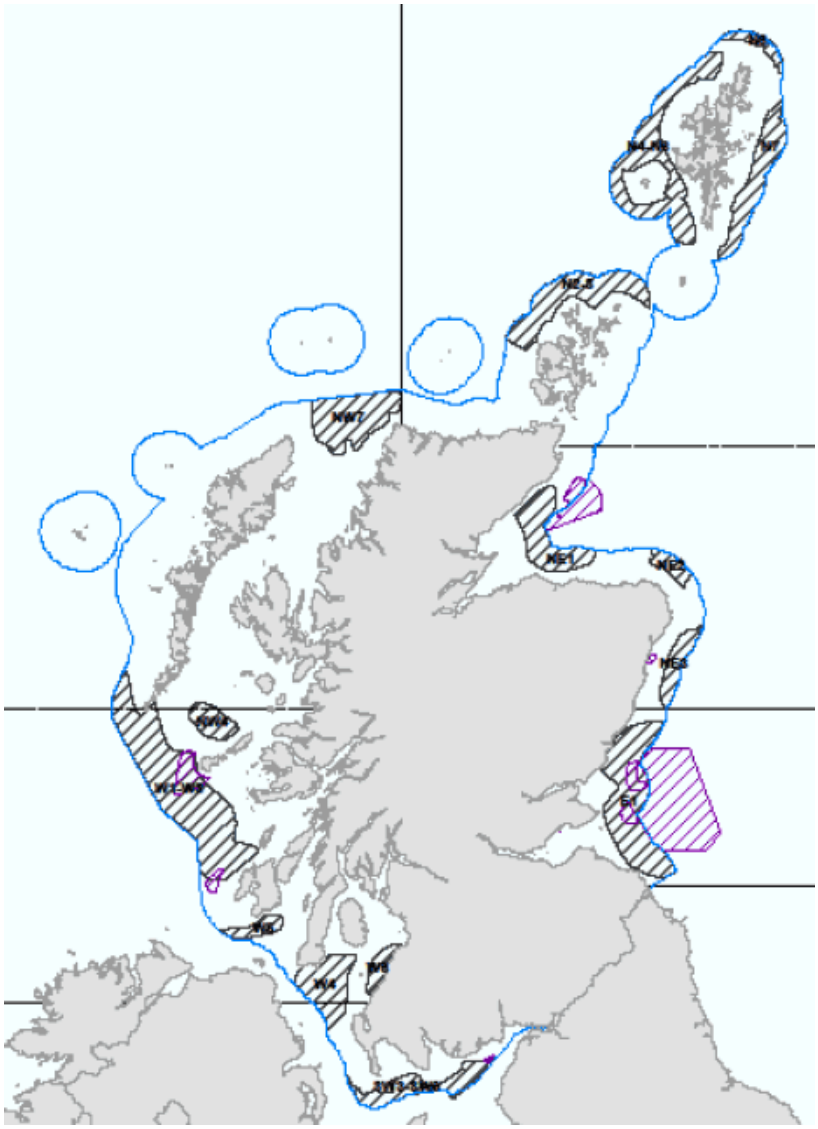
Marine Renewables

Windfarms



SSACN Position

1.0 Introduction

The Scottish Executive has set an objective of producing the equivalent of 100% of electricity demand in Scotland from renewable sources by 2020.

Various types of marine renewable energy development are being discussed as means by which to help reach this target. This paper focuses on wind turbine installations.

Structures will affect fish community structure through changes in species composition. It may be that they result in the attraction of pelagic and/or benthic species; they may increase the settlement habitat for some species or modify the diversity and abundance of resident and predatory species.

Fish that migrate through areas where renewable energy infrastructure exists could have their movement patterns impacted by electromagnetic fields and/or acoustic signals.

The marine ecosystem is highly interconnected, the management and conservation of the marine environment needs to be broader based than safeguarding areas immediately adjacent to installations.

We are extremely concerned by the lack of research which has been undertaken into the impact of operations during the life-cycle of a wind farm on inshore stocks and habitats, especially those of the various species of elasmobranchs which use the area for migratory, breeding or nursery purposes.

