Key issue 9 - Potential displacement of essential activities of marine mammals and basking shark due to the presence of wave and tidal energy converters and associated moorings / support structures

What are the relevant technologies and support structures?

The following technologies and support structures were identified during the assessment process to have the potential to significantly affect marine mammals and basking shark through displacement of essential activities and should therefore, be subject to further investigation on a project specific basis.

Relevant technologies and support structures	Relevant features, components or activities	Phase
Tidal technologies		
Horizontal axis turbine Vertical axis turbine Reciprocating hydrofoils	*Displacement due to the presence of structures or other disturbances caused by the installation (such as noise etc).*	*Installation and/or operation*
Wave technologies		
Oscillating water column (shoreline) Overtopping device (shoreline) Oscillating water column (offshore) Overtopping device (offshore) Attenuator Oscillating wave surge converter Point absorber Submerged pressure differential	*Displacement due to the presence of structures or other disturbances caused by the installation (such as noise etc).*	*Installation and/or operation*
Support structures		
Gravity/deadweight anchor and mooring lines Gravity base structure Monopile Rock anchors and mooring lines Drag embedment anchor and mooring lines	*Displacement due to the presence of structures or other disturbances caused by the installation (such as noise etc).*	*Installation and/or operation*

What species / groups may be vulnerable?

The following species were identified during the assessment process as being particularly sensitive to underwater noise and should therefore, be considered further on a project specific basis.

Relevant species / groups	Note	Possible consequences
Seals Otter	Oscillating water column (shoreline) only	*It is unknown whether displacement will occur. The effects of displacement are unknown and will be site-specific. It will depend on what activities are being displaced, the relative importance of the habitat and whether suitable alternative sites for these activities exist locally.*
Seals Cetaceans Otter	Overtopping device (shoreline) only	
Seals Cetaceans Otter Basking shark	All technologies and support structures above	

What species / groups are affected by which technologies and support structures

The following table provides a summary of the assessment results for each species or habitats in combination with each technology & Moorings/Support structures listed above.

Potentially significant at a 10MW scale	Unknown whether this will be significant at a 10 MW scale	Not Applicable	Assessed as not significant at a 10MW scale

	Technology & Moorings and Support structures																								
Common name	Horizontal axis turbine & Gravity/deadweight anchor and mooring lines	Horizontal axis turbine & Gravity base structure	Horizontal axis turbine & Monopile	Horizontal axis turbine & Rock anchors and mooring lines	Vertical axis turbine & Gravity/deadweight anchor and mooring lines	Vertical axis turbine & Gravity base structure	Vertical axis turbine & Rock anchors and mooring lines	Reciprocating hydrofoils & Gravity base structure	Reciprocating hydrofoils & Monopile	Oscillating water column (offshore) & Gravity/deadweight anchor and mooring lines	Oscillating water column (offshore) & Rock anchors and mooring lines	Oscillating water column (offshore) & Drag embedment anchor and mooring lines	Oscillating water column (shoreline)	Overtopping device (offshore) & Gravity/deadweight anchor and mooring lines	Overtopping device (offshore) & Rock anchors and mooring lines	Overtopping device (offshore) & Drag embedment anchor and mooring lines	Overtopping device (shoreline)	Attenuator & Gravity/deadweight anchor and mooring lines	Attenuator & Rock anchors and mooring lines	Attenuator & Drag embedment anchor and mooring lines	Oscillating wave surge converter & Gravity base structure	Point absorber & Gravity/deadweight anchor and mooring lines	Point absorber & Rock anchors and mooring lines	Point absorber & Drag embedment anchor and mooring lines	Submerged pressure differential & Gravity base structure
Common seal																									
Grey Seal																									
Killer whale																									
Minke whale																									
Long finned pilot whale																									
Atlantic white-sided dolphin																									
White-beaked dolphin																									
Bottlenose dolphin																									
Short-beaked common dolphin																									
Risso's dolphin																									
Harbour Porpoise																									
Otter																									
Basking Shark																									

How could the issue be addressed on a project and site specific basis?

The following tables provide a series of suggested activities and recommendations that may be taken forward to address the effects displacement on marine mammals and basking shark for those technologies and/or support structure, and species / habitats, assessed as significant in the assessment. This information is not prescriptive and should be used as a platform for discussion on a project and site specific basis in order to develop an appropriate impact assessment strategy and monitoring programme for the project.

Single test deployments

Preliminary desk based studies

Activity	Objective	Recommendation / comment
No activity recommended	N/A	N/A

Baseline characterisation surveys

Activity	Objective	Recommendation / comment
No activity recommended	N/A	N/A

Further desk based studies

Activity	Objective	Recommendation / comment
No activity recommended	N/A	N/A

Monitoring during and post installation

Activity	Objective	Recommendation / comment
No activity recommended	N/A	N/A

Demonstration arrays

Preliminary desk based studies

Activity	Objective	Recommendation / comment
Desk based review of existing information regarding species distribution / behaviour across the site	To establish the importance of the proposed development area for any potentially vulnerable species (as listed above) and to inform baseline survey strategies	Undertake this work for all demonstration arrays.
Undertake preliminary impact assessment	To determine whether or not the proposed development is likely to have a significant negative impact on the species identified To identify any particular areas of concern regarding the proposed development and to determine what/if further baseline characterisation is required (see below)	Undertake this work for all demonstration arrays.

Baseline characterisation surveys

Activity	Objective	Recommendation / comment
Conduct baseline marine mammal and basking shark surveys	To determine likely behaviour and distribution of species through and around the proposed development site To gather sufficient information against which any change through displacement can be measured	This work should only be undertaken in high sensitivity areas where there is a clear risk of displacement. Within 2km of a seal haul-out, basking shark herding area or an area used regularly by cetaceans.

Further desk based studies

Activity	Objective	Recommendation / comment
Undertake impact assessment	To determine, whether or not the development is likely to have any significant negative effects through displacement	This should follow the normal project specific EIA procedures.

Monitoring during and post installation

Activity	Objective	Recommendation / comment
Monitor marine mammal and basking shark activity during operation	To investigate behaviour around / avoidance of demonstration arrays with a control site	If displacement is found to occur, investigate the extent of displacement. If avoidance is found to occur, the results of baseline information on distribution, extent of key habitats and availability of suitable alternative habitats should be used along with the zone of effect to determine the significance.