

Impacts of Offshore Energy Structures, Transmission Lines, and Hubs on Coastal and Marine Ecosystems

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The Context

Importance of climate mitigation through development of marine renewable energy (offshore wind farms, tidal and wave facilities).

Disproportionate impacts of climate changes and shifts in coastal and marine zones reinforces this need for mitigative action.

These impacts also require sensitivity and precautionary approach in how renewable energy implemented.

Biodiversity and ecosystem services from coastal and marine areas provide important economic benefits for Europe and people.

Difficulties in achieving European biodiversity targets, including coastal and marine zones.

Introduction

Interaction between Birds Directive, Habitats Directives and Natura 2000 requirements and European and national regulation and incentives for marine renewable energy.

Potential environmental impacts, particularly from large wind farm, wave and tidal arrays on seabirds, fish and marine mammals, and the seabed and benthic layer.

Survey biodiversity and conservation issues for marine renewable energy in coasts and marine areas.

Due to timing and scope of development, briefly examine two offshore wind and tidal current leases issued in 2010 in the UK.

Biodiversity and Conservation Issues in Coastal and Marine Ecosystems for Marine Renewable Energy

Spatial planning and EU *Integrated Coastal Zone Management Recommendation* need to be implemented with the EU's *Integrated Maritime Policy* and the EU *Marine Strategy Framework Directive, Birds Directive & Habitats Directive*.

Environmental assessment is one of the tools to understand, monitor and minimize the impacts of offshore wind farms, marine renewable energy and transmission infrastructure.

***Strategic Environment Assessments* and *Environmental Impact Assessments* need to be scientifically conducted for plans, programmes and project authorizations for offshore renewable energy and related transmission infrastructure.**

Environmental assessment processes should include the possibility of not issuing leases or authorizations in specific locations, if too significant adverse impacts on bird and marine species, ecosystems and habitats, and existing and potential conservation areas.

Biodiversity and Conservation Issues in Coastal and Marine Ecosystems for Marine Renewable Energy

Large arrays of wind farms and wave and tidal projects could have additional and unforeseen impacts on birds, fish, marine mammals, and ecosystems, particularly for collisions and impacts, currents and circulatory pattern, noise, and species avoidance, gathering and migration.

The electro-magnetic fields associated with the high voltage transmission lines and hubs of the proposed electricity grids may have impacts on certain species (sharks, skates and rays) as well as the seabed and benthic organisms.

The impact of ship traffic for the operation and maintenance of these projects needs to be considered.

All impacts will have to be individually and cumulatively considered.

Ongoing monitoring and modification of offshore wind farms and wave and tidal projects may be required to address expected and unexpected impacts in construction, authorization, operation and maintenance, and the abandonment and reclamation of facilities.

Biodiversity and Conservation Issues in Coastal and Marine Ecosystems for Marine Renewable Energy

It may not be consistent with the *Birds Directive* or *Habitats Directive* to have all areas suitable for wind farms designated multiple uses, or to assume minimal environmental impacts.

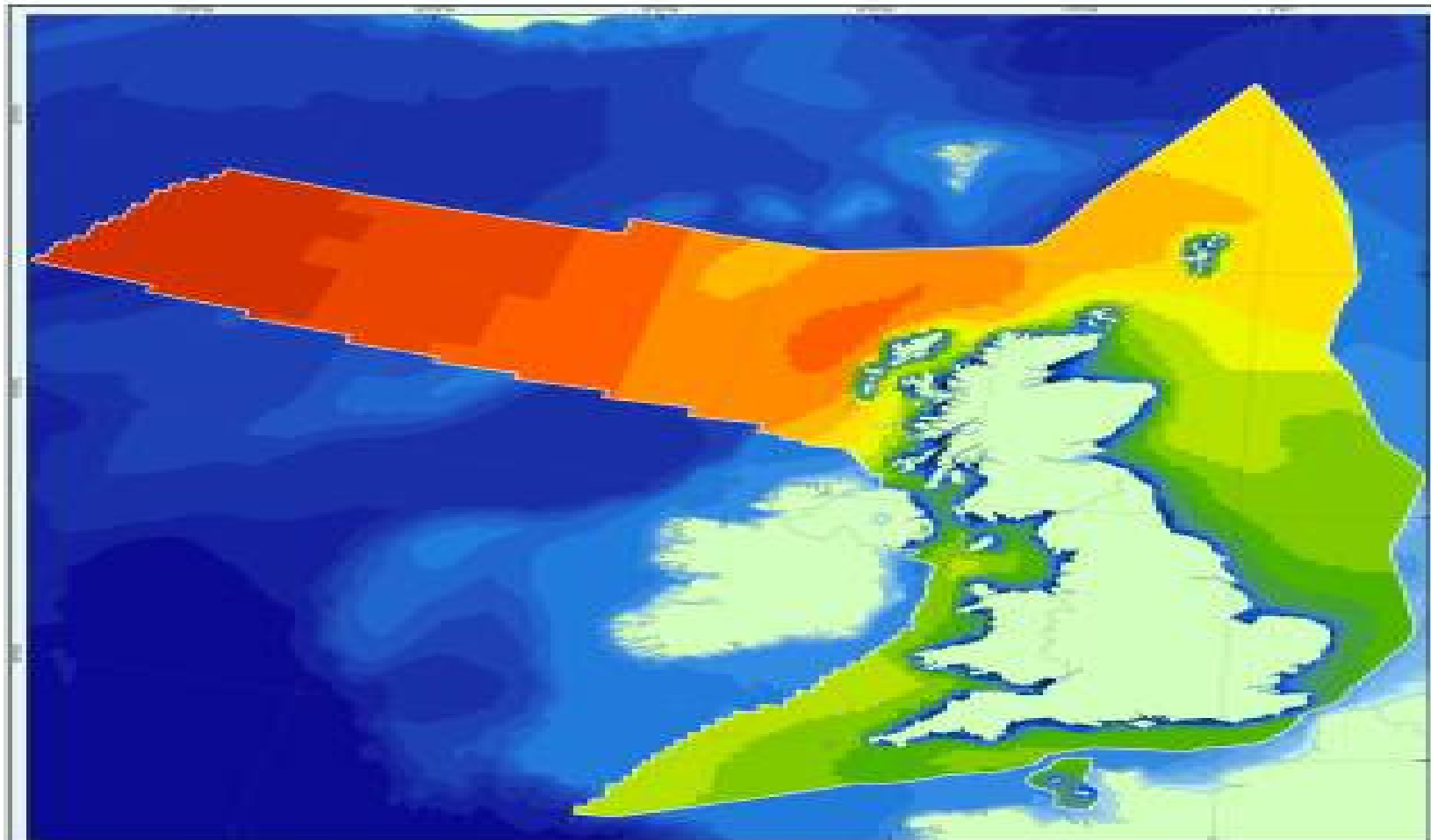
Areas that are suitable for offshore wind farms and marine renewable energy may also be important for biodiversity or fisheries.

