Key issue 5 - Potential barrier to movement for marine mammals and basking shark due to the physical 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 by potentially creating a barrier (or perceived barrier) to movement 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	*Introduction of new structures into the water column could disrupt normal movements between areas or migration routes*	Operation
Wave technologies		
Oscillating water column (shoreline) Overtopping device (shoreline)	*Introduction of new structures onto the shoreline could disrupt routes to / from feeding grounds*	Operation
Oscillating wave surge converter Submerged pressure differential Attenuator Point absorber	*Introduction of new structures into the water column could disrupt normally movements between areas or migration routes*	Operation
Support structures		
Gravity/deadweight anchor and mooring lines Gravity base structure Monopile Rock anchors and mooring lines Drag embedment anchor and mooring lines	*Introduction of new structures into the water column could disrupt normally movements between areas or migration routes*	Operation

What species / groups may be vulnerable?

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

Relevant species / groups	Possible consequences
Seals Otter	*Shoreline devices could potentially create a barrier to movement but it is not known how animals will move around perceived obstacles along the coast.*
Seals Cetaceans Otter[1] Basking shark	*It is unknown if marine mammals will perceive the technologies along with their mooring lines or support structures as a barrier to movement.*

[1] Some technologies (Attenuator, Point absorber, Submerged pressure differential) are likely to be located in water depths which are outside an otter's normal foraging range.

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 (shoreline)	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 potential of barriers to movement for 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
Desk-based review of existing information regarding species distribution / behaviour across the site	To establish the importance and use of the proposed development area for any potentially vulnerable species (as listed above)	Undertake this work for all single deployments.
Impact assessment	To determine, based on existing information, whether or not there are likely to be any potentially significant effects on the species identified	This should follow the normal project specific EIA procedures.

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 screen potential impacts on species present	Undertake this work for all demonstration arrays.
Investigate optimal device/mooring array layout configurations	To reach a design solution that minimises potential for barrier effect across tidal channels where possible	
Undertake impact assessment	To identify any particular areas of concern regarding the proposed development and to determine what/if further baseline characterisation is required	

Baseline characterisation surveys

Activity	Objective	Recommendation / comment
Conduct baseline marine mammal and basking shark surveys	To determine the behaviour and distribution of species through the proposed development site	This work should only be undertaken if the development site is positioned between a known breeding / haul-out area, and foraging site, etc or if the development could potentially act as a barrier (physical or perceived) across a channel, sound or other constricted water

Further desk based studies

Activity	Objective	Recommendation / comment
Impact assessment	To determine, based on baseline characterisation surveys, whether or not there are likely to be any potentially significant effects on the species identified	This should follow the normal project specific EIA procedures.

Monitoring during and post installation

Activity	Objective	Recommendation / comment
Monitor behaviour around the installation	To validate any predictions made and to investigate any changes in behaviour resulting from the installation of the demonstration array	This work should only be undertaken if the development site is positioned between a known breeding / haul-out area, and foraging site, etc (seals) or if the development could potentially act as a barrier (physical or perceived) across a channel, sound or other constricted water body.