"Wave and Tidal Energy in the Pentland Firth Area - how much environmental monitoring is enough?"

Report on SRDG Stakeholder Workshop 1st December 2009

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1. Introduction & Background

1.1 Background

The following report is an account of the Pentland Firth Marine Energy Stakeholder workshop held at Cowan House Inverness on the 30th of December 2009. The workshop was attended by 42 delegates representing a range of stakeholder interests.

The purpose of the one day workshop was to explore the environmental monitoring requirements for wave and tidal energy development in the Pentland Firth area. Realizing the tidal and wave energy potential of the Pentland Firth area is a priority if Scotland is to meet its carbon reduction commitments. It also offers important potential for economic development. However the physical environment and the ecology of these areas is not well understood. Added to this the environmental effects of marine energy devices are unclear. Building a better picture of baseline environmental conditions in the Pentland Firth area is now recognized as a priority for the development of a sustainable marine energy industry. The seminar was targeted at marine energy stakeholders with a direct interest in the Pentland Firth: in particular developers, government agencies, local authorities, academics and relevant NGOs known to have an active interest in the area.

1.2 The approach taken

The overarching purpose of the seminar was to explore three questions:

- What environmental data should be collected and why?
- Who should undertake environmental monitoring?
- How should environmental data be collated and disseminated?

The workshop opened with presentations from

- Andy Douse & Karen Hall (SNH),
- Rowena Langstone (RSPB)
- Sue Barr (Open Hydro)

The introductory speakers were asked to discuss the topic of environmental monitoring from the perspective of their own organization. The rest of the day was structured around three breakout sessions, with feedback after each session, followed by a wrap-up discussion at the end of the day. The aim of the day was to capture views, opinions and threads of discussion as they were raised by the participants. Importantly, the organizers took no part in influencing or directing the discussion only acting as scribes during each of the breakout sessions. Each of the four breakout groups appointed a rapporteur who provided feedback at the end of the session.

There are advantages and disadvantages to this un-facilitated approach. The organizers wanted to capture views from the assembled stakeholders and not introduce ideas or guide the conversation in any particular direction. This means that we can be confident that the record of the meeting genuinely reflects the priorities of the participants. One consequence of this approach, however, is that discussion can deviate from the allocated topic. It is also the case that there was some overlap and

repetition between the sessions. However this repetition may itself indicate the importance of a particular issue.

Attendees were categorized into the following groups:

- Private sector (developers and consultants) – blue badge.
- Official stakeholders (regulators, government, LAs etc) - red badge.
- NGOs – green badge.
- Academics (excluding the organizers) – yellow badge.

Attendees were allocated to specific breakout groups and the membership of each group changed for each breakout session. Diversity was achieved in each breakout group by dispersing multiple attendees from single organizations and ensuring a mix of categories in each group.

The breakout sessions were as follows:

- Session 1: Tidal Energy in the Pentland Firth. What are the issues and what should we measure?
- Session 2: Wave Energy in the Pentland Firth. What are the issues and what should we measure?
- Sessions 3: Environmental monitoring. Who should do it? How should we collate and disseminate information?

These notes are an account of the discussions that took place in the breakout sessions. These notes are not, however, intended to be a detailed minute of the discussion, but rather a distillation of the main themes and topics discussed over the course of the day. It should be stressed that the authors have made no comment about the validity or otherwise of the opinions recorded. No attempt has been made to filter or correct erroneous comments. No weighting or value has been applied to the comments made, other than pointing out where a topic was raised on numerous occasions by specific groups.

1.3 Documents and records

The workshop documents and presentations can be viewed at www.mreds.co.uk/events2.htm#stakeholders these include:

- Introductory presentations (Rowena Langston (RSPB), Sue Barr (OpenHydro) and Andy Douse/Karen Walker (SNH)
- Scribes notes from breakout sessions (these have been anonymised)
- Table of issues raised
- List of attendees
- Agenda, introductory letter and workshop poster.

1.4 Acknowledgements

This workshop has been part funded by the Scottish Funding Council through an SRDG (Strategic Research Development Grant) award to ICIT/Heriot-Watt University and the Environmental Research Institute at UHI. The award is for investigations into the environmental impacts of marine renewable energy development in Scotland. We would also like to thank HIE for the kind use of their premises. We would like to thank Andy Douse & Karen Hall (SNH), Rowena Langstone (RSPB), and Sue Barr (Open Hydro) for their opening presentations.

