Ocean Energy Forum – 2nd meeting

11th June 2014

The Gibson Hotel, Dublin

Note: All presentations made available by speakers are on the Ocean Energy Forum website:

Please follow this link to download the files.

Welcome remarks

Paul Verhoef (Head of Unit – New and Renewable Energy Sources, DG RTD, European Commission) welcomed participants to the second meeting of the Ocean Energy Forum and looked forward to a productive working day. He indicated that this Forum was an initiative across several Commission Directorates following the Communication on 'Blue Energy'. There is currently a lot of political attention on ocean energy as one way to help to diversify the energy generation base and improve energy security in Europe. Member State governments, research and industry should determine what the priorities are and how we should move forward. This Forum and this meeting is dedicated to that aim, seeking to identify priorities and then turning them into opportunities. The intention is that the steering groups announced today will develop clear work plans that can be endorsed at a Ministerial Meeting planned for October 2014. The proposals developed should therefore be clear, practical and realistic.

Dr. Brian Motherway (CEO of Sustainable Energy Authority Ireland) welcomed everyone to Dublin. He said that Ireland sees themselves very much as part of the international community for ocean energy. The timing is fortuitous, as the Irish Government has politically committed itself to 'Harnessing Our Ocean Wealth' with a policy focus on developing infrastructure, as well as a network of test sites at different scales. Other key elements include supply chain development, policy development and of course human capacity development for companies and people. There is a need to consider time scales, as ocean energy takes a long time, but this contrasts. It is often difficult for policy makers and the financial sector to reconcile the time scales discussed for Ocean Energy development compared with many other sectors and policy areas. However there is a strong spirit of international cooperation and Ireland wants to be very much part of this.

Introductory Session

Sian George (CEO of Ocean Energy Europe) presented the outputs of SI Ocean Energy project & market deployment strategy. SI Ocean Energy ran for the last two years as a pre-cursor to developing a technology platform for the wave and tidal sector. Final recommendations were presented yesterday at the SI Ocean Energy final meeting.

Ms George explained why new renewables should be supported: developing a new industry for Europe, climate change and energy security. So far 10GWh has been generated from prototypes deployed so far and €700m invested to date. The objective is for Ocean Energy to be a mainstream technology with 100GWh capacity by 2050. This requires a coherent road map to reduce costs and seek substantially increased investment to support continued innovation and a scale up into arrays.

The Commission's 'Blue Energy' Communication proposed a two step plan with the Ocean Energy Forum running from 2014-2016 to deliver a road map followed by a European industrial initiative for Ocean Energy.

3 work streams are proposed for the Ocean Energy Forum:

- **Technology,** which doubles up with the Technology Platform (TP) Ocean;
- **Environment and Consents** to share best practice roll out one-stop shops and advocate broad engagement.
- **Finance** to clarify and seek flexibility on State Aid checks and continue to push those with technology-readiness levels (TRL1-8) as well as encouraging early investment in innovation along the supply chain.

A cross-cutting theme is grid infrastructure: the groups need to explore innovative ways to reduce prohibitive delays.

Petra Sarapatkova, (DG MARE, European Commission) introduced the permanent chairs of the 3 Work Stream steering groups (Technology, Finance, Environment & Consenting), which each include approximately 15 Steering Group members, as well as other participants. The main goal of the day is to develop a work plan from each work stream with key issues and appointed responsibilities amongst the groups. A ministerial meeting will take place in Paris on 1-2 October 2014 where the commission is hoping to present the work plans for endorsement and to allow buy in from Member States.

Remi Gruet (Ocean Energy Europe) gave a recap of the presentations and discussions at the first OEF meeting in Brussels (Technology to be chaired by **Fiona Buckley of GDF Suez**). The inadequate infrastructure (including grid) and technology warranty is important. Some topics related to deployment and some to the devices themselves: corrosion, cabling etc. We cannot look at Ocean Energy in isolation; it is part of an integrated system. There have been a lot of Horizon 2020 submissions, but there is a need for collaboration between these research partners.

