Third-Level Education Needs of the Ocean Energy Industry

To maximize the job and income creation potential of Ireland's ocean energy resource

Discussion Paper

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Executive Summary

The island of Ireland faces an economically transformative opportunity in ocean energy- energy generated from waves and tides. The independent SQW report forecasts substantial income and job potential, particularly in the 2020's when ocean energy technology is likely to reach maturity and to be deployed on a commercial scale. The opportunity will be realised on two planes- *enterprise* (e.g. development of the supply chain in Ireland to support the industry not only here but elsewhere in Europe) and *export* (e.g. through interconnectors to the UK and elsewhere).

A key factor in determining Ireland's success in this challenging industry will be the quality and availability of appropriately skilled graduates from the Universities and the Institutes of Technology and other bodies, notably in engineering. This Paper presents the findings of a review of this issue by the Marine Renewables Industry Association with expert bodies and with those involved in the emerging ocean energy industry. The principal findings were:

- There is substantial capacity in engineering education on the island
- The supply of engineers is reasonable at present although shortages are discerned in the key field of electrical engineering and there is concern about the overall numbers entering the profession
- The opportunities in ocean energy will be modest to 2015 at least but could be very significant in the 2020s
- Ocean energy will principally require engineers with a robust, core degree in the traditional disciplines of civil, electrical and mechanical engineering.
- Little value is attached by the ocean energy industry to the various 'energy engineering' qualifications increasingly on offer
- Providing real experience of working in the tough offshore environment to engineers is a big challenge for ocean energy
- The industry- and other experts- would like to see a Masters degree programme in ocean energy engineering which draws off the expertise in specific fields of individual colleges and which is designed in conjunction with the industry to the highest international standards
- The MRIA will work with appropriate bodies to address the issues identified by this Paper.

Third-Level Educational Needs of Ireland's Ocean Energy

To maximise the job and income potential of Ireland's ocean energy resource

1. Marine Renewables Industry Association

The Marine Renewables Industry Association (MRIA) represents all of the main 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 (e.g. Wavebob, Ocean Energy, Open Hydro, Aquamarine Power and others), utilities and site developers (e.g. ESBI, Bord Gais and others), professional firms and consultants (e.g. Arup, Arthur Cox Solicitors), R & D businesses (e.g. Pure Marine, MERC3), supply chain activities (e.g. Lotusworks, B9 Energy, Port of Cork) and academic researchers. The Association is an all-island body.

2. Ocean Energy and Ireland

2.1 Potential Economic Impact of Ocean Energy

The Republic of Ireland is in the midst of an economic 'perfect storm' while Northern Ireland is also going through a period of economic difficulty with consequent loss of employment and income. 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, SEAI and Invest Northern Ireland, on the potential economic impact of ocean energy (*Economic Study for Ocean Energy Development in Ireland* SQW, 2010) 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

The opportunity in Irish ocean energy has two possible dimensions- ENTERPRISE and ELECTRICITY EXPORT-for the purposes of this Paper. Both of these points are dealt with

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

briefly below (see also: *MRIA's Response to Public Consultation on draft Ocean Energy Development Plan* at www.mria.ie)

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' faces an immediate opportunity in offshore wind in the UK which is developing rapidly into a major industry This prospect will both give early job and income benefits to Ireland and will also build companies and grow their experience and their skills to capitalise on the forthcoming wave and tidal opportunity.

2.3 Exporting Electricity

All of the stakeholders in ocean energy accept that the enormous scale of the Irish resource in wave (with a notable, but lesser, resource in tidal) represents a potentially huge opportunity for ELECTRICITY EXPORT via grid interconnectors. This is based on the likely emergence of an EU energy market and a Euro grid; potential export demand in the UK; 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

The Association decided in 2010 to examine the third-level education needs of the ocean energy sector for two reasons. First, while the industry is still at an early phase of development, it may be possible to identify its likely needs in the education field at this stage. Second, it is important to do so now as the 'lead-lag' in responding to and meeting educational requirements in any sector is long.

The views of industry, government bodies and educational institutions were gathered by interview ('face to face' and, also, by telephone in some instances), mostly in the latter part of 2010/early 2011. The support of Sustainable Energy Authority of Ireland (SEAI) for the project is gratefully acknowledged.