2. Specific Issues for Environmental monitoring in the Pentland Firth

One striking feature of both sessions one and two was how the discussion in all four groups was dominated by a series of generic or strategic issues common to both wave and tidal technology (e.g. methodology, defining baseline, deploy and monitor strategies) rather than a discussion of narrow ecological impacts and monitoring strategies associated with these. These more generic issues have been brought together in section 3 of this report. This section records more specific comments which refer to a particular ecological impact or technology.

MEC = Marine Energy Convertor, TEC = Tidal Energy Convertor, WEC = Wave Energy Convertor

	Environmental Issues
Birds	While it did not dominate discussion the potential impact on birds was the most consistently raised issue across the four breakout groups. Specifically: *Displacement* – repeatedly noted as an issue for both wave and tide. Pointed out that it has been established that some birds actively avoid vessels. This may have implications for support vessels, maintenance etc. Unclear if any displacement will be temporary birds may become familiar with activity and devices. *Collisions and diving birds* – particularly relevant in the case of tidal energy where there may be a higher risk of collision as well as displacement *Attraction* – noted that birds may be attracted to wave or tidal devices if they attract fish. Surface piercing devices may also provide roosting opportunities for birds. Both points could have positive or negative consequences. *Distribution* – need to establish favoured feeding areas. Noted that Marine Scotland is funding work in this area. Need to understand persistence of birds in different areas. Baseline survey required which will allow us to see what birds are coincident with device locations. *Near shore/far shore:* impacts will be significantly different depending how far offshore devices are (WECs) *Habitat loss* – direct loss of habitat also indirect through change in hydrodynamics.
Sea mammals	*Noise* – noted that cetaceans may be impacted by noise. They may be either repelled or attracted to devices. Noise likely to be highly device specific. Several comments implied that tidal technology was likely to be noisier. Suggested that wave environment has higher background levels of noise. Noise from some devices may not even be detectable and in the long run impacts may diminish as animals become used to noise. *Collision* – several suggestions this will be a higher risk for tidal turbines *Entanglement* – perceived to be bigger risk with WECs because of more extensive moorings. Risks will be species specific. *Displacement* – possible effect but difficult to assess. *Barrier to movement* – noted that large arrays of devices and associated moorings may produce

	a physical barrier to cetaceans even if there is no actual collision or entanglement. *Acoustic scarers* - there is the possibility of using acoustic scares to prevent collisions. Noted that effectiveness not proven and they may actually attract some species. Baseline survey – need to understand what mammals are present before impacts can be assessed. *Otters* – asked if there are potential impacts
Fish and fisheries	*Fisheries impact* – could be significant and not well understood. Likely to be different for offshore and inshore fisheries; different gear (static mobile) and different target species. *Fish Attraction* – WECs and TECs may act as fish aggregation devices (note comments on artificial reefs). Unclear whether this will actually increase fish numbers or not. *Nursery areas* - if WECs are close to shore may have impact on fish nursery areas. *Creeling* - inshore creeling most likely to be directly affected by WEC TEC deployment particularly arrays. *Salmon*- potential disruption to salmon migration routes. *Collision risk* – the extent of the risk is unclear. *Noise* - may affect fish as well.
Benthos	Some (predominately developers) suggest that this is not a problem for PF as Marine Scotland revealed that the sea bed is 'scoured' and little is there. Regulator suggested that we have a reasonable idea what is there and its conservation status. *Sediment transport* - Redistribution of sediment may cause impacts. *Light attenuation* - loss of light may impact on marine algae (& sea grass) growth in turn impacting on nursery areas for fish etc.
Water column	Water column impacts noted but not specified.
Shoreline	*WECs - more* likely to impact on the shoreline. Potential for wave shadow particularly for arrays. Also redistribution of sediment.
Pollution	Higher pollution risk associated with WEC's hydraulic fluids. Need to consider antifoulants WEC and TECs
Coastal processes/ Hydrodynamics	*Erosion/Sedimentation* - TECs more likely to have impacts outside the immediate tidal resource (sandbanks etc). Others suggest WECs will have far field effects. *Energy Removal - it is the % of energy removed that is the issue. May be higher for TECs*
Positive effects	*Reef effects* – both wave and tide particularly anchoring. May be unintended consequence or potential to create or enhance reef effect through design. Noted (largely by developers) that full decommissioning would potentially remove this benefit. Noted that extent of reef benefits (particularly to fisheries) is far from clear.
Cumulative effects	Issue raised by many participants no consensus view on the issue other than it is important and needs to be examined further. Some suggested that combined effects of individual devices may be by synergistic others (developers) suggested that effects may simply be additive.
	Monitoring Challenges
Climate Change	The issue of differentiating MEC impacts from climate change induced change was repeatedly raised in relation to birds, fish, shore line ecology and generally.
Remote techniques	Repeatedly noted that in many cases the remote and automated techniques necessary for monitoring MEC effects do not exist. Observation is costly and not always possible for offshore situations or long term monitoring. Accessibility to offshore site is a major limitation on monitoring. Even with remote techniques such as video or sonar there needs to be an automated element. It is not practicable to analyse hours of sonar or video. This is an important area of R&D itself. *Funding* - noted by (developers and NGO) that government funding is required to develop monitoring techniques.
Collision	Techniques must be developed to monitor collisions. These need to be automated.

