THE PATH TO POWER

Delivering confidence in Britain's wave and tidal stream industry

Stage 4: Report for the British Wind Energy Association

12 June 2006

FINAL REPORT

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1. Introduction

Wave and tidal energy (also known as marine renewable energy) is electricity generated from the movement of waves and from tidal flows. It has the potential to deliver a substantial, secure and renewable source of power for the UK and offers the UK the chance to create a world-class domestic industry developing, manufacturing and installing devices in an emerging global market.

The wave and tidal energy industry is now at a critical stage of development. It faces a number of hurdles that must be overcome for its potential to be realised. In response, the BWEA initiated a project, funded by npower Juice, to identify the hurdles faced by the industry and to map out a "Path to Power". The project comprises three completed studies on key issues for the wave and tidal industry:

- Stage 1: Legal and regulatory, prepared by Bond Pearce;
- Stage 2: Environmental and stakeholder impact, prepared by ABPmer; and
- Stage 3: Grid access, prepared by Econnect

These studies are available on the BWEA website at [www.bwea.com/xxx.]. In the course of this project, over 100 interviews with a range of stakeholders have been conducted, making it the largest of its kind for this sector ever conducted.

This final report, prepared by Climate Change Capital ("CCC"), summarises the potential for the industry, outlines the hurdles the industry faces and sets out recommendations for Government and others on how the industry can be allowed to achieve its long-term potential.

The report uses a number of standard definitions. Bond Pearce's report (Stage 1) identified four stages of marine renewable deployment in the UK that are followed here. The capacity definitions for these stages of deployment are:

- Prototype device – single pre-commercial devices up to 1MW in size
- Small array – small arrays of devices up to 5 MW in total export capacity
- Large array – large arrays of devices up to 30MW in total export capacity
- Significant projects – Large commercial projects in excess of 30MW

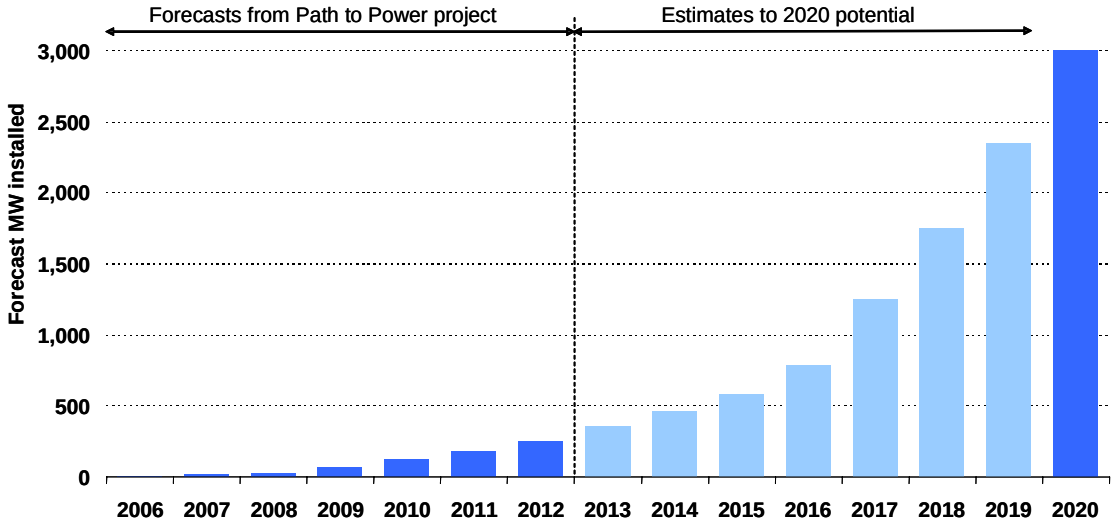
Together, prototype devices and small arrays are referred to as "demonstration-scale" installations. Tidal energy in this report refers to tidal stream (or tidal current) and does not include barrages, dams or tidal lagoons.

