

Key issue 3 - The potential effects on marine mammals from above surface noise generated by wave and tidal energy converters

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 the generation of above surface noise 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	<i>This issue is only relevant if there is a floating structure which may house noise generating equipment</i>	Operation
Wave technologies		
Oscillating water column (offshore) Overtopping device (offshore) Attenuator Point absorber Overtopping device (shoreline) Oscillating water column (shoreline)	<i>This issue is only relevant if there is a floating structure which may house noise generating equipment</i>	Operation
Support structures		
Monopile Rock anchors and mooring lines	<i>Noise above the surface generated during installation by drilling</i>	Installation

What species / groups may be vulnerable?

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

Relevant species / groups	Possible consequences
Seals Otter	<i>Potential disturbance</i> <i>Potentially greater impact for species from devices near to the shoreline</i>

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
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Common Name	Technology & Moorings and Support structures											
	Horizontal axis turbine & Gravity/deadweight anchor and mooring lines	Horizontal axis turbine & Rock anchors and mooring lines	Vertical axis turbine & Gravity/deadweight anchor and mooring lines	Vertical axis turbine & Rock anchors and mooring lines	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)
Common seal												
Grey Seal												
Otter												

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

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 of above surface noise 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 deployment

Preliminary desk based studies

Activity	Objective	Recommendation / comment
Desk based review of existing information regarding species distribution / behaviour etc across the site	To establish the importance of the proposed development area for any potentially vulnerable species (as listed above) and screen potential impact on species present.	Undertake this work for all single deployments. If it is possible to determine that either the area is not particularly important for the species identified or that the proposals are not likely to generate levels of noise of concern, it is possible that no further pre-deployment information is required.
	To identify seal haul outs and breeding sites.	
Produce a 'noise profile' for the project	To identify the components / activities associated with the proposed development which may generate potentially significant levels of noise	
Undertake impact assessment	To identify whether or not the development will have any potentially significant impact on the species identified	

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
Monitor above surface noise generated during installation and/or operation	To characterise the above surface noise signature of the installation process and/or device operation so as to inform future site selection, project development and environmental assessment work	This work should only be undertaken in areas of high sensitivity although any data gathered will be valuable for future deployments.

Activity	Objective	Recommendation / comment
Monitor behaviour of seals at any nearby haul out sites during noisy works (during construction and decommissioning)	To monitor and assess any possible disturbance from large vessel activity and installation and removal works	<p>This work should only be undertaken during noisy works within close proximity to haul out and breeding sites during sensitive periods.</p> <p>Operations using standard workboats should be able to proceed without such monitoring in areas where shipping activity is commonplace.</p> <p>For single deployments, any available results from similar studies should be used as far as possible in determining the need for any monitoring during noisy works.</p> <p>There is growing of experience of undertaking operations in proximity to seal populations and the evidence from these situations should inform the need for any monitoring.</p>

Demonstration arrays

Preliminary desk based studies

Activity	Objective	Recommendation / comment
Desk based review of existing information regarding species distribution / behaviour etc across the site	To establish the importance of the proposed development area for any potentially vulnerable species (as listed above) and screen potential impact on species present	Undertake this work for all demonstration arrays which are in close vicinity to important sites such as seal haul-outs and activities are planned during sensitive periods for the species present. If it is possible to determine that either the area is not particularly important for the species identified or that the proposals are not likely to generate levels of noise of concern, it is possible that no further pre-deployment information is required.
Produce a 'noise profile' for the project	To identify the components / activities associated with the proposed development which may generate potentially significant levels of noise	
Undertake impact assessment	To identify whether or not the development will have any potentially significant impact on the species identified	

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
Monitor above surface noise generated during installation and/or	To characterise the above surface noise signature of the installation process and/or device operation so as	This work should only be undertaken in areas of high sensitivity although any data gathered will be valuable for

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operation	to inform future site selection, project development and environmental assessment work	future deployments.
Monitor behaviour of seals at any nearby haul out sites during noisy works (during construction and decommissioning)	To monitor and assess any possible disturbance from large vessel activity and installation and removal activities	<p>This work should only be undertaken during noisy works within close proximity to haul out and breeding sites; particularly during sensitive periods.</p> <p>Operations using standard workboats should be able to proceed without such monitoring in areas where shipping activity is commonplace.</p> <p>There is growing of experience of undertaking operations in proximity to seal populations and the evidence from these situations should inform the need for any monitoring.</p>