MRIA Energy from Ireland's Waves and Tides

Maritime Infrastructure Development Priorities to Support Ireland's Future Ocean Energy Industry

Discussion Paper

December 2014

This study was supported by the Sustainable Energy Authority of Ireland (SEAI) through the Renewable Energy Research Development & Demonstration Programme. SEAI is partly financed by Ireland's EU Structural Funds Programme co-funded by the Irish Government and the European Union

Preface

The past year has seen a turnaround in the fortunes of ocean energy in the Republic of Ireland with the publication in February of the Government's *Ocean Renewable Energy Development Plan* (OREDP). The new policy recognised that the growth of ocean energy would require investment in maritime infrastructure - ships and, in particular, port facilities.

The OREDP followed the track laid down by three reports commissioned by Government since 2009 on the topic of maritime infrastructure and ocean energy (Scotland has had four reports on the same topic since 2010!). Put simply, the maritime infrastructure issue has three related strands. First, ocean energy still has a journey ahead of it to achieve technical maturity. Second, in Ireland's case, any electricity generated from our bountiful west coast wave resource may need market opportunities, particularly in the export field, and these are not anticipated for some years to come. However, given that ocean energy becomes a reliable and (gradually) competitive source of electricity and that market opportunities are developed, then a major hurdle must be crossed: the actual capacity of Irish ports to support ocean energy. Ocean energy devices are large, ideally must be built (or at least assembled) close to deployment sites and will make significant demands on port facilities.

Ireland's wave energy resource is off the west coast. It should be possible to support the development of the resource, at least at the southern end of the west coast, from Shannon Foynes and Cork. Beyond a certain level of deployment, the much smaller ports to the north of County Clare would struggle to cope with developments off Mayo –the most likely ocean energy location in the north-west - in particular.

This Paper analyses the issue, draws conclusions and make recommendations about a challenge which must be tackled if ocean energy is to develop at scale from around 2030 , a short time away in the notoriously long investment cycle times in energy and in maritime infrastructure.

Summary of Recommendations

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

1. The State should actively identify and monitor innovative solutions to the possible need for early extra port capacity arising from ocean energy development off the west coast.

2. The planned harbour developments at Doonbeg, County Clare should be supported to provide a Forward Operating Base for WestWave and other early projects.

3. The provision of suitable vessels to support ocean energy should be left to the private market place where capable local companies would welcome new business opportunities. However, the Irish Maritime Development Office should actively monitor the situation and communicate any specific needs (e.g. incentives) to the Ocean Renewable Energy Steering Group.

4. Steps should be taken as soon as possible to start *planning* at least minimum facilities to support ocean energy at a port location in Mayo. The Association is conscious of the need to avoid raising expectations and to avoid land speculation. It must be emphasised that this recommendation is made in a measured fashion and it is made only in light of the particularly long lead-time typically encountered in port developments. It represents a 'hedge' on future port needs.

5. A review of ports policy, perhaps specifically in regard to the marine renewables industry, should take place no later than 2020. At that stage, issues such as market access for marine renewables electricity, and the likely pace of development of wave energy technology, should be a great deal clearer than at present while offshore wind developments may be in prospect off the west coast. This review should be a 'whole of Government' exercise, possibly conducted under the auspices of the recently established Ocean Renewable Energy Steering Group.

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. Potential of Ocean Energy

2.1 Potential Economic Impact of Ocean Energy

The Republic of Ireland is recovering from a serious economic downturn which led to serious losses of jobs and income…and a similar situation applies in Northern Ireland. 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 ……. could produce …….17, 000-52,000 jobs and an NPV of around €4-10bn by 2030.....Similarly a tidal industry…… may deliver….. 8,500-17,000 jobs and an NPV of between 41.5-2.75bn by 2030 - SQW Executive Summary

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

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

The possibilities these forecasts represent are valid because, for example, in the view of *Ocean Energy Europe*[3]:

'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[4]*.'*

The opportunity in ocean energy in Ireland has at least two possible dimensions- ENTERPRISE and ELECTRICITY MARKETS. There may also 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.

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 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 could have enhanced that opportunity quickly if it had not been aborted and some observers are convinced that the Agreement negotiations will be revived in time. Wind energy on land is facilitating companies in Ireland to grow their experience and their skills and will enable a number of them to capitalise on the future wave and tidal opportunity.

2.3 EXPORTING ELECTRICITY AND LOCAL MARKET OPPORTUNITIES

All of the stakeholders in ocean energy accept that the enormous scale of the Irish wave resource (together with a much lesser resource in tidal in the Republic) 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 demand in southern England in particular; the development of ocean energy technology and other factors. Moreover, large scale deployment of ocean energy devices

[3] The EU trade association for ocean energy. MRIA is a Board Member

[4] *Industry Vision Paper 2013* Ocean Energy Europe, 2013

will drive the cost of ocean energy down as 'economies of scale' and the 'learning curve' effect kick in.

Opportunities for ocean energy to meet local market opportunities must not be ruled out. A lot of issues could be resolved in ocean energy over the next ten years: the intermittency of renewables might be addressed by new electricity storage solutions; there may be technical breakthroughs which make ocean energy competitive with traditional energy feedstuffs; etc.

3. Background and Terms of Reference

3.1 BACKGROUND

This paper is the fifth 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[5] of ocean energy and has led directly to the establishment 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[6] and was published in September 2012. It identified 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.

The third study examined the supply chain for ocean energy[7] in Ireland and was published in June 2013.

[5] *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

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

[7] *The Supply Chain for the Ocean Energy Industry in Ireland – Discussion Paper* MRIA June 2013

The fourth paper was published in December 2013 and dealt with the potential for co-operation between Ireland and Scotland in ocean energy[8]

All of these papers (and others on subjects such as Initial Development Zones, consenting etc) are available on the Association's website www.mria.ie .

3.2 Terms of Reference

Maritime infrastructure refers, for the purposes of this Paper, principally to ports and harbours although there are references to shipping and to the hinterland of ports and harbours, notably heavy load-bearing laydown areas, and to the supply chain generally.

The ports and harbours of Ireland have been studied extensively in recent years (see 7) from the perspective of wave and tidal energy developments. These studies set out a valuable base of data and views about the needs of ocean energy and the capacity of our maritime infrastructure to meet them. However, even in the short time since the most recent study was completed (the 'IPORES' report in 2012- see 7.3), the policy landscape has changed: Government has confirmed its commitment to ocean energy with the adoption of an ocean energy development plan in early 2014; the pioneering WestWave project has advanced and will see the ESB deploy 5MW of wave devices grid-connected devices in c2018; and the ports have begun to recover from the recession which could colour their views on supporting ocean energy.

Accordingly, the MRIA decided to review the maritime infrastructure position, particularly with a view to identifying investment priorities in a sector with notoriously long lead-times due to planning permission and other considerations:

This study will seek to identify…… the inflection points (i.e. points where an accumulation of events and developments require that strategic decisions be made); a clear set of priorities and a time horizon; and suggested policy developments. It will be rooted in the views of the ocean energy industry, policy-makers and maritime infrastructure operators and will take account

[8] *The Opportunity for Co-Operation and Collaboration between Ireland and Scotland in Ocean Energy* MRIA December 2013

of likely developments in the closely related area (from the perspective of maritime infrastructure) of offshore wind[9]

Views were gathered by interviews during the spring and summer of 2014. 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. Northern Ireland views are taken into account in the Paper.

A list of those companies and institutions interviewed for this Paper is contained in Appendix 1.

4. Policy Backdrop

4.1 Ocean Energy

Ireland – North and South – is a potential 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[10].

Ocean energy is now firmly on the agenda of the Government of Ireland. It has been singled out as a national priority for research and development support[11]. Supporting the emergence of this industry was set as one of a handful of strategic goals fixed for national energy policy to 2020[12]. The latest policy statement on the Green Economy, published in November 2012, also highlighted the potential importance of the sector and pledged support.[13] Construction is nearing completion of the new Beaufort complex

[9] Extract from MRIA submission to SEAI

[10] Siemen's presentation

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

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

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

at IMERC in Cork which will house ocean energy tank testing and other facilities. Work is also in hand for further developments at the test site for quarter-scale devices in Galway Bay (part of 'SmartBay') and at the full-scale test site (Atlantic Marine Energy Test Site- AMETS) at Belmullet in County Mayo. Financial support for ocean energy overall by Government has increased – albeit from a low base – in the past two years. The *MarEI* project – involving €25m of Science Foundation Ireland support as well as engagement, either with cash or a contribution in kind, by nearly fifty companies – is a major step forward in ocean energy R&D.