2. Executive summary

Potential of the industry

The UK possesses some 35% of Europe's wave resource and 50% of its tidal stream resource. The BWEA, using data from the Carbon Trust's Marine Energy Challenge (MEC), estimates that 3GW of wave and tidal capacity could be installed in the UK by 2020. This capacity could generate approximately 8TWh of electricity a year, equivalent to 2.1% of UK electricity supply in that year. In the long term, marine renewable energy could meet 15% to 20% of current UK electricity demand, with 3% to 5% coming from tidal stream[1] and the remainder from wave energy. Worldwide, wave and tidal energy could supply 2,000 to 4,000 TWh and around 800 TWh[2] of electricity a year, respectively. The potential for growth in the UK is shown in Figure 1.

Figure 1: Deployment scenario for wave and tidal energy in the UK to 2020[3]



The potential for this level of deployment gives wave and tidal energy a strategic importance in preserving multiple options to meet the UK's aspiration of supplying 20% of electricity from renewable sources in 2020 and intent to reduce carbon emissions by 60% in 2050.

Although the industry is at an early stage, all indications suggest that it can deliver its potential. Along with the UK's outstanding wave and tidal resource, such confidence stems from the UK's existing world-leading base of marine renewables technology

[1] Black and Veatch (2005) 'The UK tidal stream resource and tidal stream technology', Report prepared for The Carbon Trust Marine Energy Challenge
[2] The Carbon Trust (2003) Building Options for Renewable Energy
[3] Source: BWEA (2006) Energy Review submission; Bond Pearce (2005) Path to power: Stage 1 report; CCC

(which is attracting increasing interest from the private sector), research demonstrating the potential for technology cost reductions, and the UK's strong existing offshore skills.

Hurdles

Interviews with industry stakeholders identified three distinct categories of hurdle with a clear hierarchy of importance: financing, grid access, and planning and permitting.

Financing

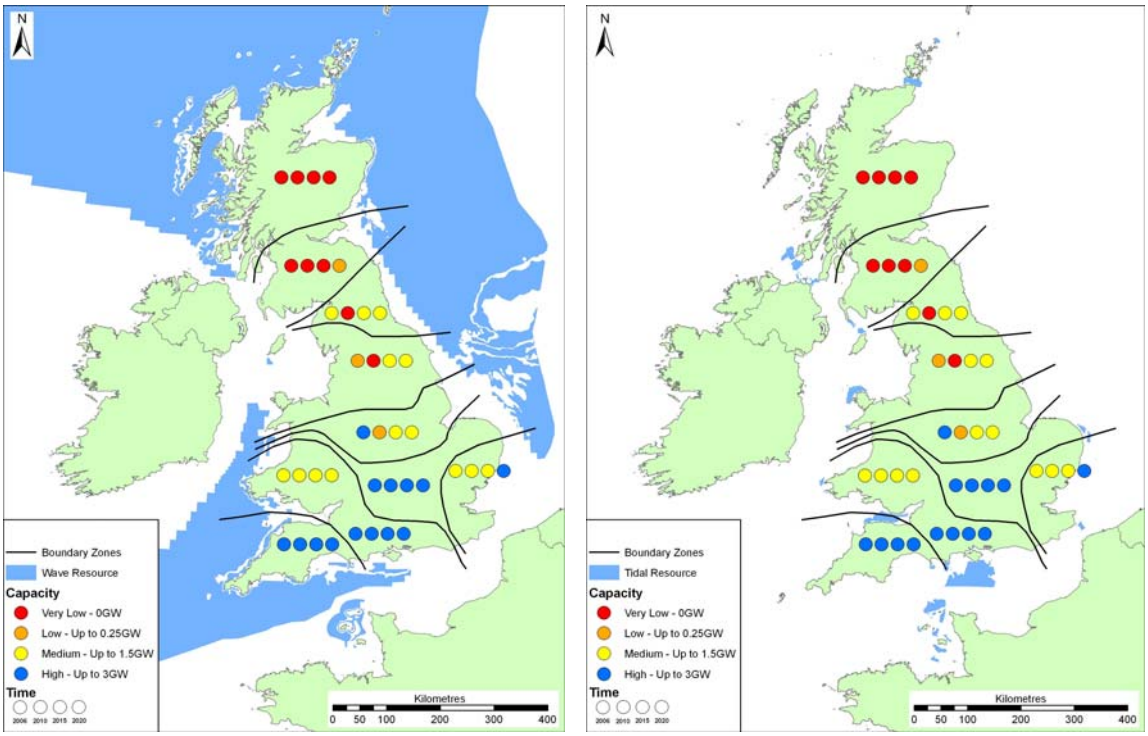
In interviews, all stakeholders highlighted the urgent need for clarity on the existence and form of a support mechanism that will enable deployment of large-scale arrays and significant projects. Such a mechanism is needed to bridge the gap between support for demonstration-stage technologies, mainly through the recently introduced DTI Marine Renewables Development Fund (MRDF), and that offered by the Renewables Obligation and Climate Change Levy to more mature renewable technologies. Without such a mechanism, it is highly unlikely that any installations above demonstration scale will be put in place in the UK.

