

Key issue 11 - The potential effects on birds of above surface noise generated by wave and tidal energy converters with generators or air turbines housed in surface-piercing components

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 seabirds 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	<p><i>Only relevant for devices with surface-piercing components.</i></p> <p><i>Noise emitted from turbines / generators within devices likely to be constant, low level noise.</i></p> <p><i>High energy environments are likely to have relatively high levels of background noise.</i></p>	Operation
Wave technologies		
Oscillating water column (offshore) Overtopping device (offshore)	<i>As above</i>	Operation
Oscillating water column (shoreline) Overtopping device (shoreline)	<p><i>Noise emitted from turbines and generators housed in shoreline structure could potentially affect species at coastal breeding site.</i></p> <p><i>Noise emitted from turbines / generators within devices likely to be constant, low level noise.</i></p> <p><i>High energy environments are likely to have relatively high levels of background noise.</i></p>	Operation

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
Common Eider Red-breasted Merganser Northern Fulmar Manx Shearwater European Storm-petrel Leach's Storm-petrel Northern Gannet Great Cormorant European Shag Black-headed Gull Mew Gull Lesser Black-backed Gull	Herring Gull Great Black-backed Gull Black-legged Kittiwake Little Tern Sandwich Tern Common Tern Roseate Tern Arctic Tern Common Guillemot Razorbill Black Guillemot Atlantic Puffin
	<p><i>Unknown to what extent these species will be affected by the noise.</i></p> <p><i>Potentially greater impact to species at coastal breeding sites if located in nearshore environment.</i></p>

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 birds 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
Establish existing seabird sensitivities of site	To find out whether the deployment area is particularly valuable for coastal breeding birds	Use existing published literature.
Undertake impact assessment	To identify any particular areas of concern regarding the proposed development and to determine what/if further baseline characterisation is required (see below)	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
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
Determine above water surface noise signatures of all technologies with generators / air turbines housed in surface-piercing components	To confirm whether or not mechanical noise will be an issue	Only undertake <i>in situ</i> measurements where noise is a particular issue. Measurements could be taken offsite for example, at a quayside to inform future assessment work etc.

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
---	---	----------------	---

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 Eider												
Red-breasted Merganser												
Northern Fulmar												
Manx Shearwater												
European Storm-petrel												
Leach's Storm-petrel												
Northern Gannet												
Great Cormorant												
European Shag												
Black-headed Gull												
Mew Gull (Common Gull)												
(Western) Lesser Black-backed Gull												
(Western) Herring Gull												
Great Black-backed Gull												
Black-legged Kittiwake												

	Technology & Moorings and Support structures											
Common Name	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)
Little Tern												
Sandwich Tern												
Common Tern												
Roseate Tern												
Arctic Tern												
Common Guillemot												
Razorbill												
Black Guillemot												
Atlantic Puffin												

Demonstration arrays (up to 10MW)

Preliminary desk based studies

Activity	Objective	Recommendation / comment
Establish existing seabird sensitivities of site	To find out whether the deployment area is particularly valuable for coastal breeding birds	Use existing published literature
Undertake impact assessment	To identify any particular areas of concern regarding the proposed development and to determine what/if further baseline characterisation is required (see below)	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
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 above surface noise generated during operation	To characterise the above surface noise signature of the device operation so as to inform future site selection, project development and environmental assessment work	<p>This work should only be undertaken in areas of high sensitivity although any data gathered will be valuable for future deployments.</p> <p>Data from test deployments of single machines and associated operations should be used as far as possible.</p>