The most important policy development of all was the publication of the *Offshore Renewable Energy Development Plan*[14] (OREDP) in February, 2014. It contains a number of new initiatives including extra financial support, an initial market support tariff for wave and tidal energy, etc. It is being implemented by a Steering Group of officials representing all relevant Departments and agencies and it is envisaged that industry will engage regularly with this Steering Group.

4.2 Next Steps

Looking to the immediate future, the Steering Group has commenced work on a number of workstreams including those dealing with the environment, infrastructure and job creation. It is anticipated that the *Maritime Area and Foreshore (Amendment) Bill* will reach the statute books soon (in 2015?) and it should provide a modern system to license and lease ('consent') sites for ocean energy.

However, much policy and practical work remains to be done. The need for an explicit decision about which arm of Government should act as 'landlord' for the seabed and operate a 'one stop shop', concerning leases and licenses, for potential developers must be sorted out (the MRIA favours the Department of the Environment, Community and Local Government). The initial market support tariff must be designed and a consultation held with potential beneficiaries and others. The timing and terms of reference of a first leasing round of an appropriate area(s) must be determined. The

[14] *Offshore Renewable Energy Development Plan- a Framework for the Sustainable Development of Ireland's Offshore Renewable Energy Resource* Department of Communications, Energy and Natural Resources February 2014. The Plan deals with offshore wind energy as well as wave and tidal energy.

all-important WestWave project will require support from across Government.

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.

4.3 Maritime Infrastructure and Ocean Energy

Maritime infrastructure directly encompasses ports and vessels to support specific activities. Indirectly, it involves issues such as the provision of security (Naval Service)[15], search and rescue (Coast Guard), navigation aids (Commissioners of Irish Lights) and marine science and surveying (Marine Institute) among others.

This Paper concentrates on direct maritime infrastructure, particularly *port facilities*. It is impossible to predict at this stage the numbers and types of *vessels* required to support ocean energy – they vary by specific type of device and there may be an overlap between offshore wind requirements and ocean energy needs. Studies, such as those reviewed later in this Paper, and anecdotal evidence arising from interviews with maritime interests suggest that a) there will certainly be a need for a significant number of ships of all shapes and sizes in due course – one recent offshore wind farm development involved ten different types of vessel[16] - and that b) shipping enterprises at home and abroad can meet ocean energy's needs provided communications about the scale and timing of the opportunity are opened up with them as early as possible.

[15] MRIA and the National Offshore Wind Association of Ireland have been actively engaged with the Department of Defence *Green Paper* consultative process to emphasize the need to develop a security policy for offshore energy

[16] *Review of Engineering and Specialist Support Requirements for the Ocean Energy Sector* RPS, commissioned by SEAI, 2009

4.4 Significance of Ocean Energy For Ports

Each ocean energy array will require extensive pre-deployment work in terms of site exploration, environmental impact studies, consenting arrangements etc which cumulatively could take several years to sort out.

Once the go-ahead for a particular site and project is given, the devices must be ordered, the cable, moorings/foundations and shore installations designed, grid connection arranged etc. Depending on the type of device and the nature of the site, devices must be either towed to the deployment site or components transported (some may need to be manufactured locally) to a port near the deployment site and assembled there. The completed machines must be towed to the deployment site, installed and commissioned. All of the available indications suggest that local part-manufacture and assembly of these large, complex devices will be a feature.

Various device manufacturers are predicting a period of up to five years between major refits for their devices but clearly there will be ongoing work in both operations and routine fault clearance and general maintenance. Operations &Maintenance (O&M) will make less demand on port facilities than initial deployments and can often be supported by generally available work boats. One view of the stages of development of a project is contained at Appendix 2.

5. Position and Outlook for Wave and Tidal Energy

5.1 Key Features of Ocean Energy Devices

Wave and tidal energy devices normally consist of four elements. In all cases, the movement of water moves an element of a device e.g. the 'flap' on the Aquamarine device[17] :

1. *Hydrodynamic system*: the 'engine' of any device which interacts with the water to extract energy
2. *Power take-off*: converts the energy extracted to electrical energy
3. *Reaction ('mooring') system*: holds the device in position
4. *Control system*: provides both supervisory and closed-loop control

[17] See www.aquamarinepower.com

Ocean energy is on a genuine 'frontier of knowledge' with enormous tests of engineering arising from the might and contrariness of the sea which impose great challenges across the spectrum from sheer survivability (particularly off the wild Irish Atlantic coast with its energy intensive waves …and in energy-bountiful tidal streams such as the Bay of Fundy in Canada) to reliability and sustainability of systems and components to device installation and maintenance.

There are a variety of technology solutions or approaches to ocean energy under examination and trial at present. In the case of *wave* devices, approaches include Attenuators, Point Absorbers, and Oscillating Wave Surge Convertors. In the *tidal* area, approaches include Horizontal Axis Turbines and Vertical Axis Turbines.

5.2 Current Position and Development Prospects

Milestone	Priorities	Goals
By 2020- **Innovation**	• Innovation-TRL progress • Demonstration and testing	• Financial close on up to 10 pilot arrays • Tech Innovation: reduce costs, increase reliability and yields
By 2025- **Cost Confidence**	• Economies of Scale	• Arrays scaling up
By 2030- **Market Roll-out**	• Continued Innovation • Supply chain engagement • Accelerating cost reduction, standardization and scaling up	• Commercial array installations (30MWS+)
By 2050 – **Mainstream**	• Rapid cost reduction-volume production	• Supply up to 100GW of ocean energy.

The table above sets out the view of *Ocean Energy Europe* (the wave and tidal industry representative body) of what is likely to happen to the sector

all the way out to 2050. The consensus appears to be that tidal energy technology is, at least at present, ahead of wave energy technology in development terms[18].

Ireland will have WestWave up and running by 2020 and there is a possibility of at least two other small wave arrays off the West coast. Given these projects and various projects planned in Scotland and elsewhere, there may be more than ten pilot arrays at work in Europe by 2020. However, the overall views of *Ocean Energy Europe* are in line with those of MRIA. In practical terms, this means that ocean energy at scale off the West coast will not occur until the latter part of the 2020's….which is a very short journey through time for investments in the ports and energy sectors.

5.3 Implications for Policy

The implications of ocean energy in terms of port facilities are significant: a port supporting ocean energy will require a <u>minimum</u> of a heavy load-bearing quay with a length of up to 200m, several hectares of heavy load–bearing area next to the quay to enable devices to be assembled and marshalled as well as heavy-lift cranes and a 5m water draught (and preferably more). To put the matter in perspective, each Ocean Energy Ltd device, tested at quarter scale in SmartBay in Galway in recent years, would involve about 1,200 tonnes of steel at *full scale*…. it would be significantly bigger than the Naval Service's offshore patrol vessel LE *Aisling.*

The potential scale of the infrastructure needed (e.g. for a major wave energy development off the west coast) can be illustrated by the recently announced Siemens offshore wind turbine facilities on the East coast of England. The project involves a blade manufacturing facility at Paull in the East Riding of Yorkshire and a turbine construction, assembly and service facility at 'Green Port Hull'- see illustration below. Total investment amounts to at least £310m (1000 new jobs will be created) with £150m of this being contributed by Associated British Port's investment in the 'Green Port Hull' aspect[19]. UK Government direct cash support for the port aspect

[18] There is an excellent description of the various technologies and the elements involved in developing, making, deploying and supporting ocean energy devices in *Wave and Tidal Energy in the Pentland Firth and Orkney waters: How the projects could be built*. A report commissioned by The Crown Estate and prepared by BVG Associates 2011

[19] *The Guardian* 25 March 2014

appears to be confined to a £10m pump priming-type grant in 2012 inter alia to prepare the site in Green Port Hull[20].

The likelihood is that wave energy arrays off the Irish west coast are unlikely to scale up until the late 2020s. This leaves, however, no room for complacency. First, as one experienced port operator pointed out to MRIA *'Ports have a huge planning risk, you can assume a seven years lead time for any major investment including three years for the planning dimension*'. Second, the eventual development of an export market for Irish renewable energy in the UK and elsewhere, coupled with maturing floating wind technology, could see significant investment off the Atlantic coast in the 2020s in offshore wind, placing big demands on the limited port facilities even before wave technology reaches full commercial status.