There may be the need to increase designations of marine protected and conservation areas to offset and compensate for the adverse impacts of offshore renewable energy facilities and transmission.

The *Environmental Impact Assessment Directive* requires that unavoidable impacts be compensated while the *Habitats Directive* calls for compensatory measures for unavoidable impacts to *Natura 2000* sites.

Compensation methodologies and implementation should be based on economic and scientific methods and offset the loss of biodiversity, habitats and ecosystems services.

UK Offshore Wind Potential



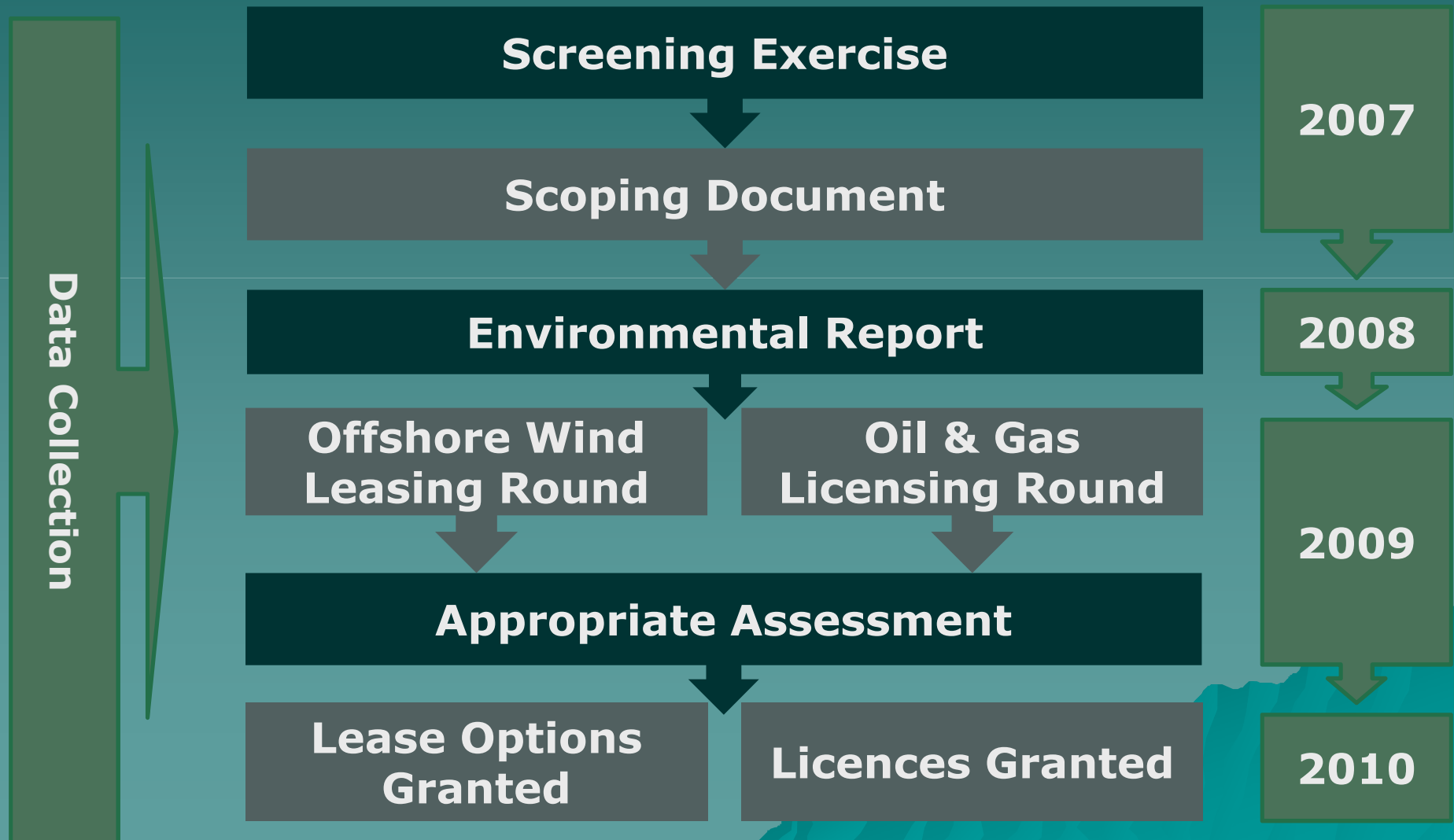
Annual Mean Wind Power at 80m

<p>Scale: 1:100,000</p> <p>0 100 200 300 400 500</p>	
Projection	European Mercator (WGS 1984 UTM Zone 31N)
Units	UK, 2011 only meters per second
<p>Map Designed and Produced by Ashford 2011</p>	

