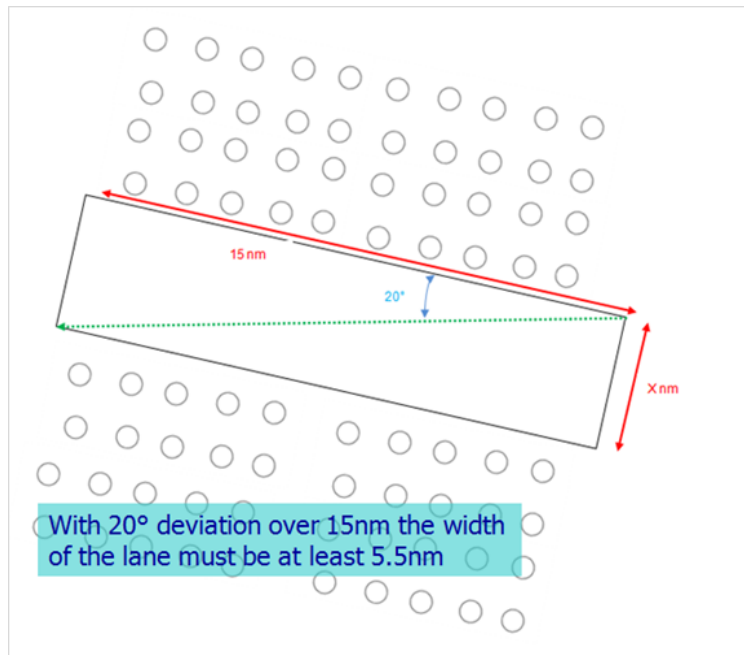
(* = or another % to be determined)

Clearly, marine traffic survey information is required to inform such boundaries. Where turbines appear along both sides of a shipping corridor, the width requirement will be proportional to corridor length, based on a 20 degree course deviation.

10. The following factors should be applied when considering the width of a shipping corridor between two turbine arrays and how far turbines should be from an established shipping route. The assessment of the required sea room must take into account the general location and sea area involved. The bridge awareness, availability of engines for immediate manoeuvre and readiness to use anchors will all vary when the vessel is on a general sea passage, as opposed to in areas of recognised constrained operation, for example port approaches and rivers.

- a. Size, manoeuvring characteristics and volume of the vessels expected to transit the proposed lanes.

- i. Standard turning circles for vessels are worked on six times the ship's length. This is a particularly good assumption when vessels on ocean or deep sea passage will not have the same manoeuvrability as when engines and systems are prepared for port approach.
 - ii. Requirements for stopping in an emergency must be considered, for example following a steering gear failure a crash stop, the quickest way to stop a vessel's movement, for a large tanker may still be up to 3km.
 - iii. The Netherlands has made an assessment of sea room requirements using data supported by the PIANC assessment for channel design. In general they strive for an obstacle free, or buffer, zone of 2nm between wind farms and shipping lanes.
 - iv. The possibility of ships overtaking cannot be excluded and should be taken into consideration. Consequently the assumption should be that four ships should safely be able to pass each other.
 - v. Between overtaking and meeting vessels, a distance of two ship's lengths is normally maintained as a minimum passing distance. This is based on the experience gained from ships' masters and deep sea pilots operating in the North Sea and has been verified by simulation trials carried out in the Netherlands (based on 400m length vessels).
- b. Provisions for possible mechanical failure of transiting vessels, bearing in mind the availability of support services.
- i. Engine failure whilst using a transit lane might necessitate emergency or unplanned anchoring, restricting available sea room for other vessels.
 - ii. Dependant on depth of water the swinging circle of very large vessels, when anchored, must be calculated to assess the sea room required.
- c. Constraints of weather, sea and tidal conditions that may be expected in the location.
- i. Unlike inshore and estuary areas, when on passage in exposed sea areas, for example offshore in the North Sea, it will not always be possible to make good a planned course. Experience also shows that in heavy sea conditions it is much harder to turn the vessel around and may not be possible to achieve a dead stop. Deviations from track by as much as 20° or more, are common and must be considered in developing corridors through OREIs.
 - ii. For example:



- d. Other traffic, for example concentrations of fishing vessels, that will affect available sea-room to manoeuvre.
- i. Concentrations of fishing vessels, or leisure traffic, will create requirements for manoeuvre and course alteration by other through traffic and also restrict sea room in the shipping lane. The risk of further vessel to vessel conflict will be consequently increased.
 - ii. Displacing a group of traffic into space utilised by other users where available sea room is already confined, must be considered. For example where leisure traffic is forced to use the same sea space as much larger and faster commercial vessels.
- e. Existence of submarine cables and obstructions.
- i. The existence of submarine cables or other seabed obstructions may affect the ability of a vessel to anchor safely away from other traffic and this may be another consideration when assessing sea room requirements.
- f. Radar interference.
- i. Dependant on the proximity to wind turbine towers, and the location of radar scanners aboard the vessel, some vessels may experience degradation of the radar display by false echoes. It may be possible that this will reduce the ability of the bridge team to identify other vessels, including crossing vessels at the extremities of the lanes, which may require avoiding action. It is common to find that the radar instrumentation is then often adjusted to reduce the unwanted interference which can have the effect of reducing actual target acquisition.

11. The wind farm “Shipping route” guidance template below is to be used as guidance and approval of distances between wind farm boundaries and shipping routes is on a case by case basis with MCA and relevant stakeholders.

Distance of turbine boundary from shipping route (90% of traffic, as per Distance C)	Factors for consideration	Tolerability
<p style="text-align: center;"><0.5nm (<926m)</p>	<p>X-Band radar interference Vessels may generate multiple echoes on shore based radars</p>	<p>INTOLERABLE</p>
<p style="text-align: center;">0.5nm – 3.5nm (926m – 6482m)</p>	<p>Mariners’ Ship Domain (vessel size and manoeuvrability) Distance to parallel boundary of a TSS S Band radar interference Effects on ARPA (or other automatic target tracking means) Compliance with COLREG</p>	<p>TOLERABLE IF ALARP Additional risk assessment and proposed mitigation measures required</p>
<p style="text-align: center;">>3.5nm (>6482m)</p>	<p>Minimum separation distance between turbines opposite sides of a route</p>	<p>BROADLY ACCEPTABLE</p>

Annex 4 – Safety and mitigation measures recommended for OREI during construction, operation and decommissioning.

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 MCA's Navigation Safety Branch and will be listed in the developer's Environmental Statement (ES). These will be consistent with international standards contained in, for example, the Safety of Life at Sea Convention, 1974 (SOLAS) - Chapter V, IMO Resolutions A.572 (14) and Resolution A.671 (16) and could include any or all of the following:

- i. Promulgation of information and warnings through notices to mariners and other appropriate maritime safety information (MSI) dissemination methods.
- ii. Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).
- iii. Safety zones of appropriate configuration, extent and application to specified vessels. See also SI 2007 No 1948 "The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 and specific DECC guidance for OREI developments
- iv. Designation of the site as an area to be avoided (ATBA).
- v. Provision of AtoN as determined by the GLA.
- vi. Implementation of routeing measures within or near to the development.
- vii. Monitoring by radar, AIS, closed circuit television (CCTV) or other agreed means.
- viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of safety zones or ATBA.
- ix. Creation of an Emergency Response Cooperation Plan with the MCA's Search and Rescue Branch for the construction phase onwards.
- x. Use of guard vessels where appropriate.
- xi. Any other measures and procedures considered appropriate in consultation with other stakeholders.

Annex 5 – Standards, procedures and operational requirements in the event of search and rescue, maritime assistance service, counter pollution or salvage incidents in or around an OREI, including generator/installation control and shutdown

The MCA, through HM Coastguard, is required to provide Search and Rescue and emergency response within the sea area occupied by all offshore renewable energy installations in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by developers and operators.

Full details and a template for the Emergency Response Co-operation Plan (ERCoP) are available from the GOV.UK web site. It should be noted an ERCoP is required to be in place for the construction, operation and decommissioning phases of any OREI. OREI developers must also fulfil the requirements of the MCA's guidance document "*Offshore Renewable Energy Installations: Requirements, Advice and Guidance for Search and Rescue and Emergency Response*" which includes design, equipment and operational requirements.

The offshore renewable energy industry is advancing and evolving and requirements and guidance may therefore have to change in light of experience and lessons learned from emergencies and SAR incidents.