[20] www.rechargenews.com 25 November 2012

6. Ireland's Ports

6.1 Recovering from Recession

In line with the overall economy, the Irish ports sector is rebounding from the 'Great Recession' which devastated business in all ports for a number of years after 2007. In 2013, traffic improved under most of the key headings[21]

- *Bulk traffic*: up 4% overall in 2013. Dry bulk accounts for 56% of the traffic followed by liquid bulk with 41%. A total of 82% of all bulk traffic is accounted for by the ports of Cork, Dublin and Shannon Foynes
- *Lift-on, lift-off (containers) traffic*: Declined marginally (2%) in 2013 with the bulk of the traffic accounted for by Dublin (54% of all-island amount) followed by Cork and Waterford
- *Roll-on, roll-off traffic*: Up by 4% in 2013 with Dublin and Rosslare Europort being the important players
- *Passenger* numbers remained steady at 4.4m
- The *Cruise* sector was buoyant with 277 cruise calls in 2013 involving 407,000 passengers and crew- Dublin was the busiest cruise port with 100 visits

The major ports are being run, first and foremost, as businesses and enjoy a healthy commercial rivalry. The bigger ports are profitable (recording a healthy return on sales) and Dublin, for example, pays a dividend to the Exchequer with Cork and Shannon Foynes slated to follow. Many of the ports have experience of being the port of entry for *onshore* wind turbines and have experience of that industry's storage and marshalling requirements.

[21] *Irish Maritime Transport Economist* Vol 11, May 2014 Irish Maritime Development Office

6.2 National Ports Policy

The *National Ports Policy* divided the network of ports into three categories[22]:

Ports of National Significance (Tier 1): Dublin, Cork and Shannon Foynes. Each of these ports is responsible for 15-20% of overall tonnage through Irish ports and are deemed to have development potential. These ports are classified as 'TEN-T' in European Union terms i.e. they are ports of significance within the trans-European transport network and are eligible for European financial aid.

Ports of National Significance (Tier2): Port of Waterford and Rosslare Europort. These ports account for at least 2.5% of overall tonnage through Irish ports and have the capability of handling greater volumes of unitised traffic

Ports of Regional Significance: These include the five smaller State owned ports and all other ports that handled commercial freight. The five State ports will be transferred to local authority control under the Harbours (Amendment) Bill, 2014. This will include Galway Harbour which might be of significance as a potential base to support wave energy developments. These ports collectively account for just 3% of total tonnage in the State.

There are also major fisheries ports, which come under the umbrella of the Department of Agriculture, Food and Marine, including Killybegs in south Donegal which is well placed to support wave energy developments in the north west and Rossaveal in Galway which is also in a position to support wave farms in the west although this would require investment in a new deep water quay (for which planning permission has been granted; it will require renewal fairly soon).

The National Ports Policy pointed out that there '….is no short-term pressure on national port capacity' but that '…the planning and development of …commercial port development demands a long-term vision'[23]. It endorsed the extant policy whereby the ports sector does not

[22] See *National Ports Policy* 2013, Department of Transport, Tourism and Sport

[23] P14

receive Exchequer funding for infrastructure investment[24]. However, the Policy states that 'Government is open to a variety of mechanisms for investment in the ports sector… (including) the possible sale of equity stakes, public-private partnership-type arrangements, build-operate-transfer arrangements or other similar proposals'. In the UK, the State provision of funding position *appears* to be somewhat looser. For example, Liverpool was grant-aided for a dredging project in 2012, much to the chagrin of other ports! Grant-aid is available for suitable projects (e.g. offshore wind associated manufacturing) which involve both a manufacturing and a port element.

There are, of course, significant port facilities in Northern Ireland which must be borne in mind in considering the maritime infrastructure needs of the wave industry in the Republic of Ireland. The Port of Londonderry has deep water and extensive quay facilities; Belfast Harbour is a major port by any standards and is home to the DONG offshore wind turbine facility and to Harland and Wolff Heavy Industries while the major engineering firm, McLaughlin and Harvey is located nearby. The facilities at Warrenpoint and Larne could also play a part in supporting developments in the Irish Sea.

Details of the scale, facilities etc of each port and harbour of modest size and upwards on the island of Ireland are contained in the reviews dealt with at 7 below.

7. Recent Reviews of Irish Maritime Infrastructure

Three separate reviews of Irish maritime infrastructure (particularly of ports and marine energy) have appeared in the past five years.

7.1 Review of Support Requirements, 2009

This 2009[25] study examined a hypothetical scenario in which a 250MW mix of wave and tidal energy devices (360 in all) are to be deployed off the Irish coast over a five year period, based on a 'weather window' of six months annually. It assumed that the assembly and build cycle would take

[24] Established in the *Ports Policy Statement* 2005, Department of Transport, Tourism and Sport

[25] *Review of Engineering and Specialist Support Requirements for the Ocean Energy Sector* RPS, commissioned by SEAI, 2009

60 days per device and that up to 10 devices might be under construction at any one time. The study examined the practical experience involved in manufacture, marshalling, assembly and deployment of early examples of devices such as those developed by MCT, OpenHydro etc. Based on this model, about 105,000 tons of fabricated steel and 450,000 tons of concrete would have to be fabricated and transported to the deployment or marshalling area in year 5 when it is assumed that 150 devices would be required.

The Review makes the point (4.1.1) that ocean energy (wave and tidal) devices '…in general are of a large size and significant weight……developers will aim to manufacture and to assemble devices as close to a suitable port as possible…there will be a requirement that sufficient land[26] be available within very close proximity to quays for the final assembly and marshalling of devices'. Turning to Operations and Maintenance (O&M), 'it is expected that ongoing inspection will be carried out using relatively small craft….any required work may use a multi-cat type workboat…some floating devices may lend themselves to removal from the deployment site for…..servicing or maintenance works' (4.1.2).

The Review concluded (4.2.1) that <u>dealing with wave and tidal energy developments would be challenging for ports and harbours compared to handling on-and- offshore wind developments</u>:

- Scale of wave and tidal developments likely to be greater and tied to a more concentrated timeframe
- Also, likely to be more concentrated geographically with demand focused on a small number of ports
- Support infrastructure will likely be of a larger scale than that which is required for wind developments

[26] Estimated at as much as 2.5-6ha based on reasonable assumptions concerning the scale of an individual development and capacity

The Review determined that only large ports will have the infrastructure

Estimated Port Facility Requirements for Annual Deployment of 150 devices

ANNUAL DEPLOYMENT: 150 DEVICES

HINTERLAND AREA NEEDED: >50,000M2

DRY DOCK: 9000M2

2 X QUAYS WITH TOTAL WATERFRONT OF 200M AND DRAFT OF 5M

CRANE LIFT CAPACITY: 170T

TABLE 4.6, P66

needed to support ocean energy. Based on the assumptions underlying the Review model, only Belfast Harbour (home of the important Harland and Wolff shipyard capabilities) has the facilities to support major deployments of devices. However, the east coast location of Belfast means that there is a long transit to the west coast where the bulk of Ireland's ocean energy potential is located. Likely deployment ports to support the west coast include Cork, Castletownbere, Shannon Foynes, Galway, Killybegs and Londonderry. There are constraints at each of these ports ranging from water depth to availability of laydown sites in the ports' hinterlands. '….no single port will be capable of supporting the installation of up to 150 units in one season'[27] which may represent a reasonable view of the level of development likely once wave device technology fully matures and major offshore arrays become possible.

The Review deemed that 'current levels of port capacity on the west coast are unlikely to be adequate to support the anticipated growth of the ocean energy industry Supply Chain' (7.2.5) and 'Significant investment may be required in Irish ports in order to meet the needs of Ocean Energy…' (7.2.5).

[27] P84

7.2 Assessment of Ports and Shipping Needs, 2011

The Assessment[28] published by SEAI in 2011 focused on ports and shipping and widened the net to include offshore wind. It illustrated the demands on facilities made by major marine energy projects by reference to the Thanet wind farm (300MW) off the coast of Kent. For a 100 turbines/300MW wind farm such as Thanet, up to 35 vessels in 10 different categories were required and the Assessment concluded that wave or tidal deployments of similar scale would require at least the same level of shipping support with wave energy systems having the additional requirement for '……the installation of multiple mooring systems….' (4.2, p40) which would require anchor handling and crane vessels in addition to those types used for the Thanet project. The report identified at least four local Irish companies with the experience, reputation and skills to mobilize such support but concluded that there is a local shortfall under almost every heading of vessels necessary to undertake a single 100MW deployment and that chartering at short notice on the open market could prove difficult (5.1, p56).

The Assessment took the view that 'Ocean Energy …devices in general are of large size and substantial weight. Road Transport of assembled devices is likely to be problematic and expensive. It can be expected that developers will aim to manufacture and assemble devices as close to a suitable port as possible…(*at the very least*) sufficient land is required close to quays for the final assembly and marshalling of devices' (6.1, p62), based on the assumption that a minimum of 10 units will need to be dealt with simultaneously.

