National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

Fuelling the debate: Energy and Climate Change Committee successes and future challenges

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About us:

[7] The National Oceanography Centre (www.noc.ac.uk) is part of the Natural Environment Research Council (NERC) and is the UK national focus for Oceanography. It undertakes large-scale, long-term oceanographic research from coast to Deep Ocean. It provides national capability in oceanographic sciences

Declaration of interests:

[8] NOC welcomes the opportunity to respond to the Energy and Climate Change Committee inquiry. The National Oceanography Centre (NOC) is a focal point for UK Marine Science and many of its programmes are funded through public money, accessed via NERC and ESPRC as well as other government departments such as DEFRA.

[9] NOC hosts the Marine Renewable Energy Knowledge Exchange Programme for NERC. This is a four-year programme running until March 2015 to facilitate development of stronger partnerships between academia and organisations in the marine renewable energy sector. The programme funds and arranges activities which work toward a sustainable future for the marine renewable energy, and which increase the impact of NERC science.

Submission Date:

[10] 9th December 2014

Consultation Questions:

Question 1: What are the greatest challenges in UK energy and climate change policy over the next Parliament (2015-2020)?

[11] The greatest challenge is to find reliable, cost effective carbon neutral energy. The ocean can provide such alternatives. Wind, wave, tidal, algal biomass (http://goo.gl/RyvuLK), geothermal energy and seafloor methane gas hydrates (http://goo.gl/UW2eLc) are possible options but have environmental, technological, engineering and societal challenges.

Environmental

[12] Offshore infrastructure developments will impact the environment (e.g. migratory swimming species). Further research will help understand the (cumulative) environmental impacts of offshore energy and its energy generation potential.

[13] Wind and waves vary, thus may not be conducive to continuous energy generation. Tidal energy is inherently more predictable and has a strong dependence on small-scale heterogeneity at any particular site within UK waters.

[14] Ocean energy and Carbon Capture and Storage (CCS) installations need long term, sustained monitoring for environmental impacts. NOC participates in a multi-partner Energy Technology Institute project, developing specialised CCS monitoring using marine robotics and seafloor fluid seepage knowledge (http://goo.gl/P6X3zC).

[15] Identifying the best location for CCS sites is challenging. Old hydrocarbon fields are the dominant CCS reservoir, already proven as geologically sound, hydrocarbon-retaining structures over the past 50 million years. However, they present challenges regarding their depth (optimal CO_2 storage is ~1km), relatively limited capacity and existing wells piercing the caprock.

[16] Saline aquifers are an alterative option, being typically shallower and having larger storage capacities. However, the integrity of cap rocks is often not known making them difficult to develop as secure CCS sites (http://goo.gl/u4oC1q).

Technological

[17] Siting new wind farms in deep water requires further technology development. Tidal is the most predictable energy form, providing a denser energy supply. However installation durability could be improved.

[18] Marine renewable energy has high up-front costs making marine renewables less economically attractive than traditional energy sources. For example, tidal barrages/lagoons are expensive to construct. However, tidal barrages provide the cheapest per unit energy. Further R&D is needed to reduce these up-front costs.

Investment is needed in offshore CCS monitoring through development of cost effective systems such as autonomous marine robotics (http://goo.gl/P6X3zC).

Societal

[19] Ocean energy requires a coherent consensus and roadmap for its development. This can be achieved through platforms such as the Marine Science Co-ordination Committee's Underwater Sound Forum and Marine Industries Liaison Group (http://goo.gl/hqOqYt).

[20] Large scale planning and regulation of offshore renewable energy generation requires data and long-term financial investment mechanisms, which are still to be developed.

Question 2: What would a UK energy system, that successfully tackles the energy trilemma, look like by 2030 and beyond?

[21] A successful energy system would focus on:

- National energy production, removing dependency on international suppliers

- Non-reliance on finite energy resources (e.g. fossil fuels) in the longer-term;
- Low cost systems;
- Stable energy production;
- Providing a good energy mix (renewables, fossil fuels, nuclear) rather than single source dependency;
- Removing atmosphere carbon inputs through Carbon Capture and Storage (CCS; http://goo.gl/u4oC1q);
- Participation in emissions trading schemes.

[22] The oceans can provide renewable energy sources and options for CCS. As an island nation, with offshore hydrocarbon fields, the UK is strongly positioned, with further investment in R&D, to utilise its ocean resources to tackle the energy trilemma.