The Paper concentrates on the Republic of Ireland (RoI) in light of SEAI support but, overall, takes account of Northern Ireland as well: the ocean energy industry is an all-island one and this is reflected in the Association's general approach and its membership. A list of those whose views were sought is contained at Appendix 1.The results of the interviews and research were considered, conclusions were drawn and the result is this Paper.

3.2 Terms of Reference

The Terms of Reference for the work were, as follows

1. Seek the views of industry, relevant third-level institutions (universities and institutes of technology) and expert bodies about the educational needs of the sector

2. Identify, in particular, the requirements and priorities of industry

3. Draw conclusions and make recommendations

This Paper is a statement of the views of industry in particular and the *Conclusions* drawn and *Recommendations* made are intended for debate with other stakeholders. The MRIA plans to advance its work in this area in a positive and collaborative way with other interests.

The Department for Employment and Learning in Northern Ireland is finalising a report on the skills required to support potential economic growth in the Northern Ireland sustainable energy sector. It is anticipated that this report will be published before the end of 2011. MRIA and the Department have had a constructive exchange of views on the broad issues.

4. The Graduate Engineering Skills Base

4.1 Education Needs and Capacity

The recent report on the future skill needs of the 'green economy'[2] in the RoI anticipated that total employment in the 'green' sector could rise from nineteen thousand in 2010 to as many as twenty nine thousand people in 2015 (p 13). It identified the core skills required across *all* 'green' occupations as being ".....high level technical skills combined with commercial awareness, marketing, finance, communications and project management skills" (p 16).

The capacity to educate various types of both undergraduate and graduate engineers is impressive. *Engineers Ireland* (in an interview with MRIA) estimate that there are at least two hundred engineering courses on offer in the Republic and MRIA estimates that there are at least forty in Northern Ireland as well. A significant number of the courses, particularly in the Republic, are geared towards civil engineering. Moreover, the future skills needs report[2] (p 21) has identified a total of some ninety-one higher education courses in 'green skills' either underway or planned at a cost of c€25-30m pa in the

[2] *Future Skills Needs of Enterprise within the Green Economy in Ireland*, Expert Group on Future Skills Needs, Forfas, November 2010

Republic of Ireland alone. The same report (p 125) states that there are twenty four courses at undergraduate level in renewable energy at fifteen universities and institutes of technology. At postgraduate level, there are eight courses-five at institutes of technology and the balance at universities.

4.2 Skills required by Ocean Energy

The core disciplines deemed by MRIA as being relevant to *ocean energy* are civil, mechanical and electrical engineering. Other areas of particular interest include computer science, health and safety, science and mathematics. Industry places emphasis on its need for experienced engineers with familiarity of working in the demanding environment offshore. The future skills report (p 46) gives examples of jobs in wave and tidal energy as including "electrical engineer, process engineer, marine energy engineer, site development manager, marine operations manager, structural engineer, mechanical design engineer, wave scientist" (p 46).

The view of industry is developed at 7 below.

4.3 Supply of Engineers

The latest bulletin on national skills [3] estimates (p 74) that there are 26,000 engineers (80% professional, balance technicians) in the Republic- this excludes civil engineering (9,500) and construction related areas. About 3,000 of these are professional electrical engineers with the numbers in this category having fallen marginally, by -1.7%, in the period 2004-9 and 4,900 mechanical engineers whose numbers grew in 2004-9

There are some shortage indicators, according to the bulletin (p 75), including in "...wind energy and high voltage electrical engineering" but it regards future demand for engineers in a positive light because inter alia"...the green agenda –renewable energy (solar, wind, wave and tidal) and environmental protection, is expected to be a significant driver of job opportunities for engineering skills...the Government is committed to supporting investment in these areas".

The pipeline of new entrants to the (non-civil and construction) engineering professions presents a reasonably positive picture, although the relatively low starting base must be borne in mind. There were 1,440 graduates (p47) in engineering and manufacturing at Diploma and Ordinary degree level in 2007-8 (the latest year for which statistics are available; this qualification applies to other statistics given here) although this masks a decline at the lower level, level 6. Applications to the Central Applications Office (CAO, the admissions body to the third-level sector) for these types of qualifications were up in 2008 and again in 2009. At honours degree level, there were 1,482 graduates (p48) in 2007-8 with CAO acceptances rising by an encouraging 16% in

[3] *National Skills Bulletin 2010,* Expert Group on Future Skills Needs, Fas, July 2010

2009. Given the small scale of the industry at present, it is unlikely that any more than a small number of the recent graduates under the various headings entered ocean energy.