The Assessment makes the important point from the perspective of ports that 'The potential for floating windfarm development is less geographically constrained (*than ocean energy*) and may present more opportunities for more Irish ports, although this type of investment is unlikely to happen on a commercial scale for some time' (6.2, p64)

[28] *Assessment of the Irish Ports and Shipping Requirements for the Marine Renewable Energy Industry* RPS, commissioned by SEAI in co-operation with Irish Maritime Development Office, 2011

A comparison of the box below and that at 7.1 earlier, illustrates that there is a similarity in requirements between ocean energy and offshore wind

> *Estimated Port Facility Requirements for Annual Deployment of 100* ***wind*** *turbines pa*
>
> 200-300M OF QUAYSIDE WITH AT LEAST 3-6TON/M^2 LOAD BEARING;
>
> AT LEAST 8HA FOR LAYDOWN AND PRE- ASSEMBLY OF TURBINES;
>
> 6-8M DRAFT BUT COULD BE UP TO 10M
>
> 24 HOUR ACCESS ETC.
>
> (6.1, FOCUSES ON OFFSHORE WIND TURBINES BUT GENERALLY APPLICABLE TO OCEAN ENERGY DEVICES)

needs. It is likely that offshore wind developments will take place off the west coast, particularly as floating wind device technology matures. Thus, the need for maritime infrastructure to match energy developments as a whole off the west coast is striking.

The Assessment stated that 'a critical requirement for the development of offshore renewables across Ireland is the upgrading of port capacity' (6.0, p58). Importantly, however, the Assessment determined that emerging high speed installation vessel designs could open up the opportunity for ports with relevant infrastructure to support distant, marine energy developments '….geographic location may not be the overriding factor in choice of port' (6.3, p67). High speed installation vessels may enhance the scope for the Port of Cork, for example, to contribute to marine energy off the west coast.

The Assessment reviewed each port on the island of Ireland and concluded (7.3, p94) that:

- The ability to provide large land areas close to load-out quays is a constraint even in the large ports- Belfast and Cork are deemed to be possible exceptions to this
- Ocean energy is not anticipated to be a core business by the ports and they won't invest in infrastructure unless there is a commercial case to do so.

- Port managements questioned the need of ocean energy developers for large amounts of land and were confident that solutions could be identified through dialogue.

The Assessment noted that 'Both the English and Scottish Governments have established incentive budgets for the development of ports in the hope of attracting major investment by (wind primarily) turbine manufacturers to a port location in the UK' (8.3,p102)

Finally, the Assessment did not identify specific ports to support wave and tidal energy developments, essentially because of the then early stage of wave and tidal technology but remarked that '…location and proximity to development sites will be a significant factor' (8.5, p106).

7.3 PORT'S OFFSHORE CAPABILITY REVIEW ('IPORES'), 2012

The 'IPORES' Review[29] was undertaken in 2012 to provide '…further consultation with the port authorities to address some concerns arising from this report (the 2011 *Assessment,* see 7.2 above) and …to further develop a picture of areas where Ireland could achieve growth in the short to medium term'[30]

This Review examined all of the main ports around the Irish coast, pointing out that a number of them have experience of supporting offshore oil and gas exploration; many of them have experience of landing, storing and part-assembling wind turbines for installation on land; a number of ports – Belfast, Greenore, Cork and Galway - have experience of dealing with early wave and tidal devices. The Review categorised ports into three groups 'as a guideline to support broad-based decision making'[31]. The Review estimated that as many as 3,800 new jobs could be created at the category A and B ports by 2026 in support of marine energy. The Review was clear that 'Ports … need to be re-evaluated at a later stage in relation to the scale of developments and technologies associated with meeting the specialised requirements of these (*wave and tidal*) marine renewable energy industries'

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[29] *Irish Ports Offshore Renewable Energy Services (IPORES): A Review of Irish Ports Offshore Capability in Relation to Requirements for the Marine Renewable Energy Industry* Irish Maritime Development Office, 2012

[30] From *Executive Summary*

[31] From *Introduction*

The IPORES Review drew off other reports in terms of specific requirements and classified them into three categories as set out below.

CATEGORY A: LARGE SCALE CONSTRUCTION ASSEMBLE AND SERVICE PORTS WHICH COULD SUPPORT LARGE SCALE OCEAN AND WIND ENERGY DEVELOPMENTS- DUBLIN, CORK AND SHANNON FOYNES PLUS BELFAST (NI)

CATEGORY B: STRATEGIC SUPPORT OPERATIONS AND MAINTENANCE PORTS- KILLYBEGS, ROSSLARE EUROPORT, WATERFORD AND GALWAY PLUS WARRENPOINT, LONDONDERRY (NI)

CATEGORY C: SERVICE PORTS BUT WITH LIMITED POTENTIAL E.G. GREENORE, LARNE (NI)

See p13

The text box above illustrates the challenge facing Irish ocean energy and, indeed, wind energy off the west coast: the only Category A port on the west coast is Shannon Foynes located in the south west which is well situated to support early demonstration arrays which are likely to locate off the coast of Clare but it may need similar or complementary facilities further north as the industry matures and expands.

The Review made a number of recommendations that are particularly pertinent to the wave and tidal energy sector including:

- A national website integrating data and general information on the ports' 'offerings' (now being dealt with through the development of an ocean energy portal by SEAI)
- Financial support by Government for specific Irish ports to attract FDI in marine energy
- On-going evaluation of the ports in relation to new technology e.g. wave and tidal to ensure that the ports' capacities can match the energy industry's requirements

7.4 OCEAN RENEWABLE ENERGY DEVELOPMENT PLAN

The OREDP, launched at the MRIA's annual *Ocean Energy Industry Forum* in February 2014, stated that:

'The development of offshore renewable energy represents a significant opportunity for our ports, particularly those along the western seaboard. They will play a crucial role in facilitating the necessary development of both offshore renewable generation and grid infrastructure, requiring investment to handle the necessary plant, equipment and cabling, and the

associated shipping during both the construction, and operation and maintenance phases of future projects…' (p15)

The OREDP's comments on ports and shipping were notable, not least because, for the first time ever, a central Government Department has directly recognised, that marine renewables development will demand investment in maritime infrastructure[32]

8. Scottish Ocean Energy and Maritime Infrastructure

8.1 Ireland and Scotland Ocean Energy Links

Ireland and Scotland face a number of common challenges in ocean energy including the developing nature of wave and tidal technology, funding at all levels and market access, both in terms of grid and in terms of commercial viability and market attractiveness. Ireland and Scotland are examining the scope for co-operation in ocean energy under the auspices of the British Irish Council[33].

Scotland is a major player, arguably the main player, globally in ocean energy. The Scottish Government has given priority to the development of the wave and tidal energy sectors and expects them to contribute to the aim of 100% of electricity needs being met from renewable resources by 2020- a challenging target. The Government has been consistent in its ambition to 'capture' a major position for Scotland in the global supply chain for ocean energy. Scotland is featured by successful ocean energy leasing rounds, a well-resourced R&D system in the universities, a 'one-stop shop' approach to consenting and a successful effort to attract FDI in ocean energy. The *European Marine Energy Centre* on Orkney is a world-renowned ocean energy test centre with enviable port facilities available locally which have been the subject of heavy investment to cater for ocean energy.

In light of Scotland's high standing in ocean energy, it is informative from an Irish point of view to examine the Scottish position on maritime

[32] *Offshore Renewable Energy Development Plan A Framework for the Sustainable Development of Ireland's Offshore Renewable Energy Resource* Department of Communications, Energy and Natural Resources, February 2014

[33] See *The Opportunity for Co-Operation and Collaboration between Ireland and Scotland in Ocean Energy* – MRIA Discussion Paper. 2013.

infrastructure investment, particularly in the Highlands and Islands where much of the ocean energy resource is located.

8.2 The Scottish National Renewables Infrastructure Plan Stage 2, 2010

The national renewables infrastructure plan[34] focused, from an ocean energy perspective, on the infrastructure needs of the Pentland Firth and Orkney waters where initial wave and tidal developments were planned with deployment of at least 1,350 MW (then envisaged) during the period to 2020.

The report concluded that existing port facilities should be adequate during the 2010-2015 period when small arrays would be deployed while '…considerable port infrastructure required'[35] as wave energy device deployments scale-up from 2016 onwards. It pointed out that '…a three to five year maintenance cycle is envisaged by most of the developers …which will create requirements over decades for the port facilities to support this'[36] , noting that operations and maintenance facilities within four hours sailing from deployment sites are favoured[37].

The Plan, however, was unable to specify the port developments needed at any stage in light of the still-emerging nature of the underlying ocean energy technology. Interestingly, the Scottish plan identified a series of port clusters and sites that could support offshore wind and ocean energy at scale and expressed confidence that Scotland had sites with the capacity to act as 'industry hot spots[38]' but that '…some decisions on port development and use *(concerning wave and tidal)* may have to be made before there is any certainty in the market[39]' in view of the long lead times involved in getting planning permissions, etc.