Atlas of UK Marine Renewable Energy Resources

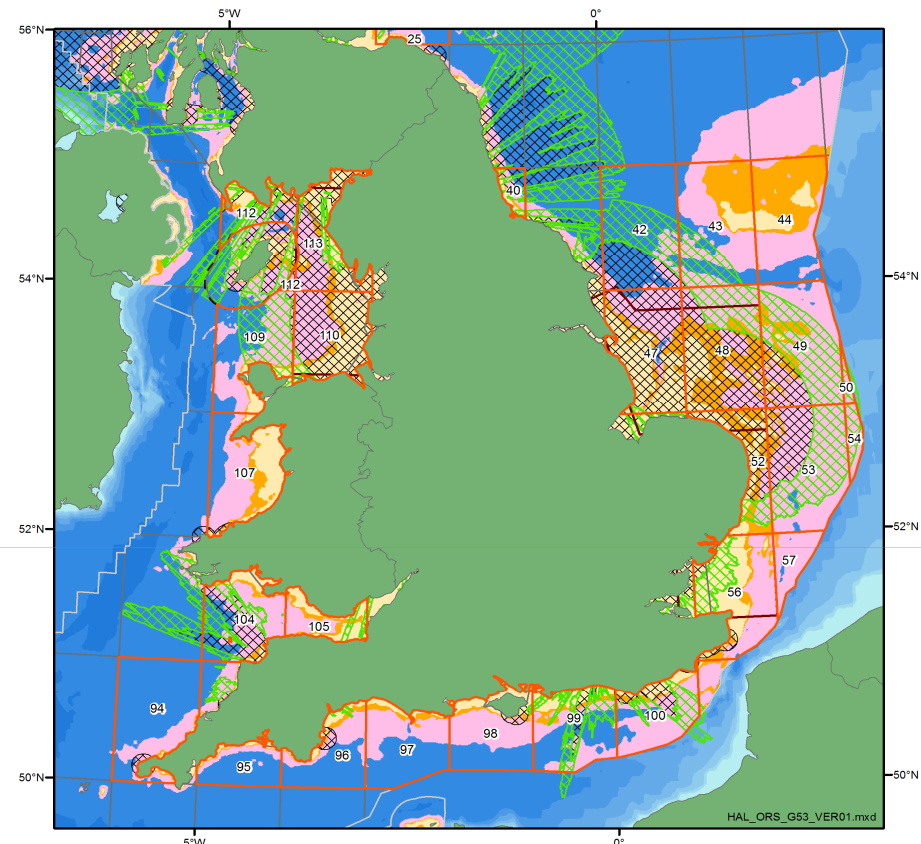


UK Strategic Environmental Assessment Process



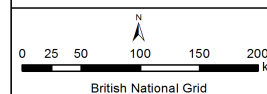
Multiple uses in the UK marine environment

- ◆ Wind, wave and tidal
- ◆ Other energy sources
- ◆ Landscape designations
- ◆ Natura 2000 sites
- ◆ Shipping lanes
- ◆ Fishing grounds
- ◆ Radar line of sight
- ◆ Ministry of Defense practice areas
- ◆ Marine mammals