The position in relation to PhD's and Masters is less positive (p 49). There were 602 graduates at this level in engineering and manufacturing in 2007 with a decline of 8% in 2008. However, PhD enrolments recently are up and the increase in undergraduate enrolments should have an impact on graduate studies in due course.

The pipeline of new entrants to engineering studies is noteworthy. CAO acceptances in engineering in 2008 were up at both ordinary and honours levels.

Conclusion 1 *The overall engineering base is fairly healthy and student numbers are moderately encouraging. The base of electrical engineers, who are vital to ocean energy, is relatively small. The large number of courses on offer in the third level sector in 'renewable energy' is notable.*

5. The Education Providers for Ocean Energy

Each of the seven universities in the Republic of Ireland has significant offerings in engineering and science as do the two universities in Northern Ireland. All bar one of the fourteen Institutes of Technology in the Republic offer engineering degrees and, remarkably, eleven of them offer degrees in civil engineering. The Colleges of Further and Higher Education in Northern Ireland are market-oriented and focused on the level known as 'grade 6' e.g. diplomas. The Colleges have 29,000 full time students of whom c1/3 are enrolled in technical subjects.

Table 1.Third level institutions offering courses in engineering

Type of College	Republic Ireland	Northern Ireland
Universities	7	2
Institutes of Technology	13 (of 14)	n.a.
Colleges of Further Education	n.a.	6
Total	20	8

5.1 The Universities

A 'snapshot' of offerings at the various universities on the island reveals a wide interest in renewable energy with some of it focused on ocean energy.

University College Cork: together with Queens University, Belfast, UCC is perhaps the main teaching and research institution in Ireland in ocean energy with important contributions also from University of Limerick, NUIG and NUIM. It offers degrees inter alia in electrical engineering as well as a BE in energy engineering and a MEngSc in sustainable energy. UCC is a partner in *MERC3* (the maritime and energy research cluster at Ringaskiddy, Cork promoted in partnership with Cork Institute of Technology and the Naval Service). All of UCC's ocean and sustainable energy activities will be relocated to new and enhanced research facilities at MERC3 by 2013- MERC3 has the potential to be a leading international ocean energy centre.

University of Limerick: has a wide range of courses in engineering and science subjects. Research encompasses wave energy power plant design and, particularly, the well regarded *Mobile and Marine Robotics Research Centre* which develops unmanned vehicles for subsea commercial and scientific purposes. UL offers a BSc in robotic engineering, an MSc in mathematical modelling and is starting a Bachelor's degree in electrical power systems

National University of Ireland, Galway: NUIG was a pioneer in ocean energy-the 'Smart Bay' test facility is located nearby- and the *Institute for Environment, Marine and Energy* deals with inter alia marine and coastal processes, biodiversity and hydrodynamic modelling, offshore structural dynamics. The Institute has notable strengths in remote sensing, structures, observations and informatics; a particular strength lies in modelling.

Queens University, Belfast: a major centre of scholarship and research in ocean energy with an *Environmental Engineering Research Centre*, a particular focus on tidal stream devices, wave tank facilities, etc. QUB offers degrees inter alia in structural, electrical and environmental engineering.

University of Ulster: although not focused on ocean energy, UU has a wide offer of engineering and science courses and works through four campuses.

National University of Ireland, Maynooth: NUIM is a respected participant in ocean energy with a focus on control engineering and wave energy. The research team focuses on electrical, electronic and mechanical engineering. NUIM offers a Masters in renewable energy with up to 35 students at a time; this course can be delivered via the internet.

Dublin Universities: None of the Dublin Universities- University College Dublin, Dublin City University and Dublin University, Trinity College- focuses on ocean energy although

all have researchers in relevant fields. For example, UCD has a wide offering in engineering including electrical engineering. The *Electricity Research Centre* is particularly well regarded and has a major research effort into the grid integration of renewables. DCU is well regarded in engineering (n.b. electronics) and computing and has undertaken research into fluid studies, wind energy, structures and modelling.