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[34] *National Renewables Infrastructure Plan Stage 2- Report from Scottish Enterprise and Highlands and Islands Enterprise* July 2010

[35] Section 8, p22

[36] Section 8, p22

[37] Section 8, p22

[38] Section 3, p7

[39] Section 8, p23

8.3 Crown Estate on Building Out Ocean Energy Projects, 2011

The Crown Estate, which inter alia is responsible for the UK's offshore property i.e. the seabed, published a report on how to build out the projects in Pentland Firth and Orkney waters[40]. The report is based on the eleven wave and tidal projects then planned in the Pentland Firth and Orkney waters which had a forecast associated expenditure of c£6bn before infrastructure investments such as grid are taken into account. It noted, presciently, that 'a substantial acceleration in technology research, development and demonstration activities is required'[41] if the deployment schedule was to be met – in fact, deployment has been pushed back by technology challenges as well as grid issues in the area.

The Report contains an excellent description and analysis of the various stages involved in ocean energy from project design to installation to maintenance. It takes the same view of other reports on the type of port facilities generally required and makes the point also that '…manufacture or final assembly of components may tend to be local to installation sites'[42]

8.4 Outer Hebrides Harbour Study, 2013

This Study[43] was commissioned to evaluate the harbours in the Outer Hebrides to support ocean energy with specific reference to the requirements of three projects with licensed sites on the north coast of Lewis- Aquamarine Power, Pelamis and Voith Hydro Wavegen[44].

The Study noted that the developers each had different installation and maintenance methods and the types of vessels needed were not uniform either. They did overlap, however, in their minimum port requirements with at least 100m length/ up to 7m draught quay requirements as well as hard standing, office and workshop space needed. A complication is that

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[40] *Wave and Tidal Energy in the Pentland Firth and Orkney waters: How the projects could be built* A report commissioned by The Crown Estate and prepared by BVG Associates 2011

[41] Section 4

[42] Section 9.2.1

[43] *Outer Hebrides Harbour Study* commissioned by Comhairle Nan Eilean Siar and Highlands and Islands Enterprise; prepared by Ramboll, 2013

[44] In late 2013, the promoters of this project announced that they would not progress it any further due to insufficient investors.

offshore wind support needs may extend the minimum quay requirement to 110m with a draft of 8m[45]

8.5 HIGHLANDS AND ISLANDS ENTERPRISE, 2014

The *Highlands and Islands Enterprise* agency has recently published (August 2014) a study on marine renewables infrastructure[46] for consultation. This report set out to gather the views of marine renewables developers on their maritime infrastructure needs.

The conclusions of this report are interesting from an Irish point of view:

1) 'It is too early to expect any convergence of developer needs at this stage (2014)- differences in technology will mean that each will have a different set of requirements…..'
2) 'Developers identified the risk of early significant investment which may prove to be unnecessary or in the wrong place…'
3) '…there is no immediate need for large scale investment in new quay facilities specifically for the marine energy industry in the near future…'[47]

9. Strategic Issues Explored with Stakeholders

A wide range of interests in ocean energy and in ports were interviewed for this Paper – a list is contained in the Appendix. A series of issues identified by MRIA was explored with the stakeholders.

First, the interviews sought to identify the attitude on the part of ports and related interests to their development role (n.b. in supporting ocean energy) as against their commercial role.

Second, MRIA reviewed the investment plans of port stakeholders and the extent to which they make provision for ocean energy.

[45] Section 1.5

[46] *Marine Renewables Infrastructure Plan (M-RIP) The Highlands and Islands* Highlands and Islands Enterprise August 2014

[47] *Executive Summary* p3

Third, the attitude of the ports to the ocean energy opportunity was teased out and discussed.

Finally, the needs of developers and others in terms of port facilities was reviewed.

Normally, in MRIA Papers, (a selection of) the direct views of interviewees are given anonymously and this is observed here where possible but in some instances it is necessary to give attributable quotes.

10. Views of Ports

10.1 Commercial v Development Roles

The chain of ports around the Irish coast are going through a period of great change. They have all suffered from the effects of the Great Recession during which their traffic collapsed from the heady heights of the Celtic Tiger, c2007…..traffic today is recovering with one major port indicating to MRIA that it will enjoy a near historic record level of traffic in 2014.

The maritime infrastructure network is going through governance changes so that the smaller harbours (e.g. Arklow, Greystones and Wicklow in County Wicklow) are being integrated into the local government system (e.g. Wicklow County Council) and tidying up of other facilities is underway e.g. Dundalk is moving from the ownership of Dublin Port to that of Louth County Council.

The bigger ports, on the other hand, are now very much stand-alone commercial businesses investing heavily for the future and are profitable - only the three TEN-T ports of Dublin, Cork and Shannon Foynes are entitled to access EU funds in terms both of grants and loans. These ports all face pressure from their shareholder, the Government, for a dividend. The overall ports policy reinforces this trend: the *National Ports Policy* emphasises that the ports must operate on a commercial basis and the Department of Transport, Tourism and Sport emphasised to MRIA during an interview that their guidance to the ports is provided with a light hand…although Departmental approval is required for borrowing, joint ventures and subsidiary creation and the Department is one of the bodies which must be consulted in regard to planning permission for port

developments. The Harbours Act, 1996 keeps any temptations to engage in excessive financial engineering at bay- ports are not permitted to borrow in excess of 50% of their net assets.

A consequence of the commercial emphasis of the ports is that they do not in practice have, nor they see themselves as having in future, a development role, a 'public good' role, in regard to ocean energy or any other activity for that matter.

Some views from the ports:

'*We are a commercial company, no State funding and we have to pay an annual…..dividend*'

'Why should a commercial company like a port provide infrastructure without a business case? For example, company X (name supplied) offered 5 years business to us but it would have involved €50m investment by us- not commercial'

'Contracts for 5 years from marine renewables firms are attractive if there is a business case'

'Won't invest money in capacity for renewables, very speculative, too many unknowns e.g. when is it going to happen?'

'Concern about the consenting regime for renewables….when will the Bill be passed into law?'

'Renewables are 20 years away, not core to our port'

'Healthy disrespect for the National Ports Policy which does not have a strategy'

10.2 Investment Plans

The main ports are operated as *well-planned* commercial businesses - Dublin, Cork and Shannon Foynes, for example, have full Master Plans and have put, or are putting, significant investment into the complex and arduous task of gaining permission from all of the planning and other authorities involved.

Cork

Port of Cork is steadily advancing its plans to invest up to €60m in two new quays (1 x 310m and 1 x 200m) plus creating 25 acres of reclaimed land for a multipurpose area which will also ease pressure on its current Ringaskiddy berths which total 485m with up to 12.5m of draught being available. Given planning permission, the new facilities could be in place by 2018.

Dublin

Dublin Port is land-locked and believes it can double the throughput of the Port based on its existing and planned estate. Its current investment plan involves much rationalisation and moving about of functions and activities to achieve a better use of existing space plus the renovation of 3km out of the current 7km of berthage as well the development of extra berthage. The Port recognises that it has little prospect of extending its current 60ha 'footprint' and this forces it to make choices in the range of businesses it wants to cater for….there are implications developments[48] in energy in the Irish Sea.

Shannon Foynes

The third major port, Shannon Foynes, has a significant Master Plan which involves a total investment of €140m including new deep water sites and envisages a total envelope of 127ha - the current port precinct is 65ha with two major quays of 280m and 290m length respectively. Shannon Foynes foresees an immediate investment of €15m commencing soon.

Other Ports

Killybegs interests claim that the port is congested at times and they would like to see a further 60m at least of quayside being developed but this depends on the availability of funding for this national fisheries harbour, from the Department of Agriculture, Fisheries and Marine. Moving down the west coast, *Rossavea*l, west of Galway, has plans (and planning permission) for new deep water berthage – ultimately, up to 400m – and is part of the national fisheries harbours chain. *Galway Harbour* has

[48] The plan for a new 'super port' at Bremore in north County Dublin has been scrapped

ambitious plans to reclaim up to 50 acres which, together with extensive dredging, would transform this port which is tidal and has limited depth of water available. The first phase of this plan would cost €51.6m and is currently at the planning permission stage. *Waterford* is well geared for the future: the port owns 65 acres at its main, *Belview*, site with 700 acres zoned for Port use and planning permission for 1km of new quays. *Rosslare Europort* has a footprint of 12ha and plans to add further land, a new quay and deepening of the draught available to 11m. This plan will be out for public consultation shortly.

10.3 Ports and Ocean Energy

The ports take a mixed view on marine renewables i.e. offshore wind, wave and tidal-they do not perceive any difference between them for practical purposes. They are, with one notable exception, open to developing business opportunities in ocean energy. Nonetheless, they are wary of making a financial commitment, beyond that involved in the preparation of master plans etc, to an industry which is years away from large-scale deployments. A selection of the views expressed is set out below.

