Subsea Cables UK Guideline No 6

The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK Waters

Document Ownership: This document is owned by the:
Renewables Sub-Group of Subsea Cables UK

This document is the result of a successful collaborative exercise involving a wide range of industry and stakeholder representatives. It is the product of a best practice approach to minimising the prospect of future disputes whilst maximising seabed development through the adoption of the principle of sharing the seabed in a manner that is both safe and sustainable.

The authors would like to thank DECC, BIS/DCMS, MMO, Marine Scotland and OFGEM for their support in the process leading to the generation of this document.

Disclaimer

The information contained in this document has been compiled by the Renewables Sub-Group ("RSG") of Subsea Cables UK ("SCUK") this being the successor organisation to the United Kingdom Cable Protection Committee ("UKCPC").

This document is based upon the combined experience and knowledge of the submarine telecommunication cable industry, the offshore renewable energy industry and The Crown Estate. It is published in good faith with the aims of promoting the highest standards of construction, operability, reliability, maintainability and safety in the subsea cable environment.

Whilst we reasonably believe the information contained herein to be valid, it is up to those who may seek to rely on such information, to satisfy themselves as to its accuracy. SCUK and all the other named associations and entities responsible for the information contained in this document and its compilation make no warranties as to its accuracy and can accept no liability (direct or indirect) for any errors in the information or for any losses or other adverse consequences arising from its adoption.

It is the intention of this document to give guidance and to facilitate discussions between effected parties, but it is not intended to replace such discussions, nor is it intended to require any affected party to behave in a certain way or remove the right of any such party to take its own commercial decisions in relation to any of the issues raised in this document.

Document Revision Procedure:

Any party wishing to propose a change to this document should address the proposed change to the Chair of the RSG of SCUK. The RSG will then review the proposed change and consider re-convening the Technical Working Group ("TWG") to discuss the proposal. Once the RSG (and TWG, if appropriate) are satisfied, their findings and the revised document will be presented to the SCUK Plenary and other respective bodies for approval. Only when all parties have approved the changes will the document be re-issued.

All changes to this document will be recorded in the tracking table below.

Issue No	Revision Date	Section	Page No's	Comments
Issue 1	Oct 2003	All	All	Initial issue
Issue 2	Sept 2006	All	All	Revision to format
Issue 3	Sept 2010	All	4 to End	Interim Revision - text & added diagrams to account for Multiple Turbine Arrays
Issue 4	August 2012	All	All	Major revision and re-write with cross-sector input via a TWG.

Table of Contents

Definitions and abbreviations

ALARP - As Low As Reasonably Practicable

BIS – Department for Business, Innovation and Skills

DCMS – Department for Culture, Media and Sport

COLREGS – Convention on International Regulations for Preventing Collisions at Sea, London 20 October 1972, (as enacted in the UK by The Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996

DECC – Department for Energy and Climate Change

Developer - An entity undertaking marine development within UK EEZ/REZ and Territorial Waters

DOW – Depth Of Water

DP – Dynamic Positioning

DPO – Dynamic Positioning Operator

EIA – Environmental Impact Assessment

FEED – Front End Engineering and Design

Hazard Area – That area centred around an individual OREI structure adjacent to a submarine cable, which reflects the OREI structure's status as a hazard for any vessel operating on said cable. The radius of the Hazard Area shall be agreed based on the level of risk to the vessel and the vessel's own capability.

HSE – Health and Safety Executive

ICPC – International Cable Protection Committee

IPC – Infrastructure Planning Commission

ISM – International Safety Management

LARS – Launch and Recovery System

MMO – Marine Management Organisation

MOU – Memorandum Of Understanding

National Infrastructure Directorate – body replacing the IPC under the Localism Act

NM – Nautical Mile (1.852 km)

O&M – Operations and Maintenance

OFGEM – Office of Gas and Electricity Markets

OREI – Offshore Renewable Energy Installation

OWF – Offshore Wind Farm including associated structures such as Met Masts and Substations

REA – Renewable Energy Association

ROV - Remotely Operated Vehicle

RUK – RenewableUK

SCUK – Subsea Cables UK (formerly UKCPC)

Stakeholder - An entity who is a seabed user or a party with vested interest within the UK Exclusive Economic Zone

Submarine Cable - An underwater telecommunication or power or control cable

The Crown Estate - The organisation, established by an Act of Parliament, which manages the hereditary estates of the Crown on behalf of the UK

TWG –cross sector Technical Working Group (comprising representatives from SCUK, RUK, REA and The Crown Estate)

UNCLOS - United Nations Convention on the Law of the Sea

WTG – Wind Turbine Generator

Zero Impact - A development / activity that has no impact upon a Stakeholder.

Executive summary

This document (referred to as the "Guidelines") provides guidance on the considerations that should be given by all Stakeholders in the development of projects requiring proximity agreements between offshore wind farm projects and subsea cable projects **in UK Waters**. The Guidelines address installation and maintenance constraints related to wind farm structures, associated cables and other submarine cables where such structures and submarine cables will occupy proximate areas of seabed.

The Guidelines discuss in section 1 some of the ***key factors determining proximity limits*** to be taken into account in reaching proximity and crossing agreement. Further details are provided in Annex A.

The importance of early ***Stakeholder consultation*** should be appreciated at the outset and it is recommended that this is actioned as early as possible as in section 2 and further expanded in Annex B. The location of existing seabed infrastructure within potential project development areas could have a significant impact upon the layout or location of a project and its design. Discussion and Stakeholder engagement are considered to be the cornerstones of generating the greatest opportunities for a successful outcome.

The Guidelines are not intended to provide a prescriptive solution on proximity but, in section 3, offer some ***guidance for indicative separation distances*** that are intended as a starting point for Stakeholder discussions.

The Guidelines provide guidance in section 4 on a ***process for determining site specific proximity limits*** including factors to consider within risk assessments that may be used to help inform proximity discussions and agreements. A checklist of key issues is included in Annex C. The Guidelines also propose some basic principles to form the foundation of discussions on safe and appropriate solutions on a case by case basis, including potential mitigation measures.

Once the parties have agreed site-specific proximity limits, the final step in the process is the drafting of a ***proximity agreement*** with accompanying method statement. Section 5 provides guidance on this topic.

The Guidelines also contain guidance in section 6 on how to deal with ***multiple cable crossings in close proximity***. Depending upon site specific layout, this may need specific attention, particularly with the increasing size of offshore wind farms.

It is expected that the Guidelines will provide the underlying basis upon which all Stakeholders can reach a mutually acceptable proximity agreement. In the event that proximity discussions falter, an ultimate recourse in the form of a ***dispute resolution process*** is outlined in section 7.

Scope of the Guideline

The scope of the Guidelines with respect to the proximity distances and water depths that it should be applied to, is summarised in Figure 1 below and the following text.

Proximity distances

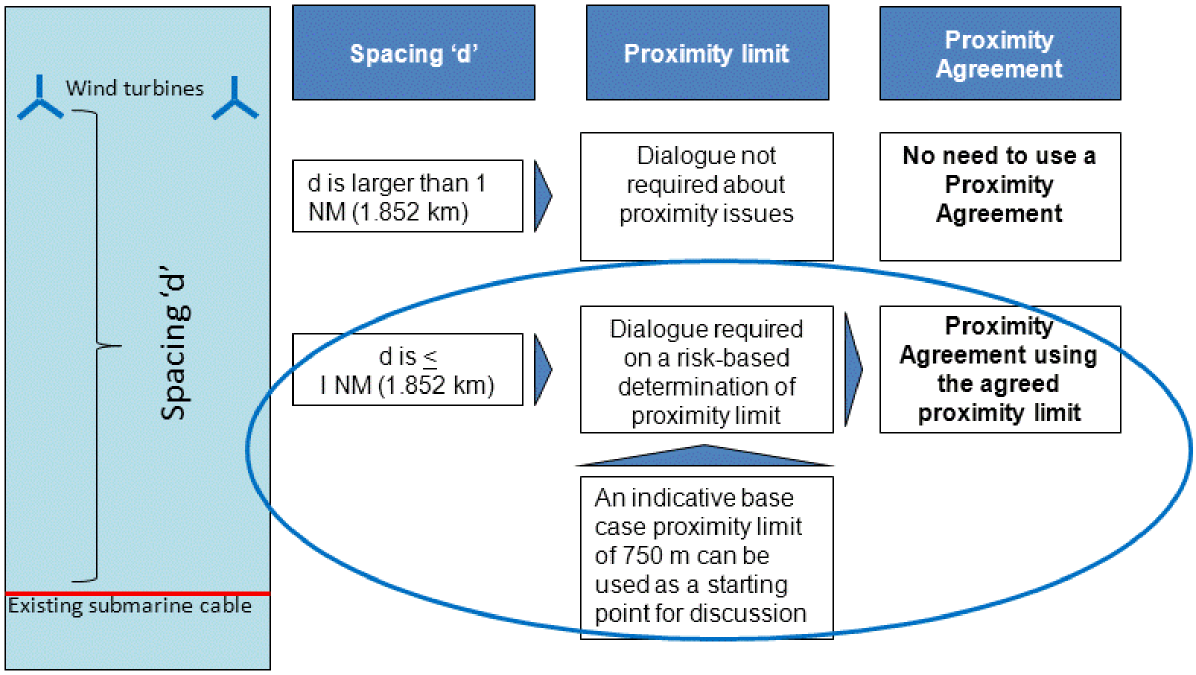

Figure 1: Proximity distances considered in the Guidelines

The regulatory framework surrounding this document is based upon current UK practices. It is the consideration of the Guidelines that no proximity agreement is required where the minimum approach of planned subsea development and planned/existing subsea infrastructure exceeds one nautical mile (1NM) (1.852 km). However, at a separation of approximately 1NM, it is considered good practice that high-level consultation is undertaken thereby ensuring that all Stakeholders are aware of each other's activities and requirements.

For a planned subsea development that is **within 1NM** of existing subsea infrastructure, dialogue needs to be established between the Stakeholders and the consideration of the Guidelines should apply to establish mutually acceptable proximity limits.

The **indicative separation distance of 750 metres** given in section 3 of the Guidelines is not intended to provide a prescriptive solution on proximity but should be used as a sensible base case to begin Stakeholder discussions to determine actual, case specific separation distances. Multiple crossings at less than 500 metres separation should be considered as being a single entity with associated potential seabed sterilisation.

Water depths

For the purpose of the Guidelines the proximity impacts between renewable energy installations and submarine cables in a range of **water depths up to 75 metres,** have been assessed. Renewable energy developments in water depths in excess of 75 metres will require a re-appraisal of the issues assessed here and are therefore beyond the scope of the Guidelines.

Introduction

The on-going development of offshore wind farms has resulted in the need for cross industry endorsed guidelines on the proximity of submarine cables and wind farms. Other forms of Offshore Renewable Energy Installations (OREI) currently being developed, such as tidal and wave energy, may also be in close proximity to existing seabed infrastructure. These guidelines however focus solely on proximity between the various offshore wind farm structures (OWF) and subsea cables.

There are common interests between offshore wind farm developers/owners and cable owners regarding safety, access and maintenance and there is a necessity for the parties to spatially interact in terms of access to the seabed. The increased use of the seabed for renewable energy developments and the potential for multiple uses of the seabed must be appreciated.