5.2 Institutes of Technology and Colleges of Further and Higher Education

Institutes of Technology: Three of the IoT's are involved in a significant way with ocean energy. *Sligo IoT* has a well-regarded Geophysical Research Group with a team of researchers. This Group deals with offshore geotechnics, research on anchoring systems, etc. *Cork IoT* is a partner in the MERC3 complex at Ringaskiddy, Cork and operates the leading edge National Maritime College of Ireland in conjunction with the Naval Service. The Institute has a wide offering of engineering courses including a BE in electrical engineering and, also, a BE in structural engineering. The CIT energy degree includes two ocean energy modules. *Dublin IoT* offers a range of courses in engineering and has a School of Electrical Engineering as well as the Dublin Energy Laboratory and the Electrical Power Research Group, each with supporting teams of researchers. Other Institutes of Technology offer courses or research in renewable energy including *Waterford IoT's* BE in sustainable engineering, *Limerick IoT's* BSc in renewable and electrical energy systems; *Tallaght IoT's* BE in energy and environmental engineering; *Athlone IoT's* BE in sustainable energy; *Dundalk IoT* has a Centre for Renewable Energy while *Letterkenny IoT* offers a Higher Certificate in Wind Energy Technology and has its own wind training tower.

The Colleges of Higher and Further Education in Northern Ireland total six in number. Typically, they offer HN and City and Guilds qualifications across a wide range of disciplines while also offering a small number of Foundation degrees including in the area of engineering.

Conclusion 2 *There is a significant engineering and, indeed, science education resource on this island. Historically, it has been skewed towards civil engineering while provision for electrical engineering is relatively limited.*

Conclusion 3 *Education relevant to marine renewables is fragmented and there is a risk also that the growing provision of broad-based 'renewable energy' courses and options, while useful for awareness raising, may lead to graduates with qualification which are of no immediate value in ocean energy at least. This point is borne out at 7 below where the industry need for engineers with a combination of robust initial degrees and, ideally, specialist skills (e.g. in various forms of modelling) is evident.*

6. Views of Expert Bodies and Individuals

A number of expert bodies and a small but representative selection of academics were interviewed. The following gives a flavour of the views expressed.

Engineers Ireland

Surplus of civil engineers and environmental experts at present while supply in other areas deemed to be 'ok'.

Big effort by *Engineers Ireland* to promote engineering to young people

Some growth in electrical engineering provision perceived in UCC and UCD

Drive on quality and standards in engineering in line with drive for Chartered Engineers approach

Forfas **(State agency responsible for policy analysis and support in the industrial arena)**

Report expected on 'green' economy skills (since published and referred to earlier)

Concentrate on core education in engineering with, perhaps, add-on modules related (e.g.) to ocean energy

Ideally, third-level institutions should specialise and share modules

Structured internships would be a 'magnet' for ocean energy

Shortages at present in electrical engineering

Irish surplus of engineers a competitive advantage for the island- Germany has a shortage of 30,000 engineers coupled with an ageing population

Work now underway on a research prioritization exercise

Estimate of 18,700 employed in 'green' activities of which 20% are engineers; demand forecast to grow at 8 % p.a.

Professor John Ringwood, National University of Ireland, Maynooth

Concerned about future availability of engineers and scientists because of issues at second-level concerning engagement with maths and science including the image of engineering and science among young people, teaching skills, etc

Concerned too about quality of applicants to third-level science and engineering

Initiatives suggested:

Use Erasmus Programme to organise joint programmes with other universities abroad

Flexible and virtual learning have a part to play-the NUIM Masters in renewable energy can be delivered by virtual means

Willing to play a part in any initiatives with other universities on the island to provide shared courses in ocean energy field

Science Foundation Ireland

Shortage of electrical engineers due to small level of graduates annually, demand by Eirgrid, etc. Hence, small numbers entering research in electrical engineering.

Shortage worldwide in power systems engineers

Award of double points for Mathematics in the Leaving Certificate (High School graduation equivalent) may impact on the numbers entering engineering studies

SFI engaged with ocean energy e.g. under (then) current Strategic Research Cluster call.