Grid access

Device and project developers consistently ranked grid access as one of the two major hurdles to the development of the industry. The maps in Figure 2 show that a substantial proportion of the UK's wave and tidal resource is located off the west coast of Scotland, where grid capacity is extremely limited today, and is likely to remain so until beyond 2020. Although the picture in the other major areas of resource – South Wales and South and South West England – is more positive, this implies that large-scale deployment of wave and tidal will be constrained by an inability to tap the best resources unless the issue is resolved.

Figure 2: Wave and tidal resource and grid accessibility, 2006-2020

Wave ***Tidal***



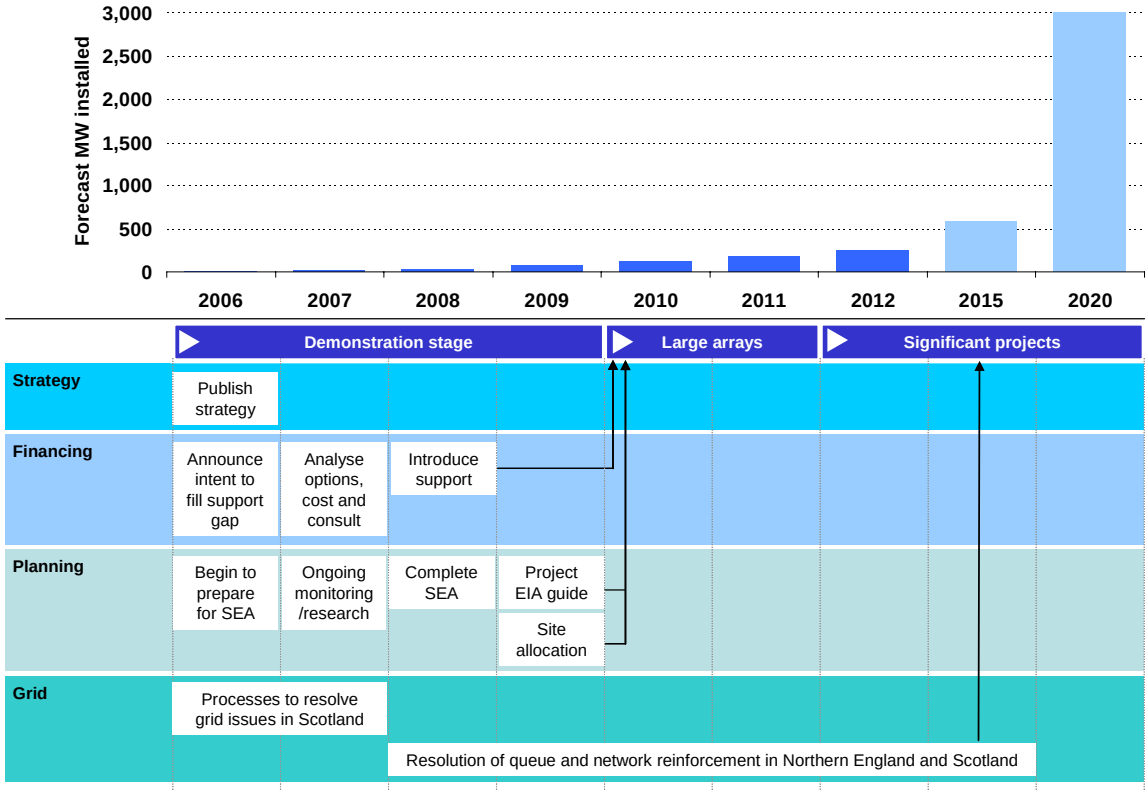
Planning and permitting

In the course of CCC's interviews, industry stakeholders identified a number of specific planning and permitting hurdles to the development of the industry. Most related to the need to ensure that a longer-term planning and permitting framework is in place in time so that the industry's development is not delayed. Many of their concerns centred on the requirement for a Strategic Environmental Assessment (SEA) in areas of resource in England and Wales, and related issues of guidance in site selection and EIA requirements for commercial deployment.

Recommendations

In response to the hurdles identified during all stages of the Path to Power project a number of recommendations have been developed to help the industry achieve its potential. Some require urgent action, others require action now to prevent a hiatus at a later stage and still others need acting on only in future. Figure 3 provides a summary of the major recommendations, their timing and their relation to the installation of wave and tidal generation in the UK.

Figure 3: Recommendations summary[4]



Publish a strategy for the wave and tidal industry

Recommendation on: UK Government, led by DTI
Timing: As soon as practicable

A consistent theme in our conversation with stakeholders was the need for Government to demonstrate a longer term commitment to the wave and tidal industry across the whole of the UK. To this end, CCC recommends that statements on many of the recommendations outlined below could be drawn together in a single strategy document, setting out the Government's belief in the industry's potential and the actions being and to be taken to help the industry realise that potential.

Such a strategy document would provide a strong signal to the industry and its current and potential future backers that the Government recognises the potential contribution the wave and tidal industry can make, and is committed to working with the industry to achieve its potential.

[4] Source: Bond Pearce (2005) Path to power: Stage 1 report; CCC

Introduce a financial support mechanism to bridge the funding gap

