Scottish Wildlife Trust
Policy

Marine Renewable Energy

Scope of this policy

1. This policy should be read in conjunction with SWT's policy *Energy and Nature Conservation* (2007). It updates that policy in certain areas in response to recent developments in marine renewable technology. The original paragraphs from the 2007 policy relating to marine renewables are reproduced at Appendix 1 for reference. SWT reaffirms here its support for the environmentally sustainable development of marine renewable energy technology and infrastructure.

2. This policy is based on the state of the marine renewables industry and related policy and practice as of March 2010 and will be reviewed periodically as the sector develops.

Policy Overview

- SWT believes marine renewables should play a key role in reducing Scotland's carbon emissions, thereby helping reduce climate change impacts on biodiversity
- SWT supports the development and deployment of marine renewables where they are shown to be environmentally sustainable i.e. where any localised, regional and wider seas impact on marine ecosystem health are shown not to be significant and / or irreversible
- SWT has concerns that nationally important marine features (including both species and habitats) are currently not adequately considered during the planning and deployment of marine renewables and must therefore be given greater consideration and protection
- SWT recognises that marine renewable devices may enhance biodiversity (e.g. creation of artificial reefs) in some types of habitat, though protection of naturally species poor habitats (e.g. certain soft bottom habitats) must also be a key consideration
- SWT calls for a precautionary and adaptive approach to marine renewable planning and deployment coupled with investment into research on both localised and cumulative impacts of the various technologies currently available
- SWT recommends the Ecosystem Approach (as set out by the UN Convention on Biological Diversity) should be used as a decision making tool when planning and deploying marine renewables
- SWT will endeavour to work collaboratively with the renewables industry, Government, the research community, the Crown Estate and other stakeholders to help ensure the environmental sustainability of marine renewables in Scotland
- SWT believes the Marine (Scotland) Act 2010 should promote environmentally sustainable marine renewable generation in a number of ways (see Table 1 below for more detail)

Context

3. Energy analysts predict that marine renewables have a vital role to play in decarbonising the UK energy supply and meeting carbon emissions targets[1]. Scotland is committed to reducing carbon emissions by 42% on 1990 levels by 2020 and by 80% on 1990 levels by

[1] e.g., Poyry (2006), www.ilexenergy.com/pages/Documents/Reports/Renewables/July08_2020RenewablesTargetpdf , The Power of Scotland Renewed, (2009); http://assets.wwf.org.uk/downloads/powerofscotland_renewed.pdf; Helweg-Larson & Bull (2007), Zero Carbon Britain, www.zerocarbonbritain.com/content/view/27/48/

2050. It aims to achieve a headline target of 20% of total Scottish energy use, 40% of electricity generation and 50% of gross electricity consumption (c.8GW) from renewable sources by 2020, with an interim target of 31% of gross electricity consumption (c.5GW) by 2011[2].

4. Marine renewable energy can be extracted from three main sources: energy from wind, from waves and from tidal movement. In addition, there are initial investigations of the feasibility of using marine algae to produce energy. Scotland has an estimated potential electricity production of 46.5 GW from marine renewables. Of this, 25 GW is expected from offshore wind, 7.5 GW from tidal power, (25% of the estimated tidal capacity for the European Union), and up to 14 GW from wave power, (10% of EU capacity). Total renewable electricity generating capacity may be 60 GW or more, considerably greater than the existing capacity from all Scottish fuel sources of 10.3 GW[3]. On the assumption that renewable sources will operate at 30% of theoretical potential, it is estimated that 5GW will be required to achieve the 2011 target of 31% of gross energy consumption from renewables and 8.3-8.4GW to achieve the 50% target for 2020.[4]

5. Most UK marine energy potential is off the north and west coasts of the UK, often in remote places, so electricity has to be transmitted to shore and then on to urban centres[5]. The national grid is not currently able to cope with the scale of development anticipated so substantial grid expansion is proposed. The carbon costs of transmission are not believed to be significant. However, the location of transmission networks can mean significant terrestrial development, with associated environmental impacts[6].

6. The National Renewables Infrastructure Plan proposes the staged development of critical terrestrial infrastructure to support marine energy development, identifying eleven Scottish 'first phase' locations for rapid development to provide manufacturing, maintenance and port facilities and possible future locations on the Pentland Firth to support the wave and tidal sector. It makes clear that planning and consenting will have to take place quickly to meet the planned installation timelines[7].