Initiatives suggested:

Provide conversion courses to ocean energy relevant disciplines at Masters level

Provide internships in ocean energy companies for students

Promote ocean energy as a career option e.g. at Young Scientists Show

Professor Colin Browne and Dr Michael Hartnett, National University of Ireland, Galway

Energy is a priority at NUIG

A major long term issue is to make the ocean energy area attractive to engineers

Examples of potential long term impact include use of data from sea to affect behaviour via the Semantic Web

Development of sensors via the 'Smart Bay' project another example of long term opportunity in ocean energy

Dr Conleth O Loughlin and engineering team at IoT Sligo

Shortage of Health and Safety experts with skills relevant to ocean energy

Shortages too in mechtronics

Virtual delivery and sharing of modules in ocean energy by colleges essential

Professor Dan Toal, University of Limerick

Get good foundation degree in civil, mechanical, electrical engineering

Offshore experience is not available

Student placements e.g. UL's 'co-op' programme are vital

Concern re student numbers

Specialist initial degree in energy doesn't have flexibility

Virtual delivery okay but must include at least project work at a fixed location.

Professor Tony Lewis, University College Cork

Engineers have to do five year degrees from 2013 -give them the opportunity via industry to do projects relevant to ocean energy.

Is there an opportunity in the Government's 'mentoring scheme' to place students or fresh graduates in ocean energy firms?

Seagoing experience- the Marine Institute already has schemes to provide seagoing experience to scientists: could this be expanded?

Don't disregard existing degree courses in energy – they could complement the jointly provided ocean energy courses recommended in this Paper. 'Ownership' is a big issue for universities.

Conclusion 4 *There is a notable degree of consensus across the spectrum of expert bodies and academia about a number of issues: the need to enhance the 'image' of engineering with young people; the variable quality of mathematical skills and teaching; the shortage of all-important electrical engineers*.

Conclusion 5 *The need for provision of courses and qualifications which are really relevant to ocean energy is recognised and there appears to be considerable interest among colleges in providing this in some form of joint fashion. The scope for virtual delivery is deemed important.*

7. Views of Industry

The firms interviewed are listed at Appendix 1. The views of industry are at the heart of this Paper and are elaborated below under the questions posed. Direct quotes are used where possible and are not attributed as companies were concerned about anonymity. A record of the interviews is on file.

7.1 What graduate and post graduate skills are, or will be, in short supply?

This question was aimed at unearthing basic underlying supply trends as deemed by industry. Recurring issues which emerged included the shortage of electrical engineers in particular, need for offshore experience, importance of core engineering qualifications, lack of industry interest in general 'renewables' courses and anticipated limited demand for people in the immediate future- marine renewables is an *emerging* technology. It should be noted that, as the Marine Institute has pointed out in correspondence with MRIA, there is an ample supply of skills and capabilities in the ICT area, notably software engineering for control systems etc, to support ocean energy.

The views expressed included:

'Electrical engineers- focus of existing population (of electrical engineers) on building and construction; no experience/expertise in 'hooking up' to offshore devices'

'People with offshore experience (from oil and gas industry) needed'

'Electrical engineers (needed) with interest/experience in generation and conversion'

'Really struggle to recruit engineers in construction, electrical, structural fields with offshore experience'

'People with oil and gas experience too expensive for marine renewables at this stage'

'Growth of marine renewables is slow; no concerns about supply'

'...it is a shortage of experienced engineers, not a shortage of skilled engineers'

'Can recruit abroad; two qualified c.v.'s received each week; can hire from competitors; what is the problem?'

'Lack of people with offshore operational experience will be blockage'

'Takes ten years to get relevant experience'

'Experienced people in UK retiring without replacement- will hit here'

'...old fashioned engineering degrees in civil, mechanical, aeronautical and electrical engineering will be of most value to the industry'

'Lots of students seeking placement but no interest by companies'

'Lack of genuine marine health and safety skills including training for engineering designers'

'Skill constraints i.e. difficulty in 'transferring skills' to the marine environment'

'Specialist skills in short supply including oceanography; wave modelling; (occasional need for) naval architects; environmental consultants to 'convert' wave modelling packages'

'Shortages of civil engineers in modelling, wave theory, fluid dynamics, force hydrodynamics. Electrical engineering shortages in dynamic modelling, grid code compliance plus shortages generally of creative/dynamic people and of people with maritime skills in offshore construction, operations and maintenance and diving'

Following views were highlighted by several companies as being of particular importance:

Concerns re 'energy' and 'energy engineering' degrees- too general. Specialist modules preferred with common high standards delivered by whichever institution the expertise in specific modules lies in.