With no research or historical data available it is impossible to say at this stage whether the proposed wind turbine installations will provide a migratory barrier or adversely impact breeding / nursery areas.

SSACN hopes the government will adopt the precautionary approach and insist the necessary research, including input from the sea angling sector, is carried out before planning consent is given.

This paper provides SSACN's overview of the potential impacts on the marine environment and biodiversity which may arise from different forms of marine renewable energy development. It will be updated from time to time as information becomes available.

Last revision March 2012

2.0 Conclusions

1. The environmental impact of marine renewable technologies is data deficient and the duty of care owed by the Scottish Government to the environment is being ignored.

2. Since there is sufficient evidence that the placement and operation of installations and cables may affect the marine environment, political and/or commercial expediency should not be allowed to over-rule the precaution and appropriate mitigation measures.

3. Any renewable technologies installed in the marine environment must have the least adverse impact on Scotland's natural marine environment and biodiversity; a coordinated approach across all developments is required to ensure the minimum of damage to seabed, shoreline and coastal habitats from undersea cabling and landfalls.

4. In general, marine renewable energy developments should not be permitted in areas designated specifically to protect habitats / species of special importance. There must be minimal disturbance to key breeding/spawning areas.

5. The approval of renewable installations and their associated sub-sea cables should require the preparation of a comprehensive Environmental Impact Assessment (EIA) which should describe the environmental impacts of installing, operating and removing the installations and ensure adequate measures are identified to manage those impacts.

6. An EIA should specifically address the potential impacts to feeding, breeding and nursery areas, fish migration routes through developments, the impact on recreational interests and the socio-economic consequences of any displacement with the effect of any particular impact considered throughout all phases of the life-cycle of an installation.

7. On-going surveys of the entire marine ecosystem throughout the life-cycle of an installation addressing should be performed against the considerations raised in the original EIA.

8. Further research into a number of environmental impacts which will have important implications for regulatory advice and the implementation of mitigation measures in the construction of offshore wind farms is required.

3.0 Strategic Environmental Assessment (SEA)

A SEA is a means of considering the environment when preparing public plans, programmes and strategies. It identifies potential significant environmental effects and, where necessary, proposes how these effects can be avoided or reduced. Through consultation, it also provides an opportunity for the public to express their views on the proposed policies and their potential environmental impacts.

Note : The Robin Rigg development was approved without a rigorous SEA.

4.0 Opportunities for impacting fish stocks and their habitats.

This section sets out the impact a number of factors which could affect the marine environment from SSACN's point of view. It collates the findings of a number of reports.

Offshore wind farms are likely to be larger than onshore, both in size of turbine and in extent and their development will be dependent to some extent on new transmission capacity realised through sea-based transmission lines around the coasts of Scotland.

Marine wind farms create a mixed bal of short and long term impacts to the environment throughout their life-cycle (Appendix B).

Overall the significance of impacts will also be relative to any protection or conservation measures in place within the development area eg: if the development is within a MPA or Natura site the significance of any impacts must be assessed against tests associated with that form of protection.

Studies on the effects of offshore wind farm construction on marine life have so far focussed on behavioural reactions in porpoises and seals. The effects on fish have only very recently come into the focus of scientists, regulators and stakeholders.

As with the offshore oil and gas in the past, the pre-installation and construction phases offer the greatest opportunity for impacting the marine environments and fish stocks.

Activities likely to cause short term impacts are :

- Seismic exploration;
- Intense noise due to ramming/piling, drilling and dredging operations;
- Increased vessel activities during exploration and construction;
- Increased turbidity due to construction and cable laying; and, later,
- Decommissioning which may involve the use of explosives.

Activities likely to cause long term impacts are :

- The presence of the structures ;
- Continual operational noise and transmitted vibrations;
- Electromagnetic impacts due to cabling (may be of particular concern for elasmobranchs
- Increased vessel traffic for supply and maintenance operations.

Though some of these impacts may be limited within themselves, their cumulative effect may have far greater impact on both local and regional scales.

4.1 Electromagnetic fields

Fish known to be electro receptive are the elasmobranchs and their relatives.

Elasmobranches possess Lorenzini´s ampullae - specialised electroreceptors in series of pores on the surface of the skin which are able to detect very weak voltage gradients down to 0.5μV/m in the environment around them.