The primary common interests of the parties are summarised in Figure 2 below:

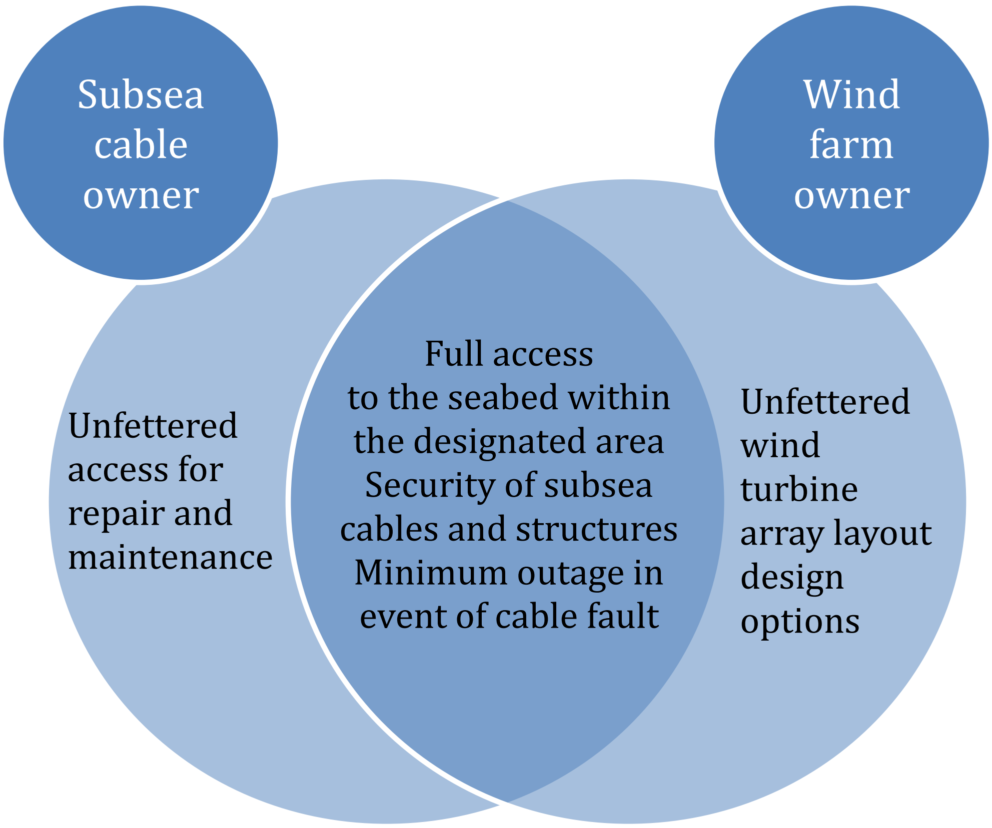

Figure 2: Primary common interests

The information supplied in the Guidelines has been compiled by a cross-sector Technical Working Group (TWG) comprising members of Subsea Cables UK (SCUK) (formerly UKCPC)), RenewableUK (RUK), Renewable Energy Association (REA), The Crown Estate and representatives from telecommunication and offshore renewable energy sector owners, developers, operators, installers and maintenance providers.

The Guidelines are therefore based upon the combined broad experience and knowledge base contained within the submarine cable industry, the offshore renewable energy industry and The Crown Estate.

Subject to the Disclaimer on the cover page of this document, it is the intention that the Guidelines should be used as a reference document on the subject matter with the aims of promoting the highest standards of construction, operability, reliability, maintainability and safety in the offshore renewable energy and submarine cable environment commensurate with co-existence in close proximity to each other.

It is very important to appreciate that the Guidelines do not provide a prescriptive solution on proximity. The distances contained within this document are intended to provide a starting point for Stakeholder discussions. It is recognised that an OWF developer may generally prefer to locate structures closer to existing seabed infrastructure than the Guidelines indicate. Under certain conditions and layouts this may well be possible. Conversely, an existing seabed infrastructure owner / operator may prefer an increase in the proximity distance to an OWF structure.

The optimised proximity distance will only be achieved by dialogue and agreement between the parties based upon a risk assessment process where appropriate.

It is in the interest of all Stakeholders that to achieve a mutually acceptable and optimal proximity agreement, very skilled and experienced resources should be utilised during these discussions. It is of the utmost importance that all Stakeholders understand and appreciate each other's requirements and safety issues. All parties should therefore commence proximity discussions as early as possible, proactively and with open minds.

Evidence based study

To support the development of the proximity guideline The Crown Estate commissioned an evidentiary desktop (and interview) study in September 2011 (The Crown Estate, 2012).

The study report can be found on the website of The Crown Estate link below:

www.thecrownestate.co.uk/marine/cables-and-pipelines/studies-and-guidance/

The evidentiary study is not intended as a guideline document in its own right but is provided as a reference tool for the parties.

1. KEY FACTORS DETERMINING PROXIMITY LIMITS

Submarine cables have been suffering faults from the outset of their 160+ year history and so the need to restore a system quickly has always been paramount. Stakeholders in a discussion on proximity limits between submarine cables and offshore wind farm structures are advised to develop and agree safe and appropriate solutions on a case by case basis to determine how much sea room is actually needed to efficiently and safely execute a cable repair.

The experience acquired in repairing submarine cables has evolved into a recognised set of maintenance and repair processes and procedures. In order to assist all sectors in understanding the interactions and impacts, four key determinants of sea room required by a cable ship are:

- Fault location;
- Cable recovery;
- Cable repair; and
- Re-deployment.

For detail please refer to Annex A.

2. STAKEHOLDER CONSULTATION

It is vital that all sectors engage with each other at as early a stage as possible in the development process, regardless of which sector the developer is from and who owns the existing infrastructure. This engagement will facilitate appropriate proximity agreements and should continue throughout the consenting process and through the operational lifetime of the asset as illustrated in the below project cycle overview, Figure 3.

Figure 3: Stakeholder consultation in all phases of the project lifecycle

There is significant growth in OWFs at the present time and hence much discussion herein assumes that the new development is an OWF (and the existing infrastructure being a submarine cable). It should be accepted that the Guidelines apply equally if the new development is a submarine cable and the existing infrastructure is an OWF.

Stakeholder engagement should commence as soon as is practicable following the award of a development zone or project area and continue with all Stakeholders, throughout the process, until the project is fully commissioned.

Please refer to Annex B for further details on proposed Stakeholder consultation and interactions in UK waters.

3. GUIDANCE FOR INDICATIVE SEPARATION DISTANCES

The Guidelines do not provide a prescriptive solution on proximity, rather, they stress the need for proactive dialogue about a site specific, risk based outcome. However, some guidance for indicative separation distances is outlined here. This is intended to provide a starting point for Stakeholder discussions.

Two primary issues to be observed when considering separation from third party vessels are:

Cable Maintenance Vessel Safety Zone – The Safety Zone around the vessel with restricted manoeuvring ability (maintenance or repair vessel), from approach of other vessels, shall be established in line with COLREGS 1972. It is also normally requested by the vessel master (in accordance with Article V of the Convention for the Protection of Submarine Telegraph Cables, 1884), for all ships to keep at least 1NM clear whilst they are engaged in cable operations that restrict their ability to manoeuvre.

Wind farm Structure Safety Zone – Wind farm operators can request, via the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 (SI/2007/1948), that typically a 50m safety zone be established around any wind farm structure. Guidance for the implementation of such safety zones is provided by DECC (DECC, 2011).

Two fundamental concepts must be considered when deriving a generic proximity distance:

- **Working Zone**, applied either side of the subsea cable; and
- **Hazard Area,** applied around the cable repair vessel.

The Working Zone and Hazard Area concepts are further discussed below and can be found illustrated later in Figures 5, 6 and 7. These showing how the Working Zone and Hazard Area would be applied to a subsea cable repair vessel in various scenarios.

Working Zone - A Working Zone is required either side of an in-service submarine cable to enable access for cable maintenance and repair operations by a suitable vessel. The parameters of the Working Zone are a function of many variables, several being site-specific. Nevertheless, the Working Zone is most pertinently the space required by a vessel to conduct all operations which a cable repair potentially comprises, including those discussed in detail within Annex A.

The Working Zone for traditional repair scenarios is likely to be in the order of **500m either side of the existing subsea cable**. This is based on the expected area required to undertake cable fault location using trailed electrodes, grapnel and final bight deployment operations. Greater detail can be found in TCEs Evidentiary Study.

Guidance in this document is considered appropriate for water depths up to 75m.

Consideration should also be given, but not limited to, the following:

- Proximity of other adjacent developments (i.e. oil and gas);
- Proximity of hazards, density of traffic and navigation schemes;

- Type, size and manoeuvrability of vessels;
- Support vessels;
- Cable type and existing burial status/protection;
- Alternative repair options, such as a lay-through repair, or adjusted final bight location;
- Predicted prevailing metocean conditions (wind, wave, current, tides) etc.; and
- Seabed type.

Nothing in the Guidelines is intended to detract from the Master's responsibility for the safe navigation of the vessel and the safety of those on board. The Master will always retain the prerogative to depart from the Guidelines, or any subsequent plan or agreement reached as a result of the Guidelines, if circumstances dictate (Ref. Annex A, Section A.9).

Hazard Area - Independent of, and in addition to, the Working Zone, where there are fixed structures near to a vessel undertaking cable operations close to the limit of the expected or planned Working Zone, a Hazard Area should be considered as a trigger radius around the vessel. If there is potential for a WTG to come within this Hazard Area as a result of vessel movement, then additional risk assessment needs to be carried out and determination made on the need for application of any appropriate pre-planned risk mitigations. Where this situation occurs, additional consideration needs to be given to supplementary control protocols, weather considerations, etc.

The radius of the Hazard Area needs to be determined by discussion between the key stakeholders (e.g. wind farm developer, the existing subsea infrastructure owner and any affected maintenance provider). The Hazard Area should provide sea room to ameliorate risks of work in close proximity to a WTG. If there is no other direction for opening that discussion, then it is recommended that **consideration begins at a minimum of 250 metres**. Even at this minimum distance, there will still be constraints on vessel operations including, but not limited to, repair procedures and weather criteria.

Figure 4 shows how the Working Zone and Hazard Area would be applied to a submarine cable repair vessel when operating on the cable line, i.e. during jointing, ROV burial/fault location, or stock cable laying.

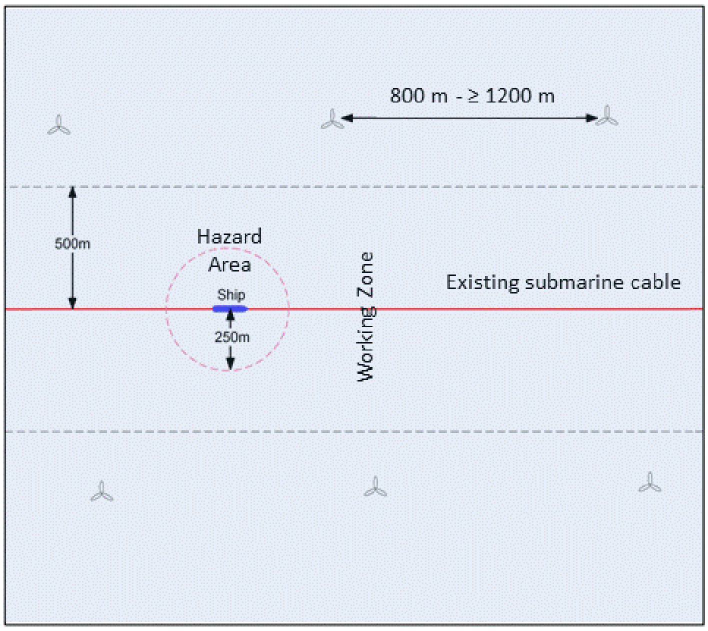

Figure 4: Vessel operation on the cable line

Figure 5 illustrates how the Hazard Area would be applied to a submarine cable repair vessel when operating at the extent of the Working Zone. This being when deploying a final bight between the adjacent WTGs thus presenting a reduced risk solution.