Electrical engineering perceived as too hard/unattractive; need to communicate the exciting opportunities for electrical engineers in marine renewables.

Supply would be helped by more industry/academic collaboration e.g. projects for final year students; work experience opportunities. However, the practical difficulties in doing this in light of the early stage of development of the industry was recognised

Critical to have a robust primary degree in civil/electrical/mechanical engineering and then add specific marine renewable skills and qualifications

Good project management skills (needed) in a marine environment.

Conclusion 6 *The messages given by firms engaged in ocean energy were that the skills challenges are medium term a. electrical engineers- in short supply, work to be done to attract more qualified candidates to enter the profession b. a good quality initial degrees in one of the traditional engineering disciplines is key with specialist add-ons later-doubt about the value of current energy engineering type degrees c. real concern about the availability of engineers with specialist ocean energy skills d. lack of offshore experience and skills in working in marine environment a serious worry across the board.*

7.2 What are your recruitment plans for the next 5 years? Beyond that? What skill categories?

The purpose of this question was to quantify the demand for people by the industry over the next five years and beyond. As the selection of comments below illustrate, the demand over the next few years will be limited as the underlying technologies reach maturity and no-one was able to speculate in a firm way as to what the demand would be once the industry starts to take off.....but it is likely to be very substantial: see the SQW report referred to at the start of this Paper.

'Expect to double (from 60 people at present) in next 3-4 years-half current team are PhD's, Masters in electrical, mechanical and civil engineering'

'Will increase to 30 from small current base by 2015'

'Add another c30 to current 40 over 3 years'

'Utility skills already available in the organization, will recruit externally for people with offshore experience'

'Plan to recruit across engineering disciplines but must have additional skills e.g. dynamics of offshore structures, geotechnical design, etc'

'Will grow by c60 people at rate of c10% p.a.'

Conclusion 7 *The ocean energy industry is at an early stage of development. Companies' immediate recruitment plans are limited but the core needs of the industry for highly educated and specialist engineers are clear. In addition, there is evidence again of the issue concerning a lack of people with offshore experience.*

7.3 What institutions at home and abroad do you rate as potential sources of supply?

This question sought to establish (or otherwise) in a broad way the credibility of educational institutions on the island as a source of the graduate skills required by marine renewables. The results were fairly positive but indicate that local institutions must have high standards if they are to compete internationally to meet the needs of this industry.

'No particular favourites in Ireland; in the UK- Oxbridge, Bristol, Edinburgh, Strathclyde. Irish and UK graduates are of equal quality'

'None in Ireland. Nantes (France), Trondheim (Norway) and Marin (Netherlands) abroad'

'QUB, UCC/MERC, UCD and University College, London'

'UL, MERC and QUB'

'Trinity- very good graduates, QUB and UCC'

'NUIM- control systems, UCC-HMRC- test tanks, electrical engineering, etc; QUB- similar to UCC-HMRC; Heriot Watt – offshore engineering; also-Exeter, Robert Gordon's University and Strathclyde'

'UCC/MERC, QUB principally with specialist parts of UL, NUIM, NUIG and ERC at UCD'

Conclusion 8 *The willingness of the ocean energy industry to cast its recruitment net widely is evident here. The current importance of Queens University Belfast and University College Cork, together with specialist parts of other colleges, is apparent too*.