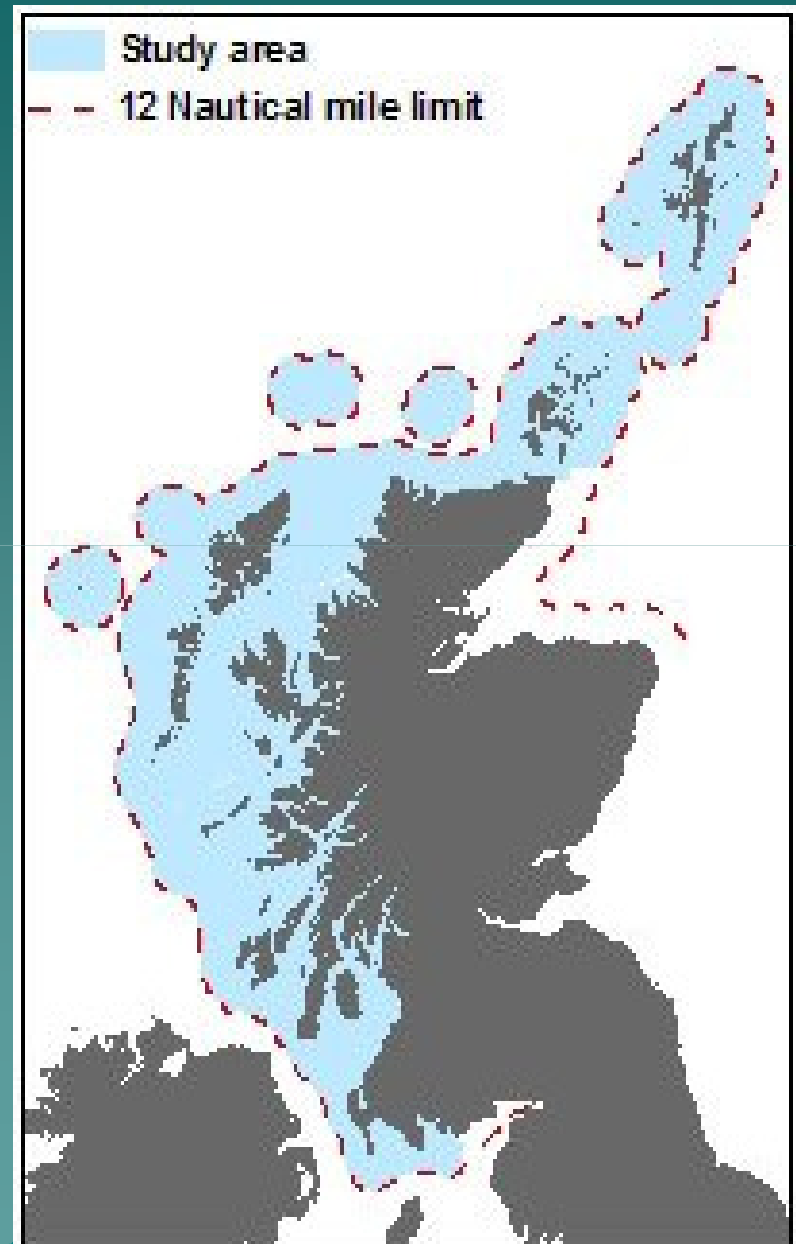
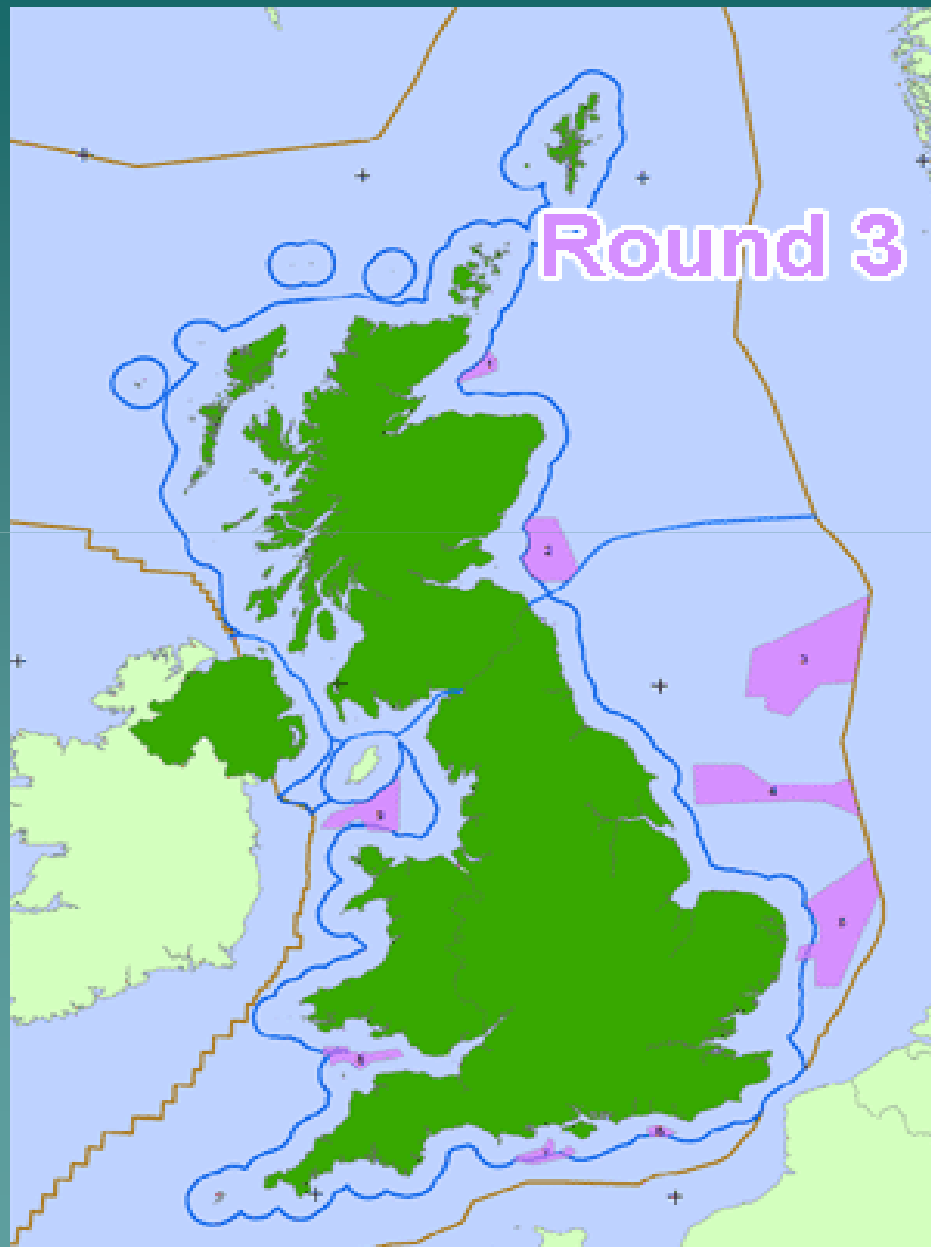
Legend