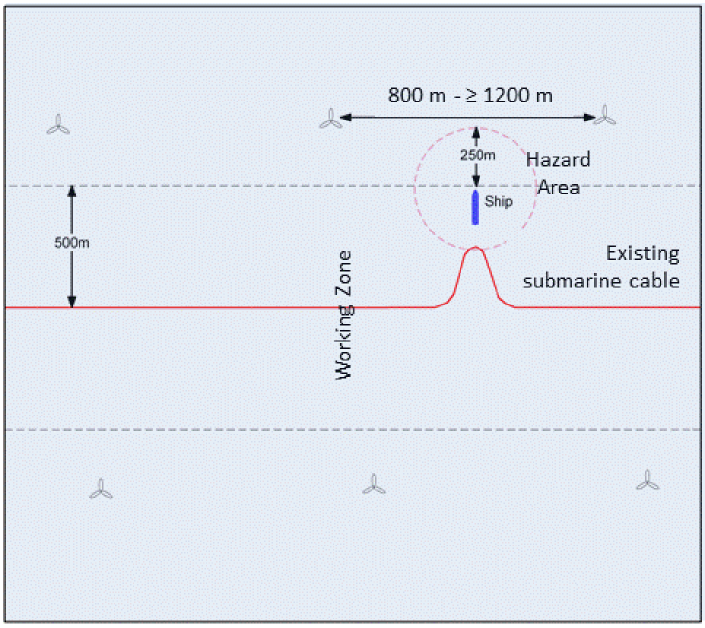

Figure 5: Vessel operation on the extent of the Working Zone when deploying a final bight

Figure 6 illustrates how the Hazard Area would be applied to a submarine cable repair vessel when driving away from the cable line during a grapnel drive to recover the cable. Note that the adjacent WTG represents a significant risk should there be any loss in vessel position. An option to reduce the risk of this occurrence is to plan drives between turbines.

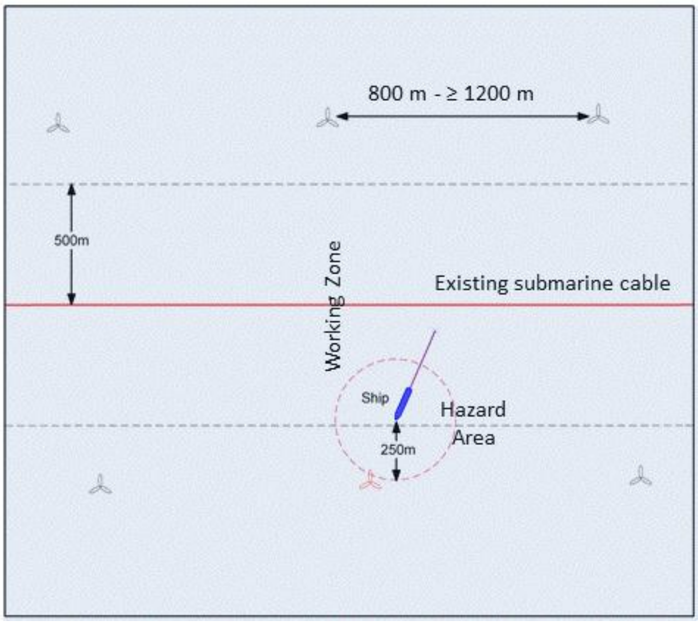

Figure 6: Vessel operation when driving away from the cable line during a grapnel drive to recover the cable

4. PROCESS FOR DETERMINING SITE SPECIFIC PROXIMITY LIMITS

A generic set of limiting distances cannot be derived for all cable / wind farm proximity scenarios without recourse to a large number of caveats and exceptions. The recommended approach is to use the principles of a holistic risk based process for determining site specific proximity limits. This allows consideration of a range of external influences, both those beyond the control of the parties and those internal influences that can be affected by the parties.

Once the parties have agreed site-specific proximity limits, the final step in the process is the drafting of a proximity agreement with accompanying method statements.

The overall process is outlined in Figure 7 below:

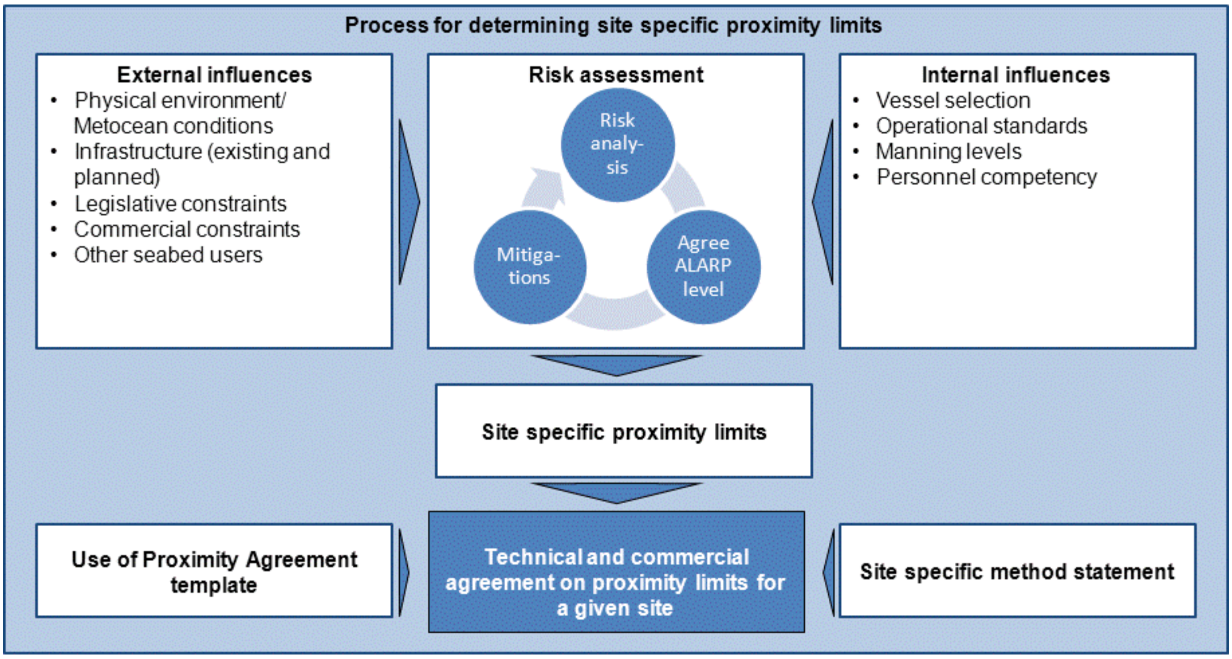

Figure 7 - Process for determining site-specific proximity limits and drafting a proximity agreement

Risk to Personnel and the influence of HSE legislation and regulation is considered to be included under External influences in the diagram above (Figure 7), as well as risks included in Operational Standards under Internal influences.

Personnel risk is properly governed by detailed legislation and is therefore outside the scope of the Guidelines. However, it should be noted that Safety Of Life At Sea is one of the primary drivers for adopting sensible proximity agreements and serves to underpin every decision process for either risk assessment or mitigation selection and application.

Risk Assessment

In order to come to a site-specific agreement between the involved parties it will usually be necessary to undertake a risk assessment during discussions on proximity agreements. This is achieved by applying the cyclic approach embedded in the process, as illustrated in Figure 8 and considered below.

The risk assessment should include an analysis of all relevant site specific influences (external and internal), examples of which are given above. In order to provide a sensible basis for discussion, risks need to be assessed realistically.

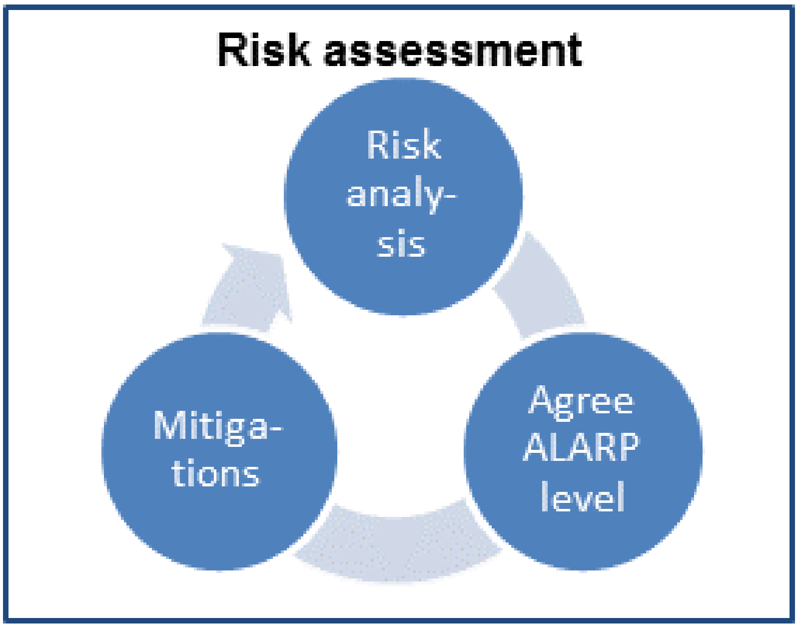

Fig 8 - Cyclic approach to risk assessment

Safe separation is required between existing submarine cables, WTG and other OWF structures to ensure the continuance of reasonable, timely and cost effective availability to maintain both the existing and the newly installed assets. The requirements of each stakeholder are however likely to vary depending on the site-specific circumstances.

In order for the involved parties to reach agreement it will be necessary to determine the As Low As Reasonably Practicable ("ALARP") risk level that is acceptable to each Stakeholder. This will be site-specific and the appetite for risk is likely to vary. The various site-specific issues should be carefully analysed in respect of risk impact, and a mutually acceptable ALARP level of risk agreed. Consideration of the acceptable risks will then allow informed discussions on the potential mitigations and lead to site-specific proximity limits.

It should be appreciated from the outset by all parties that no activity is ever entirely free from risk. Companies and regulators do however require that safety risks are reduced to levels that are ALARP. The technique associated with this often encompasses the use of a Risk Severity Analysis to try to quantify the issues.

Please refer to Annex C.3 for details of ALARP principals and a Risk Severity Analysis

Potential mitigation measures to support reaching agreement

Before decisions are made regarding proximity and cable crossings, other solutions should be considered to potentially mitigate or reduce the impact. Such mitigation measures may influence a proximity agreement. Examples of potential mitigation measures include:

- Diverting the existing cable around a wind farm rather than through it;
- Provision of additional spare cable for stock and other wet plant in case of repair;
- Change the cable repair vessel within the maintenance agreement and the necessary financial considerations;
- Joint use of cable repair vessels in a specific / generic maintenance agreement;
- Construction of a wind farm in a different area or reconfiguring the WTG layout;
- If multiple crossings are unavoidable, discussions of the required number, location and spacing should take place and be agreed;
- Undertake appropriate surveys to identify exact location of "in service" and "out of service" cables as required;
- Agreement on site-specific methodologies for repair; and
- Methods of arresting any loss of vessel position, e.g., emergency anchoring procedures, support vessels, etc..