Rob Hastings (The Crown Estate, Chair of the Finance work stream,) stated finance is critical to the success of the sector as a whole. There is a need to understand the relationships between development, asset management and financing as well as managing expectations as dividends will not be forthcoming until the sector is financially self-sustaining. The cost of putting large arrays in the water is a huge challenge, but will provide investment opportunities that are sustainable and clean, with long-term hedged returns. The goal is to finance 10 pilot projects, thus triggering early investment in the supply chain.

Phil Gilmour (Marine Scotland, Chair of the Environment and Consenting work stream) highlighted that the group brings together a wealth of experience on challenges and lessons learnt to date. The process of gaining consent can be lengthy, expensive and unpredictable. But there are opportunities for introducing efficiencies, robustness and greater certainty. There is also limited experience with few, single devices in the water, although arrays should be deployed in the near future. There is a great deal of research, and we need to ensure that this is shared and coordinated.

Break-out Sessions

Work stream 1: Technology

Chair of the group, Fiona Buckley (GDF Suez), introduced the Work Stream steering group. FB Introduced co-chairs (**Ken Street, Alstrom** and **Kai Kolmel, Siemens**) and the general secretary of the Technical Platform on Ocean Energy, **Remi Gruet (RG) of Ocean Energy Europe.**

RG provided the background to the Technical Platform on Ocean Energy, TP Ocean. This permanent group has grown to over 110 members. It consists of a steering group, OEE as secretariat, and an advisory board (organisations or companies not directly involved in sector but with relevant experience – e.g. wind developers, shipping, regional development agencies, etc.). Below this would be 3 or so working groups reporting to the steering group. The funders of the technology platform were thanked for enabling progress in 2014 before Horizon 2020 funding is made available.

Dr. Bjoern Elsaesser of Queen's University Belfast (BE) gave a presentation on 'Developing Ocean Energy Technology', which included a brief history of renewable energy technology development and showed Ocean Energy is at an early stage in a similar way to wind in the 1980's. However wave and tidal is not a backyard business as €10-50million is required to get prototypes into the water. A developer needs to address a lot of different areas (finance, technology, O&M and environment). The number of people and companies involved is small compared to the tasks ahead. So there is also a need for more experienced professionals as the sector is competing with the Oil & Gas and wind sectors for engineers. Engagement with other maritime skills are needed such as naval architects, O&G sector, general power generation, smart components (e.g. aerospace), power control (e.g. automotive industry), economy of scale (e.g. wind). A stronger supplier backbone is needed that can provide components, resulting in more sub-sectors rather than one company trying to produce everything. How to get there requires:

- Tackling the skill shortage (dedicated degrees, post grad training, etc.) needs a push from the industry
- Provide access to testing facilities (of all types, not just open water sites for full deployment)
- Develop closer links between research and industry (e.g. FP7 Marinet involvement, the close links between Queens University and Aquamarine Power and foster open-access research, not just under non-disclosure agreements)
- Providing a longer term vision for ocean energy sector with a clear funding strategy (focusing on the devices that have potential for scalability), facilitate development and selection, the political will to develop this sector.

Gareth Davis (Aquatera, Orkney) suggested that the transfer of technology from the wind sector had often failed. Practical sea experience needs to be engaged with (e.g. fishermen, divers, etc.) that know first-hand about how the technology is performing rather than just engineers.

All those present in the work stream introduced themselves and proposed topic areas for the technology group to consider. The steering group then determined topics to be taken forward and presented these to the wider group. A key topic that was common to all work streams was **Standardisation**: agreeing a common methodology for setting Technology Readiness Levels (TRL) including the testing of devices and the use of common metrics. There was also discussion around grid issues as a cross-cutting theme. There should also be a link between working group and the overall steering group.