7. The body of science on the predicted sensitivities and impacts of marine renewables on the marine environment is growing and being translated into current practice[8]. Given the early stage of the industry the actual impacts of large-scale and cumulative development of all technologies will be uncertain until such developments are in operation and the results of monitoring are available.

8. The main sources of potential damage from wave and tidal devices are believed to be disturbance or displacement of key species during construction, and habitat loss beneath and adjacent to the installed devices. During operation the main risks are from injury through collision with moving components, disturbance due to operational noise, barrier

[2] Scottish Government (June 2009) Renewables Action Plan; Scottish Government (2008) Making Scotland a Leader in Green Energy. http://www.scotland.gov.uk/Publications/2009/07/06095830/0
[3] Scottish Government (2008) Making Scotland a Leader in Green Energy.
[4] Scottish Government (2008) Making Scotland a Leader in Green Energy.
[5] The Carbon Trust estimates a loss of 2% per 100kW hour in cable transmission of electricity to shore. www.carbontrust.co.uk/SiteCollectionDocuments/Various/Emerging%20technologies/Technology%20Directory/Marine/MEC%20cost%20estimation%20methodology%20-%20report.pdf . The average transmission loss in the UK system is currently 1.5%. www.ofgem.gov.uk/Sustainability/Environment/Policy/SmallrGens/CommArrg/ChgsandEmbdded/Pages/ChgsandEmbdded.aspx Transmission losses of c. 3% per 1000 km are estimated from HVDC lines, for AC lines losses are higher http://www.trec-uk.org.uk/elec_eng/grid.htm
[6] Terrestrial impacts are not considered within the scope of this policy.
[7] Scottish Enterprise & Highlands and Islands Enterprise (2010). First phase sites are Leith, Dundee, Nigg, Energy Park Fife at Methil, Aberdeen, Hunterston, Arnish, Campbelltown/Machrihanish, Ardesier, Peterhead, Kishorn.
[8] See, for example (March 2009), Wet renewable energy and marine nature conservation: developing strategies for management http://www.abpmer.co.uk/files/R1451_Final_05Mar09.pdf. The hub of research on wind is the Collaborative Offshore Wind Research into the Environment (COWRIE), http://www.offshorewindfarms.co.uk

effects, and changes to benthic habitats and loss of foraging areas. For wind turbines the main sources of potential damage during the construction phase are similar, with a particular concern over the noise impacts of pile driving. Barrier effects, potential changes to benthic habitats and foraging areas (both positive and negative) are also considered important. Structures placed across estuaries, dependent on the type of technology, are believed likely to have more or less significant impacts on estuarine ecology, as well as on natural carbon storage capacity. The risk of damage to ecosystem integrity and function from marine renewables has not been considered in detail. It is acknowledged that greater understanding is needed of a whole range of ecosystem components, including water column ecology and processes and the role of benthos and fish within wider ecosystems[9].

Policy statement

9. SWT believes that marine renewables, including wave, wind and tidal stream devices (amended position from 2007 policy on *Energy and Nature Conservation* which did not support tidal stream devices) can play a key role in reducing Scotland's carbon emissions, thereby helping to reduce climate change impacts on biodiversity. However, SWT recognises there is also uncertainty over the relative level of impact of such devices on Scotland's unique and internationally important marine biodiversity.

10. SWT believes that all developments must be subject to full environmental impact assessment and that where unacceptable impacts are predicted, alternative sites should be selected. The most appropriate 'end use' should also be identified at this EIA stage with options ranging from complete removal of all extant infrastructure, to leaving structures in place where they are unlikely to cause environmental damage, or otherwise enhance biodiversity. In deciding the 'level' of decommissioning, factors such as the ecological integrity as well as species diversity should be considered, e.g. the creation of artificial rocky reefs adjacent to soft bottom habitats may enhance species diversity but disrupt natural habitat functioning.

11. SWT recognizes that the physical presence of marine installations may sometimes have beneficial effects on biodiversity through, for example, acting as artificial reefs which provide hard substrata for encrusting organisms and can act as fish aggregating devices. However, this may not be the case within habitats where species have become adapted to non rocky habitat types, and where significant modification of the community interactions could ensue with the introduction of new structures.