This list is not exhaustive and, depending upon circumstances, additional mitigations could also be developed by the parties through mutually acceptable operational (and other) procedures involving wind farm developer / operator / owner and the existing cable owner / marine repair contractor etc.

The benefits of "safe havens" and "escape corridors" within large wind farms as potential mitigations of risk were considered by the TWG. The consensus of discussions with cable maintenance providers was that such measures do not deliver appreciable mitigation.

Principal Mitigation considerations for gross deconfliction

Following consideration of the issues of proximity and safe operation of co-located subsea infrastructure, it is apparent that the presence of an OWF development will restrict or prevent development opportunities for new Subsea Cables through OWFs without both parties compromising respective systems protection, security and performance objectives. Such compromise may be either unacceptable or undesirable. Options for mitigation can therefore become constrained.

Some examples of potential mitigation measures in this instance include:

- Routing a new subsea cable through an existing corridor through an OWF by virtue of a pre-existing subsea cable;
- Route new subsea cables around OWF developments, between projects or through wind recovery areas where suitable corridors may exist; and
- Subsea cable developers select alternative routes away from OWFs.

5. PROXIMITY AGREEMENT

When site-specific proximity limits have been agreed, a bilateral proximity agreement with accompanying method statement can then be drafted based on a standard template and these guidelines. Such a proximity agreement should be based on the format and spirit of existing cable crossing and proximity agreements in common use throughout both industries, where appropriate.

It is recommended that where possible, finalisation of wind farm layout planning should not be undertaken until such time as Proximity Agreements and the requirements therein have been properly reviewed, discussed and agreed at least in principle, with the wind farm developer, the cable owner and any affected maintenance providers.

Survivability of agreements is essential to the parties' interests.

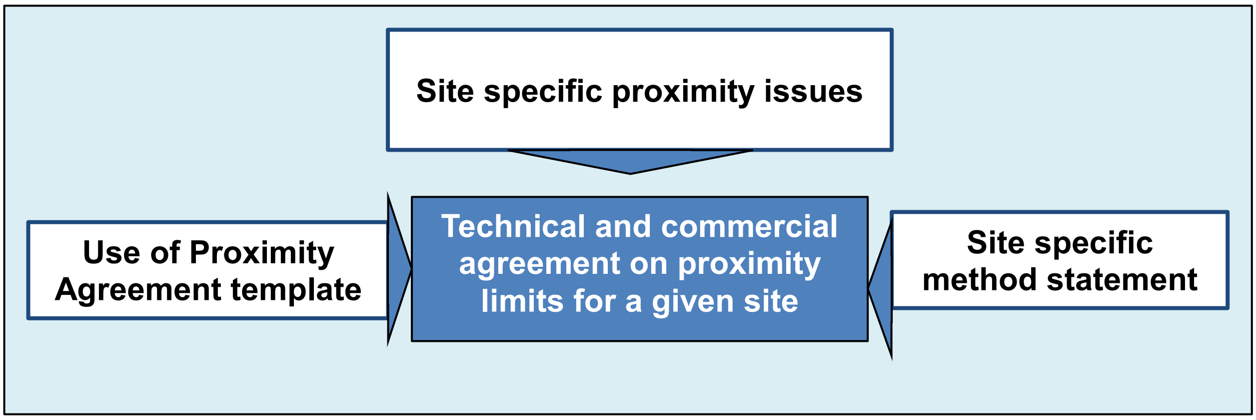

Figure 9: The drafting of a site-specific Proximity Agreement and Method Statement

5.1 Proximity agreement recommendation

The recommended approach is to use the principle of a bilateral proximity agreement for each specific scenario.

It is recommended that the following key elements are included in such a proximity agreement:

- Clauses to define the liabilities and rights of both parties;
- The exclusion/inclusion of consequential losses;
- Details of financial compensation arrangements for each party where applicable relating to specific arrangements;
- Clearly defined limits of the area to which the Proximity Agreement applies;
- Details of how the work would be carried out, to include method statements provided by the party carrying out the work and accepted by the other party as suitable prior to

work proceeding, it is recommended that installation procedures be included in the Agreement;

- Future maintenance requirements of both assets. This should include the method by which notification of operations by each party is given to the other and the provision and storage of additional plant to support agreed repair methodology and the establishment of local 3rd party support vessels, if identified as a requirement;

- Definition of the expiry/survival of the Agreement (for example, at the decommissioning and/or recovery of one or other of the assets); and

- Provision of representatives from one party to the other party's operations and their rights, obligations and limitation of authority.

5.2 Site specific method statement

A method statement is an essential part of any proximity agreement. The following is a task checklist which the parties can use as a basis for drafting a site-specific method statement. It is not intended to be an exhaustive list of items to be included by prescription but should prompt evaluation of the most useful and relevant issues for consideration.

There needs to be reciprocity with respect to method statements for repairing and installing across both industries.

Pre requirement for a repair

- Delivery of all as-laid positions of infrastructure – lat/longs, geodetic datums, cable burial, WTG dimensions and blade arc, crossing constructions, rock placements, etc.;
- Emergency 24/7 contact procedures including escalations, details of any field-specific VHF communication channels and details of site engineers;
- Historical metocean data on currents and wind to inform marine providers (may not be available - especially during the O & M phase);
- Establish notification requirements during operations, i.e., daily reports, notice of seabed interaction, surface vessel activity, etc.;
- Purchase of additional expendable gear, e.g., additional cable, crossing materials (should preferably be agreed upon during early pre-construction discussions);
- Establish additional manning requirements, e.g., additional reps, marine warranty surveyors, anchor watch crews, etc.; and
- Establish bridging documents, as appropriate.

Pre-repair

- Consider installation of local position reference systems;
- Consider temporary cessation of interruptible works nearby;
- Establish preferred subcontractors in area for guard boats, tugs, other support vessels;
- Confirmation that WTG's, which are in the area of the cable ship operations, are stopped and locked in position, preferably 'Y' position, as necessary;
- Depending on fault nature and location, powering down of closest inter-array/collector cables, as necessary;
- Up to date metocean data;
- 'Live' metocean data feed from any applicable on-site equipment to establish weather window for repair (wave rider buoys only give out present condition - not forecasts);
- Distribution list from all parties for notifications during repair ops;
- Boarding requirements of any additional personnel;
- DP trials nearby repair site to establish all systems functioning correctly; and
- Coordination meeting and confirmation of communication lines (shore project management).

During repair

- Daily activity reporting;
- Dependent on communication plan within proximity agreement, notifications when works are expected to be seabed intrusive; and
- Assistance in enforcing 1 NM exclusion zone around repair vessel for other marine traffic (as no requirement as of yet exist for a wind farm to have Marine Coordinators during the O & M phase, there may not be personnel ashore to monitor marine traffic on a daily basis).

Post repair

- Sharing of revised infrastructure location data; and
- Post repair review meeting / Lessons Learnt exercise to feed back improvements to the process or relevant industry contacts.

6. MULTIPLE CABLE CROSSINGS IN CLOSE PROXIMITY

A standard protocol for submarine cable crossings is well established and can be found detailed within ICPC recommendations 2 & 3 and also SCUK Policy No 1.

Multiple cable crossings in close proximity have been undertaken on a number of occasions and are therefore not a new scenario. However, ideally, crossings should be kept to a minimum from the point of view of the existing cable(s).

Multiple crossings within a wind farm area, for example a telecommunication cable crossing a number of inter-array power cables as shown on Figure 10 (for illustration of the issue only) should generally be avoided or mitigated.

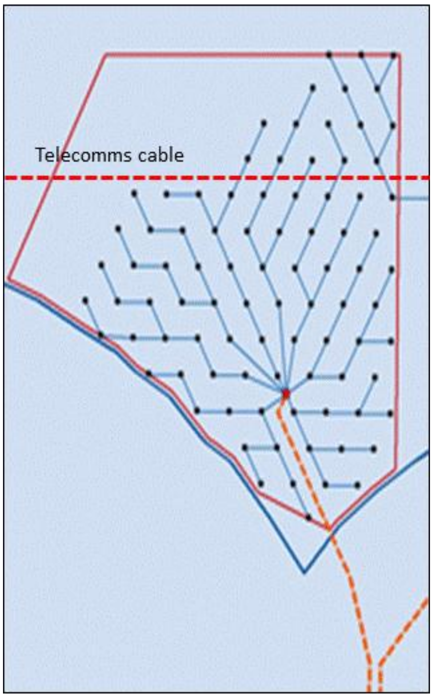

Figure 10: Potential Multiple crossings within a wind farm.
Ref: The Crown Estate

The amount and frequency of crossings should form part of discussions on crossing/proximity agreement between the parties.

If crossings were less than 500 m apart it may make recovery of the underlying cable between crossings unsafe and impractical. As such, **crossings at less than 500m separation should be considered as being a single entity** and subsequently sterilising that area of seabed and existing cable. Any repair of the crossed cable would involve cutting either side of these crossings and lay back over the top.

It is appreciated that the development of large offshore wind farms has created the potential for a high concentration of crossings by multiple export, collector and/or array cables. This could result in limiting the available space for cable repair vessels to operate and also pose technical problems regarding cable recovery/replacement and repair within the crossing area. It is recommended that the following principles are initially considered:

- Multiple crossings of existing cables by export, collector and/or array cables should be avoided wherever possible;
- Where multiple cable crossings are deemed necessary, the crossing cables should be spaced so that safe, timely and economical repairs to both the crossing and the crossed cables can be conducted without prejudice.

The potential impacts of multiple cable crossings should be carefully assessed. This should be included in the discussions of proximity/crossing agreements. As with all construction work, there are many different situations that will need to be considered when multiple cable crossings in close proximity are being discussed. Before cables are laid close to or across existing cable(s), it is recommended that the parties should consider the following:

- When the operation(s) is to be carried out;

- Which technical method(s) will be used;
- Whether a pre-lay survey is required along both the existing cable(s) and the route of the new cables;
- At what approach distance from the existing cable(s) the crossing cables can be buried by plough/ROV/other means of jetting;
- If required, what kind of protection should be used between the cables at the crossing point (Polyurethane, concrete / bitumen mattresses, rock placement etc.) and the thickness of the separation layer;
- In the event of a later repair, which technical methods are to be used;
- How close can an ROV or a grapnel be used to the other party's cable(s); and
- Confirm who has priority in the case of simultaneous faults.

7. DISPUTE RESOLUTION PROCESS

It is recommended that any dispute arising out of or in connection with the parties' negotiations to establish an agreed distance between the submarine cable and wind farm development in question (a dispute) may be resolved by using a typical mediation process, an example of which is shown below.

In the event of any matter for expert determination, senior representatives of the parties shall, within [30] calendar days of service of a written notice from any party to the other parties (a disputes notice), hold a meeting (a dispute meeting) in an effort to resolve the dispute. If the parties are unable to agree upon a venue, the dispute meeting shall be held at an appropriate neutral location. Each party shall use all reasonable endeavours to send a representative who has authority to settle the dispute to attend the dispute meeting.

