MRIA Energy from Ireland's Waves and Tides

The Opportunity for Co-Operation and Collaboration between Ireland and Scotland in Ocean Energy

Discussion Paper

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Preface

Ireland, North and South, and Scotland are world leaders in the field of ocean energy and are endowed with substantial wave and tidal resources, excellent and growing Research and Development capacity and are home to many of the world's leading companies in this field. Historically, Scotland has been ahead of Ireland in developing ocean energy, principally because of the strong commitment of Scottish political leaders to winning a commanding position for Scotland in the industry. On the island of Ireland, Northern Ireland has made commendable progress in exploiting its tidal resource but the Republic of Ireland has been the laggard despite its world-beating wave resource and its significant R&D effort. The position is changing in the Republic with positive signs of Government support including a new Bill to transform the consenting system ('planning permission') offshore while the *Ocean Renewable Energy Development Plan* is imminent.

Despite the progress, ocean energy in both Ireland and Scotland faces formidable challenges: the *technology* has a distance to travel before it reaches commercial ubiquity; the *finance* required to commercialise the technology is substantial; and there are significant issues of market access, particularly in Scotland, because, for example, wave and tidal resources tend to be distant from major grid capacity.

This Paper was drawn up to examine the scope for the various parties – particularly the Republic of Ireland and Scotland but also Northern Ireland– to work together. It is based on the views of a wide range of interests, mostly in Government and Industry, who expressed remarkably similar views regardless of geographical location. The Paper ends with a series of recommendations and suggests that these might form a series of work streams for the *British Irish Council's* Marine Energy Committee.

Summary of Recommendations

The Marine Renewables Industry Association recommends, in summary, that:

1. Ireland and Scotland should co-operate and collaborate in ocean energy.

2. Northern Ireland should be a partner in this co-operation and collaboration.

3. The delivery mechanism, or at least the focal point, for this joint effort should be the *British Irish Council*- Marine Energy Committee which is an established Inter-Governmental body on which all of the relevant actors are represented (with the exception of industry).

4. The *British Irish Council*- Marine Energy Committee should establish working groups to review and plan the joint effort in detail - engagement of industry representatives in this work would be highly desirable.

5. A joint competition be established with a prize fund for *joint* project proposals.

6. A practical starting point for co-operation, and one with potential for 'quick wins', would be joint projects in R&D.

7. The *British-Irish Council* work with the ESB to identify ways in which the WestWave project might become a jointly supported effort.

8. A group be established which involves both statutory and voluntary bodies to examine the need and scope for joint work in the environmental field.

9. Provision be made in the Anglo-Irish *Inter-Governmental Agreement* on electricity exports for a modest quantum of the capacity involved to be earmarked for ocean energy. The Agreement might be a source (e.g. through a levy) to finance the prize fund referred to at 5.

10. All senior Irish public servants engaged in ocean energy be required to undertake a short study tour of appropriate Scottish institutions and that a reciprocal opportunity be arranged for Scottish public servants to tour Irish facilities.

11. The key development agencies, Enterprise Ireland/IDA Ireland, InvestNI and Scottish Enterprise be mandated to work together to produce a joint supply chain development plan.

12. Industry representatives to be appointed to the *British Irish Council*- Marine Energy Committee to contribute advice on the implementation of these proposals.

Contents

1. Marine Renewables Industry Association

The Marine Renewables Industry Association (MRIA) represents the principal interests on the island of Ireland engaged in the wave and tidal sector of marine renewables energy, also known as ocean energy[1]. The Association includes firms engaged in device development and manufacture, utilities and site developers, professional firms and consultants, R & D businesses and academic researchers. The Association is an all-island body. For further details, please go to the Association's web page, www.mria.ie . You may follow MRIA on Twitter at @*Marineireland*.

2. Ocean Energy Impact

2.1 Potential Economic Impact of Ocean Energy

The Republic of Ireland is in the midst of an economic depression with consequent loss of employment and income…and a similar situation applies in Northern Ireland while Scotland too has suffered under the Great Recession. Ocean energy has the potential to make a significant employment and wealth creation impact over time. A study commissioned by the relevant State agencies on the island of Ireland, Sustainable Energy Authority of Ireland and Invest Northern Ireland, on the potential economic impact of ocean energy[2] states that:

There is currently sound quantitative evidence that by 2030 a fully developed island of Ireland OE sector providing a home market and feeding a global market for Renewable Energy could produce a total Net Present Value (NPV) of around €9billion and many thousands of jobs ....It is possible that an island of Ireland wave energy industry meeting the 500MW 2020 target could produce at least 1,431 additional FTE jobs and an NPV of €0.25bn, increasing to 17,000-52,000 jobs and an NPV of around €4-10bn by 2030.....Similarly a tidal industry providing 200MW of capacity by 2020 may deliver around 600 FTE jobs and an NPV of €111m, increasing to 8,500-17,000 jobs and an NPV of between 41.5-2.75bn by 2030 -SQW Executive Summary

Side by side with this outlook for Ireland, the priority given by Scotland's political leadership to ocean energy reflects their positive view of its

[1] Wave + tidal energy = ocean energy (+ offshore wind) = marine renewables or marine energy

[2] *Economic Study for Ocean Energy Development in Ireland* SQW, 2010

potential economic impact which is particularly important as Scotland's offshore resources are gradually winding down with a consequent effect on jobs (c120, 000 people work in the Scottish offshore oil and gas industry).

The technology challenges faced by ocean energy, particularly in the wave field, make the achievement of the 'SQW' projections to 2020 unlikely at this stage. Nonetheless, the possibilities they represent remain valid, albeit over a longer time-scale, because, for example, in the view of the EU Ocean Energy Association:

'As a fledgling industry, the European ocean energy sector is making positive progress. Several European utilities and engineering giants from Europe, the US, Japan and Korea have all invested in SMEs, testing programmes and early project development in Europe. This clearly points to growing confidence in the viability of these technologies[3]*.'*

The opportunity in ocean energy in Ireland and in Scotland has at least two possible dimensions- ENTERPRISE and ELECTRICITY 'EXPORT'. There will be scope for local electricity supply in the medium/long terms (see also: MRIA's *Response to Public Consultation on draft Ocean Renewable Energy Development Plan* at www.mria.ie) in Ireland. Wave and tidal are expected to contribute to Scotland's aim of 100% 'electricity demand equivalent' from renewables by 2020….and to 'exports' to the rest of the UK.

2.2 Enterprise

The ENTERPRISE element ranges from research and development and device manufacture to operations and maintenance, finance and legal support. This '*supply chain'* in Ireland and Scotland has an immediate opportunity in wind-based energy, particularly offshore 'wind', in the UK which is now a major industry. The planned *Inter Governmental Agreement* on energy between Ireland and the UK will enhance that opportunity in Ireland in due course. Wind energy is enabling companies in both countries to grow their experience and their skills, enabling a number of them to capitalise on the future wave and tidal opportunity.

Scotland is on course to becoming a major base (the impressive *European Marine Energy Centre-EMEC*- in Orkney accounts for c250 jobs in an industry that is only at the test stage!) for the supply of ocean energy equipment and services world-wide. The Republic of Ireland could do well,

[3] *Industry Vision Paper 2013* European Ocean Energy Association, 2013

provided that the industry gets appropriate Government support (see *The Supply Chain for the Ocean Energy Industry in Ireland – Discussion Paper* at www.mria.ie). Northern Ireland is exploiting its resource in a structured fashion.

2.3 Exporting Electricity

All of the stakeholders in ocean energy accept that the enormous scale of the Irish and the Scottish resources in wave (together with a lesser resource in tidal) represents a potentially huge opportunity for ELECTRICITY 'EXPORT' (either internationally or within the UK, in the case of Scotland and Northern Ireland) via grid interconnectors. This is based on the likely emergence of an EU energy market and a Euro grid; potential export demand in the southern England in particular; the development of ocean energy technology and other factors. Moreover, large scale deployment of ocean energy devices will drive the cost of ocean energy down as 'economies of scale' and the 'learning curve' effect kick in.