Areas of interest	Depth (m)	100 - 250	-20
UKCS boundary	< 5	250 - 500	-25
Isle of Man waters	5 - 10	500 - 1000	-50
Round 2 strategic areas	10 - 20	1000 - 2000	
Civil aviation radar			
Likely to interfere	20 - 30	2000 - 3000	
Potential to interfere	30 - 40	3000 - 4000	
	40 - 50	> 4000	
	50 - 100		



Data obtained/derived from:
 National Air Traffic Service
 DTI Renewables Atlas
 DTI Maritime Data
 Office of National Statistics
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UK Offshore Wind Farm (Round 3) & Wave and Tidal Leases (Study area for Round 1)



UK- Dogger Bank Offshore Wind Lease, Round 3, 2010



UK Round , Zone 3 – Dogger Bank Zone Developer

Forewind is a consortium of SSE (Scottish and Southern Energy plc), RWE npower renewables, the UK subsidiary of RWE Innogy, and two of Norway's largest companies, Statkraft and Statoil.

Key facts on Zone 3 – Dogger Bank

The Dogger Bank zone is located off the east coast of Yorkshire between 125 and 195 kilometres offshore. It extends over approximately 8,660 km² with its outer limit aligned to UK continental shelf limit as defined by the UK Hydrographic Office. This is the largest zone in Round 3.

The water depth ranges from 18–63 metres.

Forewind begin the extensive surveys, assessments and planning required for the consent process. The consortium's commitment is to secure all the necessary consents for the construction and development of Dogger Bank, up to the point of an investment decision, which is anticipated around late 2014.

Forewind has agreed with The Crown Estate for a target of installed capacity of 9GW, though the zone has a potential for approximately 12GW, which equates to around 10 per cent of the total projected UK electricity requirements.

If developed, it is likely to be the world's largest offshore wind project.

Dogger Bank Biodiversity and Conservation

Dogger Bank lies within the jurisdiction of three EU member states, and the Round 3 UK wind farms are first major development.

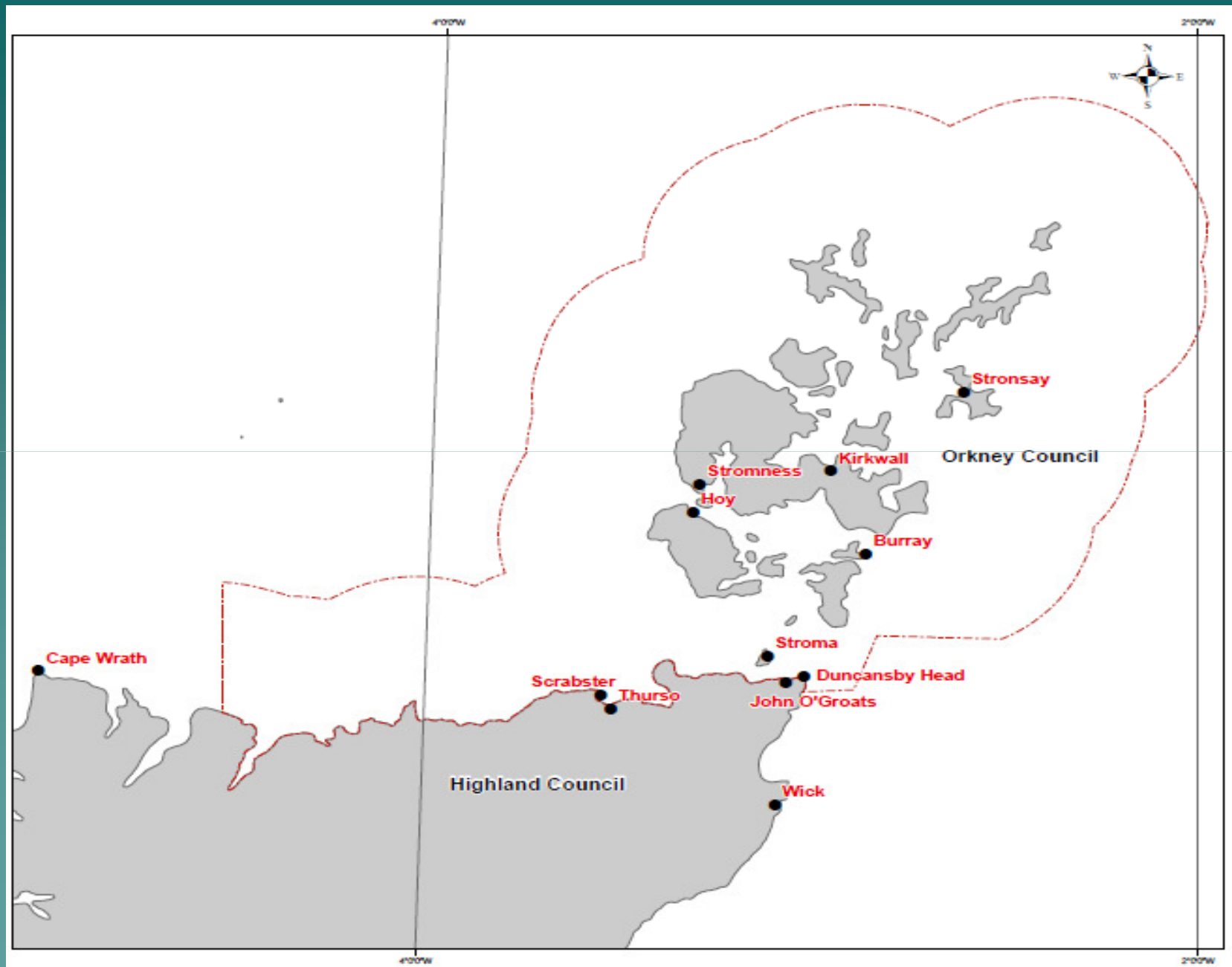
Important biodiversity values of the banks and historic and current importance of the bank for fishing and for other species (sea birds and marine mammals)

Dogger Bank considered previously for protective status in the UK due to biodiversity and conservation values.