Recommendation on: DTI
Timing: Announce intention and begin work as soon as practicable, leading to introduction in 2008

The introduction of a support mechanism to bridge the funding gap to the RO is both critical and urgent. Our conversations with stakeholders highlighted two key requirements for a support mechanism to bridge the funding gap:

- A preference for revenue rather than capital support
- The support should be set at an appropriate level to create a market pull, overcoming the risks of an early-stage industry and recognising that, perhaps out to 2015, the industry is likely to be prevented from tapping the best resources at any significant scale by grid constraints.

The Path to Power has not analysed the best form a further support mechanism might take, but two studies analysing the options are underway:

- A Carbon Trust study identifying and assessing the potential options to change the current renewables policy framework.
- A Scottish Executive consultation looking at the level of financial support required by marine technology developers and assessing how this level of support may be delivered through the banding of the Renewables Obligation (Scotland).

Given the industry's request for early clarity, the UK Government should announce a programme of work as soon as practicable to identify a support mechanism to bridge the funding gap for wave and tidal. This programme could include a study commissioned to analyse promising options, building on the results of the two studies now in progress. These options could be costed, with a view to earmarking a sum within the 2007 Comprehensive Spending Review (should there be any taxpayer funded requirements) and consulted on with a view to introducing the new mechanism in 2008 Throughout this process DTI and Scottish Executive should note that industry's preference is for a single UK-wide mechanism.

Participate in existing processes to resolve grid issues

Recommendation on: Industry
Timing: Current and ongoing

The grid-related hurdles to the development of a wave and tidal industry are shared, at a larger scale, by the on- and offshore wind industries. As a result, much effort is already being made to resolve the connection and charging problems. In particular, four processes are of major importance, in which the wave and tidal industry should participate actively to ensure that its interests are reflected in the outcomes:

- Ofgem's third consultation on the transmission price control review 2007-2012.

- A related National Grid consultation process on managing access to the GB transmission systems.
- Ofgem's programme of work on the regulation of offshore electricity transmission.
- A DTI consultation on capping TNUoS charges for wind generators in remote locations in Scotland to help enable the UK Government to meet its renewables targets.