7.4 What initiatives do you think are needed, if any? Any other thoughts, issues, comments?

This was a broad ranging question which inevitably led to some overlap with the responses to previous questions. The responses included:

'Too much overlap between the universities e.g. at least three of them are interested in ocean energy economics'

'Need to encourage second-level students into engineering, idea of bonus points for maths well regarded'

'Ocean energy drowned (in academia) by computer studies and electronics....our needs are around civil engineering, heavy structures, mechanical and electrical'

'More links between third-level and marine renewables (needed) on education side-already there to some extent in research'

'Education for purpose is the issue'

'Strong economic multiplier from investment in education geared to marine renewables'

'Engage in Skills Fair –get views of IWEA and NOW Ireland'

'Education in maritime law is needed'

'Lack of language skills is an impediment to entering the Portuguese and Spanish markets'

'Lots of expertise across Irish education but should go to virtual educational and research approach'

'Third-level needs to give a better, co-ordinated offering in wave and tidal in conjunction with MRIA'

'Modules offered across the system form centres where expertise lies is the future'

'Highlight the excitement of the opportunities for electrical engineers'

Conclusion 9 *The same type of issues as recorded previously arise here too: the need to make the engineering profession more attractive to young people and the need for a more co-ordinated approach to specialist education for ocean energy by the third-level sector.*

8. Overview

There is no real shortage at present of any third-level skills in the nascent ocean energy industry although electrical engineering is a challenge and more needs to be done to attract young people into engineering generally. In part, this reflects the early stage of development of ocean energy which is more likely to generate hundreds of new jobs

rather than thousands of new jobs in the period to 2015. In the post-2015 period, the industry is likely to scale up to 'utility' level and this could lead to major expansion in employment during the 2020's (see the SQW Report referred to earlier) in particular.

The real issue is this: should Ireland leave it to the marketplace to provide our key, high-income skills and are we willing to accept that many of these could be recruited abroad with consequent challenges to the island's ability to become a leading player internationally in ocean energy? Or should we, as the MRIA believes we should, act now to ensure that a local body of qualified people, with back-up local research facilities, are available to staff the top and high value- added posts in ocean energy as part of an all-island drive to maximise jobs and wealth creation in this field?

The industry wants action to ensure a flow of people with robust degrees in traditional engineering disciplines with an add-on of an ocean energy module or a full degree at Master's level in ocean energy skills such as modelling, basic oceanography, etc. This should be looked at also in the light of the requirement from 2013 that engineers must undertake five year degrees (e.g. Bachelors followed by Masters) before practising professionally.

This approach is in line with the findings of the report on 'green economy' skills[2] which, in addressing the needs of all 'green' sectors, states (p21)

'There is scope for improving the alignment of current provision towards meeting the skills needs of enterprise while optimising the use of existing funding and expertise. There should be closer collaboration between industry and education/training and between institutions themselves for the design, development and delivery of education and training provision. It is more feasible to have one centre build up expertise within an emerging specialism area, and then share the module(s) across the system. This should be done on an all-island basis to make optimum use of available expertise and resources'

Ideally, in the ocean energy arena, there should be a common offering with components drawn from the individual colleges based on their expertise. Moreover, industry needs action to crack the conundrum of offshore experience: how are engineers and others to achieve real offshore experience prior to entering ocean energy?

Discussions with industry were clear on one point: there is no appetite- and this is unlikely to change- in the ocean energy community for general degrees or modules in energy, sustainable energy, marine energy, etc. Generally, they are not valued. Nonetheless, it must be recognised that a number at least of these courses have a good reputation and may have value in other areas of energy

The third-level skills ecosystem for a developing ocean energy industry in the medium term might comprise of three tiers: engineers with ocean energy training on top of their core disciplines, as discussed above; second, specialists who will be required in

relatively small number such as naval architects; and, finally, engineers with a background in the core disciplines who also hold a qualification e.g. a Master's degree in the broad energy field

9. Follow up by MRIA

The Marine Renewables Industry Association will focus on three issues arising from this Paper

First, the Association will enter a dialogue with the third-level and the expert bodies such as Forfas and others so that our (evolving) needs are taken into account in planning and policy fora e.g. the need to increase the supply of electrical engineers

Second, MRIA will seek to influence the academic community to provide a world class *common* ocean energy Master's module or, better still, a full Masters, designed in cooperation with the industry and ideally made available for delivery by virtual means

Finally, we will look at ways and means of dealing with the 'offshore experience' issue in conjunction with the Marine Institute and the National Maritime College of Ireland

Appendix 1- Companies Interviewed

- Pure Marine
- SSE Renewables
- Aquamarine Power
- Tonn Energy
- HMRC (as a major resource to the industry)
- Arup
- ESBI
- Bord Gais
- Open Hydro
- Ocean Energy
- CETO Developments