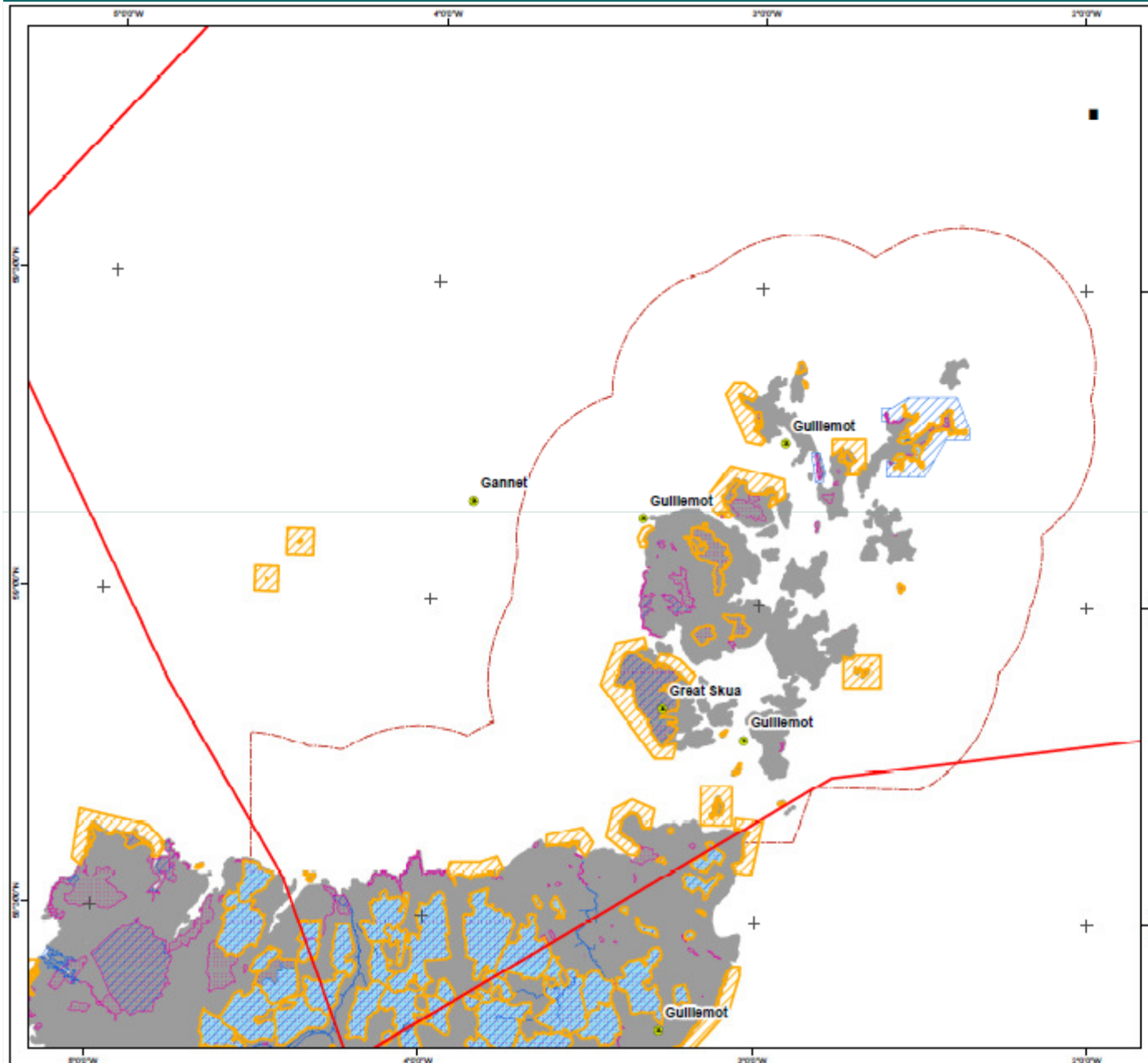
How can UK and other countries' wind farms in Dogger Bank be reconciled with the significant biodiversity and ecosystem values of this area.

If further studies find that the wind farm causes adverse impacts on seabird, fish or marine mammals or their habitat for Dogger Bank, how will these impacts be addressed, eliminated or compensated consistent with European and UK requirements

Pentland Firth and Orkney Waters, Scotland



Pentland Firth & Orkney Waters– Marine Spatial Planning



PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Protected Sites

Legend

- UK Land
- MSP Study Area
- Important Breeding Colonies
- Bird Conservation Value >50
- Proposed Special Protection Areas (pSPA)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Special Areas for Conservation (SAC)
- Wetland Conservation (Ramsar)
- Potential Reefs



Date Wednesday, May 20, 2009 16:21:31

Projection British National Grid

Spheroid Airy 1830

Datum D_OSGB_1936

Data Source TCE, OS, JNCC, SNH

File Reference J:\P1199\Med\Report\Figure_2-1_Protected_Sites.mxd

Checked Produced By Harshal Galgale
Reviewed By David Wotherspoon

AECOM



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Wave and Tidal Leasing Round in Firth and Orkney Waters

In March 2010, the Crown Estate announced the names of the successful bidders for the world's first commercial wave and tidal leasing round, for ten sites in Pentland Firth and Orkney waters. The 1.2 GW of installed capacity proposed by the wave and tidal energy developers for 2020, 600 MW each from wave and tidal.