3. Background and Terms of Reference

3.1 Background

This paper is the fourth in a series of studies into long-term development issues in ocean energy undertaken by the MRIA.

The first of these dealt with the third-level education needs[4] of ocean energy and has led directly to the generation of a Master's degree in engineering focused on ocean energy which is being executed jointly by a number of institutions (led by University College Cork) in both Ireland and Northern Ireland. The new degree commenced in academic year 2013/14. The inter-college task force established to develop this project was led by the Association.

The second study reviewed research and development in ocean energy in Ireland[5] and was published in September 2012. It arrived at a series of five research priorities in ocean energy both for the research community and, also, for those engaged in the allocation of research resources.

[4] *Third-Level Education Needs of the Ocean Energy Industry – to maximise the job and income potential of Ireland's ocean energy resource* MRIA August 2011

[5] *Research and Development and Ocean Energy- A Review of Research and Development in Ocean Energy in Ireland* MRIA September 2012

The third study examined the supply chain for ocean energy[6] in Ireland and was published in June 2013.

3.2 Terms of Reference

Ireland and Scotland face a number of common challenges in ocean energy including:

- *Technology*: tidal technology is making progress towards commercial status while wave technology is still on an upward slope and full commercial deployment at scale is unlikely much before 2020. R and D is, and will continue to be, a key requirement in both fields.

- *Funding*: the ocean energy industry in all its aspects is 'cash consuming' at this stage of its development and this is putting significant strain on resources, both public and private, in both countries.

- *Market Access*: both *physically* (wave and tidal resources are concentrated away from major markets; grid including interconnectors is an issue) and in terms of *commercial viability* (costs compared, in early years, to alternative sources of energy; tariff support needs) is an issue both in Ireland and Scotland.

Co-operation and collaboration between Ireland and Scotland might represent one useful pathway for these and related issues, under the umbrella of the *British Irish Council*-Marine Energy Committee. The British Irish Council was established as part of the multi-party agreement reached in Belfast on 10 April 1998. The membership comprises representatives from the Irish Government; UK Government; Scottish Government; Northern Ireland Executive; Welsh Government; Isle of Man Government; Government of Jersey and Government of Guernsey.[7]

'The study will identify areas for co-operation between the two countries and involve 1. A review of the policy landscape in both Ireland and Scotland; 2. Seek out the views of key stakeholders…., 3. Set out proposals for future co-operation and initiatives'[8]

[6] *The Supply Chain for the Ocean Energy Industry in Ireland – Discussion Paper* MRIA June 2013
[7] See www.britIshirishcouncil.org
[8] Extract from MRIA submission to SEAI

Views were gathered by interviews in Ireland and in Scotland during the summer and autumn of 2013. The support of the *Sustainable Energy Authority of Ireland* for this project is gratefully acknowledged.

In the light of SEAI support, this paper was written with a Republic of Ireland slant to it. However, it should be noted that the Association is an all-island one and this is reflected in the make-up of MRIA's membership and Northern Ireland views are taken into account in the Paper. Moreover, the geographical location of Northern Ireland, between the Republic and Scotland, alone determines that Northern Ireland must be involved in any collaborative efforts!

A list of those companies and institutions interviewed for this Paper is contained in the Appendix.

4. Policy Landscape

4.1 Overall Position

Ocean energy is an emerging technology. Wave and tidal devices are now at the pre-commercial stage with a number of technologies being tested at full-scale and plans in place for the first small arrays. Experts suggest that we will start to see the first small commercial farms in Scottish waters in the next few years (drawn from FP7, NER 300, MRCF and MEAD projects-perhaps eight in all) with commercial maturity possible in the early to mid-2020s. In Ireland, the WestWave project (and other projects) alone should, if appropriately supported, give Ireland a significant position at the starting line of this important new industry. In addition, increased European Union interest in ocean energy is worth noting with support for the area encompassed in the new EU research and innovation programme, '*Horizon 2020'.*

The capital intensive nature of ocean energy, the enormous investments that will be required by individual commercial developments at sea and the long lead-times associated with the energy industry determines that both industry and Government must make preparations now. The compelling factor, **the reason that this industry should be singled out for special attention, is the scale of the opportunity it presents for jobs and income creation in both Ireland and Scotland**.

The table below illustrates the currently strong position of Scotland and the probable awakening of Ireland (with an emphasis on the Republic of Ireland), 'owner' of the world's most productive wave resource.

Feature	**SCOTLAND**	**IRELAND**
Level and quality of Resource	Tidal: high; Wave: medium	Tidal: Low (but good in NI); Wave: very high
Policy Framework	Advanced; strong institutional back-up	Lot of broad support recently; key steps – Consenting legislation (Bill published) and OREDP (pending)
Targets and Ambition	Strong ambition and demanding targets	Ambition and targets in positive transition – consenting legislation and OREDP key steps forward
Stage of Development	World leaders in technology development; strong Government support; EMEC a major asset	Government support and attitude in transition to positive; excellent R and D infrastructure in place or on the way
Grid Availability	Delayed for initial sites	Could be made available early for demonstration arrays

4.2 Ireland

Ireland – North and South – is potentially a renewable energy powerhouse and the sum of its wind (both onshore and offshore), wave and tidal resources is deemed by Siemens to account for 1/3 of all such resources in Western Europe[9].

[9] Siemen's presentation

There was a steady stream of helpful developments in the Republic of Ireland in ocean energy recently. Ocean energy has been singled out as a national priority for research and development support[10]. Supporting the emergence of this industry was set as one of a handful of strategic goals fixed for national energy policy to 2020[11]. The latest policy statement on the Green Economy, published in November 2012, also highlighted the potential importance of the sector and pledged support.[12] Financial support has been approved for the new Beaufort complex at IMERC which will house tank testing and other facilities and for further developments at the test site for quarter-scale devices in Galway Bay (part of 'SmartBay'). Financial support by Government has in fact increased in 2013, albeit from a low base, and a further increase is anticipated for 2014. Most importantly, the *MarEI* project – involving €25m Science Foundation Ireland support as well as engagement either with cash or kind by nearly fifty companies – will be a major step forward in Ocean Energy R&D.

Looking to the immediate future, the publication of the Ocean Renewable Energy Development Plan (OREDP) is imminent and all of the indications are that it will represent a positive turning point in the development of the ocean energy industry. It is anticipated that the *Maritime Area and Foreshore (Amendment) Bill* will reach the statute books in 2014 and should provide a modern system to license and lease ('consent') sites for ocean energy. Realistically, it will take at least 2018 before Ireland has fully consented and leased areas of the seabed. The OREDP and the Bill must be viewed in parallel with other vital measures such as the provision of grants and revenue support. All of these must be in place before investors will have the confidence to build wave farms in Ireland.

In Northern Ireland, the first offshore leasing round has taken place and two significant tidal projects (200MW each) were among those selected; significant R and D work continues to be recorded e.g. under the *Centre for Advanced Sustainable Energy* (CASE). Northern Ireland has generally run ahead of the Republic in terms of ocean energy policy and implementation.

[10] *Report of the Research Prioritisation Steering Group*, Forfas, March 2012

[11] *Strategy for Renewable Energy:2012-2020* Department of Communications, Energy and Natural Resources, 2012

[12] *Delivering our Green Potential - Government Policy Statement on Growth and Employment in the Green Economy* Department of Jobs, Innovation and Enterprise November 2012

Finally, and very importantly, the Irish and British Governments are engaged in negotiations on a framework to enable trading in electricity between the two countries which, from the Irish perspective, will facilitate exports. In the background are several major (mostly onshore) wind-based projects at the early planning stage. All of the informal indicators point to approval in 2014 by the two Governments.