Begin preparations for an SEA

Recommendation on: DTI, other relevant government departments and bodies
Timing: As soon as practicable, leading to SEA in 2008.

CCC believes that the Government should formally begin preparations for an SEA as soon as practicable in order to be able to complete an SEA in 2008. This will help the identification of sites for large-scale projects and allow the completion of work that depends on the SEA and that will be required in order for large arrays to be installed.

Beginning the SEA process would involve scoping an SEA's requirements, initiating generic studies and providing guidance for the monitoring requirements of installed devices. Overall this may take up to three years. In addition, the Government should set out the regions that will be covered by marine renewables SEAs.

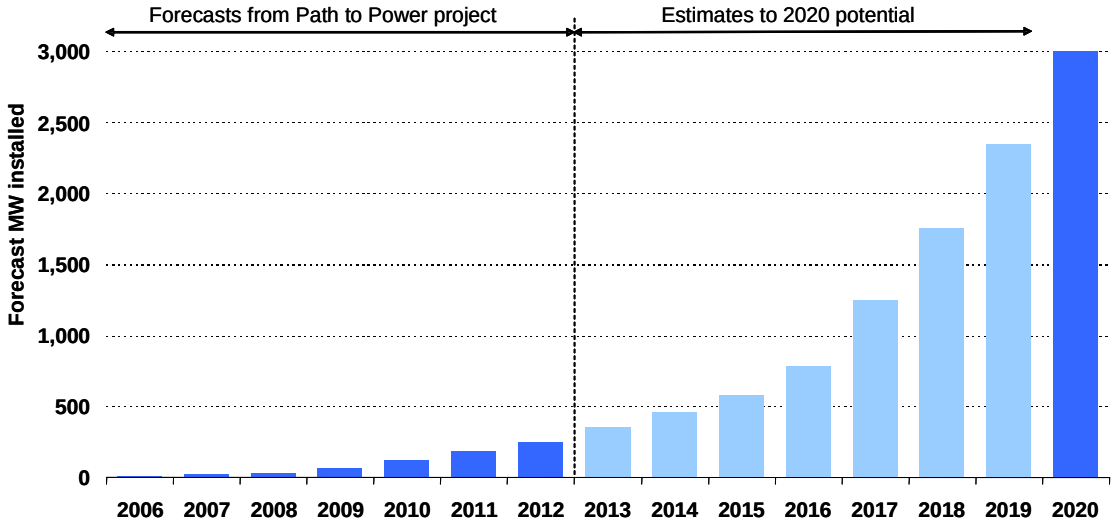
The Scottish Executive is already preparing a wave and tidal SEA, which is examining the Western seaboard including Inner Isles, Western Isles and Argyll and Bute; the Solway Firth; and The Northern Isles (Orkney and Shetland). This SEA is expected to be completed towards the end of 2006.

The remaining areas with the greatest wave and tidal potential that still require an SEA therefore appear to be in South West England and South Wales. Once preparatory work has been conducted, completion of an SEA is expected to take around one year. Once an SEA is complete, the Government should publish guidance on the EIA requirements for large arrays and significant projects and work with the Crown Estate to identify potential sites for development and develop an approach to site allocation. In addition, the SEA can feed into any process of marine spatial planning that may emerge from the current Marine Bill consultation.

3. Potential of wave and tidal industry

The UK possesses some 35% of Europe's wave resource and 50% of its tidal resource. The BWEA, using data from the Carbon Trust's Marine Energy Challenge (MEC), estimates that 3GW of wave and tidal capacity could be installed in the UK by 2020, as shown in Figure 4. This capacity could generate approximately 8TWh of electricity a year, equivalent to 2.1% of UK electricity supply in that year. The MEC suggests that this capacity would constitute a substantial proportion of between 1.0GW and 2.5GW each of wave and tidal energy expected to be installed across Europe.[5]

Figure 4: Deployment scenario for wave and tidal energy in the UK to 2020[6]



In the long term, marine renewable energy could meet 15% to 20% of current UK electricity demand, with 3% to 5% coming from tidal stream[7] and the remainder from wave energy.