The developers have signed agreements for lease with The Crown Estate to take forward the development of their wave and tidal energy installations. This will allow developers to enter the statutory consenting process for their sites with security of access to the seabed.

Developers who have signed a total of ten agreements for lease are:

Wave:

- SSE Renewables Developments Ltd, 200 MW for Costa Head site
- Aquamarine Power Ltd & SSE Renewables Developments Ltd, 200 MW for Brough Head site
- Scottish Power Renewables UK Ltd, 50 MW for Marwick Head site
- E.ON, 50 MW for West Orkney South site
- E.ON, 50 MW for West Orkney Middle South site
- Pelamis Wave Power Ltd, 50 MW for Armadale site.

Tidal:

- SSE Renewables Developments (UK) Ltd, 200 MW for Westray South site
- SSE Renewables Holdings (UK) Ltd & OpenHydro Site Development Ltd, 200 MW for Cantick Head site
- **Marine Current Turbines Ltd, 100 MW for Brough Ness site**
- Scottish Power Renewables UK Ltd, 100 MW for Ness of Duncansby site.

Marine Tidal Current Energy

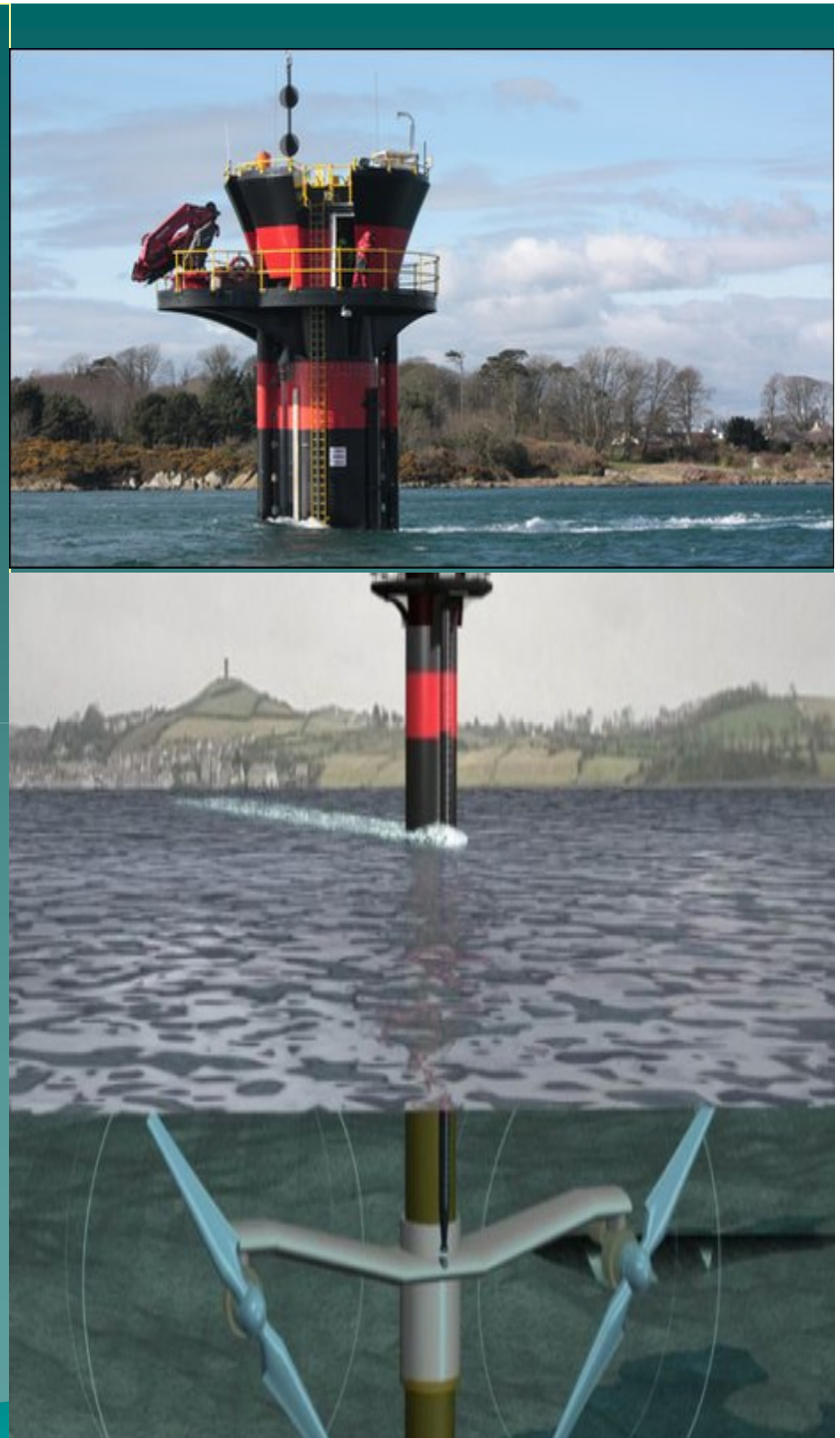
SeaGen turbine, which acts like an underwater windmill, passed 1,000 hours of operations.