The implications (arising from this framework) for ocean energy are significant. Agreement between the two countries would allow a number of large wind projects to go ahead- various numbers have been speculated about but a cumulative 8+ GW of new capacity is conceivable although 5 GW by 2020 represents the announced starting point. The employment implications are very significant. Critical, from an ocean energy point of view, is that exports, and export facilities, will be opened up which undoubtedly will benefit wave energy in particular when it reaches commercial maturity and scale.

4.3 Scotland

Scotland has an estimated potential of 36.5 GW of installed capacity from offshore wind, 7.5GW from tidal power (claimed to be 25% of EU capacity) and up to 14GW of wave power (10% of EU capacity)[13]. The Scottish Government has given priority to the development of the wave and tidal sectors in particular and expects them to contribute to the aim of 100% of electricity needs being available from renewable resources by 2020- a challenging target.

The world's first round of wave and tidal leasing took place in Scotland- six wave and five tidal schemes are to be developed in the Pentland Firth and in Orkney Water. These projects have the potential to generate 1.6MW of Marine Energy by 2020. A second round took place recently. This commitment has been backed up with cash e.g. the *Saltire Prize*, at £10m, is the largest innovation prize in history and will go to a commercially viable wave or tidal technology that generates at least 10GWh over two years using only the power of the sea. In August 2012, the Scottish Government gave another example of its commitment to the industry with an announcement that five marine energy developers will benefit from a total of £7.9m in funding under the second round of *WATERS* (Wave & Tidal

[13] Scottish European Green Energy Centre website: *www.segec.org.uk*

Energy: Research & Demonstration Support) to further develop testing of new wave and tidal prototypes in the seas around Scotland.

Scotland has recognised the need to support ocean energy with strong institutional arrangements (e.g. Marine Scotland is a 'one stop shop' for marine energy planning and leasing), partnerships (e.g. with Scottish Natural Heritage and the Royal Society for the Protection of Birds), R and D (e.g. at EMEC) and planning (e.g. National Renewables Infrastructure Plan). There is also recognition[14] of the need for action on key issues e.g. grid development to connect the key ocean energy sites to markets.

The planned and well-resourced (e.g. in R&D in the universities) efforts by Scotland have already generated tangible results. Scotland has attracted investment by most of the 'big names' in the industry and supported important locally based companies, including Alstom, Siemens, Andritz, Total, Aquamarine Power[15] and Pelamis while the European Marine Energy Centre on Orkney is world- renowned and supports as many as 250 local jobs. Indeed, Scotland's strong 'early mover' position in renewables generally has led to some tensions with the Scottish Government warning quite recently that Marine Scotland needed time and 'space' to undertake its work- the comments principally related to offshore wind projects but point to the challenge to administrative and regulatory resources that growth in ocean energy will bring.[16]

5. Strategic Questions Put to Irish and Scottish Interests

A wide range of interests in ocean energy in both countries were interviewed for this study - a list is contained in the Appendix. A number of core questions had been identified at the early stage of formulating the study and they stood up well to the practical test of dialogue with industry and other stakeholders.

First, it was deemed important in the interviews to ascertain views across the board on the state of development of ocean energy.

Second, the interviews sought to establish the level of awareness in Scotland of Ireland and its ocean energy potential - the resource, policy

[14] *2020 Roadmap for Renewable Energy in Scotland* The Scottish Government, Edinburgh 2011

[15] The company has its origins in Queens University Belfast where it maintains R&D facilities

[16] Report of comments by Scotland's Energy Minister at the RenewableUK Offshore Conference in *Renews,* 20 June 2013

infrastructure etc. The reciprocal question was not posed formally to Irish interests as strong anecdotal evidence suggests that Irish ocean energy participants are fully (indeed enviously!) aware of all aspects to the Scottish position, a view quickly borne out as the study progressed!

Finally, and most importantly, views were sought on the scope for co-operation and collaboration in ocean energy - the 'best fit' between the two sides; opportunities in specific areas e.g. R&D etc

As is the custom with MRIA Papers, the direct views of interviewees are given anonymously but, to avoid undue repetition, only a representative selection is reported. There was a remarkable confluence of Irish and Scottish views on many of the topics examined and, thus, no distinction is drawn between Irish 'voices' and Scottish 'voices' - they are often quite obvious!

6. Views on Ocean Energy

The discussion under this heading broke down into four topics: views on the state of development of the industry; scope for Ireland and Scotland to take on complementary roles as the technology matures over the next few years; identification of the biggest obstacles faced by the industry in the two countries; and views on the mutual international rival(s) in ocean energy.

6.1 State of Development of the Industry?

The views divided into two parts: the alleged divide between the stages of development separately achieved by wave and tidal and, second, the next steps needed to build the industry.

There was a consensus across the board that *tidal* is progressing well as a technology while *wave* is at a less developed stage- the key waypoints for wave, it is suggested, include attracting partnerships with major engineering companies (as Open Hydro has done with DCNS in the tidal area) and generating Mega Watts to the grid on a consistent basis.

The next steps to build the overall industry are judged to include an early grid connection to the Scottish islands (hugely important in Scottish eyes), extra funding especially for wave device developers and 'hours on the clock' i.e. regular, dependable provision of electricity to the grid from wave and tidal energy conversion devices.

Wave and Tidal Progress:

'Difficult period right now. Big issues with grid…. there is a political will to fix…but it is compounded by technical issues (in wave technology). The delay to 2018 of new grid connections to the (Scottish) islands welcome by developers because of those technical challenges'

'Tidal is moving faster (than wave) due to major engineering companies buying tidal companies e.g. Siemens/MCT; DCNS/Open Hydro. A comfort factor is that 47% of tidal devices are based on a horizontal axis- in line with wind turbine practice. Don't see convergence going away…speed is important in the adoption of technologies…the struggling technology companies need major engineering companies as partners'

'Wave is more developmental (than tidal). There is no pre-set standard approach but this gives scope for different technical approaches to devices. Interesting too that wave devices can be used for desalinisation. We may end up with two or three wave devices that actually work'

'Very optimistic although wave has fundamental issues to resolve. Investment in the industry of c£100m at this stage. More comfortable with the progress of tidal- tidal is almost there and there is a parallel to offshore wind; technical approaches to wave more varied. Tidal has devices generating electricity.'

'Looking at past decade, there has been steady progress, electrons are going to the grid from marine renewables devices, and the sum of knowledge has grown. Reasons to be positive, reasons to be despondent'

'Number of different technologies are getting to pre-commercial stage in tidal ….small arrays on the way……consolidation of approach to technology'

'Tidal will start to mature in 2015/16 and wave in 2016/17. The big challenge is to generate MWs and …will be lucky to get there by 2020'

Next Steps:

'Key issues are: more MW ('hours on the clock'), grid for the islands (n.b. Lewis and Orkney); EMR; capital grant support'

'Focus marine renewable commercialisation funds on wave which will keep the utilities supportive, itself a key challenge'

'Government support in Scotland is very positive with support too from Department of Energy and Climate Change etc. Support is for demonstration device deployment- key to developing arrays and making things happen'

'Tidal v Wave? Key is running time in the water which gives confidence to utilities. Need to see an ocean energy site operational in Scotland before 2018…but a lot of 'ducks need to be arranged in a row' before that happens'

'Must understand that wave and tidal are competing with offshore wind for the attention and resources of utilities' boards'

'There is a lot of work to be done. Look at resources. Will be in next decade. (Scottish) Referendum is going to bring focus on wave and tidal'

6.2 Scope for Complementary Approach to Early Development?

The organisations interviewed were asked if the infant ocean energy industry could grow more quickly if Ireland supplied facilities (e.g. sites with grid) and Scotland supplied machines-i.e. the two countries developed along complementary lines.

The dominant voices here were Scottish for whom the potential lack of a grid connection until at least 2018 is a critical issue. The possibility of trying out early devices at a grid connected site or sites in Ireland seemed to be of interest and there was a broadly held view that deployments in Irish waters could be supported effectively by a combination of the Irish and the Scottish supply chains.