Other species known to be electro sensitive do not possess specialized electroreceptors but are able to detected induced voltage gradients associated with water movement and geomagnetic emissions. The actual sensory mechanism of detection is not yet properly understood.

In limited trials, evidence of response to electric fields has been found for common eel, Atlantic cod, flounder, plaice and Atlantic salmon - all species currently found in Scottish waters.

In a Danish monitoring programme the first three plus Baltic herring were found to be significantly affected by the presence of a power cable or cable trace.

4.2 Cable-laying / trenching / armouring

In the construction phase, installing power cables may temporarily lead to impacts such as:

- Increased turbidity, noise, disturbance, habitat loss, habitat damage and in certain cases
- Long-term habitat change due to introduction of artificial substrate.

Environmental impacts are generally limited to the near proximity of the cable routes and only in the case of alteration of the habitat are they long-term. The impacts can be mitigated to some extent by:

- Avoiding sensitive habitats/areas
- Scheduling work to certain times of the year to avoid disturbance of sensitive species
- Avoidance of heavily contaminated areas in order to prevent the re-mobilisation of contaminants from sediments.

Depending on their technical design, the transmission of electric power through these cables may generate electromagnetic fields strong enough to disturb the behaviour and migration of fish and marine mammals which are sensitive to electromagnetic fields. In addition, loss of energy in the form of heat will occur, raising the temperature of the inhabited sea bottom and potentially affecting benthic species and processes.

The main long-term impact of submarine cables is the presence of the cable itself and any accompanying protective structures such as trenching or armouring. These can provide artificial hard substrate habitats that attract flora and fauna that may not be typical of the area.

4.3 Effects of pile driving noise and vibration

Pile-driving noise is of particular concern as the very high sound pressure levels could potentially prevent fish from reaching breeding or spawning sites, finding food, and acoustically locating mates. This could result in long-term effects on reproduction and population parameters.

A study by Cowrie was the first to document behavioural response of marine fish due to playbacks of pile-driving sounds. The results indicated that a range of received sound pressure and particle motion levels will trigger a range of behavioural response in marine fish.

The exact nature and extent of the behavioural response needs to be investigated further as only cod and sole were the subject of the study; reaction thresholds and therefore the impacts of pile-driving on the behaviour of a wider range of species are completely unknown.

5.0 Further Research Required

Many of the potential impacts in the marine environment are characterised by a high level of data deficiency. This has been recognised to some extent by the Scottish Government, the industry and the Crown Estate which has led to the establishment of the COWRIE programme of research.

SSACN has identified the following key areas affecting the marine environment and biodiversity which we feel require further research to ensure the interests of the recreational sector are not over-ridden by commercial or political expediency.

- The impact of electromagnetic fields on a broad range of fish species.
- Impact on migration, breeding and nursery areas of wind farm and cable complexes.
- Noise and vibration reaction thresholds and therefore the impacts of pile-driving on the behaviour of fish.
- Investigations in to the environmental impacts of the placement and operation of cables should be conducted in order to close existing gaps in knowledge.
- Field studies into changes in benthic communities and microbial sediment processes due to increased temperatures in the immediate vicinity of sub-sea cables.
- The interaction of marine recreation users and offshore installations
- Effects on sedimentation processes and seabed morphology
- Life Cycle impact analysis across all operations.

Appendix A - Marine Protected Areas and Special Areas of Conservation.

With the exception of fish farm proposals, the regulation of development beyond the MLWS tideline falls outwith the remit of the Town and Country Planning system and associated environmental impact assessment requirements. The following Acts / initiatives may have some relevance:

- Renewable energy generators require consent under the Electricity Act 1989 and may be subject to environmental assessment requirements under the Electricity Act 1989.
- To establish structures on the seabed requires a licence under the Coastal Protection Act 1949
- The UK is signatory to the OSPAR Convention for the Protection of the Marine Environment of the North Atlantic.
- A network of MPAs is proposed to protect certain marine species and habitats, though none have been agreed yet.
- Special Protection Areas for birds, under the EU Birds Directive and Marine Special Conservation Areas, under the EU Habitats Directive, both forming part of the Natura 2000 protected sites.
- The EU Habitats Directive requires member states to designate locations for certain internationally important habitats and species as Special Areas of Conservation contributing to an EU wide network of protected areas.