The potential for this level of deployment gives wave and tidal energy a strategic importance in preserving multiple options to meet UK's aspiration of supplying 20% of electricity from renewable sources in 2020 and intent to reduce carbon emissions by 60% in 2050. These targets necessitate options beyond those available today.

Quote - "Wave and tidal stream technologies will only make a small contribution towards the 2010 renewables target but, if they can be successfully developed on a commercial

[5] Carbon Trust (2006) Future Marine Energy, as cited in BWEA (2006), Energy Review Submission, Appendix C
[6] BWEA (2006) Energy Review submission; Bond Pearce (2005) Path to power: Stage 1 report; CCC
[7] Black and Veatch (2005) 'The UK tidal stream resource and tidal stream technology', Report prepared for The Carbon Trust Marine Energy Challenge

scale, they could make a significant contribution towards achieving the 2020 aspiration and beyond."[8]

In addition, because the industry is at an early stage, it offers the opportunity to create a new manufacturing industry serving the domestic and export markets. According to the Carbon Trust, "UK plc has the opportunity and potential to create competitive positions in all areas of design, manufacture, installation and operations of marine renewables".[9] Acknowledging uncertainties, they estimate that the value of worldwide electricity revenues from wave and tidal projects could ultimately be between £60bn and £190bn annually.[10]

All indications suggest that the industry has the potential to deliver this goal. Along with the UK's outstanding wave and tidal resource, such confidence stems from:

- The UK's existing world-leading base of marine renewables technology
- Increasing private sector interest in the industry
- Research demonstrating the potential for cost reductions in the technologies
- The UK's strong existing offshore skills

Base of marine renewables technology

The UK has established itself as an early market leader with over 30 technology developers headquartered in the UK, compared to approximately 15 developers in the rest of Europe and around 20 developers in the rest of the world. In addition, the UK has pioneered the establishment of shared facilities for testing of wave and tidal devices such as the European Marine Energy Centre (EMEC) in Scotland and the Wavehub project in southwest England.

Increasing private sector interest in the industry

Initial investments in the industry were restricted to device developers' own equity and to limited venture capital financing. However, in the last three years the industry has seen the initial involvement of major utilities in both technology provision – for example Scottish and Southern Energy's role in developing Neptune, a tidal energy device – and in project development, illustrated by the relationship between Ocean Prospect and Ocean Power Delivery to develop a demonstration project in the southwest of England[11]. A number of relationships are also in place between device developers and major industrial manufacturers. A good example is the acquisition of Wavegen, a wave energy systems company, by Voith Siemens. Venture capital interest in the sector has risen substantially, although it remains constrained. However, the industry has had some success in raising

[8] HM Government (2006) The UK Climate Change Programme 2006, Pg 37
[9] Carbon Trust (2003) Building Options for Renewable Energy, Pg15
[10] Carbon Trust (2006) Future Marine Energy, Pg 7
[11] Ocean Power Delivery website, www.oceanpd.com

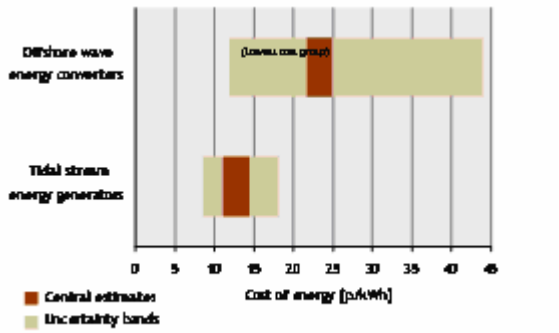
finance from the public markets, with the listing of Ocean Power Technologies on the London Stock Exchange's Alternative Investment Market in 2003.[12]

Potential for cost reductions

The UK's technology providers are at varying stages of development. Although a few devices have been tested in sea conditions, and at least two companies are now planning to install large arrays, there are no wave and tidal projects completed to date. While there are some clear market leaders in terms of proximity to project development, the market has not selected the winners as yet.