12. SWT believes that it is in the public interest for the marine renewables industry to be successful and sustainable and that marine biodiversity can be protected in the context of a thriving marine renewables sector provided that there is sufficient investment in science, and if infrastructure is sited and designed appropriately and in accordance with the Ecosystem Approach.

13. SWT believes that all marine renewables development must deliver a net reduction in carbon emissions while maintaining the integrity and function of marine ecosystems and avoiding damage to nationally and internationally important features. Where appropriate and possible, marine renewables development should be designed and located to benefit marine biodiversity. A healthy and functioning marine environment will help to support the sea's natural carbon storage capacity, help to ensure marine biodiversity is resilient to the effects of climate change and support the delivery of a range of other essential marine goods and services like food production and nutrient cycling.

[9] UKERC, 2009, Spatial planning for marine renewable energy arrays workshops

14. SWT believes that the twelve principles of the Ecosystem Approach[10] and the European Marine Strategy Framework Directive marine ecosystem objectives[11] are helpful tools that must be used to direct marine renewables development towards environmental sustainability. The Marine (Scotland) Act 2010, which will establish these marine ecosystem objectives, as well as a new marine planning and licensing system and network of marine protected areas, must be well implemented in order to ensure that marine renewables can contribute fully to sustainable marine development.

15. SWT urges industry and government to continue to work together on increasing the knowledge base for marine renewables. SWT acknowledges that different technologies have different potential impacts and it is vital that the right infrastructure should be in the right locations.

16. SWT believes that the current strong policy driver for maximising the potential of marine renewables could, if not informed by sound science, in the long term damage the sustainable development of the sector. SWT recommends that greater focus on the following areas would benefit both the marine renewables industry and the natural environment:

    - **Cross-sectoral co-ordination** – greater co-ordination and shared objective-setting across the energy, climate change, biodiversity and marine sectors of government is required.

    - **Precautionary principle** - economic and political drivers and the imperative to deploy urgently renewables to cut carbon emissions have resulted in the timing of developments pre-empting strategic consideration of their potential environmental impact. This is not an ideal situation and the precautionary principle should be used if available science suggests there could be significant environmental impacts from a given development.

    - **Protection of the functioning of the marine ecosystem** - Although efforts are being made to minimize risk to the environment, environmental sustainability and the Ecosystem Approach are not at the heart of strategic decision-making. There is currently an over-reliance on mitigation rather than avoidance of sensitive areas. The important role of healthy marine ecosystems in natural carbon storage and in ensuring resilience to climate change also needs to be promoted more. Design of devices to benefit marine biodiversity, which could be delivered at minimal cost, should also be prioritised.

    - **Protection of nationally important marine features** - while the European Habitats Directive ensures that a limited number of protected sites and species are taken into account in development decisions, there is still a concern that nationally important marine biodiversity is not adequately considered in decision making due in part to the urgency of marine renewables deployment.

    - **Environmental data** - baseline data and understanding of impacts on habitats, species and ecosystems, although growing, is still lagging significantly behind development

[10] See Annex I for the Convention on Biological Diversity principles of the ecosystem-based approach to conservation. SWT outlined its thinking on this in Hughes J & Brooks S (2009) Living Landscapes: towards ecosystem-based conservation in Scotland, Policy futures series 1/2009, Scottish Wildlife Trust, and Edinburgh.

[11] The European Marine Strategy Framework Directive (MSFD), currently being implemented throughout the EU, aims to protect, preserve and where practicable, restore the marine environment by applying an ecosystem-based approach and putting in place measures in order to 'achieve or maintain good environmental status' in EU waters by 2020.[11] It sets out 11 qualitative descriptors to guide the achievement of good environmental status on which Scottish marine ecosystem objectives delivered through the Marine (Scotland) Act 2010 will be based. See Annex I for details of qualitative descriptors.

proposals and is insufficient for the assessment of cumulative and in-combination impacts and adaptive management.

- **Cumulative impacts** – while the European Habitats Directive allows, in principle, for the cumulative and in-combination impacts of development to be considered in respect of some marine habitats and species, speed of development and lack of baseline data will make such impacts difficult to assess. There is no mechanism for considering such impacts for nationally important marine features or, crucially, for ecosystem function.