'See a synergy between Scotland and Ireland on marine renewables – Scotland makes the machines and Ireland supplies a quick and easy place to deploy them'

'Grid is a huge issue… industry needs sites with infrastructure plus support services, a good tariff and all the necessary 'architectures' which allow developers to put in arrays of 4-6 machines'

'There is a concern in the marine renewables industry about the supply chain but….are the energy convertors working?'

'Scottish machine working in the sea off Ireland? Good- proves Scottish device!'

'If Scotland is providing the technology/manufacturing while Ireland supplies the sites, where is the balance of taxpayer return for both? Is it worthwhile

for both? Just how many sites could Ireland offer with grid access and when? What is the likely cost of getting access to those sites e.g. grid charges? What is the cost of a site in Ireland versus the same site in Ireland inclusive of fees?'

'Things like grid are holding Scotland back. Ireland has a clear run at the 'energy' dimension and ideally this would be an energy export dimension'

'Of course the Scottish supply chain would work on the West coast of Ireland. The concern here is that Scotland does the 'heavy lifting' and the benefits go elsewhere, for example to France.'

'Yes…other factors to be borne in mind include logistics, cost, quality etc'

'Big issue is how to keep the industry moving forward given lack of access to grid (in Scotland). Is there scope to progress projects in Ireland using Scottish technology? Worth looking at.'

6.3 What is the Biggest Obstacle to Development in Scotland, in Ireland?

The biggest issue by far for everyone in the industry is 'money' - investment to support the ongoing work in technology development and to build the support infrastructure, followed by grid development, particularly in Scotland.

'No obvious answer! So many balls in the air….interlinked issues for the industry include access to finance; Electricity Market Reform, grid etc…there is no lynch pin'

'Investment community is looking for a return and for an exit, not for endless follow-on investment rounds'

'Money! Pre- commercial industry, small companies which need support, dealing with an indicative future. Parallel to life sciences is striking: long lead-times and emerging markets'

'Money; raising profile (of the industry) to attract investors; make the industry commercial; demonstrate that devices can work reliably and cheaply'

'Utilities and OEMs are interlinked in ocean energy. OEMs need utilities with their strong balance sheets involved.'

'Finance…ability to attract in the private sector. Grid too is a concern as is slower than anticipated development of wave technology….needs 'hours on the clock'.

'Scotland: challenge of getting the grid 'away' …..rigidity of consenting system which currently sets unrealistic milestones; Ireland: all the usual suspects are a problem: consenting, tariff and policy (delays to the Ocean Renewable Energy Development Plan)'

'Projected plans for Scottish grid are ok, whether these aspirations can be met is the issue. A further risk for OEMs trying to raise finance'

'…..developers are finding sites far more challenging than anticipated.'

6.4 Which Country is the Key Ocean Energy Rival to Scotland and Ireland?

The most potent rival in everyone's estimation is France. There is a concern that Scotland in particular might end up 'doing the heavy-lifting' of early technology development, only to lose the Enterprise prize of jobs and income to France in particular.

'France is biggest rival to both countries. The French are keen on local content in projects and have less grid worries'

'France is biggest rival; focused to date on tidal but 'sniffing at wave'. Contender after France is Canada.'

'France….there could be trouble (for Ireland/Scotland) if they focus on this industry'.

'France. But not concerned about rival nations as we need to focus on our own issues. Keen to see Pelamis succeed and note that Carnegie are making progress……'

'Japan is greatest rival- they can take 3-4 ideas and parcel them out to big companies to develop. Next is France – recently issued a call for demonstration devices. Has created France Energie Marine – 'Beaufort on steroids'. Big developments at Brest – cable in the water to support 10-20MW; will have a floating offshore wind turbine next year; DCNS are a big driver of ocean energy. Korea is third- spending money on oscillating water column devices and tidal stream devices. And, of course, China is in the background'

'France… big push behind their test centres etc. But it is a positive thing as the more countries that get involved with marine energy the better…it helps to drive things forward. Lot going on in the Far East'

'France: they have a desire to see things happen even though they have a mediocre tidal resource and a medium wave resource'

7. Awareness and View of Ireland

There is strong awareness of Ireland's wave resource in Scotland but there is much less cognisance there of what the country has to offer, particularly in the area of R&D facilities etc. Unfortunately, Ireland's slow progress, until recently, in drawing and implementing an 'architecture' of supportive policy and legislation is widely known and there is some scepticism about the imminent major developments in both fields.

7.1 Knowledge of Resource

'Aware. How to tie in to the Irish resource?'

'Huge resource in Ireland. Very aware of the wave resource in particular'

'Yes, aware'

'High awareness'

'Conscious of general potential. Aware- everyone knows about it – of WestWave.'

'Low level awareness'

'Scotland is good on tidal but not very big for British Isles – will ultimately meet % of UK demand. Scotland has a lower wave resource…located more offshore and bathymetry is different to Ireland'

'High awareness under all headings'

'Well aware of resource etc'

'Very aware of what is happening in Northern Ireland due to Crown Estate leasing round'

7.2 Awareness of R & D Effort?

'Aware of facilities at HMRC and 'Smart Bay'

'No, not aware'

'Aware. Lot of effort in Ireland in research but need for greater academic: industry co-operation'

'New tanks in Edinburgh but they are complicated- good for wave and tidal but operate at the same time. New tanks at Beaufort will be more versatile; different scales; wave and tidal operate at different times. Good tow tank facility in Strathclyde…but is 'tow' the same as 'flow'?

'There are more people involved in R and D in ocean energy in academia in Scotland…..MarEI in Ireland will bring us up to their scale'

7.3 Cognisance of Policy – OREDP, Consenting etc?

'*Know that there are strong policy ambitions in the policy, consenting etc areas'*

'Aware that work is underway'

'Ireland needs to put in tariff support, hold a leasing round etc,'

'(Ireland)…needs a cultural and paradigm shift, not just appropriate policy drivers and financial incentives'

'…marine renewables has political buy-in at every level in Scotland….do not think it has the same level of commitment in Ireland…'

'Scotland has a high level of collaboration between various interests in renewables e.g. industry and Government, National Grid. There is informality and a real Team Scotland approach…strong collaboration is a feature of Scotland'

8. Co-Operation and Collaboration between Ireland and Scotland

The questions and discussions under this heading with stakeholders on both sides of the Irish Sea generated a lot of views and the broad, instinctive and, indeed, enthusiastic interest in co-operation and collaboration was a little surprising in the light of the relatively low knowledge of Irish facilities and policy in Scotland.

In sum, there was a wide and uniform welcome for the notion of the two nations co-operating and collaborating in ocean energy. Those questioned held that there is considerable scope for working together and a list of specific project ideas was generated. Interestingly, the forthcoming *Inter-Governmental Agreement* between Ireland and the UK arose and a joint

costs and tariffs regime was mentioned by several parties. Other areas for co-operation and collaboration tabled include joint R &D arrangements, shared learning and joint actions at EU level.

8.1 Welcome for Working Together

There was an unqualified, warm welcome for the idea of co-operation and collaboration between Ireland and Scotland in ocean energy and the 'voices' reported below are drawn from both sides.

'Yes, absolutely in favour of co-operation and collaboration…there are obvious synergies between the countries and their projects e.g. WestWave'

'Welcome collaboration and a co-ordinated approach between the two countries'

'Marine energy needs a 'Second Front' (to Scotland) with a graded approach to tariffs etc'

'WestWave will demonstrate to Scottish politicians the benefits to Scotland of Ireland's wave resource, grid, market, R and D capability etc and how this is attractive for Scottish developers….foster Scottish political support for Irish testing and demonstration to further Scottish technology development'

'Collaboration on ocean energy would be warmly welcomed by the British Irish Council'

'Warmly welcome any getting together of Ireland and Scotland in ocean energy'

'Strongly welcome collaboration between the two countries'

'We certainly support a joint approach to ocean energy by Ireland and Scotland. We need to develop a narrative which supports and naturally leads to co-operation and collaboration between the two countries'

'There would be advantages to Ireland/Scotland co-operation. The EU are pushing funding to extend the boundaries of both companies and countries'

'Sensible to work together but what will be the trade-off between the two countries in terms of benefits?'