But until the extent of Scotland's conservation obligations under these Directives has been fully clarified, there will remain some uncertainty over the extent to which such designation may constrain any potential renewable energy development.

The Marine (Scotland) Act 2010 ("the Act") created new powers for Scottish ministers to designate Marine Protected Areas (MPAs) in Scottish territorial waters in order to protect marine biodiversity, geodiversity, the historic environment and in order to demonstrate or research new methods of sustainable resource use or management solutions.

The MPA powers in the Act complement the powers in the Marine and Coastal Access Act 2009 to designate MPAs in offshore waters adjacent to Scotland in order to protect marine biodiversity and geodiversity.

The designation and management of SACs must comply with the requirements of the Habitats Directive; the designation and protection of MPAs is governed by the Marine Acts.

Case law of the European Court of Justice regarding **Special Areas of Conservation** dictates that member states may not take account of economic, social and cultural requirements or regional and local characteristics when selecting and defining the boundaries.

The European Commission Guidance on **Managing Natura 2000 Sites** states that management measures should take account of economic, social and cultural requirements or regional and local characteristics subject to ensuring that deterioration of the location is avoided.

A science-led approach is being used to identify **nature conservation MPA** proposals with provision in section 68(8) of the Marine (Scotland) Act to take account of socioeconomics in decisions on designation.

For **MPAs under national legislation**, there is no EU guidance on the inclusion of economic or socioeconomic factors when considering their designation and management; Scottish MPAs will be managed on the basis of sustainable use with provision in section 68(8) and 71(3) to take account of socioeconomic impacts including displacement.

Appendix B – Impact Marix

Phase	Impact
Exploration	Seismic surveys Grab / core sampling
Cable installation	Turbidity from trenching / armouring Electromagnetic field effect on species Shoreline impact at land connection Array impact on migration routes
Wind farm installation	Pile driving noise and vibration Vessel movements – noise and bubble curtains
Wind farm complex	Sedimentation and scour Anti-fouling paint Operational noise and vibration Change in fish community structure
Others	Overall increased vessel traffic and noise Exclusion of recreational craft from areas adjacent to turbines Loss of goods and oil spills from service vessels Decommissioning which may involve the use of explosives.

'red' / 'black' / 'blue' = most to least likely to have an impact.

NB :: This table should not be used as a full checklist for environmental assessment.

Appendix C - Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters

The Scottish Government has set a range of challenging targets for energy and climate change.

To assist in meeting these targets, a Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters (Blue Seas - Green Energy) sets out the Government's vision for developing offshore wind energy up to 2020 and beyond and has identified short term development sites for offshore wind up to 2020, with a potential to deliver almost five Gigawatts (GW) of electricity generation capacity; and a further 25 areas for further exploration beyond 2020. Currently, up to 10 GW of planned development is in progress at offshore wind sites in Scottish Waters, divided roughly equally between Round 3 sites and sites in Scottish Territorial Waters (STW).

Potential plan option areas within Scottish Territorial Waters identified in the scoping study:

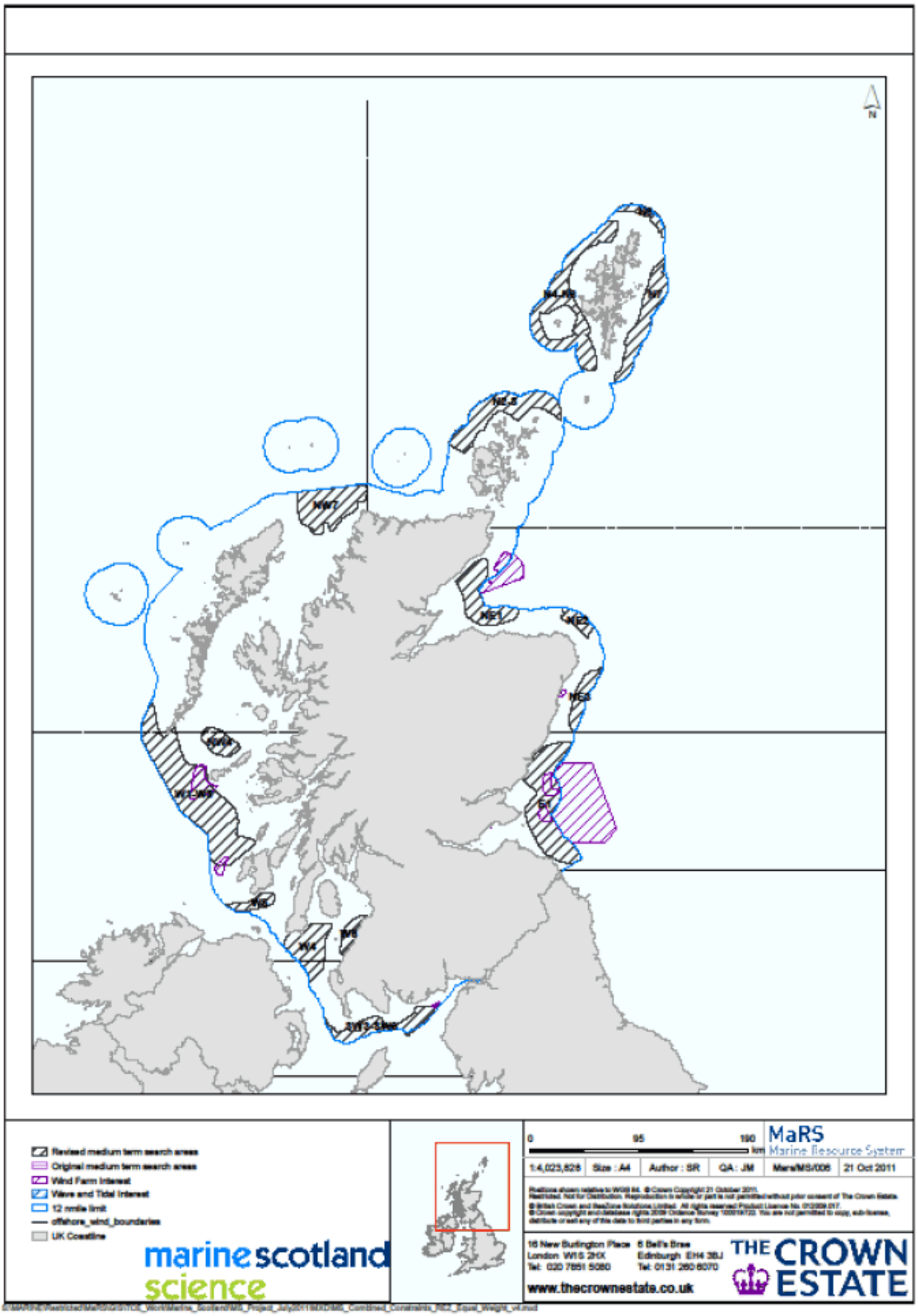
E1 Off the Firths of Forth and Tay
NE1 In the inner Moray Firth
NE2 In the south eastern part of the Moray Firth
NE3 Off the east coast of Aberdeenshire
N2-3 North of Orkney
N4-6 West of Shetland
N7 East of Shetland
N8 North of Shetland
NW7 North Minch
NW4 South MInch
W1-3 Sea of the Hebrides
W4 South of Islay
W5 South of Islay
W6 West of Ayrshire
SW3-6 Solway region

Potential development areas with water depths less than 60m are identified in the Forth and Tay area, and in the Moray Firth, adjacent to TCE Round 3 lease areas which are currently in the in the process leading to application for Marine Licence and other consents. Further areas of 60 - 80 m depth are found in the same general areas, and may represent development opportunities once the technology for working in such depths of water is established. There is also a potential development area north of Orkney with 60 - 80 m depth.

There are large areas of water of 80 - 120 m depth. These areas are not currently amenable to fixed foundation turbine structures, but may be suitable for floating turbine systems. Very extensive areas in this depth range are found in the Scottish waters in the North Sea.

The options identified are shown on the map overpage.

C.1 Options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Revised medium term search areas
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Appendix D – Sources and further reading.

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