- **Setting upper thresholds for development and adaptive management** – while the European Habitats Directive allows, in principle, for developments to be scaled-back to reduce impacts on some marine habitats and species, there is no such legislative mechanism for nationally important features or ecosystem function. In the absence of sufficient baseline data to provide the necessary evidence, setting upper thresholds for development and scaling back or amending development will be difficult to implement.

- **Carbon impacts** – while initial estimates indicate that marine renewables will deliver a net carbon benefit, there should be a requirement to calculate and minimise adverse carbon impacts either as part of strategic development decisions or at project level.

- **Community and other stakeholder engagement** – there is currently no independent expert scrutiny of key environmental documents, for example Strategic Environmental Assessment (SEA). Non-statutory stakeholder groups, for example communities and environmental non-governmental organisations, should be brought within the decision-making process.

17. SWT welcomes the Marine (Scotland) Act 2010 and believes that the provisions of the Act, if properly implemented, offer an excellent opportunity to address these concerns over the potential impacts of marine renewables development (see Table 1 detail). This legislation will establish (i) a new statutory planning system of national and regional marine plans, (ii) a set of marine ecosystem objectives which plans must deliver, (iii) a streamlined licensing system and (iv) a new network of marine protected areas. The Act includes general duties on Scottish Ministers and public authorities to further the achievement of sustainable development, including the protection and, where appropriate, enhancement of the health of the Scottish marine area and to act to mitigate and adapt to climate change

Table 1.

Issue	How SWT believes the Marine (Scotland) Act 2010 could promote sustainable marine renewable generation
Cross-sectoral co-ordination	• The UK Marine Policy Statement should provide a strong framework for sustainable development with environmental sustainability as a guiding principle. • Marine Scotland should work with energy and climate change sectors of Government to produce a Sustainable Marine Renewables Strategy to provide context for the sustainable use of marine renewables. • Marine Scotland should work with energy and climate change

	sectors of Government to ensure that incentives to drive forward marine renewables are 'sustainability proofed' to ensure they do not encourage damage to marine biodiversity and ecosystem health. • Marine Scotland should work with energy and climate change sectors of Government to ensure that incentives are designed to encourage synergies between marine renewables and marine biodiversity protection and enhancement.
Precautionary approach	• A gradual, staged approach to the scaling-up of marine renewables development should be adopted, underpinned by reliable and comprehensive environmental data and monitoring. • Planning should allow for a precautionary spatial approach, including avoidance of important or sensitive areas, including marine protected areas, with mitigation a last resort.
Prioritise the environment	• National marine policy and planning should be steered by Ecosystem Approach principles. • A 'sustainable development' test should be developed and applied to large-scale developments to provide an index of sustainability for planning purposes. • Planning should include a natural resource audit of plan areas, identifying appropriate zones for development. • The design and location of development should benefit the environment where appropriate and possible.
Protect nationally important marine features and ecosystem function	• Regional locational guidance for marine renewables should underpin planning and take account of internationally, nationally and, where appropriate, locally important marine biodiversity, marine protected areas, sustainable device design, ecosystem functions and cumulative and in-combination impacts. • Best practice should be developed and adopted by developers to ensure assessment of environmental impacts is thorough and effective.
Environmental data and research	• The Crown Estate, regulatory bodies, SNH, eNGOs and research bodies should work together to establish and resource a national marine data management system, co-ordinated research and monitoring programme and improved data sharing and knowledge transfer between marine sectors, research and the policy and regulatory community. This should be directed in the short-term towards filling knowledge gaps, in the long-term to providing good baseline data for all planned areas to aid a sound understanding of marine renewables impacts on habitats, species and ecosystems.
Cumulative impacts	• Review of marine plans should provide an effective mechanism for feeding project-level information back to regional and national