monitoring	Will be difficult to measure mortality/injury rates from collisions. Carcass collection has been adopted approach at Strangford Lough. However this will be very difficult in Pentland Firth.
Noise	It is important that noise levels are assessed relative to background levels. Noise monitoring: (i) background before, (ii) installation (pilling etc), (iii) post development (array).
Observation	This will be easier for near shore devices. Perception that most WECs will be further offshore and hence harder to monitor.
Scaling up	Difficult to scale up observations from device to arrays/cumulative.
Other	
Relative Impact	*WEC/TEC*- Several commented that tidal likely to have the largest environmental impact. Some believe that wave impacts will be undetectable. Wave devices perceived to be moving more slowly. *Other activities* – repeatedly noted that other activities almost certainly having a larger impact (e.g. fishing and shipping) but not being forced to undertake same level, or indeed any, monitoring.

3. Wave & Tidal Energy in the Pentland Firth: What are the issues that should be measured? (Generic Issues)

A surprising feature of sessions 1 & 2 was how little time the breakout groups spent discussing specific ecological impacts and monitoring requirements associated with these. A significantly larger proportion of time was spent considering generic issues. These more generic issues included: the distinction between baseline and ongoing monitoring; the role of monitoring in the consent process and the pros and cons of strategies like 'deploy and monitor'. The following table gives a summary of the main threads of discussion.

Risk and uncertainties	*Risk based evidence* – Developers, NGOs and regulators noted the need for monitoring based on an assessment of "*real risk, based on evidence*". As a starting point this may look at what species are coincident with devices. The need to identify risks and then rank or otherwise assess the significance of risks was repeatedly noted. This process could help identify what to monitor. *Scoping* – a scoping process similar to an EIA could help identify the key issues *Scale of impacts* - what scale of impact would require monitoring effort? Two separate aspect