The topics were then allocated to the four working groups as follows (with some potentially addressed across more than one working group):

1. **Measurements & Data** (modelling, resource assessment, standards, data sharing)

[chair Bjoern Elsaesser , Queen's University and co-chair Ed Mackay, DNV]

Main issues raised were: the unknown interactions within arrays, the standardisation of models to enable comparison and the potential for a data-sharing platform.

2. **Logistics** (including access, installation operations & maintenance, mooring and foundations)

[chair Christophe Cognard, DCNS and co-chair Gareth Davis, Aquatera]

Main issues raised were the need for a risk assessment/opportunity assessment process to identify and learn from previous experiences and the development of mooring and foundation components including for floating devices.

3. **Prime Movers/Devices** (including materials, structural integrity, efficiency)

[chair Andrew Scott, Pelamis and co-chair Peter Frankel, Franakel-Wright]

Main issues raised were: improving reliability of devices and a more holistic approach to cost assessment was advocated involving structural assessment and performance. Meeting the grid requirements and how to move from peak power to continuous supply were also raised.

4. **Components and sub-systems** (PTO, array, connectors, electricals, performance and control system)

[Andrew McDonald ORE Catapult, co-chair Mikael Sidenmark, Ocean Harvesting Technologies]

Main issues raised were: Exploring how to make the most of existing technologies from other sectors and innovative materials so that performance and reliability is improved. Multiple connectors for arrays and establishing selection processes for early technologies are needed.

It was suggested that prioritising the topics be given as a task to the working groups as there could be a number of criteria to consider. Common metrics could be determined across the working groups as had been developed for SI Ocean. A number of useful background documents were identified. The TP Wind research agenda could be a good model for Ocean Energy to adopt. The outputs from SI Ocean such as the STA are also useful.

Participants were reminded that the OEF is established for 2 years to deliver a road map for the industry initiative in 2016. The main objective of the platform is to get a research agenda developed – a strategic research agenda is the intended end result.

A next meeting of the group was proposed for early September (see TP Ocean Energy website to subscribe to the TP) to assign people to each of the working groups. An approach to prioritising the issues proposed will be circulated. The group favoured the use online tools to help the work progress in between meetings. OEE will discuss the options for this with the Commission.

Work stream 2: Finance

Rob Hastings (**the Crown Estate,** UK & Chair of the finance work stream) opened discussions by stating that accessing adequate and appropriate finance was the key constraint to be addressed by the sector. He gave a recap of the work done to date and asked the steering group members to introduce themselves.

Martin Simpson (the Crown Estate, UK) ran through an 'Opportunity Framing' process that would assist in developing a route map. The group considered the following four elements related to finance:

Givens	Decision needs
• Most MRE very early, so uncertainties over risk and finance. • Drivers include prioritization by EU in renewables, need for pipeline projects, roll out by 2020, 100 GW is possible with right support. • Industry has over-promised and under-performed in the past –, lack of common understanding, but possibly due to the nature of finance available to the industry. • Political risk aspects over rising costs. Issue is lack of support for 2030 renewables target. • Will need to work towards competitive technology, with all forms of energy, esp. for heating. • a need for collaboration.	• Need for public and private funding • Make case for investment e.g., for utilities, how it is structured, crowd funding models, consortia structure. • Needs to be different structures for waves and tidal investments • Need to be local links e.g., benefits, jobs, etc. to engage local communities / supply chains. • Uncertainties around cost, so need completed arrays and possible cost-reduction / risk mitigation • Need to reduce insurance costs and risk
Opportunities	**Threats**
• Need for clear standards, best practice and capitalizing on existing facilities. • Many additional benefits e.g., jobs, lower electricity costs • Let's not reinvent the wheel – tools are similar to previous emerging industries. • Technology gains and IRR increases. • Learning from carbon capture • Collaborative investment from 'super fund', consortia approaches, other cooperative approaches etc. • Crowd funding, great opportunities, but needs further consideration, esp. over suitability for different scales of investment	• Crowd funding might not suit all opportunities, esp. loss of public confidence from early failures. • State aid and grant conditionality – finance must fit the project, not vice versa. • Technical risks: failures impact insurance, 3rd party verification needed, etc. • Competition and costs (from other renewables, inc. shale and nuclear) and from other areas e.g., Canada which might be a threat. • Threat of competition between EU Member States limits the market. Need to be pan-European and capitalise on MS strengths • Social acceptance – early popularity may be lost if poor decisions are made now