Dublin:

'No space for marine renewables on a sustained basis i.e. assembly etc and later O&M'

'Greenore is a possibility for marine renewables – has 8m draught on 50% of the quay wall with 6.5m on the balance of the 300m'

Cork:

'We are a multipurpose facility and have the facilities to cater for marine renewables which are covered in our Master Plan'

'Steaming time to marine renewables' deployments is not an issue. The critical thing is logistics- inward transportation of everything involved in assembly or manufacturing of wind and ocean energy devices. The Port of Cork has seven services a week which between them give direct connections to Rotterdam, Zeebrugge, Antwerp, Le Havre, Southampton and Felixstowe.

'Port of Cork could easily handle marine renewables with its existing facilities'

'We are open to innovation including FPSO-type facilities which are well – tried.'

'Need to get Foreshore Bill implemented'

'Availability of international airport and helicopter services are important'

Shannon Foynes:

The current master plan places a great emphasis on energy generally and the local Council has designated areas that would be suitable for energy activities.

'Our future growth will lie in supporting oil and gas exploration and exploitation as well as renewables'

'Already handling 50% of on-land wind turbines being imported. Not operating to capacity- doing 1.7m tons; vision is 5m+; berth load factor is 50-55%, 2.5-2.6m tons is limit to current facilities'

'We see the enterprise value of ocean energy i.e. it can attract manufacturing and is near to a deep water resource. Marine renewables has huge strategic importance for ports'

'Could handle up to a 100MW p.a.'

'We do big projects all the time but co-operation with Cork would be natural fit if needed'

'Have taken 3 years off the development time for deep water sites because of our planning effort to date. A suite of sites is available'

'Decisive investment event would be driven by ship occupancy e.g. €50m spend on Foynes Island would meet all conceivable needs

'Investment is funded by long term projects'

Galway Harbour:

'Focus on marine renewables exemplified by our involvement with SmartBay and marine research. Our other interests lie in cruise shipping; commercial shipping; and marine leisure'

'Have imported wind turbines for Enercom, SSE Moycullen (66 turbines)'

'Currently have 2.8 acres laydown area plus further two sites with 5 and 7 acres respectively and the new plan will generate 15 acres'.

'Can handle WestWave, working with the Marine Institute, have planning permission for a 2.8 acre wave energy site'

'Infrastructure is a magic wand- build it and they shall come!'

Killybegs interests:

'We are already engaged in importing wind turbines for Northern Ireland and the northern part of the Republic. A local bridge issue was resolved specifically to accommodate wind turbine imports'

'We have 20 acres of laydown area and are looking at additional space'

'Open to co-operation with other ports to support marine renewables'

'Killybegs can handle any likely energy projects with its existing facilities'

Waterford:

IDA promotes Waterford for wind energy projects. Waterford has handled wind turbines; our capacity is underutilised. Conscious too of plans for oil and gas exploration and we are anxious to handle them.

Some comments from a number of other sources:

'*Lack of demand for offshore wind capacity at ports, market depends on the still-born Midlands scheme (to export electricity to the UK)'*

'Probably isn't any port that can handle an entire project of scale- ideally, project and ports in a region get together and allocate work'.

'Don't discount importance of distance (from ports to deployment sites). Cost of hiring vessels is key e.g. recent instance of €85k per day'

'UK west coast has lots of underutilised space e.g. Mostyn, Barry, Cardiff, Heysham. East coast of Ireland is different: shallow, sandy ports (Rosslare may be exception) – all river ports which support their hinterland populations n.b. for Dublin'

10.4 Position of Device and Array Developers

The views of device developers and of potential site developers was very focused on short-term needs.

'Will use Foynes or Rossaveal or Galway for WestWave- need to keep a competitive spirit going among the ports'

'Current Irish ports are sufficient for the next 10 years for WestWave scale projects….but can't prejudge beyond that'

'At full scale on the west coast, new ports may be required'

'A floating platform is one option for calmer waters e.g. in the lee of the Aran Islands'

Generally, don't see a problem regarding ports for the short to medium term and not lobbying for any …….specific port investments

'Installation cost directly related to steaming time from support port to deployment site'

(OpenHydro) *'Canada: 10m unit in 2009 (assembled Halifax), 16m in 2015. Tow to Bay of Fundy takes 3-9 days depending on weather. Biggest cost is tugs/tugs on standby. Weather limits access to site, need two week weather window'*

'France (Brest): day to day site costs significantly less, no weather stand-by, only takes 3-4 days' notice to get a tug (not specialised)'

'Tug (bollard pull 70 ton) costs: €7-8k per day + fuel which costs typically €500 per day; standby rate is €4k per day while mobilization charge is €25k (12.5 x 2)'

'O&M every 5 years – recover to quay side; electrical coils and bearings are the only 'consumables''.

'Canada: recently quoted €7m from one operator for jack up barge hire i.e. €250k per day. Cost €5m to build own unit'

'Nearer the better' is important, transport cost is important. Issue in Orkney is range of services limited – can't deal with some modular matters

'Scottish Enterprise and Highlands and Islands Board are trying to co-ordinate ports and investment in maritime infrastructure, trying to understand the requirement'

'Ocean energy developers/ device manufacturers underestimate the cost of support vessel operations involved'

'Capacity to support wave and tidal seems ok at present and no major investment needed/indicated at present'

11. Conclusions and Recommendations

11.1 Conclusions

The Irish *tidal resource* is concentrated off the north-east coast in County Antrim and can be readily supported from Belfast and other ports in the locality. The Irish Sea off the Republic of Ireland's coast will be an important location for *offshore wind* when market outlets for the electricity can be developed. Offshore wind farms developed in east coast Irish waters can be supported from Belfast, Warrenpoint and other ports to the north and Waterford in the south east with, perhaps, a role also for Rosslare Europort…with, of course, the major maritime centre in Cork available to play a part. Support for operations and maintenance could also come from small ports such as Greenore and Wicklow. Dublin Port has limited interest in becoming a centre for this industry as it is land-locked and fully occupied with its existing, profitable, lines of business. If bottlenecks on the east coast of Ireland occur, it would be straight forward to support Irish offshore wind from the UK west coast ports such as Mostyn in Wales.

THE REAL ISSUE LIES WITH *WAVE ENERGY* DEVELOPMENTS AT SCALE OFF THE WEST COAST, PARTICULARLY OFF THE NORTH-WEST COAST…..THE CHALLENGE WILL BE HEIGHTENED BY POSSIBLE OFFSHORE WIND DEVELOPMENTS IN THE SAME AREA.

Developments off Clare (where demonstration arrays n.b. WestWave are planned) and Kerry can certainly be supported from Shannon Foynes and/or Cork - indeed, both ports are open to co-operating with one another to support marine renewables – with some back-up possible from Fenit in north Kerry if required and a forward operating base at Doonbeg, County Clare. Shannon Foynes and Cork are *Ports of National Significance* which

already have the infrastructure and the plans to deal with developments in offshore wind and in wave energy.

THE CHALLENGE IS HOW TO SUPPORT DEVELOPMENTS AT SCALE FURTHER NORTH, PARTICULARLY OFF MAYO, WHERE PORT FACILITIES ARE VERY LIMITED.

This is especially true with device-types (quite possibly the majority) which require local manufacture of at least part of the device and which must be assembled locally.

THERE IS NO ESCAPING THE FACT THAT OCEAN ENERGY DEVICES ARE LARGE PIECES OF ENGINEERING KIT AND WILL MAKE A HUGE IMPACT ON THE FACILITIES OF DEPLOYMENT PORTS.

Many potential device designs have high deployment costs i.e. they need expensive, hired-in deployment vessels and, therefore, they are sensitive to the distance and steaming times between a support port and a deployment site. Killybegs in south Donegal and the Galway ports of Rossaveal and Galway Harbour obviously could all play a part. But, arising from a possible scenario around 2030, there could be a need to make a significant port investment years beforehand in the west.