This lack of operating devices creates considerable uncertainty over the potential future viability of the industry, especially as costs are currently high compared with more mature renewable generation technologies. The current cost and potential for cost reductions has been studied independently by The Carbon Trust through their Marine Energy Challenge (MEC). This study states that central estimates for current costs of offshore wave energy projects are in the range 22-25p/kWh and for tidal projects' from 12-15p/kWh, as shown in Figure 5.[13] However, some device developers believe that the cost ranges for offshore wave technologies does not reflect the position of the more advanced technologies in the industry and as a result is too high. The large majority of tidal technologies, on the other hand, are beginning to consolidate around the horizontal axis turbine. This results in greater clustering of current cost potentials around the central estimates.

Figure 5: Current costs of wave and tidal energy[14]



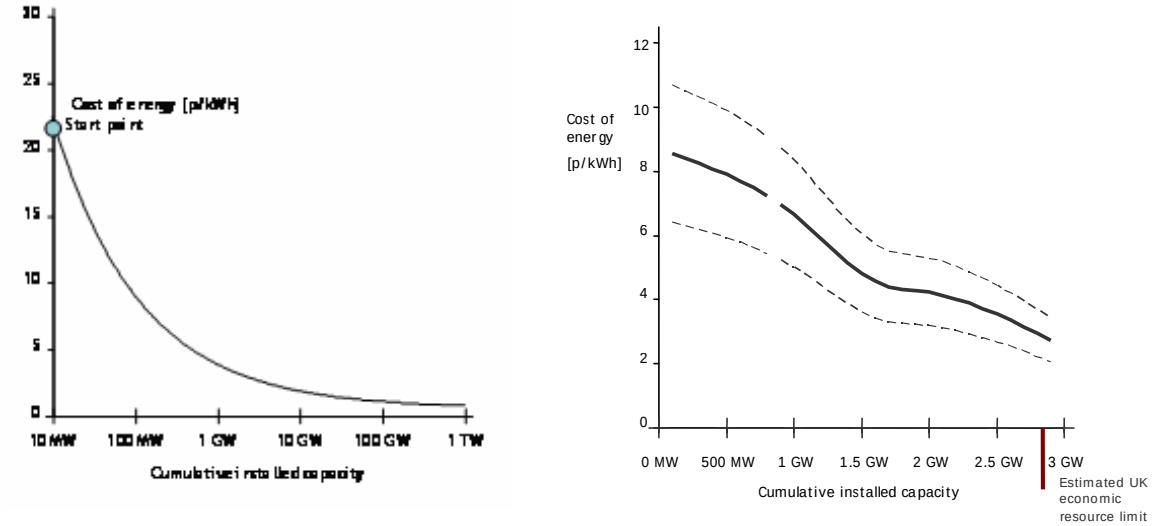
The MEC provides a central scenario for cost reductions in offshore wave and tidal energy keeping in mind the estimated UK economic resource potential given in Figure 6. The MEC concludes that based on these scenarios, "there is potential for marine renewable energy to become competitive with other generation forms in the future."[15] This is not dissimilar to the development of the wind industry, which has seen a reduction

[12] Ocean Power Technologies website, www.oceanpowertechnologies.com
[13] Carbon Trust (2006) Future Marine Energy, Pg 15
[14] The current costs of wave and tidal energy are estimated using a 15% rate of return, reflecting investors current risk perceptions. (Carbon Trust (2006) Future Marine Energy, Pg 14)
[15] Carbon Trust (2006) Future Marine Energy, Pg 19 & 22

in costs with increasing installed capacity, as seen in Box 1. Although tidal energy is likely to be cost effective sooner; offshore wave has the most potential in the UK due to the significantly higher economic resource potential.

Figure 6: Cost estimates for offshore wave[16] and tidal energy

Wave ***Tidal***



Box 1: Development of wind energy and potential for cost reduction[17]

The installed capacity of wind energy worldwide increased from a few megawatts in 1980 to around 50GW in 2004. In line with this increase, the cost of wind energy during this period fell from €20c/kWh to under €5c/kWh, implying a learning rate of 18%.