	of this issue were noted (1) what level of impact is of sufficient concern to warrant monitoring; (2) the monitoring techniques used must appropriate to the anticipated scale of impact. Noted that "*until we know what changes to look at we cannot develop monitoring protocols*" A better connection between baseline and ongoing monitoring could save money and reduce risks. *Acceptable change* - Developers raised the question "What level of change is acceptable?" Some believed that identifying the scale of change that is acceptable and hence to be assessed is necessary before baseline and ongoing monitoring protocols can be produced. *Attribution of environmental risk/impact* – repeatedly noted by developers that any additional environmental risk posed by MEC development is incremental to existing (and arguably more harmful) activities e.g. shipping and fishing. However these existing activities do not bear any burden of environmental monitoring.
Timescales / longevity and Scope monitoring	*Long term monitoring* - several participants commented (mainly regulators academic NGO) that long term monitoring is essential. Necessary to determine inter annual variability and to help identify and differentiate climate change induced effects from MEC induced effects. In many cases 'attributing change' rather than simply 'identifying change' may require a longer time series of data. It was noted that in the case of sea mammals decadal time series data required to detect population level impacts of MEC devices. *Extent of monitoring* – Two divergent views emerged from the discussions (i) monitoring programmes should be based on a risk based approach which identifies key issues. Producing a targeted approach to monitoring. (ii) Initial monitoring should be broad based. Efforts may in the future focus in on key impacts identified. That lack of background data in the marine environment makes detailed baseline monitoring more important. It will take time to understand what issues are important and which are not. Uncertainty about future impacts makes gathering a broad base of data important. Noted that development timetable may not accommodate the second approach. *Residual Uncertainties* –suggested that any long term monitoring should focus on residual uncertainties. *Buffer zones* – suggested that it is important to detect the gradient of change in effect moving away from the locus of development. There will not be a clear line between zones of effect and no effect. *Longevity of monitoring data* - there was some concern amongst developers about the *shelf life* of data and how long it remains relevant after being collected. Concern that money will be spent on monitoring that has little relevance to future development.
Deploy and Monitor	At some point all the groups discussed the pros and cons of *"deploy and monitor strategies".* Broadly speaking this was taken to mean deployment of devices and monitoring in parallel as opposed to a period (potentially multi-annual) of baseline monitoring preceding deployment. Three arguments were presented in support of this position: (i) 'deploy and monitor' will allow development to take place more quickly and on a well defined timetable essential for early progress.

	(ii) the only way to understand the effects of devices is to install them and observe outcomes. (iii) It may not be possible to define a baseline. The idea of a equilibrium baseline (without development) against which we can measure change is illusory because : (a) baseline conditions are probably in a constant state of fluctuation; (b) the marine environment is already highly modified by other pressures which are constantly changing (e.g. fishing); and (c) climate change induced effects makes the notion of baseline redundant. Beyond this however there was little detailed discussion about how 'deploy and monitor' strategies would be implemented. The issue of 'what to monitor' or 'how to interpret' monitoring data, in the absence of a baseline, was not discussed in detail. It was pointed out that it may be difficult to reconcile 'deploy and monitor' with certain environmental legislation. Habitats directive suggests that developers must prove no harm prior to deployment. It is also an offence to harm a cetacean - '*is government prepared to take the risk'*.
Purpose of monitoring	*Purpose*- point made that there is a distinction between collecting data for consent, longer term monitoring of effects and for research. Concerns were raised (mainly by developers) that we must not "*collect data for data's sake*" and the data collection should be linked to identifiable risks. There was general lack of clarity about the distinction between (i) data gathering for consent, (ii) baseline and (iii) long term monitoring. Strong view from developer that we should be monitoring to meet legal requirements and 'get devices in the water' Fear that levels of monitoring/research required may be unreasonable. Fear of free loading research on the back of developer consent requirements. Suspicion that marine energy development is seen as an opportunity to collect data (and pay for data collection) which is motivated by other objectives (research, conservation). *Expectation management* - not all actors have same expectations in terms of timescale, protocols, locations and scale of requirements.
Guidance	*Lack of guidance* - Developers repeatedly mentioned a lack of guidance regarding monitoring requirements. They suggest that lack of clarity about the extent, duration and timing of environmental work makes it difficult to budget projects. It also has major implications for project timetables, particularly if deployment (and survey work) can only happen in the summer. *Post consent* – developer argued the lack of clarity of post consent monitoring is particularly worrying "*everything could be asked to be done*" *Consultants* - One developer noted that it is difficult to find the right consultants in the absence of clear guidance on monitoring.
Definitions	*Definitions* - The discussion highlighted a lack of shared understanding about terminology – e.g. survey, monitoring, and baseline. Typical comments include "*what is difference between survey work and monitoring*" and "*need to define monitoring*" were repeated. Lack of clarity about what baseline data required and how this relates to monitoring requirements. *Consultants* – need to understand legislative requirements (regulator comment). Implicit

	assumption that consultants know what is required (developer comment).
Positive effects	*Mitigation* – some discussion about whether positive effects could be seen as mitigation for any impacts *Decommissioning* – positive effects may be lost upon decommissioning
Cumulative effects	Cumulative effects and their assessment was repeatedly raised. Little detail in the comments however the following themes emerged: *Synergistic effects* - the cumulative effects may be greater than the sum of individual impacts *Data requirements* - suggested that the prediction of cumulative impacts is a justification for a high level of monitoring on the first devices that are placed in the water even if the environmental impact of single devices is likely to be low. [This point raised additional questions about individual developer responsibility for monitoring wider effects, see next section of these notes]. *Identifying individual device impacts* - noted that if a given area is populated with a range of different MEC technologies and a cumulative effect is observed, then it will be difficult to determine the specific effects of different devices.
Priorities	Suggested that the current monitoring agenda, and expenditure, is largely being driven by "*who shouts loudest*" rather than an objective assessment of where risks actually lie. This explains the current focus on birds and mammals with little emphasis on shoreline impacts, fisheries, coastal processes etc which may turn out to be bigger issues in the long run.