THE MARINE RENEWABLES INDUSTRY ASSOCIATION HAS CONCLUDED THAT EXISTING PORT FACILITIES ARE SUFFICIENT TO SUPPORT THE NEXT STAGE OF OCEAN ENERGY – DEPLOYMENT OF EXPERIMENTAL DEVICES AND SMALL ARRAYS - BUT BELIEVES TOO THAT THE '**WESTERN GAP**' IDENTIFIED ABOVE MUST BE TACKLED **IN TIME** OR, AT THE VERY LEAST, THE GROWTH OF OCEAN ENERGY AND, NO DOUBT OFFSHORE WIND ENERGY, AT SCALE OFF THE WEST COAST WILL BE SEVERELY HAMPERED…..OR IT WILL HAVE TO BE SUPPORTED FROM THE UNITED KINGDOM AT A COST TO IRISH JOBS AND INCOME CREATION

There have been numerous reports on the need for investment in port facilities in both Ireland and Scotland – see 7 and 8 above- to support ocean energy and offshore wind developments

ONE DIFFICULT (PARTICULARLY FOR GOVERNMENT) CONCLUSION THE MRIA HAS DRAWN FROM THEM IS THAT POLICY DECISIONS MAY HAVE TO BE MADE ABOUT PORT INVESTMENTS **IN ADVANCE** OF FINAL TECHNOLOGY MATURITY – WAVE ENERGY TECHNOLOGY IS THE KEY ONE HERE FOR THE REPUBLIC OF IRELAND – AND IN ADVANCE OF DETAILED MARKET OUTLET ARRANGEMENTS FOR THE ELECTRICITY WHICH MAY ARISE.

As the latest Scottish study in this area points out, '…current technologies may not be representative of future devices as innovation drives new entrants into the market while 'convergence' (of technology solutions) is unlikely until later in this decade as it will take until then to narrow down the commercially viable technologies'[49]

It is also clear that the current- and no doubt adequate for current requirements – National Ports Policy will require a radical review by the end of this decade and the outcome could be of decisive importance in terms of jobs and income creation in the ocean energy sector. As one port source stated to the 2011 *Assessment* (see 7.2 above), 'It is vital that port development be considered as an integral part of overall policy development focused on ocean energy. Ports cannot make this happen on their own; a combined 'Ireland Inc' approach is needed- a top-down approach with policy support'[50]

THE ASSOCIATION BELIEVES THAT GOVERNMENT MUST TAKE AN OPEN- MINDED VIEW OF HOW TO FINANCE PORTS' DEVELOPMENTS TO SUPPORT THE OCEAN ENERGY OPPORTUNITIES THAT SHOULD COME TO MATURITY IN THE NEXT FIFTEEN YEARS – A SHORT TIME FRAME IN THIS CONTEXT – AND MAY HAVE TO SUPPORT THE DEVELOPMENT OF A NEW WEST COAST PORT.

However, there is time to take stock, to plan carefully and to ensure that public resources are properly husbanded.

THE MRIA CONCLUDES THAT THE STRUCTURED AND CO-ORDINATED APPROACH TO OCEAN ENERGY WHICH HAS STARTED TO EMERGE RECENTLY MUST BE EXTENDED ON TO CONSIDER THE PORTS CHALLENGE – THE NEED TO FILL THE WESTERN GAP – IN AN IMAGINATIVE FASHION.

None of the conclusions and recommendations in this report matters unless market access is resolved. Ireland has limited need, at least based on the policy considerations of today, for electricity generated offshore.

THE KEY TO IRISH OCEAN ENERGY IS TO OPEN UP NEW MARKETS FOR ELECTRICITY – EXPORTS AND TO PROVIDE FOR OCEAN ENERGY AS ONE SOURCE FOR LOCAL ELECTRICITY GENERATION IN FUTURE OVERALL ENERGY POLICY. ONLY THEN CAN THE POTENTIAL FOR

[49] See 8.5 above; p12 and p3

[50] See 9.1, p107 of the 'Assessment'

JOBS AND INCOME BE REALISED. ULTIMATELY, PORTS AND MARITIME INFRASTRUCTURE GENERALLY ARE ONLY ENABLERS OF, PERHAPS, STUNNING ECONOMIC GROWTH OPPORTUNITIES BASED ON MATURE WAVE ENERGY TECHNOLOGY AND INTERNATIONAL ELECTRICITY EXPORTS.

11.2 RECOMMENDATIONS

11.2.1 Support Innovation in maritime infrastructure

Ocean Energy is an emerging and evolving technology and it may resolve its technical challenges earlier than currently anticipated (and thus accelerate the need for port facilities) and, conceivably, deployment methods could change e.g. as a result, for example, of fast deployment vessels. Given the long lead time (seven years?) in the provision of permanent extra port facilities, there is a need for innovation in maritime infrastructure to be able to respond quickly along the west coast to ocean energy developments, to bridge the western gap, while permanent solutions are being readied

ACCORDINGLY, THE MRIA RECOMMENDS THAT THE STATE (VIA EXPERT BODIES SUCH AS SEAI AND THE MARINE INSTITUTE) ACTIVELY IDENTIFIES AND MONITORS POTENTIAL 'QUICK', PERHAPS TEMPORARY, SOLUTIONS TO ANY PORT BOTTLENECKS THAT MIGHT EMERGE IN REGARD TO OCEAN ENERGY– FOR EXAMPLE, MOBILE OFFSHORE PLATFORMS (SUCH AS JACK-UP BARGES). A MODEST EXAMPLE WILL BE THE 'SEASTATION' PLANNED FOR SMARTBAY AND THE MRIA WILL WATCH ITS DEVELOPMENT WITH INTEREST.

Innovation should be conducted in consultation with industry and potential solutions subject to rigorous cost-benefit analysis.

11.2.2 Forward Operating Base

The ESB is developing its WestWave project at Killard, County Clare and at least one other experimental project is planned for the Clare coast.

SHANNON FOYNES WILL, OF COURSE, BE THE MAIN SUPPORT PORT FOR THESE DEVELOPMENTS. THE MRIA RECOMMENDS, HOWEVER, THAT PLANNED HARBOUR DEVELOPMENTS AT DOONBEG SHOULD BE SUPPORTED IN ORDER TO PROVIDE A FORWARD OPERATING BASE TO SUPPORT, IN PARTICULAR, OPERATIONS AND MAINTENANCE.

11.2.3 Support Vessels

It is clear from the various reports cited earlier that a significant range of vessels will be needed to support ocean energy developments. The numbers, capabilities and designs will evolve in line with the maturing of ocean energy technology.

THE ASSOCIATION BELIEVES THAT THE PROVISION OF SUITABLE VESSELS TO SUPPORT OCEAN ENERGY SHOULD BE LEFT TO THE PRIVATE MARKET PLACE WHERE CAPABLE LOCAL COMPANIES SUCH AS ISLAND SHIPPING, SINBAD MARINE SERVICES, MAINPORT GROUP, BURKE SHIPPING AND OTHERS WOULD WELCOME NEW BUSINESS OPPORTUNITIES. HOWEVER, THE IRISH MARITIME DEVELOPMENT OFFICE SHOULD ACTIVELY MONITOR THE SITUATION AND COMMUNICATE ANY SPECIFIC NEEDS E.G. INCENTIVES TO THE OCEAN RENEWABLE ENERGY STEERING GROUP.

11.2.4 Planning for a Port Facility in Mayo

It is possible that the western gap could be filled by a combination of developments at Killybegs in the north and Galway and Rossaveal to the south of Mayo. But what is to happen if further development at Killybegs does not take place, the planned developments at Galway Harbour don't go ahead and there is no further development at Rossaveal…….or if these ports can't cope with ocean energy at scale even if all planned developments at them *do* take place?

Prudence dictates that an important step is taken at this stage.

THE MRIA RECOMMENDS THAT STEPS ARE TAKEN AS SOON AS POSSIBLE TO UNDERTAKE ALL NECESSARY PLANNING TO PROVIDE AT LEAST MINIMUM FACILITIES (200M QUAY, HEAVY-LOADING LAYDOWN AREA, ETC) AT A LOCATION IN MAYO. MAYO COUNTY COUNCIL ALREADY HAS A DETAILED DATABASE ON ALL POSSIBLE LOCATIONS FOR PORTS DEVELOPMENT IN THE COUNTY. THE ASSOCIATION IS CONSCIOUS ABOUT THE NEED TO AVOID RAISING EXPECTATIONS AND TO AVOID ENCOURAGING LAND SPECULATION AND SO IT MUST BE EMPHASISED THAT THIS RECOMMENDATION IS MADE IN A MEASURED FASHION AND IT IS MADE ONLY IN LIGHT OF THE PARTICULARLY LONG LEAD TIME TYPICALLY ENCOUNTERED IN PORT DEVELOPMENTS. IT REPRESENTS A 'HEDGE' ON FUTURE PORT NEEDS.

11.2.5 Ports Policy Review

The current ports policy, published in 2012, is appropriate at present. It sorts out long-standing governance issues (e.g. pensions), rationalises port structures (e.g. moves smaller ports into the ownership of local authorities) and, generally, gives the ports the commercial freedom to thrive in the open market with, of course, the very commercial requirement that the bigger ports pay dividends to the Exchequer. It also lays down that the ports are 'on their own' in terms of funding future developments and that the State will not provide investment funds directly.

