Key issue 13 - Potential for collision between diving birds and the moving turbine blades / hydrofoils of 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 pose a significant collision risk for marine birds 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	*Potential for collision with moving turbine blades within the water column*	Operation

What species / groups may be vulnerable?

The following species were identified during the assessment process as being particularly at risk of collision and should therefore, be considered further on a project specific basis.

Relevant species / groups		Possible consequences
Greater Scaup (Scaup)	Slavonian grebe	*Collisions have the potential to cause death / injury to marine birds.*
Common Eider	Black-necked Grebe	
Long-tailed Duck	Northern Fulmar	
Black Scoter (Common Scoter)	Cory's Shearwater	
Surf Scoter	Great Shearwater	
Velvet Scoter	Sooty Shearwater	
Common Goldeneye	Manx Shearwater	
Red-breasted Merganser	Balearic Shearwater	
Goosander	Northern Gannet	
Red-throated Diver	Great Cormorant	
Black-throated Diver	European Shag	
Great Northern Diver	Common Guillemot	
Yellow-billed Diver (White-billed Diver)	Razorbill	
Great Crested Grebe	Black Guillemot	
Red-necked Grebe	Atlantic Puffin	

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
Greater Scaup (Scaup)									
Common Eider									
Long-tailed Duck									
Black Scoter (Common Scoter)									
Surf Scoter									
Velvet Scoter									
Common Goldeneye									
Red-breasted Merganser									
Goosander									
Red-throated Diver									
Black-throated Diver									
Great Northern Diver									
Yellow-billed Diver (White-billed Diver)									

	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
Great Crested Grebe									
Red-necked Grebe									
Slavonian grebe									
Black-necked Grebe									
Northern Fulmar									
Cory's Shearwater									
Great Shearwater									
Sooty Shearwater									
Manx Shearwater									
Balearic Shearwater									
Northern Gannet									
Great Cormorant									
European Shag									
Common Guillemot									
Razorbill									
Black Guillemot									
Atlantic Puffin									

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 risk of collision between diving birds and the moving turbine blades / hydrofoils of tidal energy converters, 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.

Note - monitoring underwater collision events for seabirds is fraught with difficulties and technology is not yet proven for such monitoring. What is more manageable, and may in fact indicate whether this is a key issue, is to investigate the behaviour of birds in the vicinity of tidal streams to see if they are diving into the areas where devices are located. The basis for this type of work is outlined below.

Single device deployments

Preliminary desk based studies

Activity	Objective	Recommendation / comment
Collision risk assessment	To determine whether species present in an area are at risk of collision	From published sources establish a list of birds likely to be present in the tidal stream. Establish the depth to which species will typically dive based upon existing literature. Establish the depth in the water of any moving parts. Establish the speed of movement and type of movement for any moving parts. Determine if any hazard exists and if so for what species.
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
Observations of bird behaviour	To establish the likely distribution pattern of birds in the tidal stream and their typical behaviour	Observations over a number of days during summer breeding period and any other period with prolific use of the site. This would provide info on which species are observed diving in tidal stream and therefore which species may potentially be at risk but no info on what depths they are using – would need to use typical depths from literature.

Further desk based studies

Activity	Objective	Recommendation / comment
Re-consider risk assessment	Take information learned from observations to inform hazard assessment	Adjust conclusions about level of hazard presented by turbines based upon site observations.

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
Further observations of bird behaviour	To investigate the behavioural response of marine birds in the vicinity of tidal devices with moving blades / hydrofoils	Observations over a number of days during summer breeding period and any other period with prolific use of the site.

Demonstration arrays (up to 10MW) (same as single device)

Preliminary desk based studies

Activity	Objective	Recommendation / comment
Collision risk assessment	To determine whether species present in an area are at risk of collision	From published sources establish a list of birds likely to be present in the tidal stream. Establish the depth to which species will typically dive based upon existing literature. Establish the depth in the water of any moving parts. Establish the speed of movement and type of movement for any moving parts. Determine if any hazard exists and if so for what species.
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
Observations of bird behaviour	To establish the likely distribution pattern of birds in the tidal stream and their typical behaviour	Observations over a number of days during summer breeding period and any other period with prolific use of the site. This would provide info on which species are observed diving in tidal stream and therefore which species may potentially be at risk but not info on what depths they are using (use typical depths from literature).

Further desk based studies

Activity	Objective	Recommendation / comment
Re-consider collision risk assessment	Take information learned from observations to inform hazard	Adjust conclusions regarding level of hazard presented by turbines based

Activity	Objective	Recommendation / comment
	assessment	upon site observations.
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
Further observations of bird behaviour	To investigate the behavioural response of marine birds in the vicinity of tidal devices with moving blades / hydrofoils	Observations over a number of days during summer breeding period and any other period with prolific use of the site.