Antoine Rabin (**Indicta, France)** gave a presentation on **'Marine Renewable Energies - Innovative and alternative sources of funding for ocean energy'.** He showed a number of elements relating conventional financing of marine renewable energy (MRE), a number of innovations in this area, as well as upstream models such as crowd funding which is already used to fund wind farms. He suggested there is a need to develop incentives for regions and countries via preferential tariffs and the investment in test sites. Individual investors can also be incentivised with for example lower energy costs.

Funding large-scale MRE will require specialised banks (now 15 banks covering 80% of CAPEX), but who require a positive IRR comparable to other energy projects, renewable or otherwise. A second financial factor to address is the unit cost of energy production, currently 170 to 350 €/MWh today, moving towards a target cost range of between 100 to 120 €/MWh by around 2030 (except OTEC). MRE must be competitive with existing energy production processes. This will require a huge amount of innovation to ensure economics of scale through the supply chain can be met. It is likely

that a relatively low 12% rate of return will be needed to attract public finds. The use of public banks for CAPEX funding could lower the IRR rate (if a 6% IRR will reduce CAPEX costs by 21%).

Following the presentation there was an open discussion on the subject of MRE financing. Key comments included:

- To get to commercial scale, need to have multiple devices in the water operating reliably
- There are numerous options for power conversion, which significantly impact costs.
- Equipment reliability under different site conditions is key to supporting investor confidence
- MRE consortia that allow differing returns to partners will overcome many conventional consortia issues, thus allowing utilities to invest alongside public bodies and private companies.
- MRE needs to be cost-competitive and financially self-sustaining in the long-term.
- Funding must fit projects, not *vice versa*.
- Need to consider reducing risk and the cost of insurance as the technology develops.
- Need to demonstrate best practise, standardised and streamlined approaches refined by evaluation.

The group broadly agreed the following opportunity statement: 'The opportunity exists for 100 GW of Ocean Energy technology to be deployed by 2050 to support the achievement of EU policy objectives of reducing greenhouse gas emissions. This will be achieved through:

- EU supporting the launching of a European Industrial Initiative for Marine Energy
- Sustainable supply chain creation
- Value recognised by citizens / public support/offer to the public
- Security of energy supply
- Pre-2050 cost convergence reached after 10 GW capacity achieved
- Retaining EU leadership in innovation.

The working group then developed a series of 'value drivers', which were scored by votes from those present. For the top value driver, Quick delivery of the project, the group identified the main 'critical success factors' required as follows:

Value Driver	Critical success factor
Quick delivery of first project	Need for state intervention through grant funding at this initial stage (provides legitimacy) Adequacy of capital grant support Conflicting investment offers Technology robustness and novel investment risks Ability for SMEs to offer performance / output guarantees Long-term security of market and MS commitments Need to use established infrastructure where possible to reduce risk Favourable consenting environment

Work stream 3: Environment and Consenting

Chair **Phil Gilmour (Marine Scotland)** introduced the members of the work stream steering group.

Dr Anne Marie O'Hagan (HMRC, UCC, Ireland) gave a presentation on **Environmental and consenting challenges for ocean energy.** She highlighted that the process of consenting varies internationally and there is no standard process in place. Ocean energy development is only starting to appear and therefore it is not seen as a priority to invest in changing the consenting system specifically for ocean energy.