'Of course, the two countries should work together. There won't be enough skilled people available in either country when the industry does mature'

'It would be very valuable to analyse the opportunity (for co-operation etc) further….analysis means answering these questions

- *Why is there a grid constraint in Scotland; how real is it, how long will it last? Would it be easier for the Scots to fix it rather than go to Ireland*
- *How would the economics work if Ireland was the site and Scotland was the technology?*
- *What are the chances that UK energy policy will turn its back on marine energy (regardless of whether it is in Scotland or Ireland)?*

8.2 Scope for Co-Operation and Collaboration

The interviewees envisaged a wide scope for working together. In particular, co-operation on the prestigious WestWave project was judged important; risk-sharing and linking the two countries supply chains arose; and there were calls for co-operation between the development agencies- Enterprise Ireland/IDA Ireland and InvestNI and Scottish Enterprise.

'Need to have specific projects (to work on) in this emerging industry. Possibilities could be WestWave or a Scottish project. Involve Irish and Scottish companies in providing solutions. (Another possibility is)…subset of ERA Net, grid stabilisation. Common problems for Scotland/N Ireland/Ireland….tackle via Interreg? Pick specific issues for Scottish co-operation /collaboration'

'WestWave is a key to co-operation and collaboration. Doesn't matter where it is located or which devices it uses'

'Need to deal with how Ireland and Scotland would deal with joint projects- might make sense to do engineering on a project in Scotland, test at Wavehub (England), do other work at Beaufort Laboratory and so on'

'We have scraped the surface of the opportunity for co-operation – we should co-operate on testing, sharing resources (national and international), resources for ocean energy are getting scarcer etc'

'Important for industry not to put all its eggs in the one (Scottish) basket. Ireland has apparent advantage with grid availability as the overall technology matures but issues such as tariff support and consenting need to be addressed'

'Scope for supply chain specialisation between the two countries? Scottish supply chain will be maxed out e.g. marine companies. Encourage collaboration of smaller companies e.g. Techworks in Ireland with a Scottish counterpart'

'Co-ordinate policy'

'While there are areas of collaboration across the three (RoI, NI and Scotland) jurisdictions e.g. Isles project, there are also policy areas where Scotland and NI will be liaising with DECC re UK matters….In all of this there is collaboration but tinged with an element of competition as each have their own concerns/issues'

'Am strong admirer of Scottish model- joined-up thinking, top-down political and civil service support…an environment which delivers turnkey solutions….Strong similarities between Ireland and Scotland in ocean energy: resource, infrastructure etc. How do we reconcile Scotland with its oil and gas skills and Ireland with its R & D capacity?'

8.3 Specific Project Suggestions

Suggestions under this heading included joint work on environmental issues; sharing experiences and forging relationships between the consenting bodies; direct Scottish involvement with WestWave; a joint 'lighthouse' (i.e. major demonstration) project; and joint work on knowledge transfer to Third Party countries.

'Need collaboration between nations on the cumulative impacts of marine renewables on mobile wildlife'

'All of the effort in marine renewables is focused on engineering issues and not enough is being done on environmental impacts which are not national border bound. Scotland and Ireland need to develop a shared agenda e.g. on protocols and frameworks which are integrated at national and international- region levels to avoid negative environmental impacts of marine renewables'

'Inter-action between marine renewables and wildlife- need empirical evidence. Encouraging Governments to invest in monitoring at a strategic level- surveys should have been done years ago. Have to be reasonable in making demands on developers and tie in to regional and national policies'

'Enterprise Ireland and Scottish Enterprise should work together to identify opportunities for Irish and Scottish companies to collaborate on …supply chain'

'…there might be scope for interaction/further collaboration on the business/supply chain/product development or on the R & D/University areas for research'

'Run a workshop between key interests in both countries to tease co-operation and collaboration out'

'Can we get Scotland involved with WestWave? Involve Pelamis?'

'Get Enterprise Ireland, SEAI to engage with Scottish Enterprise and work together (including promotion of joint ventures) on developing the supply chain in both countries for ocean energy'

'Scotland –Ireland working together should involve knowledge sharing and involve companies and we must recognise the links that already exists e.g. Open Hydro's work in both countries, SSE spans both nations etc'

'The industry needs 'Lighthouse' projects. Might mean focusing activity initially in one place (Scotland) e.g. ESBI get involved at this stage in Scottish based projects and then move them to Ireland (to AMETS, initial grid connected sites)'

'Co-ordinated tariffs not collaborative ones (between Ireland and Scotland) would make sense'

'We need a vehicle or platform for co-operation …. a Marine Energy Park concept which sees Scotland/Ireland and SW England work together would be a good start. EMEC is full, Wave Hub faces various restrictions and AMETS is only getting off the ground…surely there is scope to pull them all together in a way that they complement one another'

'Ireland and Scotland should work together on commercially- founded knowledge transfer arrangements to other countries e.g. Chile'

'Co-operation arrangements between Scotland and Ireland would be a way of showing that Ireland is 'open for business''

'Being a new industry means a learning experience. Political will is key: must be very firm on "you will work together" '.

8.4 Role of Inter-Governmental Agreement

The *Inter-Governmental Agreement* on electricity exports under negotiation by Ireland and the UK arose and the importance of developing a place for ocean energy within it was highlighted.

'Market integration & inclusion of ocean energy exports in the forthcoming Inter-Governmental Agreement on Electricity between Ireland and the UK is an important issue:

- *Ocean Energy must develop in the context of the Ireland and GB electricity market …….competitiveness with other offshore renewables will determine the level of penetration in this market (currently offshore wind is the best new entrant renewable in markets where onshore opportunities are constrained).*
- *Access to the GB market for SEM-connected wave energy projects will be an important issue for consideration. There stands to be potential enterprise, energy and environmental policy benefit in both jurisdictions in accessing the Irish wave resource to contribute to the integrated market's renewable energy requirements.*
- *For economic reasons, Irish offshore renewable exports are likely to be considered after onshore wind is exploited. However, it seems likely that public acceptability for offshore exports would be less of an issue than those arising from onshore'.*

'The Inter- Governmental Agreement on electricity exports must make provision for ocean energy'

'How could the MOU be used as a template for marine renewables perhaps on a wider European level? One way for the industry to drive costs down is to install 1GW in some risk mitigating way across Europe. Need to see joined up approach in Europe and Ireland and Scotland could work together on this.'

8.5 Grant and Tariff Sharing

There were a number of calls for two countries to find a way to share the cost burden of developing ocean energy technology (e.g. joint capital grants) and, indeed, to devise some form of blended tariff support regime; some sceptical voices were also recorded in this regard!

'A collaborative approach between the two countries would imply some sort of tariff sharing approach. But co-ordinated tariffs might be possible- Ireland doesn't need as high a tariff for wave because of the higher energy intensity of west coast of Ireland waves'

'How to turn cost sharing and collaboration in various ways into sharing of benefits is the nub of the issue'

'Ireland and Scotland should not outbid one another for projects- they should seek to share risk….they have not dissimilar-sized economies, geographical proximity etc'

'Ireland and Scotland should share programmes, commercialisation arrangements and co-operation on tariffs'

'People (investors, governments) want risk-sharing'

'*Joint tariffs would be ridiculously complex*'

'It is hard to argue that any nation would fund the development of another's supply chain. Ireland can only argue that that it is extracting energy and selling it using Scottish technology, giving Ireland energy revenue and Scotland jobs. Joint subsidies are counter- intuitive; we can't both have the same jobs'

'Should share the cost of commercialisation- share cost; share economic activity. Cost of new technology is not trivial. Don't have to do the same project in each country or bring the same machine to similar test sites'

'The Orkney supply chain is maxed out'

8.6 Research and Development Collaboration

There was a widespread desire expressed for a joined up approach to R&D e.g. collaboration on research into common issues; linking up the (apparently complementary) Atlantic Marine Energy Test Site (Ireland) and the very busy European Marine Energy Centre (Scotland); and, also, links between universities were among the ideas which were put forward.

