DEVELOPMENT OF THE OCEAN ENERGY ORJIP

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- R&D priorities for regulators and industry to de-risk consenting focussing on EIA / HRA;

- Technology innovation to reduce costs of site characterisation / post deployment monitoring
R&D priorities for consenting arrays

Project 1 - *Research and monitoring studies around single devices and first arrays* to gather further information on the behaviour of marine mammals, birds and fish;

Project 2 – Further investigation into the *possible physical consequences of collision* for marine mammals, diving birds and fish with operating tidal turbines

Project 3 - Further development of *suitable instrumentation and methodologies for monitoring wildlife behaviour* around wave and tidal devices and arrays and for detection of any collision events

Project 4 - Development of an *agreed approach to assessing the potential effects of displacement* of marine mammals and birds from wave and tidal arrays

Project 5 - *Establishment of an acoustic ‘evidence base’* for operational wave and tidal devices and first arrays

Project 3 - Further development of instrumentation and methodologies for monitoring wildlife behaviour around devices and arrays

Several groups working on developing these technologies:

- Marine Scotland demo project – SMRU mainly with Benjamin Williamson – KTP with Meygen;
- US - Brian Polagye (PNNL) and Gayle Zydlewski (Univ of Maine)
- ‘Collision-o-meter’ - detecting an actual ‘clunk’- Prof Ben Wilson, UHI.
FLOWBEC rig – combined Simrad EK60 echo-sounder and Imagenex multi-beam sonar – Behaviour around devices / arrays

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Development of sonar system – to observe interactions of fish and turbines

A DIDSON (“Dual-frequency IDentification SONar”) image reveals a swirl of fish in New York City’s East River, a tidal channel.

Courtesy: Gayle Zydlewski & Garrett Staines, Univ of Maine (see also EIMR, 2012)
‘Collision-o-meter‘ - Development of a collision detection system

• options tried include use of strain gauges / cameras / sensors mounted on or within blades / pedestal;
• many questions to achieve cost effective / reliable system:
  – Significance of signal? How to distinguish between logs and bodies?
  – More cost effective if dual function eg. condition monitoring

NB: scope of work defined and feasibility study about to kick off
**Project 1** - Research and monitoring studies around single devices and first arrays to gather further information on the behaviour of marine mammals, birds and fish;

Considerations:

- R&D and monitoring at one array site for entire life cycle not most useful as some sites may only capture sub set of issues – need more sophisticated approach;
- So make sure key issues are recognised up front and sites identified where they can be addressed;
- Share learning from single devices and ensure integration of this knowledge into consenting first arrays;

Hence the Ocean Energy ORJIP ITT – coordination, knowledge sharing, project development to ensure joined up R&D UK wide
Project 2 – Further investigation into the possible physical consequences of collision for marine mammals, diving birds and fish with operating tidal turbines

• Rick Jepson, Sandia labs – simulated collision of adult male *Orca* and Open Hydro device;
• Use of post mortems to understand different types of injury:
  – recent observations at Isle of May by SMRU team
  – one adult male caught and killed 14 pups
  – wound patterns cover all those observed to date on corkscrew carcasses
Project 4: Development of an agreed approach to assessing the potential effects of displacement of marine mammals and birds from wave and tidal arrays

- At current scale of development (single devices / small arrays) – unlikely to be a consenting issue;

- PCoD model has been developed to point of an ‘interim approach’ – [http://www.smru.co.uk/pcod/](http://www.smru.co.uk/pcod/)

- Next step - further primary R&D to develop the model further in context of marine planning (NB ; Linkage with offshore wind ORJIP)
NB: Capture potential positive effects of displacement INTO renewables sites eg. foraging

Windfarms:
SMRU tracked 11 harbour seals visiting Sheringham Shoal and Alpha Ventus

Photo courtesy Debbie Russell, SMRU

Wave Hub:
Armouring of cable route provides new habitat for spider crabs

Photo courtesy Tony Bicknell, Exeter Univ
Project 5: Establishment of an acoustic evidence base

- Unlikely that noise of a device will prevent a consent being awarded (on evidence so far – eg. MCT Strangford Lough);
- BUT - consequences for behavioural responses to devices could be very significant eg. potential for collisions;
- If deployment of acoustic deterrent devices (ADDs) being considered - need to understand the cumulative / interactive effects (time and space)
Mammal responses to wave and tidal array scale device noise

Technology needs: Further development and testing of acoustic deterrent devices (ADDs):

- Review and test ADDs for at risk mammal spp. – (operation in tidal stream? Effective for wave farms in preventing entanglement?)
- Produce a protocol for their use, and agree with industry, advisors, regulators, NGOs

* See also _ORJIP – Offshore Renewables Joint Industry Programme_
National Physical Laboratory hosting an internship (Irene Vollmy, Bristol Univ)

– Contacting those likely to have information – eg. Inst for Sound and Vibration Research, developers - what they have and whether able / willing to share,

– Contacting regulators and their advisors plus consultants to find out what they need,

– Working with MeDIN and OREC Wave and Tidal Knowledge Network to find a means of making data available more widely
Technology needed to reduce cost of site development and monitoring

- RPA (remotely piloted aircraft) demo project focusing on the “White Ribbon” (SAMS);
- AUVs / ASVs for baseline environmental characterisation / monitoring – multi beam/ photography / PAM (NOC / SMRU)
Ocean Energy ORJIP Forward plan

• OE ORJIP to be funded jointly by the Crown Estate, scottish / welsh governments

• Development of R&D projects to address EIA / HRA consenting risks for wave and tidal arrays

• Knowledge sharing across UK business / research clusters around testing centres plus integration of non UK contributions

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