4. Environmental monitoring who should do it? How should we collate and disseminate data?

The third session of the day considered where responsibilities for environmental monitoring lie and how data might be shared and managed. Comments relevant to this issue but raised in sessions 1 and 2 have been recorded here. Unlike the previous two sessions the discussion in each of the breakout groups remained focussed on the given task. The bulk of the discussion in this session centred on the division of responsibility how this changes when moving from near field to far field (and cumulative) effects. A second focus of conversation was the difficulty in balancing the benefits of data sharing with issues of commercial confidentiality.

Division of responsibility for monitoring	Generally (but not exclusively) held view that government should be responsible for long term/baseline strategic monitoring. Suggested that Government should be responsible for setting the monitoring agenda and collecting long term data and data concerning far field and cumulative effects. However government led public/private partnerships (perhaps on a regional basis) may take on responsibility for some of this activity. Generally agreed that data collection which forms part of the consenting process is the responsibility of the developer. Though (some developers suggested that) financial help

	for this activity may benefit the wider community. There was a division of opinion about ongoing/post consent monitoring. Noted that in the case of onshore wind post consent monitoring is paid for by the developer and suggested that (by regulators/NGOs) that marine energy developers should take some responsibility for this and that this may reasonably be part of the consent requirements. In Denmark the monitoring agenda is established by regulator, developer, and stakeholder agreement. Discussion centred around three types of activity: (1) strategic monitoring (baseline and cumulative effects); (2) consent driven survey; and (3) development specific ongoing survey. It was noted that there is potential overlap between these activities and the dividing line between each activity is not clear.
Existing data	Noted by a number of participants that a great deal of effort is already being put into gathering baseline data in particular: DEFRA, Marine Scotland and the Crown Estate. Noted that information gathered by COWRIE may also be relevant.
Data Sharing	There was a widely held view that there are advantages to data sharing, in particular (i) Avoiding repetition of survey work cuts costs and speeds up the development process. (ii) Sharing data and experience avoids repetition of same mistakes e.g. inappropriate sites, failed monitoring techniques; or even environmental impacts. (iii) Data sharing may be essential for the assessment of cumulative effects; (iv) Data sharing stimulates wider research and development advantageous to the sector as a whole. *Commercial pressure* - while advantages of data sharing were recognised, developers point out that they are in competition and that it is difficult to release data which may help a competitor. Also perceived as unfair for developers to bear the cost of initial data gathering if this is given away free of charge to future developers. *Non cooperation* – there is a perception that developers do not share data. Despite the benefits of collaboration it is unlikely that developers will share or otherwise pool data without some regulator/government encouragement or incentive to do so (at least until consenting process is over). *Lease/consent condition* – the release of data could be made a condition of consent/lease. Could be a condition of grant funding that any data collected is made public. *Monitoring Protocols* - a number of participants noted the importance of developing standard monitoring protocols as this is the only way to ensure that data collected by different surveys is comparable. A lack of common protocols would result in "*Methodology Chaos*" Even if there was a willingness or requirement o share data it would serve little purpose without standard methods. The development and promulgation of protocols was generally seen as a responsibility of government or some other central authority. *Data Management* - The management of publically available or shared information is a key issue. Some "centralising body" required to collect hold, manage and distribute data. Several options were identified : (i) Government (Marine Scotland) or regulator(e.g. SNH)