If the representatives of the parties cannot resolve the dispute within [60] calendar days after the service of a disputes notice, whether or not a dispute meeting has been held, the dispute must be referred to a senior manager of UK operations of each party who must use all reasonable endeavours to resolve the dispute within [30] business days after the dispute is referred to them (referral period).

Any dispute which is not resolved within the referral period, shall, at the request of any party made within [30] calendar days of the expiry of the referral period, be referred to an independent expert for determination.

The parties shall agree on the appointment of the expert and shall agree with the expert the terms of their appointment. If the parties are unable to agree on the identity of the expert, or if the person proposed is unable or unwilling to act, then, within [30] calendar days of either party serving details of a suggested expert on the other or the proposed expert declining to act, either party shall then be entitled to request that an expert be appointed by an independent arbiter. All costs of and associated with the request for the appointment of an expert by the independent arbiter shall be borne equally between the parties. The expert appointed may be an individual, partnership, association or body corporate and shall be generally recognised as an expert in the field of cable installation and maintenance. The independent arbiter shall be mutually agreed between the parties.

The expert shall act on the following basis:

a. *on their appointment, the expert shall confirm his neutrality, independence and the absence of conflicts in determining the dispute;*
b. *the expert shall act as an expert and not as an arbitrator;*
c. *the expert's determination shall (in the absence of manifest error) be final and binding on the parties and not subject to appeal;*
d. *the expert shall decide the procedure to be followed in the determination in accordance with this agreement and in consultation with the parties and shall be requested to make his determination in writing, with reasons, within [30] calendar days after their appointment.*

For the avoidance of doubt, all costs related to the instruction the expert shall be borne equally by the parties.

8. RECOMMENDED CONSIDERATIONS, GUIDELINES AND REFERENCES

When planning the route of submarine cables it is recommended that developers consult the following International Cable Protection Committee (ICPC) and SCUK guidelines/policies:

ICPC – www.iscpc.org

Recommendation No.1:	"Management of Redundant and Out of Service Cables"
Recommendation No. 2:	"Recommended Routing and Reporting Criteria for Cables in Proximity to Others".
Recommendation No.3:	"Criteria to be applied to Proposed Crossings between Submarine Telecommunications Cables and Pipelines / Power Cables
Recommendation No.4:	"Recommended co-ordination procedures for repair operations near in service cable systems"
Recommendation No.7:	"Procedure to Be Followed Whilst Offshore Civil Engineering Work Is Undertaken In The Vicinity Of Active Submarine Cable Systems"

SCUK – www.subseacablesuk.org.uk, Policy No.1: "Cable Crossing Agreements"

DECC, 2011. *National Policy Statement for Renewable Energy Infrastructure (EN-3).* [Online]. Available at:
http://www.official-documents.gov.uk/document/other/9780108510793/9780108510793.pdf

Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 (SI/2007/1948),. Available at:
http://www.legislation.gov.uk/uksi/2007/1948/contents/made

The Crown Estate, 2012. Submarine cables and offshore renewable energy installations – Proximity Study:

www.thecrownestate.co.uk/marine/cables-and-pipelines/studies-and-guidance/

ANNEX A - KEY FACTORS DETERMINING PROXIMITY LIMITS

The experience acquired in repairing submarine cables has evolved a recognised set of maintenance and repair processes and procedures. In order to assist all sectors in understanding the interactions and impacts, the four key determinants of sea room required by a cable ship are summarised in this Annex, namely:

- Fault location;
- Cable recovery;
- Cable repair; and
- Repair bight deployment.

In addition, the following basic operating issues governing the determination of proximity limits are addressed:

- Vessel design and capability;
- Anchored operations;
- Operations within a Hazard Area (or Area of Enhanced Operational Awareness);
- Safety management and competency; and
- The role of the Master.

Part of the information contained in this Annex is extracted from TCE's Evidentiary Study which contains more in-depth information about the subjects, including overview tables and worked examples. It is generally recommended to consult this study report when considering specific issues to be analysed for inclusion in a proximity agreement.

A.1 Fault location

Confirmation of fault location and cable recovery is carried out by ROVs where metocean conditions allow. The use of electrodes, trailed behind the repair ship as it zigzags its way along the cable route may however be necessary for fault location under certain conditions.

Trailed electrodes remain a well proven technique for fault finding in both telecoms and power cable repair operations. For expediency it is common for the main repair vessel to carry out the work but auxiliary vessels may also be employed if these are available and the operational conditions are suitable.

In either case, the sea-room required for the vessel to safely and efficiently manoeuvre whilst using trailed electrodes must be properly considered within the proximity agreement.

A typical manoeuvring pattern is illustrated in Figure 11 below.

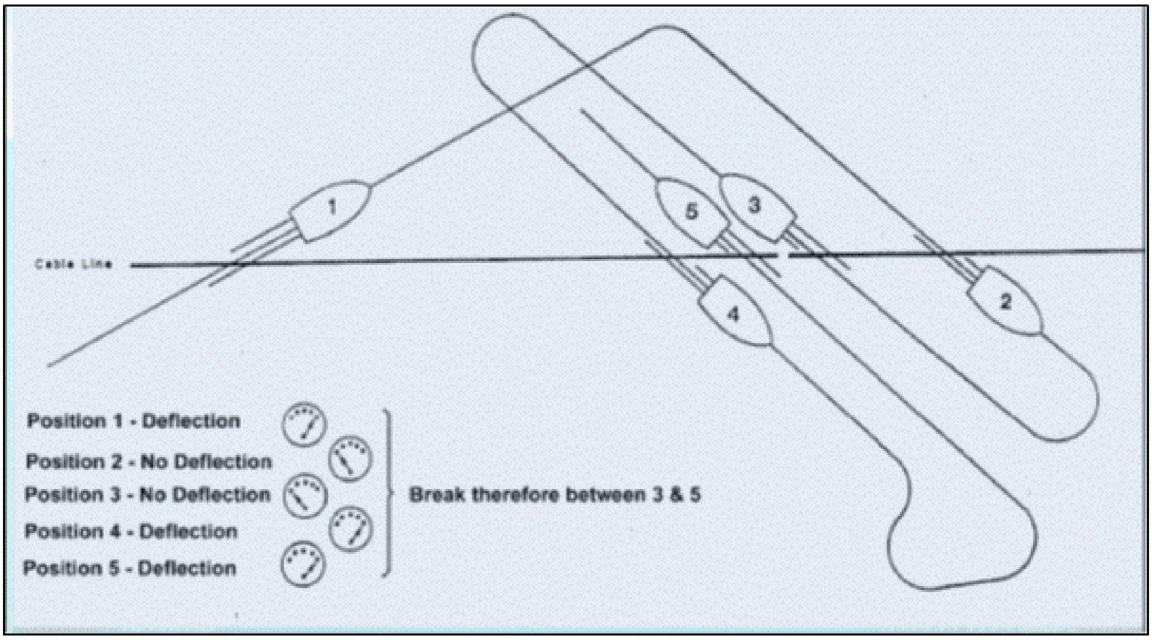

Figure 11: The process of determining fault location through the use of trailed electrodes. (Internal Document, GMSL, 2011)

Electrodes would be approximately 150 m in length in 50 m DOW, and typical distance offline would be 400-500 m. The latter distance is a function of electrode length, ship length and requirement to tow the electrodes far enough away from the cable line so that any deflection is sufficiently positive to inform a judgement on fault location and not be overtly affected by background noise.

A.2 Cable recovery

The recovery of telecommunication cables for repair may be undertaken by conventional grappling techniques, the use of ROV or a combination of both. The sea-room required to efficiently execute cable recovery is one of the key determinants of cable and OWF proximity. This should be properly addressed in the drawing up of proximity agreements and associated documentation.

ROVs & Related Subsea Equipment

In most cases, ROV intervention would be the preferred cable intervention method in water depths up to 200 m, at least initially when the fault location would be inspected. Once initial ROV inspection has been completed then the options become broader ranging, including towed grapnels. The recovery method would be dictated by seabed type, depth of burial, environmental parameters, cable offline distance (in which case ROV is preferable), cable type, proximity of hazards, etc.

If these factors allow, once the fault has been located the cable will be exposed, cut by the ROV and recovered by a lift line, thus reducing the amount of system cable removed and minimising cable ship excursions from the cable route. Alternatively, the initial cut may be performed by ROV before the two cable ends are recovered to deck via grapnels. In some situations, use of ROV may be restricted to initial fault location and identification of suitable locations to conduct recovery via grapnels only.

Indicative base case proximity limits for ROVs, and other subsea tools can be found in TCE's Evidentiary Study.

Grapnel operations

Grappling remains a valuable cable recovery technique, especially when metocean conditions or cable burial preclude the use of ROV. This activity will usually consist of a cutting drive at the fault position followed by holding drives to recover the two cable ends. De-trenching grapnel under-running is potentially required when the recovery of cables from deep burial would otherwise create excessive tensions on the cable during recovery.

The distance required to conduct both cutting and holding grapnel drives is broadly similar and is a function of ship length, grapnel rig length and run-on – a DOW dependent distance deemed appropriate to ensure the grapnels have sufficient opportunity to engage the cable. Grapnel runs would preferably be conducted up any substantial seabed gradients and perpendicular to the cable route, hence they result in the cable ship making significant excursions from the cable route as in Figure 12 below.

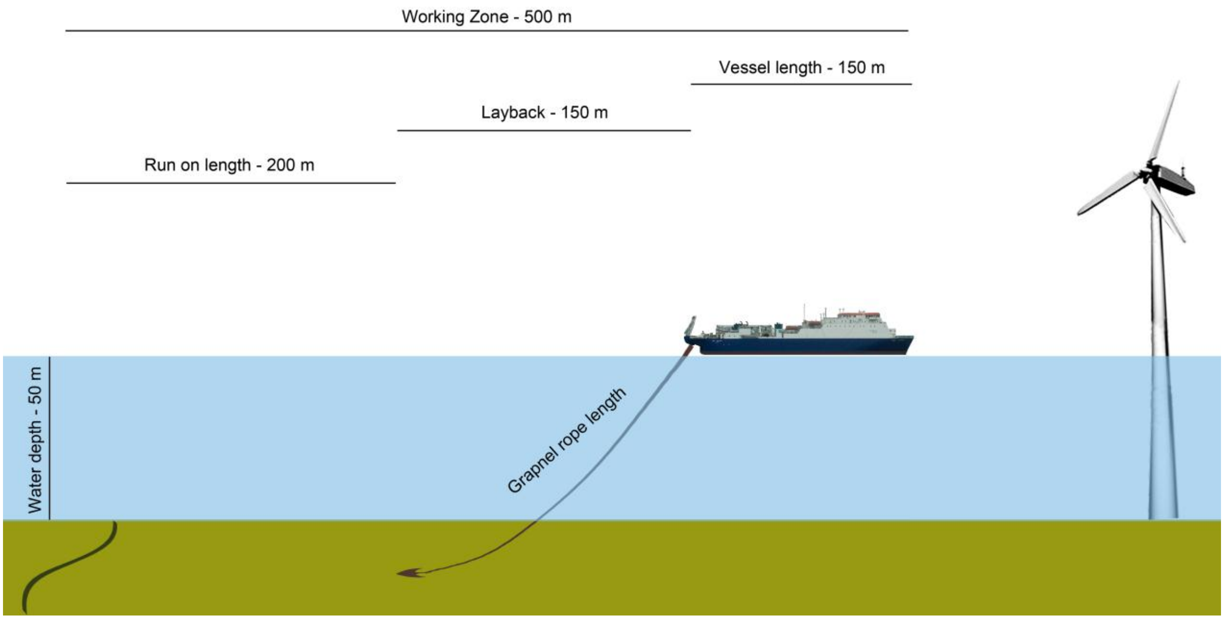

Figure 12: Example of indicative distances required when conducting traditional cable recovery methods with grapnels in 50m depth of water

The size of excursion shown in Figure 12 from the cable route may be reduced by using a shortened grapnel rig layback, conducting operations with the vessel direction parallel to the cable line or by making optimal use of conditions (further details relating to such a scenario are provided by The Crown Estate (2012) (refer to Table 0-4 of that Study)). However, the normal scenario above should be allowed for when discussing proximity and, as grapnel operations require more sea-room than ROV cable recovery methods, the use of grapnels is a key consideration for this guideline.