However, current ports policy, set in 2012, may in time prove to be an *obstacle* to the achievement of another objective of public policy (albeit finally determined only in 2014 in the form of the OREDP) which is to support the development of a marine renewables industry. Given that market outlets emerge for the electricity that could be generated, there may well be a thriving marine renewables industry off the Irish coast in just fifteen years' time (less in the case of offshore wind?) which will require major investments in port capacity, some of which may be beyond the capacity of even *Ports of National Significance,* such as Cork or Shannon Foynes, to fund …not to speak of smaller ports on the west coast, north of the River Shannon.

The *National Ports Policy* expects the 'Ports of National Significance to lead the response of the State commercial ports sector to future ports capacity requirements'[51]- only one of those Ports, Shannon Foynes, is on the west coast. Furthermore, investment by State or European institutions such as the National Pension Reserve Fund or the European Investment Bank '…will only be made on a commercial basis with a commercial return'[52]. This public policy was drawn up in advance of the publication of the OREDP and was reasonable in light of the ocean energy policy position at that time.

However, it is unlikely that the Ports of National Significance (e.g. Dublin) would be interested in developing new facilities along the north west coast to address ocean energy needs, particularly in the absence of central Exchequer support…..even if the 'National Ports Policy is not prescriptive

[51] *National Ports Policy* Department of Transport, Tourism and Sport 2013, p14

[52] P40

as regards the specific location of future ports capacity'[53]. Moreover, it would be incongruous for public policy to enable, for instance, State funding of major road developments to ports supporting marine renewables and then completely rule out, as a matter of principle, any State involvement in funding vital new port facilities! Interestingly, the State made a huge investment in the past in specialist ports to support another industry, fisheries. It is interesting too that Scotland is open to public sector funding to support ocean energy related port developments with the national infrastructure plan[54] stating that 'Investment by Scottish port owners, with support from the public sector where appropriate, will expand the range of potential locations' and 'Funding by the public sector will be focused on securing a sustainable economic impact'

The issue becomes even more stark when the possibility, remote at present but conceivable nonetheless, of the need for a major new port in the north west is brought into consideration.

THE MRIA RECOMMENDS THAT A FURTHER REVIEW OF PORTS POLICY, SPECIFICALLY IN REGARD TO THE MARINE RENEWABLES INDUSTRY, TAKES PLACE NO LATER THAN 2020. AT THAT STAGE, ISSUES SUCH AS MARKET ACCESS FOR MARINE RENEWABLES ELECTRICITY, AND THE LIKELY PACE OF DEVELOPMENT OF WAVE ENERGY TECHNOLOGY IN PARTICULAR SHOULD BE A GREAT DEAL CLEARER THAN AT PRESENT WHILE OFFSHORE WIND DEVELOPMENTS MAY BE IN EARLY PROSPECT OFF THE WEST COAST. THIS REVIEW SHOULD BE A 'WHOLE OF GOVERNMENT' EXERCISE, PERHAPS CONDUCTED UNDER THE AUSPICES OF THE RECENTLY ESTABLISHED OCEAN RENEWABLE ENERGY STEERING GROUP. IT IS LIKELY TO BE A CHALLENGING EXERCISE WHICH COULD BE A KEY DETERMINANT OF IRELAND'S CAPACITY TO ENJOY THE JOBS AND INCOME FRUITS OF OUR GREAT WESTERN OFFSHORE ENERGY RESOURCE. THE ROLE OF THE STATE AS ONE SOURCE OF INVESTMENT FUNDS FOR LARGE, HIGH RISK PROJECTS CANNOT BE RULED OUT IN ADVANCE.

The Department of Transport, Tourism and Sport plans to introduce a series of independent port capacity analyses at regular intervals from 2018 onwards. The results of this work should aid the Review proposed above.

The experience of Newfoundland is very telling in regard to the need for new ports. The Port of St Johns is the major port on the island and, of

[53] P43

[54] See 8.2 above at 6, p13

course, makes a contribution to supporting the recent natural resource developments, particularly in oil and gas, which have emerged in recent years. However, St Johns has limited capacity (part of the waterfront is owned by private maritime companies) and so significant new port facilities have been developed at Argentia and Bay Bulls.[55]

[55] MRIA visited the Port of St Johns in the course of preparing this Paper

Appendix 1: LIST OF BODIES INTERVIEWED

Dublin Port

Port of Cork

Shannon Foynes Port

Galway Harbour

Rossaveal FHC interests

Rosslare Europort

Killybegs FHC interests

Port of St Johns, Newfoundland and Labrador, Canada

Department of Transport, Tourism and Sport

OpenHydro Ltd

Port of Waterford

Aquamarine Power Ltd

ESB

Island Shipping Ltd

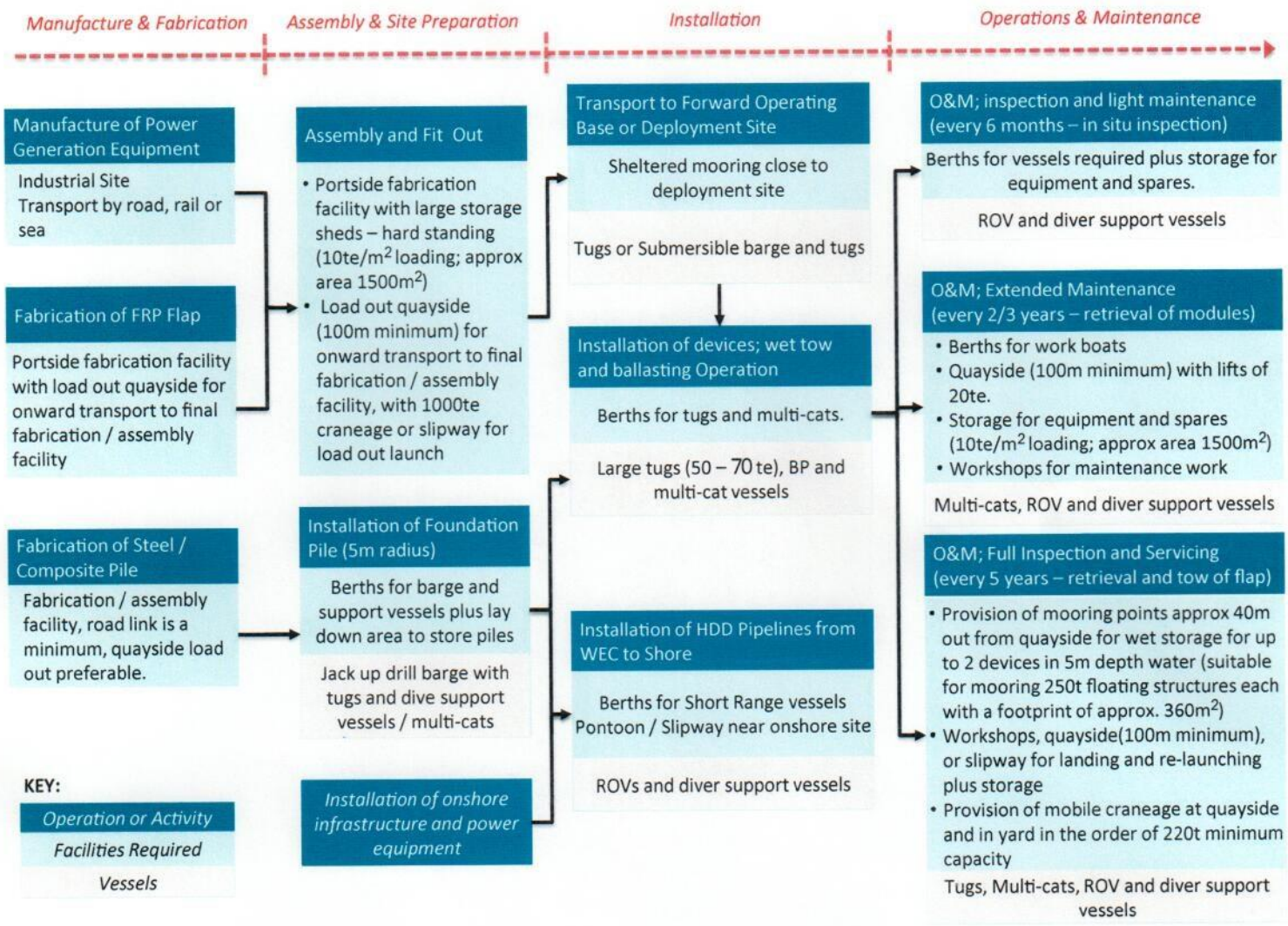
Sinbad Marine Services Ltd

Highlands and Islands Enterprise

Irish Maritime Development Office

Mayo County Council

Appendix 2: STAGES OF DEVELOPMENT OF AN OCEAN ENERGY PROJECT



Source: Aquamarine Power Ltd