	plan level to enable prediction, assessment and review of cumulative and in-combination impacts. • Marine Scotland, as single marine authority, must take responsibility for dealing with the wider consequences of development on the marine environment.
Setting upper thresholds for development and adaptive management	• Marine ecosystem objectives should be strong targets used as part of marine planning to ensure threshold setting and adaptive management so that development operates within environmental limits. • Co-operation between authorities should ensure that lease and consent decisions are taken in accordance with marine ecosystem objectives and strict conditions are set to ensure developers minimise environmental and carbon impacts. • Review of marine plans should provide an effective mechanism for adaptive management, including scale back where appropriate. Decision-support tools are provided to facilitate this.
Carbon impacts	• Marine renewables strategy and policy must take full account of the role of marine ecosystems in carbon storage and resilience to climate change effects. • There should be a requirement to assess the full carbon impact of marine renewables development at strategic and project level.
Third party engagement	• There should be independent scrutiny of key environmental documents. • There should be full transparency in development decisions. • There should be effective mechanisms for communication and, where possible, collaboration, between marine sectors, the policy and regulatory community, the research community, the eNGO community and local stakeholders. The Marine Strategic Studies Forum or equivalent representative stakeholder group should meet regularly and have direct input into decision-making.

SWT priorities for action

- SWT will continue to advocate the principles outlined in this policy statement to Government, the business sector, the wider public and other key stakeholders. In particular, we will advocate for environmental sustainability to be central to the implementation of the Marine (Scotland) Act 2010, particularly in relation to marine planning, marine protected areas and the application of marine ecosystem objectives.

Cross reference to other related SWT policies

Energy and Nature Conservation 2007

Approved by Council June 2010

Appendix 1 – *Energy and nature conservation* – marine renewables

"Offshore wind

"SWT believes there are significant environmental and economic opportunities for Scotland if it utilises its pre-eminent position as one of the most favourable environments for offshore wind power generation in the Europe. SWT notes that the estimated potential exploitable capacity for offshore wind exceeds 25 gigawatts. Even if only half this capacity were to be exploited, offshore wind could potentially contribute over 40,000 gigawatt hours per year, more than the projected electricity demand for the whole of Scotland by 2020 even without factoring in savings from reducing energy demand. Government should encourage investment in offshore wind power through an ambitious range of policy measures and adjustments to economic instruments.

"SWT believes that subject to the adoption of rigorous best practice, electricity generation from offshore wind could be amongst the least ecologically damaging of all renew able technologies. We note there may even be positive effects on marine biodiversity through the creation of 'artificial reefs' on turbine substructures. However, SWT urges that detailed and objective environmental impact assessments should always be made prior to consent, particularly in areas of high seabed biodiversity or where there are important migratory or resident seabird populations. Potential impacts on the marine ecosystem which need to be fully assessed prior to development include:

- the direct habitat loss associated with pile construction and cable laying on biodiverse areas of the sea bed;
- changes in sedimentation patterns;
- changes in turbidity and suspended sediments, particularly during construction;
- the impact of noise, vibration, lighting and electromagnetic effects on marine mammals and larger fishes; and
- bird strikes

"SWT advocates a sustained increase in investment in research and development of offshore wind technology, including the testing of large turbines (3 megawatt plus) located in deep water and distant from shore.

"Wave power

"SWT supports the development of wave energy devices and believes they can play a significant part in delivering Scotland's renew able energy portfolio. As with offshore wind, the exploitable capacity of wave power in Scotland is potentially very high at around 14 gigawatts or 45,700 gigawatt hours per year and recent technological advances are promising. Although on current knowledge the environmental impacts of wave power appear slight, SWT believes that more research on potential impacts should be carried out before large-scale developments are permitted.

"Tidal barrages, impoundments and tidal stream devices

"At the present time, SWT does not support the deployment of tidal barrages, impoundments or tidal stream devices in Scotland because the potential impact on marine biodiversity of tidal rapids (a UK BAP habitat) is unacceptably high. Impacts on species and ecosystems could include:

- creation of a physical barrier to marine mammals, fish and other aquatic life;
- collisions of marine mammals, fish, diving birds and other aquatic life with turbines;
- changes in water levels and possible flooding affecting both aquatic and shoreline ecosystems;
- changes to the quality of the water in the basin or estuary including increased sediment; and
- loading affecting turbidity of the water and causing ecosystem instability.

"SWT advocates continued research into these potential technologies, particularly tidal stream devices which, if the environmental impacts are proven to be within acceptable limits, could in the near future contribute significantly to Scotland's renewables portfolio."