Governance systems have differing levels of power and scales of consent dependent on the type and size of developments e.g. test centres are often pre-consented such as EMEC in Orkney. Responsibilities are often split across principles such as electrical, environmental, land based etc, often with different leases for each. There is little formal coordination of decision makers and very few true 'one stop shops', although the Danish Energy Agency is one example. National targets can drive industry and its regulation forward. However common EU legislation across Member States is interpreted and implemented differently, which inhibits learning and does not allow like for like comparison.

A number of barriers to achieving consent exist including conflict between EU objectives such as commitments to renewable energy development and the requirement to comply with Birds and Habitats Directives. There are often no timelines set out for achieving consent, only those set out within the EIA Directive. This makes it very difficult to plan budgets; this increases regulatory risk for financial investors.

There are opportunities for improvement including a focus on integrated, inclusive planning. Allocated development zones are one possibility; this requires environmental information up front and would therefore be attractive to developers. In terms of legal aspects there is a new Maritime Spatial Planning Directive, which was agreed in April 2014 and is likely to enter into force in 2 years, and will make marine spatial planning a requirement.

There are many environmental directives that have to be complied with, but are interpreted differently. In general, Strategic Environmental Assessment (SEA) has been under utilized for the purpose of marine renewables, with UK and Ireland exceptions. SEA provides a good basis for environmental information and there is potential to use it more effectively. EIA requirements are based on offshore wind and are only beginning to focus on ocean energy. Methodologies for monitoring also vary greatly and it is unclear which methods are preferable. Opportunities exist to standardize good practice and feedback form all the data that has been collected to date.

The following topics for the work stream to take forward were identified:

Procedural aspects: Aiming to promote more efficient consenting with the following suggested:

- Review processes and provide a framework for best options
- Focus on high level principles
- Share lessons learnt
- To be developed by steering group and disseminated by the steering group
- Short term timeframe

It was agreed by the group that Dr. O'Hagan's presentation was a good starting point and online tools could be used to collate document, enable steering group comment and expansion.

Strategic solutions: Aiming to share research and monitoring data with the following features:

- European wide monitoring and data collection of appropriate receptors
- Sharing knowledge and data e.g. GP wind

Social aspects: Creating a public relations document highlighting the social aspects of ocean energy. The following points were made:

- Methodology for Social Impact Assessment currently underway by Edinburgh University
- Communicating social success of projects e.g. employment in Orkney
- Highlighting good practice and importance of job creation
- Highlight opportunities and transposing skills e.g. diversification for commercial fishermen
- Case studies of good practice that worked to overcome barriers e.g. communication & liaison with fishermen
- Audience is the public – public engagement regarding benefits of ocean energy

The above work stream outputs were presented to plenary for further comment.

Concluding remarks

Concluding remarks were made by **Paul Verhoef (DG RTD)** who appreciated that Ocean Energy is a vast area of work even if a comparatively small industry at present. He found that the three groups met on some questions and in the next phase there could be a discussion over what engineers want from financers and vice versa.

He reminded participants that they are not doing this for the Commission, but for the sector and asked for practical suggestions that can be addressed co-operatively. Brussels can help to facilitate this and so the Commission needs to see clear proposals presented under Horizon 2020. The OEF process should deliver a focused list of issues to be taken to the ministerial meeting in October. Ministers need to be convinced that OE should be on the agenda as it is one of many sectors trying to get attention and support. He stressed that 'Airbus-type solutions' – i.e. a European OE device – is not likely. A lot can be done by the sector itself and more can be done through co-operation. Issues are far from resolved and there is a lot of work to do within the steering groups and he hoped that the groups would continue the discussion started today. The Commission plans to organize another meeting of the full plenary before the middle of September to make sure the material is further developed prior to being put forward at ministerial level.

Dr. Brian Motherway CEO of SEAI closed the meeting and thanked attendees for their efforts. He suggested that politicians needed to see a road map to fully appreciate the potential of the Ocean Energy sector and establish the political will and funding within Member States. He applauded the OEF initiative and the work by the Commission in facilitating the co-operation and collaboration established today.

Close of meeting