Table 1 is offered as a guideline set of base case operational distances for grapnel operations. It is acknowledged however that final proximity limits for a given repair scenario will be dependent on a large number of variables that combine to produce a unique set of requirements for each cable repair.

Water depth (metres)	Layback (metres)	Run on (metres)	Length of Grapnel Rope (metres)
10	30	50	40
20	40	50	50
30	70	50	90
40	100	50	120
50	140	50	150
100	240	50-60	250-300

Table 1 - Indicative reduced grapnel operation distances (The Crown Estate, 2012)

The reduced layback and run on distances provided by The Crown Estate (2012) are to be considered as 'shortened' distances and are derived assuming the most optimum conditions and a reduced grapnel layback. In practice, an allowance for differences in grappling rig arrangements, operational contingency (e.g. wind & tidal effects) and attention to the particular circumstances of the case should be made and the arguments expressed here adjusted accordingly.

A.3 Cable repair

Once a cable end has been recovered and "recovery" damage removed, the system is tested to determine whether the end is faulty or fault free. If faulty the vessel will proceed to clear the fault if local to the repair vessel. Once the cable has been cut back sufficiently to remove the fault and has been tested successfully the cable ship will buoy off the good end and relocate to recover the other side of the cable.

The cable ship will repeat the process on the second end until it is standing to a fault free end and will then splice to a length of repair "stock" cable. Once this splice is completed and tested, the cable ship pays out the new "stock" cable section (depending upon the position of the cable ends during fault location, the cable ship will aim to place the cable on the original cable line) laying out to the first cable end buoy – including any crossing constructions which may be required over inter-array or export cables.

When the cable ship reaches the cable buoy it will recover the first end, test both ends and perform the final splice (see Figure 13 below).

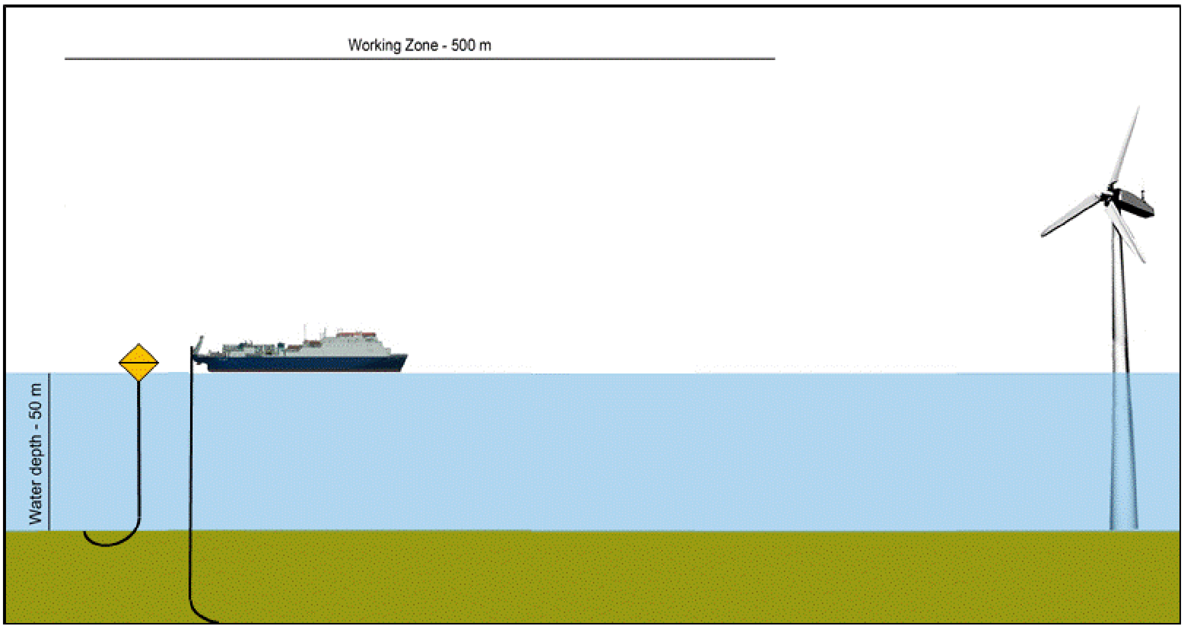

Figure 13: The repair of a cable is usually not dimensioned in respect of proximity distance to a wind farm structure

A.4 Repair bight deployment

Once the final repair joint is complete the vessel will manoeuvre to lay the final bight, as in Figure 14 over, and, if possible, the entire repair footprint will be re-buried using the ROV.

It should be noted that the physical characteristics of the repair bight are dictated by the variations in design and purpose of the vessel involved.

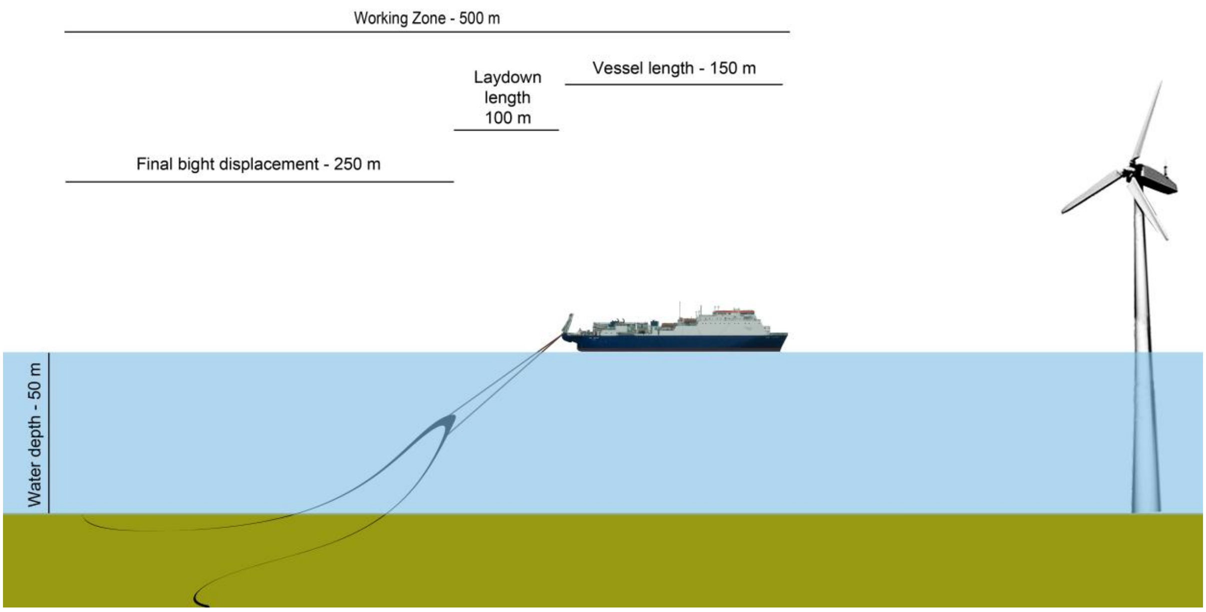

Figure 14: Example of indicative distances displaced off the cable line when deploying a final bight to the seabed in 50m depth of water

The displacement of a final bight created by a cable repair will be a function of:

- water depth;
- the physical characteristics of the cable, particularly bend radius and catenary;
- deck length, jointing space layout and freeboard of the cable repair vessel; and
- prevailing weather conditions at the time of the laydown operation.

Figure 15 overleaf illustrates the terms 'water depth', 'freeboard', 'deck length' and 'repair bight crown'.

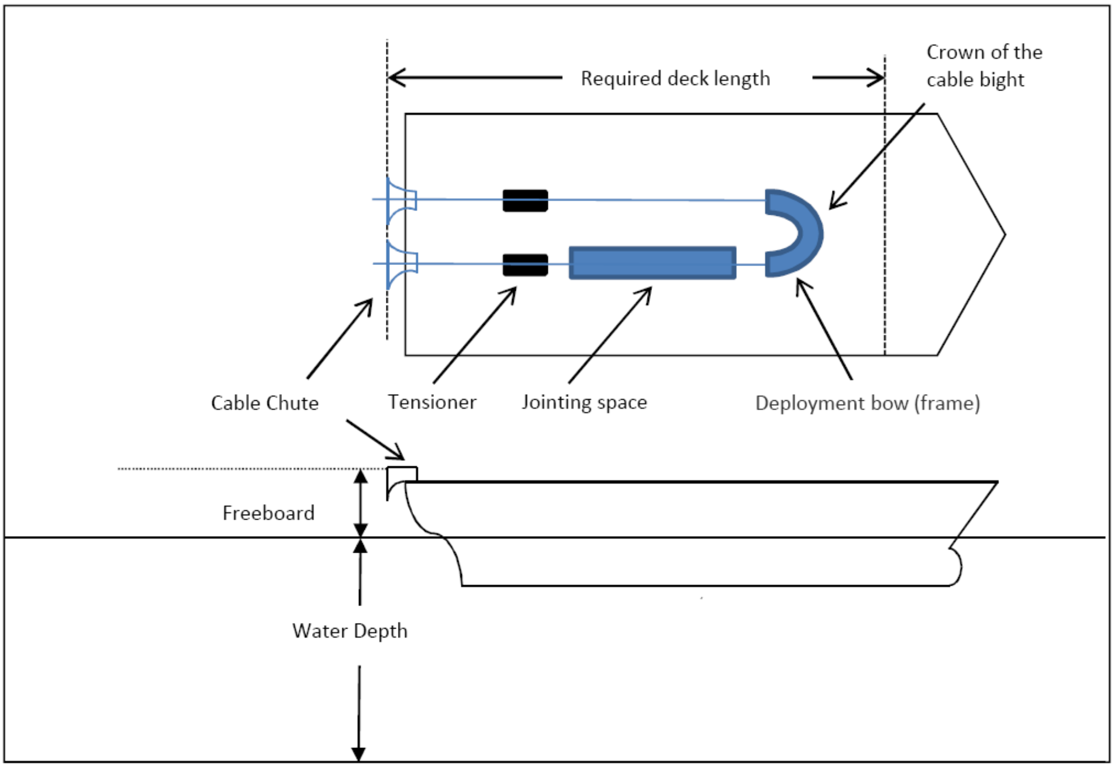

Figure 15: Terms relating to cable repair bights

The deployment of a final bight is likely to be the key determinant of the space required to conduct maintenance of a submarine cable in the vicinity of an OWF development. Not only is it likely that the operation during a repair requires the greatest excursion offline, hence placing the vessel closer to the OWF than at any other stage of the repair operation, it takes place when the cable ship is least manoeuvrable and most constrained in her ability to respond to any loss of position. A method to reduce the risk of the proximity of the ship and the nearest wind turbines is to plan the deployment of the final bight between or away from the turbines. If practicable, the ROV will also be utilised to inspect and re-bury the cable post repair. Attention is drawn to the differences in bight deployment techniques between telecoms and power cables. Also, the differences in preparation and laying out of cable ends for jointing are significant when comparing telecoms and power systems. As such, due recognition of each should be fully incorporated in all proximity planning.