'R and D, data sharing etc should be encouraged and particular developers should be encouraged to use the facilities available in the two countries, perhaps under MARINET'

'Do a joint demonstration zone'

'If a standardised approach to power collection could be developed, it would enable tidal array design costs to be significantly reduced and minimise technical risk in the early development processes'

'R and D collaboration desirable – R and D is key to industry leadership'

'Collaborate on areas of common concern – foundations, wet mate connectors, seals, control and instrumentation. Practical industry-led research agenda.

Ireland could be a real value-add to existing research teams. No need to reinvent the wheel…'

'AMETS could be a follow-on and / or complimentary test centre to EMEC:

- *Linking of AMETS / EMEC*
    - *Some elements of common governance (standards / application process) and sharing of resources?*
    - *Linking through EU initiatives such as MARINET (network of marine test facilities).*
    - *Linked test programmes – e.g. following a Pelamis P2e initial deployment at EMEC for shakedown and to build up reliability, a subsequent deployment of the same machine at AMETS would be more effective in proving survivability and energy production. Such sharing can maximise the value of advanced demonstrator projects, both to the technology development company and the host markets (as a broader market can be developed). It could make better use of government supports also.*
- *Need to distinguish the role of EMEC and AMETS as test infrastructure:*
    - *Need to see EMEC as an ideal test site for a managed, phased deployment, design / configuration optimisation of pre-type machines and establishing a sufficient reliability for subsequent testing at AMETS / WestWave.*
    - *Need to see AMETS as an ideal test site for building up hours on energy production and gaining confidence in reliability, survivability and maintainability in the target market.*

'Don't know. No Skills challenge. Edinburgh University and Strathclyde University are both strong in ocean energy. Surprised if there is an opportunity'.

'Crown Estate are to do a wave and tidal leasing round for demonstration projects and they envisage managing agents in the demonstration zones. Crown Estate want to support demonstration zones in a structured way and have two or three companies set up facilities …EMEC might manage…involve Irish and Scottish universities in this process?'

'Joint funding applications would be attractive:

- *It is conceivable that Irish west Coast sites (including AMETS) may suit initial arrays (5-10MW scale) better than Scottish sites, due to available distribution level grid capacity. At this scale project cannot justify grid reinforcement investment to remote locations in Scotland.*

- *Such projects could be supported in a more international fashion whereby in cases where Scottish technology, deployed in Ireland could be supported in a European context as well as by both national governments. This would be a more efficient use of public funding to bridge the notorious "valley of death", whereby considerable spend is required to develop reliable, type-certified hardware and a supply chain of scale. This approach would develop the supply chain across the strategic Ireland–GB electricity markets, likely to be integrated under EU regional market policy.'*

'Promote R&D, particularly Beaufort Laboratory links to Scottish Universities:

- *…. there is already co-operation in FP7 projects (such as Marinet, etc) between Irish and Scottish Universities. However, this could be further enhanced …. to avoid duplication of effort in areas of numerical and physical modelling capability.*
- *New facilities at the Beaufort Laboratory are likely to be of interest to Scottish technology companies who may already have relationships with Scottish / Northern Ireland Universities. Links to ensure technology applications can access laboratory capabilities in Beaufort and elsewhere in Ireland could be of significant benefit.*
- *Capabilities in other parts of the IMERC campus (e.g. ship simulation of novel marine operations, safety training for specific operations) are unique and could have a big impact in the overall R&D capability on the islands'*

'AMETS could be good outlet for Scotland if there is congestion at EMEC or if they need facilities for projects who want to test at the next stage'

'Tailor-make a solution for small companies which involves use of both EMEC and AMETS'

'General indications of support from developers at EMEC for working with Ireland….knowledge sharing between EMEC and AMETS in particular would be desirable…..could there be co-operation generally on test sites particularly as the Scots are the 'thought leaders' in ocean energy'

'ERANET will provide a wider platform/opportunity for joint responses to calls-there could be pre-call co-operation. There could be an ERANET for ocean energy led by Scotland and Ireland'

'Scots want to work with the Irish…just look at the bibliography of Irish research publications'

'R & D:

1. *Application of performance standards for WEC devices – some work is on-going in this area.*
2. *Study of mooring solutions for major WEC types – OWC, Attenuators etc.*
3. *Support for development of integrated numerical modelling solutions.*
4. *Advanced materials solutions for WEC devices'.*

'Joint collaborations already attempted, and failed, in the UK/Scotland context due to lack of genuine interest'

8.7 Learning

This was a 'one way' track i.e. the suggestions related only to the Irish learning from Scottish experiences. There was particular interest in the idea of seconding or exchanging civil servants and various data-sharing possibilities were also put forward.

Leasing and consenting: share as much experience as possible to make Irish system best in class…forge links with Marine Scotland, EMEC and Crown Estate'

'Finding it hard to find hydraulic/control/instrumentation/electrical engineers- anything that Ireland/Scotland co-operation could do to ease this?'

'Any co-operation in relation to the development of the Belmullet (AMETS) test site would be valuable'

'(Data sharing is a) Good idea'

'Data is gathered but not shared…sharing is a key enabler. Challenge of 1st and 2nd tier operators benefiting from the data of early movers'

'Promote sharing of environmental and resource data and EIA experiences so both nations give equal weight and /importance to EU Directives'

'Could be done. Bring under Marinet- EMEC, Smart Bay and AMETS are parties to it. All about collaboration on standards etc'

'Resource and data sharing, secondments of civil servants etc are all highly desirable'

'*Use the British Irish Council as the vehicle to share learning or to drive learning- don't duplicate'*

'Do exchanges of appropriate officials by both sides'

'Secondments of officials is a great idea. Scottish Government would be open to it. Marine Scotland would be a good place to exchange officials with as they have generated quite a level of competence (in ocean energy)'

'Potential for secondments (both ways) from civil service to ensure sharing best-practice relating to leasing and consenting, OREDP, Environmental and resource data, LCOE and deployment and, finally, research'

'There is potential for AMETS (The Atlantic Marine Energy Test Centre in Mayo) to learn a significant amount from the experience at EMEC.

- *Governance of the facility, optimal staffing levels and scope of activities for the owner of the common assets.*
- *Suitable application process and permitting for access to infrastructure to ensure safety critical aspects are managed.*
- *Issues of insurance, liability, etc.*
- *Infrastructure requirements: heavily used vessels, shore-side requirements, accommodation, office space, data, etc.*
- *Data acquisition / collection & associated research, dissemination of site data*
- *Mobilising the local supply chain for maximum enterprise impact.*
- *Community acceptance*

'Ocean energy receives strong Government and regulatory support in Scotland…one lesson. Second, the uncertainty generated by (the then forthcoming) EMR is something to learn from. Finally, tie the regulatory and the planning regimes together…Marine Scotland do a great job in this regard- learn from the good bits of Marine Scotland'

'Lessons to be learnt from Scottish experience of trying to get a clear, concise plan and avoiding duplication'

8.8 European Co-Operation

There was support for Ireland and Scotland to work together on European matters, particularly in the funding arena.

'Could be scope for co-operation- (Scottish lobby) not doing much in this field and need to be there'

'European co-operation between Ireland and Scotland is a possibility'

'We should work together on Horizon 2020 and the SET plan'

'Will focus on EU Ocean Energy Association and Scotland's efforts in Europe'

'Do joint applications under Horizon 2020'

'Tremendous that marine energy is on the SET plan, opens much bigger door for ocean energy- big 'tick in the box' for Ireland/Scotland co-operation ….it would be a natural collaboration, not a false one as is so often the case in EU projects…..EU can do a lot of the financial heavy lifting e.g. through NER 300'

'What we need from Europe is a clear plan plus funding plus a level of understanding of ocean energy which is not there at present'

'Ireland and Scotland are collaborating already e.g.in FP 7 and the European Energy Research Alliance is the cornerstone of SET.'