	(ii) Regional Marine Spatial Planning bodies (iii) Crown Estate (iv) Private/Private collaboration – effectively a club where developers share information but no wider public access. (v) Public/Private sector collaboration. Oil industry example of UKOOA noted as a potential model as was Cowrie and Irish Sea Offshore Wind Group. Offshore wind sector in Denmark operates public/private collaboration to prioritize and fund monitoring as well as share data. Such a collaboration could be pan Scottish or alternatively area specific (e.g. Pentland Firth and Orkney Waters) *Access to data* - Questions were raised about the access to data, will it be freely available or limited to members of "the club". Noted that Cowrie operates two levels of access to data one for the general public and one for members.
Funding and management	*Government*: general agreement that baseline monitoring in this pre-development stage. Some debate about ongoing monitoring and the potential for developer or crown estate contribution to this activity as they will profit from development in the long run. *Developer*: generally accepted that developer has responsibility for funding consent related monitoring. *Public private collaboration*: it was noted that post development monitoring in Denmark is financed through a combination of public service obligation and developer funding. *Pooling effort*: suggested that developers could pool effort perhaps co-fund monitoring activity or reduce costs by purchasing and sharing monitoring equipment. There is potential to do this as part of a regional 'club'. *Payback* - Suggested that if developers donate data that they have paid for there could be some sort of payback – e.g. tax break, reduced lease costs, access to other data free of charge. *Methodologies/protocols* - generally recognised that the development of standard methodologies and protocols was essential and this activity needs to be coordinated and funded by government or some other central authority.

5. Summary and Conclusions.

In many respects the list of specific issues raised was unsurprising. Potential impacts on birds and cetaceans were the main topic of conversation however other issues were raised (e.g. fisheries benthos etc). There was some interesting discussion concerning the practicalities of monitoring these effects. It was noted by a number of individuals that the development of remote and automated sensing techniques is something of a priority. Monitoring based on human observation would not always be possible or practical. It was suggested that research and development into remote and automated sensing should be a priority for funding.

Relatively more time was spent discussing generic issues to do with monitoring rather than specific environmental impacts. Key features of this discussion include:

- There is a lack of any shared understanding of terminology, and understanding of the distinction between and purpose of different types of monitoring e.g. baseline, monitoring for consent and post development monitoring.
- There is a clear perception amongst developers that there is insufficient guidance available on monitoring requirements. It was repeatedly claimed that this lack of clarity creates problems for budgeting and timetabling projects.
- Considerable debate around the scale of baseline monitoring required. Two prevailing views
  (i) baseline monitoring should be targeted based on a risk based assessment of probable impacts
  (ii) initial baseline monitoring should be as broad as possible. Later monitoring may be more focussed when issues emerge.
- The concept of "Deploy and Monitor" was widely discussed. Perceived by some that this would let development happen at an appropriate pace without having to wait on baseline assessment. However no clear views about how to decide what to monitor or how to assess information in absence of a baseline.
- Some concerns expressed about the purpose of monitoring. Concerns that data may be being collected for its own sake rather than focusing on what is required to let development go ahead.
- Concerns aired about differentiating effects of MEC deployment from other impacts and also climate change.
- Cumulative impacts noted as a particular concern.

The final session of the day concerned the division of responsibility for environmental monitoring and the possibility of data sharing. The key points raised were as follows:

- There was general agreement that the developer should have responsibility for consent related monitoring and that government should have responsibility for broad scale assessment of baseline and long term monitoring programmes. There was less clarity about post consent monitoring. However it was noted that onshore wind developers can have significant post development monitoring responsibilities.

- It was noted that a great deal of effort is already being put in by public bodies to acquire baseline data.
- It was pointed out that many existing users of the sea are having a significant impact on the environment but they are not burdened with monitoring obligations.
- There was a focussed discussion on the benefits of data sharing and public access to data. The potential benefits of data sharing were recognised by most participants. However the fact that developers are in competition can make data sharing difficult.
- General consensus that data sharing would not happen unless it was facilitated by (or a requirement of) government or some other central authority.
- Noted that there are other examples in other industries (oil and gas) and sectors (offshore wind Cowrie, Denmark, Irish Sea) where information is shared.
- Agreed protocols and standard methodologies for monitoring are a prerequisite to data sharing and this is probably the responsibility of government.
- Possible incentives to encourage data sharing were discussed.
- Regarding funding it was generally agreed that broad scale baseline monitoring should be funded by government and consent related monitoring is the responsibility of developers. Regarding post development monitoring, various options were noted including developer government partnerships.