A.5 Vessel design and capability

It is demonstrable that with increasing technical reliability of propulsion and control systems, the main causes of DP station keeping incidents are related to human error. While the DP class of a particular vessel remains relevant, procedural regimes and behavioural safety are considered to be of significant importance in developing proximity limits for DP and other self-propelled vessels.

DP Class 1 vessels in common use within the telecommunications cable repair sector, provide lower levels of redundancy in the event of a system failure or loss of position. Providing proper operating controls and procedures are followed, however, the use of DP Class 1 vessels should not translate into more station-keeping incidents than for DP Class 2 vessels, providing such DP Class 1 vessels are operated more conservatively in terms of proximity distances.

A.6 Anchored operations

An anchored barge may be used for cable installation or repairs in proximity to a wind farm or conversely for wind farm work in proximity to an existing cable. The use of jack up barges for wind farm construction or cable repair activities can also involve the deployment of anchors to aid positioning prior to jacking operations.

While the deployment of anchors represents an additional constraint when planning proximity limits, the fact that anchor lines can span an existing subsea cable allows a degree of flexibility in the use of anchors in a congested seabed area.

While it is not possible to prescribe minimum proximity limits for anchors and wires that suit all situations, given proper controls, some base case limits for anchored operations can be found in TCE's Evidentiary Study.

The proximity and direction of anchors should be given specific consideration and procedural process in the site proximity agreement.

A.7 Safety management and competency

The station keeping performance capability of any vessel is a combination of design, maintenance standards and operational competence in the face of environmental and site specific conditions. This guideline considers that close attention to safe operating practices, competency assurance and behavioural based safety should be equally important as the technical reliability and performance of vessels and equipment when defining proximity limits.

Whilst the safe operation of vessels is legislated at international and national levels, there are a range of applicable safety standards depending on the size and/or power of a particular vessel. Some vessels (particularly towed barges) fall outside the more stringent requirements such as the International Safety Management (ISM) Code. It is recommended that the principles of the ISM Code be applied to proximate vessel operations irrespective of vessel size, power or class.

A.8 Operations within a Notification Area

Typical crossing and proximity agreements generally prescribe additional safety controls within a defined area around a fixed or floating structure in order to manage the additional safety hazards present. A 'Notification Area' around structures is often adopted where vessel entry would activate these additional requirements specified in the crossing or proximity agreement. It is recommended that the definition of such a notification area be included within the proximity agreement within which a heightened level of operational readiness and safety awareness be activated.

A.9 The role of the Master

In common with conventional maritime law and practice, the ship's Master has overall legal responsibility for the safety of his vessel, the personnel on-board, and the protection of the environment. It is recommended that this is properly acknowledged in the development and spirit of the proximity guidelines and that nothing contained therein should detract from this ultimate responsibility for the safe conduct of operations.

It should be noted, the prerogative of the vessel's Master will play a significant part in the actual execution of the works that are defined within any proximity agreement and in all vessel operations discussed therein. This guideline considers it imperative that maintenance suppliers and their marine personnel (of both parties) be engaged in both the proximity agreement formulation and any repair operation planning.

ANNEX B STAKEHOLDER CONSULTATION

This Annex describes a typical offshore wind development programme and the sequence of high level activities and proposed stakeholder interactions during the various project phases. The TWG acknowledges that some OWF developers may choose to progress further with proximity agreements, prior to consent application, than suggested below. However, Figure 16 below, and the explanatory text, provides some guidance on the suggested timings of interactions between an OWF developer and subsea cable operator.

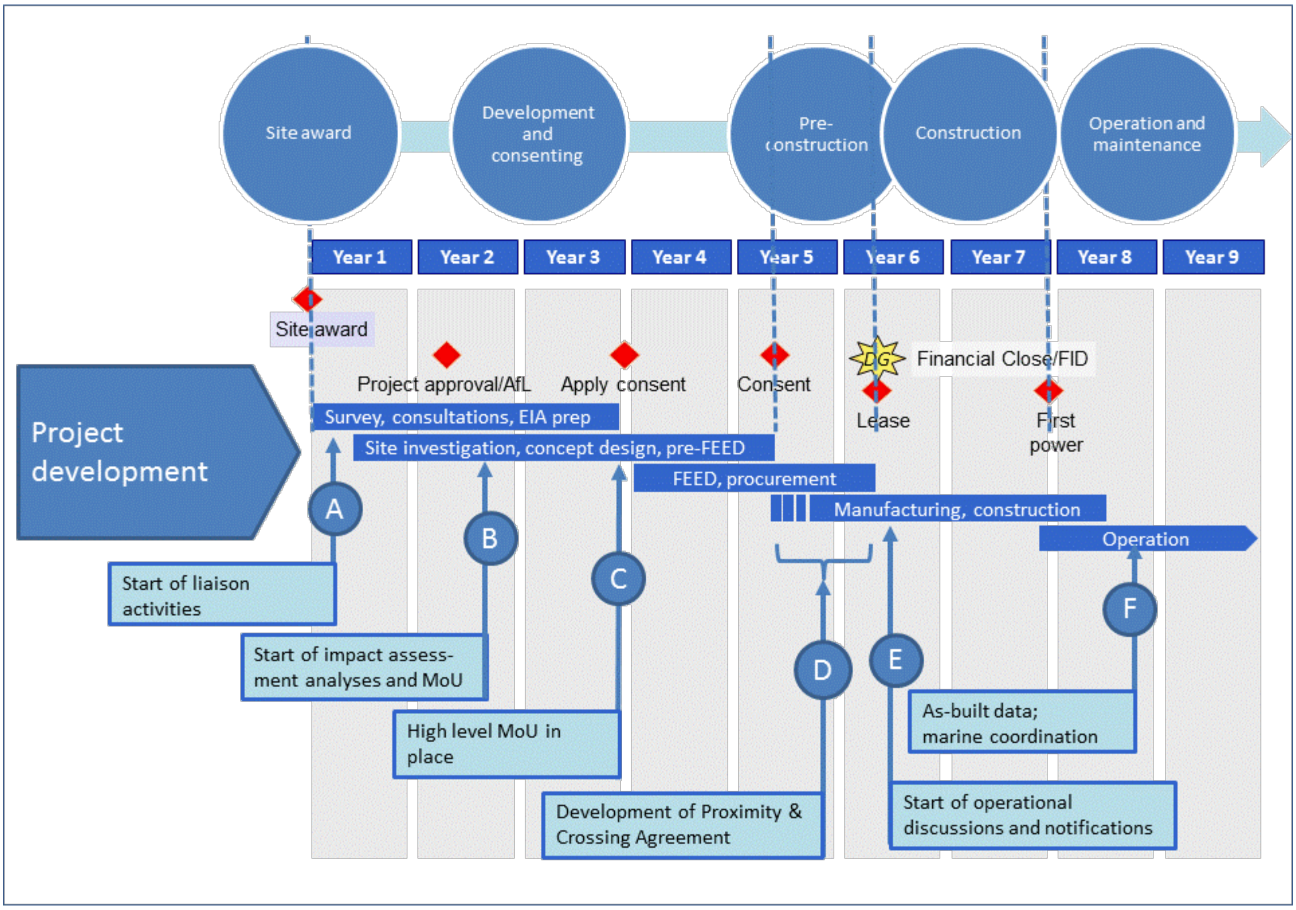

Figure 16: Suggested stakeholder consultation during development and construction of an offshore wind farm project

B.1 Development and consenting phase

The UK processing model for offshore wind farms can take more than 5 years from identification of a development zone through to commencing construction. Developers have a number of stages to complete before gaining planning consent. Owing to the nature of the planning system for offshore renewable energy projects, detailed and effective engagement is required with all stakeholders during this time and the developer must report on this consultation and on the way in which stakeholder concerns have been taken into account within their consent application. To assist in this process, The Crown Estate maintains a ‘phonebook’ listing all appropriate contacts.

A Start of liaison activities

The first liaison activities between the developer and the involved stakeholders should include advice on intent, process and timescales of the development.

Communication should include the issue of charts providing details of the site under development. Where possible, this could also be provided in a suitable GIS format. Once communications have started, follow-up communication should continue on a regular basis – perhaps twice a year (although this should be agreed on a case-by-case basis, depending on the potential nature of the interaction between parties).

B Start of impact assessment analyses and MoU

Once a project (or zone development plan) is better defined, one-to-one meetings with the affected stakeholders should commence. The key aim of these meetings should be to discuss proximity issues and the potential requirements for cable crossings. Under the Planning Act a developer must demonstrate a suitable level of consultation and engagement with a project's stakeholders. As a result it would also be beneficial to discuss the overall nature of the principles which will need to be established between the two parties when coming to proximity or crossing agreements.

It should be noted that even at the point of consent application, the wind farm developer may not know the exact layout of the offshore wind farm. Wind farms are usually consented on a 'project envelope' basis, known as a Rochdale Envelope, which allows for a variety of potential options in technology, layouts, project size, etc., to be built out. Importantly for this document, the layouts are only likely to be confirmed post-consent. Whilst some developers will be happy to sign up to certain distances on which a proximity agreement can be reached before consent, it may not be possible to sign full proximity and crossing agreements before the submission of a consent application if developers cannot provide this level of certainty. It is therefore anticipated that where developers cannot sign up to certain constraints before consent application and hence where there are potential conflicts between a cable and an offshore wind farm proposal (and where there is a possibility that the cable operator may object to the IPC/Marine Scotland as a result of the conflict) the affected parties may look to develop a two-stage agreement. The suggested stages for this are detailed below but may need to be adapted to meet the needs of individual developers and their stakeholders.

Whilst an offshore wind farm developer, in this instance, would not be able to provide final details of a project layout pre application, it is suggested that parties consider entering a high level Memorandum of Understanding (MOU) before a developer submits a consent application to avoid the need for any objection to an application. The level of information within this MOU would be largely dependent on the desired level of agreement, pre-consent, of the OWF developer and cable owner. It is suggested that such a high level MOU would look to establish the principles on which a proximity agreement would be reached for the project in question and would intend to focus the parties on the principles laid out within it. Such a high level MOU may look to identify minimum proximity without any compromise to maintenance operations on the telecoms operator's part as well as, for example, suggesting suitable mitigation measures that could be adopted should proximity be reduced in a number of increments. This may present numerous scenarios on which the offshore wind farm developer could base a design when finalising the wind farm design depending on the final project parameters, hence retaining the flexibility contained within the Rochdale Envelope. It is recognised however that an MOU may not be applicable or appropriate for all developers and hence it is suggested here as one option to ease concerns of both parties. A developer (or existing cable owner) may prefer to take another approach as part of ongoing consultation on the proximity agreement.

During the discussions on a high level MOU, the parties may agree to undertake certain impact assessment analyses and technical studies, if required, to determine the level of risk imposed and allow an informed discussion of potential mitigations.