'European policy is an opportunity to work together following SET and need to establish a 'route map'...Horizon 2020 is a further fruitful area for co-operation'

'Work together to shape NER process and make it more fit for purpose for marine energy…remember, it was designed around carbon storage and capture'

'Joint lobbying for structural funding for ocean energy related infrastructure development'

'Seek joint projects for EU (funding approval)'

9. Conclusions and Recommendations

9.1 Conclusions

The Association is pleased at the interest shown by all quarters in co-operation and collaboration in ocean energy between Ireland and Scotland.....and the MRIA assumes that Northern Ireland will be given the opportunity to join in all initiatives considered appropriate by the authorities there.

Ireland is in the interesting position of having an enviable, prize resource in its 'best of breed' energy- intensive waves together with an emerging policy and support framework for ocean energy. Northern Ireland has excellent

tidal facilities, support arrangements and a maturing policy framework. Nonetheless, it is not surprising that Irish interests are eager to work closely with their Scottish neighbour who has given top economic development priority to ocean energy with all that implies in terms of substantial financial support and political drive as well as policy and institutional development.

What is surprising is the almost uniform interest, and openness, shown by Scottish companies and organisations in working with Ireland. In part, we attribute this to local issues (e.g. concern over the delay in providing grid connections to the Scottish islands) to which, conceivably, Irish-Scottish links could provide an answer. But, we also perceive a willingness on the part of Scottish ocean energy (and, indeed, their Irish counterparts fall in with this view as well) to ' think outside the box' for three closely related reasons:

1. Ocean energy (particularly wave) is an emerging technology aimed at a harsh environment, dealing with hugely challenging engineering issues and doing so with relatively little, aggregate, State support world-wide. It is worth bearing in mind that other energy sources - nuclear, solar, gas turbine etc - all received enormous financial aid, principally through defence programmes, before their application to electricity generation. Renewable sources, on the other hand, have developed on a financial shoestring to date, even in Scotland.....

2. Accordingly, there is an underlying view in all quarters that the ocean energy industry, as well as the island of Ireland and Scotland generally, might both benefit if they joined forces at this difficult early stage of ocean energy.....

3. Particularly, as Ireland and Scotland between them account for a large part of Europe's ocean energy resource, R & D capacity, expertise and experience generally in the field.

Nonetheless, it would be easy to overstate the position. There is an enthusiastic interest, a curiosity and an openness on both sides towards co-operation and collaboration. But, it must be harnessed and be led, initially at least, by the respective Governments. In this respect, the *British Irish Council's* Marine Energy Committee is ideally placed to forge and lead a programme of co-operation and collaboration. Indeed, the very constitution of the Council makes it ideal as the involvement of other Administrations (notably the Northern Ireland Executive) as well as

Ireland and Scotland facilitates their participation in ocean energy collaborative ventures.

9.2 Recommendations

9.2.1 Principle of Co-operation and Collaboration…and Delivery Body

THE MARINE RENEWABLES INDUSTRY ASSOCIATION BELIEVES THAT IRELAND AND SCOTLAND SHOULD CO-OPERATE AND COLLABORATE IN OCEAN ENERGY.

The countries are neighbours who together:

- are tied into joint political arrangements, notably the British Irish Council in this instance
- effectively control much of Europe's potentially most productive wave resource and a notable share of the exploitable tidal resource
- provide the bulk of the important R&D facilities including EMEC, Queens University, IMERC, AMETS etc in Europe, indeed in the world
- have generated or house most of the significant companies - notably energy conversion device developers - in the industry globally
- have the ambition- well established in Scotland, probably emerging in Ireland - to be a significant force in world ocean energy
- face enormous financial and technical challenges in developing this potentially rewarding but still early- stage industry.

THE ASSOCIATION IS FIRMLY OF THE VIEW THAT NORTHERN IRELAND SHOULD ALSO BE A PARTNER IN THIS CO-OPERATION AND COLLABORATION

The reasons for engagement with Northern Ireland include

- there is a single electricity market on the island of Ireland
- Northern Ireland has most of the island of Ireland's tidal resource and is home to significant supply chain companies (e.g. Harland & Wolff Heavy Industries, McLaughlin and Harvey), R&D facilities etc
- it is also a member of the political arrangements referred to above
- the geographical position of Northern Ireland between Scotland and Ireland dictates that is essential for it to be included in any possible joint arrangements

The *British Irish Council*- Marine Energy Committee is key to making co-operation and collaboration happen. It also facilitates the involvement and support of the United Kingdom Government.

THE DELIVERY MECHANISM, OR AT LEAST THE FOCAL POINT FOR JOINT EFFORTS, SHOULD BE THE *BRITISH IRISH COUNCIL*- MARINE ENERGY COMMITTEE WHICH IS AN ESTABLISHED INTER- GOVERNMENTAL BODY ON WHICH ALL OF THE RELEVANT ACTORS ARE REPRESENTED (WITH THE EXCEPTION OF INDUSTRY)

It should be recognised, however, that such a key role for the Council may require a step-up in workload for the Secretariat (provided by Scotland in Marine Energy matters) and, particularly, for the Governments - possibly not a problem for Scotland which already allocates significant civil service resources to ocean energy but undoubtedly a challenge, a test of commitment for the Republic of Ireland where minimal staffing has been provided to date, albeit against the background of a contracting public sector.

Specific recommendations for co - operation and collaboration between the two countries emerged from the interviews conducted for this Paper and are set out in the following sections in the form of topics or work streams.

THE *BRITISH IRISH COUNCIL*- MARINE ENERGY COMMITTEE SHOULD ESTABLISH WORKING GROUPS TO REVIEW AND PLAN THE JOINT EFFORTS IN DETAIL - ENGAGEMENT OF INDUSTRY REPRESENTATIVES IN THIS WORK WOULD BE HIGHLY DESIRABLE.

9.2.2 Grant and Tariff Sharing…Prize Fund for Joint Proposals

The biggest challenge facing ocean energy is the need to develop wave and tidal devices which work all day, every day generating electricity to the grid and to do so along a visible development path to gradually falling capital and operational costs. Meeting this challenge will require huge expenditure for years to come to support R&D and early commercialisation. The private sector alone will not do this and, in fact, shows signs of reluctance to invest in an emerging sector. Moreover, there are no truly effective special investment incentives for private investors, tailor-made to the ocean energy sector.

As remarked earlier, *renewable energy is perhaps the only electricity generation source in modern history to emerge without vast State expenditure up-front, typically through defence programmes*. Nonetheless, the public purse is thin and stretched on both the island of Ireland and in Scotland while the need of, notably, ocean energy device developers for aid

is particularly high at this point in the development cycle. Most serious players are either at the stage where they need to iterate their technology concept with a series of test devices and/or are at the early pre-commercialisation stage - both are extraordinarily 'cash intensive'.

A view repeated throughout the interviews underlying this Paper is that an effort should be made to develop joint funding (grant aid) arrangements which, for example, recognise the complementary nature of the two nation's R&D facilities and the fact that key device developers (e.g. Open Hydro, Aquamarine Power) have roots in both Ireland and Scotland. It is held that such an approach would provide economies of scale for limited tax payers' funds. Moreover, suggestions have been made about a joint or blended tariff support deal for early stage projects. Projects might be awarded a 'high', Scottish tariff support while on test at EMEC and a lower Irish support while undergoing further testing at AMETS - the difference being accounted for by the likely greater maturity of devices by the time they reach AMETS and by the more energy intensive nature of Irish west coast waves.

A joint approach along lines set out in this section would be unique but would certainly pose serious issues (e.g. legal issues and issues surrounding the allocation of both benefits and costs between the two countries in particular projects). Nonetheless…it represents the radical thinking that may be needed if Ireland and Scotland are to harvest their ocean energy.