The 1.2MW tidal current turbine has a capacity factor of 66% and delivered 800MWh into the national grid. The initial lease has been extended; the facility have a 25 year life.

There has been monitoring the impact of SeaGen on Strangford Lough, a protected environmentally sensitive area.

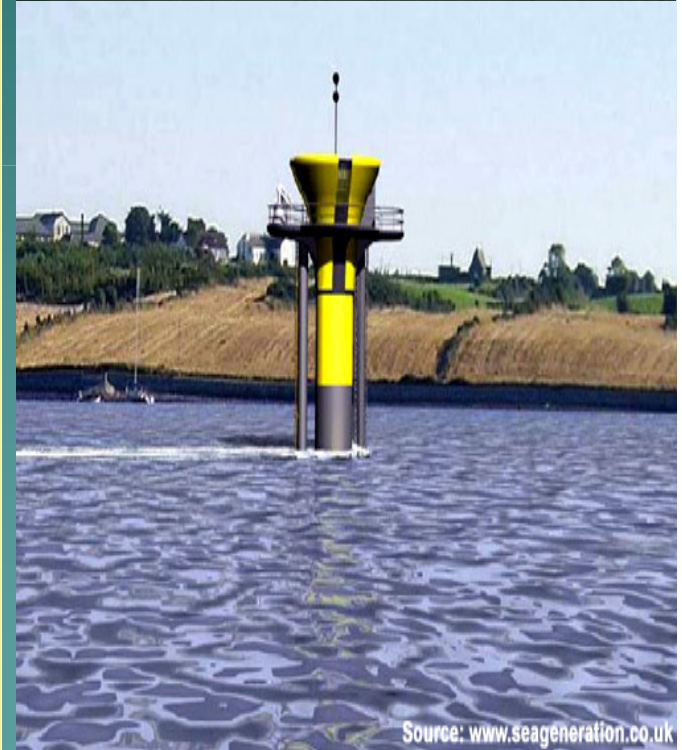
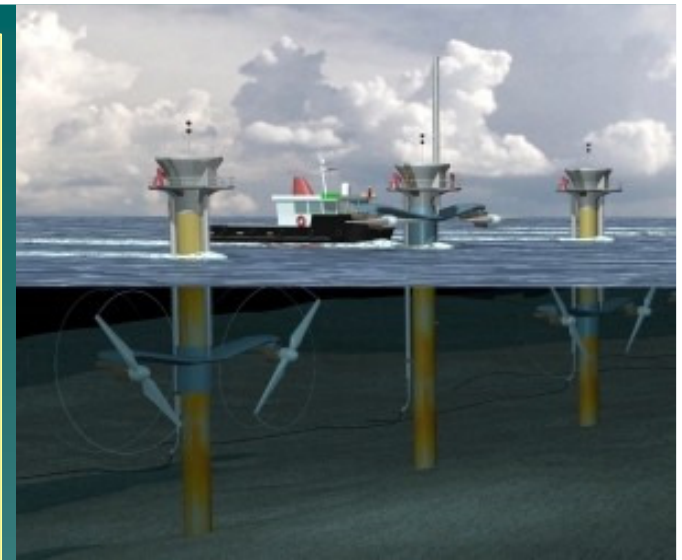
Environmental observations:

- When it started running, the porpoises passing it stopped making acoustic noises.
- Porpoise numbers have remained stable at the entrance and top of the lough.
- A sonar device stops the blades turning when a marine species comes close.
- There have been no injuries or damage to life on the seabed.
- Initial restrictions of marine mammal observers, which subsequently removed; and no operations at night.



Round 1 Wave and Tidal Leasing, 2010: Tidal farm, Pentland Firth & Orkney Waters

Marine Current Turbines Ltd (MCT) received a lease from The Crown Estate to deploy its SeaGen tidal current device off Brough Ness, on the southern most tip of the Orkney Islands (South Ronaldsay) and north east of John O'Groats. The first phase of SeaGen tidal turbines will be deployed during 2017, with the whole scheme operational by 2020. MCT will install 66 SeaGen tidal turbines in three phases over a four year period in a site area of 4.3 square kilometres. The Brough Ness tidal array will have a total generating capacity of 99MW. Martin Wright, Managing Director of MCT said: "The Pentland Firth and Orkney waters are strategically the most important marine energy areas in Western... MCT already has the valuable experience of deploying and operating SeaGen in Northern Ireland's Strangford Lough and within the next two to three years we expect to have deployed our first tidal farm in UK waters."



Source: www.seageneration.co.uk

Pentland Firth & Orkney Waters: Strategic issues identified in December 2009 for preparation of formal marine spatial plan

Increased protection required through legislation

Need to adopt ecosystem approach to management of environment but limited knowledge on ecosystems.

Data gaps relating to: species and habitat abundance and distribution, and identification of keystone species

Knowledge gaps relating to:

- Effects of climate change on habitats, species and ecosystems
- Effects of other marine sectors on habitats, species and ecosystems

Need for increased awareness of value and importance of marine environment.

Local designations apply to mainly terrestrial and coastal areas.

There are currently no formal mechanisms for protecting important seascapes (e.g. through designations) or archaeological assets.

Threat of coastal erosion and sea level rise on archaeology.

Nutrient enrichment of coastal waters from aquaculture and agricultural runoff.

Other industrial other discharges into coastal waters..

Effects of climate change on water quality – salinity and pollution from increased runoff.

Thank you, et je vous remercie

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