C High level MoU in place

If considered appropriate, a high level MOU would be put in place between the developer and the affected party as part of the consultation process. In this case, it would provide the offshore wind farm developer and affected party with the reassurance that a project will proceed on the previously agreed terms and hence will avoid potential further dispute at a later stage.

In this scenario, the second stage of the proximity agreement would occur post-consent and once the layout has been approved, where detailed agreements between cable operators and offshore wind developers are finalised and agreed (as discussed further in Annex B.3).

B.2 Pre-construction phase

D Development of Proximity & Crossing Agreement

Once consent is granted by the relevant authority, the developer will start narrowing down design options for the offshore wind farm through detailed design, tendering and procurement processes (although some developers may begin this process during application determination). During this period of time (typically approximately 2 years), the developer should continue to engage with the cable owners and establish more firm proximity (and crossing) agreements in line with the previously agreed principles laid out within the high level MOU or any other applicable documents. These would be based on the established wind farm layout, electrical infrastructure, etc.

Depending on the nature of the offshore wind farm consent, there may also be a requirement to demonstrate to the regulator that a proximity agreement has been reached.

B.3 Construction phase

E Start of operational discussions and notifications

Once the financial investment decision is taken by the developer's board(s) and offshore construction is mobilised, there will be certain precautions to be taken in respect of construction operations near offshore cables. This is detailed in the method statement forming an integral part of any proximity agreement.

Representatives of installation and/or maintenance contractors should be involved in operational discussions as early as possible, as necessary. This is to enable agreement of working arrangements for installation, repair and maintenance of the parties' facilities within the bounds of the proximity (and crossing) agreement.

Notification for defined activities should be provided as agreed on a case by case basis. An example of a notification timeline could be at countdown intervals of 3 months, 1 month, 1 week, 48 hours, 24 hours prior to construction commencement and upon completion of operations. Any alterations to the Method Of Procedure (MOP) during construction will require further discussion and flexibility in the proximity agreement.

B.4 Operation and maintenance phase

Following construction, the coordinates and necessary charting information shall be supplied to all parties as soon as practical to enable them to update their databases. The obligation is to provide as-built data works for all parties. The wind farm operator should provide as-built data and as-laid coordinates of all infrastructure. Submarine cable operators should provide a revised route position list after a cable has been lifted for repair or installation of a new cable.

During the operation and maintenance phase there will be new issues in respect of marine coordination, issues during major overhauls, etc., and there might be options for shared maintenance services.

ANNEX C – CHECK LIST FOR ISSUES TO BE CONSIDERED IN A SITE SPECIFIC RISK ASSESSMENT

This Annex provides a check list of the key issues ('External / Internal Influences') for consideration in a site specific risk assessment. It may be appropriate to consider these as part of a suggested agenda for discussion between the key stakeholders.

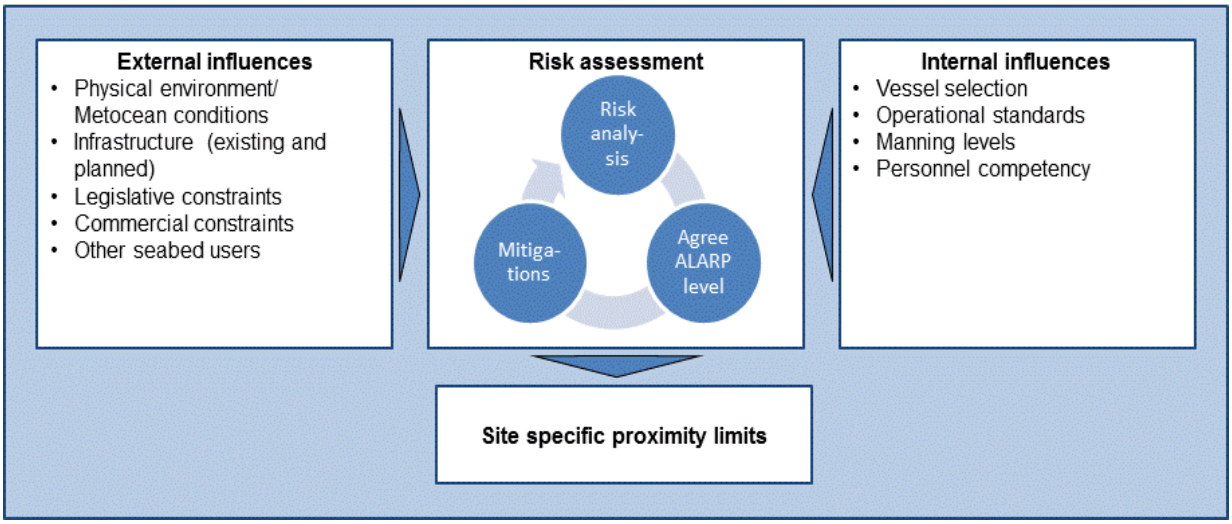

Figure 17 – The External and Internal Influences to be considered in determining site specific proximity limits

C.1 External influences

The following is an aide-memoire of the key areas of 'External Influences' (i.e. issues where none of the affected parties can have an impact on the condition) for consideration in reaching successful proximity agreements. It is not intended to be an exhaustive list of items to be included by prescription.

Physical environment/metocean conditions

- Historical metocean data;
- Benthic conditions;
- Depth of water.

Existing infrastructure

- Availability of accurate survey data;
- Existing subsea plant information (burial / protection) and specification;
- Other seabed users / stakeholders and proximate developments;
- Cable crossings and any required burial / protection (mattresses, rock etc.);
- Proximity of surrounding infrastructure foundations / turbines / substations.

Planned infrastructure

- Planned location and potential layout scenarios, including crossings.

Legislative/regulatory constraints

- UNCLOS and other regulatory constraints;
- HSE regulations;
- Local rules and regulations;
- Other permit applications lodged during development of a proximity agreement.

Commercial constraints

- Is a high level MOU between the parties in place?;
- Impact on contractual performance requirements of cable owner's customers / marine provider;
- Reduction in OWF developer's power generation.

Other seabed users

When submarine cables are located in close proximity to offshore wind farm developments and other stakeholders (such as oil & gas, shipping, aggregate extraction, marine protected areas, etc.), the developer should consider the cumulative impact of all the sectors' requirements. This should ensure each stakeholder can continue their legitimate activities in a safe and timely manner. Where impacts are identified, they should be quantified and assessed, and all legitimate concerns addressed. Where multiple developments / stakeholders are identified, the Working Zone agreed between stakeholders using this guideline may vary on a case by case basis.

C.2 Internal influences

In addition to the External Influences outlined above, a range of 'Internal Influences' (i.e. issues that are in some kind of control by at least one of the affected parties) should also be taken into consideration when discussing a risk-based assessment of appropriate proximity limits. Again, the list is not intended to be exhaustive or prescriptive but should prompt evaluation of the most useful and relevant issues for consideration.

Also, these internal influences should be part of the agenda for discussion between the key stakeholders and may eventually be elements of the method statements to be developed and agreed through the dialogue.

Vessel / Equipment selection or availability

- Differing vessel types, capabilities and operating footprints;
- Vessel and positioning capability;
- Weather forecast and related decision process;
- Impact of vessel losing position;
- Vessels required to undertake remedial works – multi-vessel simultaneous operations;
- Position reference systems and the impact of surrounding structures;
- Deck and cable handling arrangements;
- ROV / LARS spec and capability;

- Methodology, operational procedures and techniques employed;
- Available spare cable / plant.

Operational environment

- Proximity agreement boundary;
- Pre-existing jack up zones and cable-free areas;
- Anchor spread requirements for multi-point mooring systems;
- Cable protection;
- Post-lay surveys and the transmitting / sharing of data;
- How a repair affects future interaction and works;
- The requirement for powering down part of a system during works.

Manning levels

- Competence and experience adequate to meet the additional demands of the circumstance;
- Additional manning requirements, e.g. DPOs, watch keepers, proximate party reps, operational personnel to expedite the repair, etc..

Personnel competency

- Ensure that relevant cross sector expertise is engaged;
- Health, Safety and Environmental considerations;
- Experience in proximate / close quarters / simultaneous operations.

C.3 Application of ALARP

What is ALARP?

The ALARP level should not be misunderstood as simply being a quantitative measure of benefit against detriment. ALARP is reached when the time, trouble and cost of further reduction measures, become uneconomic or unacceptable with respect to the additional risk reduction obtained.

In order to come to an agreement between the involved parties it will be necessary to determine the level of risk ALARP level which is acceptable to each stakeholder. This will be site specific and the appetite for risk is likely to vary.

Whilst account should be given to potential worst case scenarios, these should not be used as the basis for discussions between the parties if they cannot also be considered likely. Limiting discussions to worst case scenarios or, for instance, a single 20 year + event, is likely to lead to disagreements where neither party can be satisfied or may potentially prevent an agreement being reached at all. Wherever possible, the assessment of risk should include, but not be limited to:

- Any historic data available on reliability or damage for the existing infrastructure or installed similar examples elsewhere;

- Likely return rates of periods of poor weather which may, under the planned interaction, prejudice repairs when compared to the baseline current situation;
- Likelihood of inability to maintain control of the vessel; and
- Completion of sufficient due diligence to ensure that all parties to the agreement are considered competent to meet the requirements of the proximity agreement.

Consideration of the acceptable risks will then allow informed discussions on the potential mitigations that may be available to reduce the risk caused by a new development and therefore reach an acceptable ALARP level.

Consider the following Probability – Impact table and Risk Severity Analysis example when determining and mitigating to the ALARP (YELLOW**)** level(s). Note, the risk severity index can be calculated simply as Probability x Highest Impact, the solution being inserted within the P-I table in the Green (Tolerable), Yellow (ALARP) or Red (Intolerable) areas.

This might be viewed in a Probability / Impact (P-I) severity table as outlined in Figure 18 below.

Probability

10	20	30	40	50	60	70	80	90	100
9	18	27	36	45	54	63	72	81	90
8	16	24	32	40	48	56	64	72	80
7	14	21	28	35	42	49	56	63	70
6	12	18	24	30	36	42	48	54	60
5	10	15	20	25	30	35	40	45	50
4	8	12	16	20	24	28	32	36	40
3	6	9	12	15	18	21	24	27	30
2	4	6	8	10	12	14	16	18	20
1	2	3	4	5	6	7	8	9	10

Highest Impact of Risk Event

Figure 18: Probability Impact table and associated ALARP levels

A risk analysis taking into consideration all site-specific External Influences and Internal Influences should be carried out during discussions on proximity agreements. The base case proximity distance tables provided in the Evidentiary Study applied intelligently provide useful tools in the risk assessment of the various scenarios.

Such an assessment could include but not be limited to:

- Risk/likelihood of damage to existing/proposed infrastructure in the area of the interaction including potential for change to anticipated fault rates due to the planned new infrastructure;
- Risk/likelihood that a fault may occur during a period of poor weather which would lead the Master of the vessel to delay or suspend operations due to the proximity of an OWF alone (as opposed to the weather being unworkable in any situation);
- Acceptable level of downtime of any infrastructure under normal circumstances and its strategic importance;
- Loss of potential revenue for any OWF operator as a result of loss of available acreage and impact on the project as a whole;
- Cost of alternative options, such as, re-routeing a new cable around as opposed to through an existing OWF and impact on the project as a whole.