HOWEVER, GIVEN THE DIFFICULTIES REFERRED TO, IT IS RECOMMENDED THAT, AS A FIRST STEP, SERIOUS CONSIDERATION BE GIVEN BY THE *BRITISH IRISH COUNCIL* TO ESTABLISHING A JOINT COMPETITION WITH A SUBSTANTIAL PRIZE FUND FOR JOINT PROJECT PROPOSALS IN OCEAN ENERGY

9.2.3 Research and Development

Ireland and Scotland have or are developing the best and most comprehensive suite of R&D, education and test facilities, perhaps in the world. Many of these are complementary- IMERC, Beaufort, Smart Bay, EMEC, AMETS and the facilities at Queens University Belfast essentially deal with different types of projects or with projects at different stages of development. It might be possible to 'bundle' and market them (perhaps including Wavehub in South West England?) to industry as a joint and joined-up facility. One informed contributor to this study, however,

remarked that joint Scotland/UK collaboration had been tried without success.

There are many other suggestions cited at 8.6 about co-operation and collaboration in R&D.

A PRACTICAL, RELATIVELY UNCONTENTIOUS STARTING POINT FOR CO-OPERATION, AND ONE WITH POTENTIAL FOR 'QUICK WINS', WOULD BE JOINT PROJECTS IN R&D.

9.2.4 WestWave

The WestWave project, led by Ireland's ESB utility, is a candidate for the latest round in the EU NER 300 competition. The project, and its promoters, are highly respected on all sides in ocean energy. It represents a potentially substantial Irish contribution to Ireland-Scotland co-operation and a project in which there is significant Scottish interest. WestWave could be up and running on the grid in Ireland in advance of early Scottish projects being grid connected.

IT IS RECOMMENDED THAT THE *BRITISH-IRISH COUNCIL* WORK WITH THE ESB TO IDENTIFY WAYS IN WHICH THE WESTWAVE PROJECT MIGHT BECOME MORE OF A JOINT EFFORT WITH JOINT SUPPORT. THIS IMPLIES, FOR EXAMPLE, COSTS AND BENEFITS SHARING BETWEEN THE TWO PARTIES AND, AS WITH OTHER RECOMMENDATIONS IN THIS PAPER, WOULD BE A COMPLEX UNDERTAKING.

9.2.5 Environmental Issues

Nature does not respect political borders. Thus, wildlife in one jurisdiction (e.g. Scottish waters) may be subject to study as part of an ocean energy consenting exercise; an amount of 'displacement' of that wildlife permitted; and, yet, no data can be collected about the actual displacement effects as the wildlife may move of their own accord to Irish waters!

IT IS RECOMMENDED THAT A GROUP BE ESTABLISHED BY THE *BRITISH IRISH COUNCIL* INVOLVING BOTH STATUTORY AND VOLUNTARY BODIES TO EXAMINE THE NEED AND SCOPE FOR JOINT WORK IN THE ENVIRONMENTAL FIELD. THIS COULD BEGIN WITH THE RELATIVELY STRAIGHT FORWARD TASK OF DATA-SHARING AND COMPLEMENTARY DATA-GATHERING WORK…..AND PROGRESS LATER TO EXAMINING THE SCOPE FOR COMMON ENVIRONMENTAL STANDARDS AND PROCESSES WHICH WOULD BE BENEFICIAL TO THE DEVELOPMENT OF INDUSTRY. IT WOULD BE IMPORTANT TO INVOLVE THE NORTHERN IRELAND AUTHORITIES IN THIS WORK FROM THE OUTSET.

9.2.6 *Inter-Governmental Agreement*

The forthcoming (first half of 2014?) *Inter-Governmental Agreement* between Ireland and the UK on electricity exports from Ireland will be an economic development opportunity of the first order of magnitude. Much of the generation capacity envisaged will come from land sources, notably wind. There will be scope too for offshore wind.

IT IS RECOMMENDED THAT PROVISION BE MADE IN THE *AGREEMENT* FOR A MODEST QUANTUM OF THE CAPACITY INVOLVED TO BE EARMARKED IN SOME FASHION FOR OCEAN ENERGY. THIS WOULD BE AN ENCOURAGEMENT, AN INCENTIVE TO THE INDUSTRY AND WOULD SERVE AS A FURTHER ATTRACTION FOR IRELAND-SCOTLAND COLLABORATION. IN ADDITION, THE *AGREEMENT* MIGHT PROVIDE ONE SOURCE OF FUNDING (E.G. IN THE FORM OF A LEVY) TO PROVIDE FOR A JOINT PRIZE FUND - SEE 9.2.2 ABOVE

9.2.7 Learning

There is a perception among industry figures in particular that relevant Irish public servants would benefit from exposure to the Scottish Government's more mature administrative and policy-making arrangements in ocean energy and suggestions about secondment of civil servants from Ireland to Scotland were made in the course of this study.

Given the tight staff supply situation in Irish Government Departments, it is unlikely that secondment arrangements could be made at all or at least at a level and on a scale that would make a difference.

MRIA RECOMMENDS THAT ALL SENIOR IRISH PUBLIC SERVANTS ENGAGED IN OCEAN ENERGY BE REQUIRED TO UNDERTAKE A SHORT (ONE WEEK?) STUDY TOUR OF APPROPRIATE SCOTTISH INSTITUTIONS AS A FIRST STEP AND THAT A RECIPROCAL OPPORTUNITY BE ARRANGED FOR SCOTTISH PUBLIC SERVANTS TO TOUR IRISH BODIES, NORTH AND SOUTH. THESE VISITS COULD BE ORGANISED UNDER THE AEGIS OF THE *BRITISH IRISH COUNCIL*

9.2.8 Supply Chain

It is vital, from the perspective of job creation, that as much of the supply chain as possible for ocean energy globally be "captured" for Ireland and Scotland. This should not lead to undue conflict or rivalry- at present, for example, the Scottish supply chain is reportedly stretched locally at EMEC in Orkney while the potential Irish supply chain has not yet been energised by ocean energy. Most important, with proper policy support, both Ireland and Scotland have the potential to export to the rest of the world a range of

goods (e.g. energy conversion devices) and services (e.g. technical, legal, R & D etc) with significant potential for job creation in the home countries.

IT IS RECOMMENDED THAT THE KEY STATE DEVELOPMENT AGENCIES, ENTERPRISE IRELAND/IDA IRELAND, INVESTNI AND SCOTTISH ENTERPRISE BE MANDATED TO WORK TOGETHER TO PRODUCE A JOINT SUPPLY CHAIN DEVELOPMENT PLAN.

9.2.9 Industry Involvement with British Irish Council

Finally, two recurring themes in this Paper are the vital role of industry in ocean energy development and the key part which the *British Irish Council* could play in promoting and supporting joint efforts between both jurisdictions on the island of Ireland and Scotland.

ACCORDINGLY, THE ASSOCIATION RECOMMENDS THAT A REPRESENTATIVE OF *SCOTTISH RENEWABLES* AND A REPRESENTATIVE OF *MRIA* BE APPOINTED IN A NON-VOTING CAPACITY TO THE *BRITISH IRISH COUNCIL*- MARINE ENERGY COMMITTEE IN TO GIVE ADVICE ON THE IMPLEMENTATION OF THESE PROPOSALS.

Appendix

List of Organisations Contacted For This Study

Scotland

Aquamarine Power

Crown Estate

European Marine Energy Centre (EMEC) consultant

Open Hydro (active developer in Scotland but an Irish company, based in Co Louth)

Scottish Government

Scottish Enterprise

Scottish Renewables

Scottish & Southern Electricity

Royal Society for the Protection of Birds

Vattenfall

Pelamis

Ireland

Atlantic Ocean Energy Alliance

Carnegie Wave

Commissioners of Irish Lights

Department of Communications, Energy and Natural Resources

ESB

Enterprise Ireland

HMRC/ Beaufort Laboratory

IMERC

Invest Northern Ireland (contributed material)

Ocean Energy Ltd

Sustainable Energy Authority of Ireland

Department of Enterprise, Trade and Investment, Northern Ireland