Existing offshore skills

The wave and tidal industry should be able to benefit from the UK's wider base of experience in the marine environment particularly that gained in the oil and gas and offshore wind industries. This experience includes:

- Offshore engineering and fabrication
- Offshore technology deployment and maintenance
- Understanding the impact of fixed structures on the marine environment

Quote - The offshore industry has been involved in several initiatives targeted at cost reduction; this experience will benefit wave energy system economics as developers seek

[16] This is the central scenario of a 21.6p/kWh starting point and a 15% learning rate
[17] Carbon Trust (2006) Future Marine Energy, Pg 31

to drive down costs – a key challenge for the next three to four years. Technology transfer of this type will be vital to wave power developments throughout the world.[18]

4. Hurdles to achievement of potential

Although there have been a number of positive developments for the wave and tidal industry recently, it still faces a number of hurdles if it is to achieve its potential.

The interviews with industry stakeholders identified three distinct categories of hurdles with a clear hierarchy of importance. In order of importance these were:

- Financing
- Grid access
- Planning and permitting

Financing

The lack of adequate financial support for the industry was stressed by almost all industry stakeholders interviewed as the most important hurdle to development and one that needed to be addressed in the near term. At present Government provides support to the industry through two main mechanisms:

- The DTI New and Renewable Energy R&D Programme (now the Technology Programme)
- The Marine Renewables Deployment Fund (MRDF), a new fund specifically to support the wave and tidal industry. The key aspects of the MRDF are highlighted in Box 2.

Box 2: Key aspects of the MRDF[19]

The primary objective of the MRDF is to encourage the accumulation of manufacturing and operating experience necessary for the continued evolution of marine renewable technologies towards commercial viability. Key features of the scheme are:

- A total amount of £50 million allocated with £42 million for project support, £2 million for monitoring the impact of deployment on the marine environment and the remainder for support in other areas that can help to develop the industry, such as infrastructure projects and general environmental studies to complement project specific-EIAs;
- A combination of capital grants and revenue support for grid-connected devices;
- Capital grant support to projects up to 25% of eligible costs, and limited to a

[18] World Energy Council, available at http://www.worldenergy.org/wec-geis/publications/reports/ser/wave/wave.asp#top on 16 April 2006
[19] DTI (2005) Marine Renewables – Wave and Tidal Stream Energy Demonstration Scheme, Pg 3-4

maximum of £5 million;

- Revenue support payment of £100/MWh, in addition to the market value of electricity the Renewables Obligation Certificates that they generate;
- Support for a period of up to two years for commissioning and a maximum of seven years for operation;
- Cap of £9 million per project; and
- First round of applications submitted 8th May, 2006.

The MRDF is a strong positive signal of early stage project support for technology developers that qualify for the funds. A majority of industry stakeholders favoured the combination of capital and revenue support and were of the opinion that the mix of these two was broadly correct in order to reduce project risks while rewarding performance. However some felt that the qualifying criteria were too restrictive. In particular, several respondents commented that the funding cap on projects excluded support to technologies with large unit sizes, thereby creating a bias towards smaller-scale devices. Developers also found that the level of support is not sufficient to allow the installation of arrays of a scale (greater than around 5MW) attractive to project developers.

Most technology providers and developers agreed that while the MRDF could be made to work for demonstration-scale arrays, the industry requires urgent clarity on the existence and form of a support mechanism that will enable deployment of large-scale arrays and significant projects with backing from project developers. Such a mechanism would help bridge the gap between funding the demonstration-scale technologies that the MRDF was designed to support and the support offered by the Renewables Obligation and Climate Change Levy to more mature renewable technologies.

The urgency of such a mechanism stems from two primary factors:

- The leaders in the industry are looking to deploy arrays larger than those the MRDF was designed to support. As a result, they face a direct and current funding gap in the UK that is preventing developers from bringing forward projects.
- Many more technology providers, especially those who are sufficiently advanced to potentially benefit from the MRDF are finding it difficult to raise capital from private sources without clarity on a support mechanism beyond the MRDF. This problem is especially acute for those seeking venture capital funding, where investors have less strategic interest in the sector and shorter time horizons. Without greater clarity on future support, this substantial pool of funds will remain largely closed to the industry.

Without such a mechanism, it is highly unlikely that any installations above demonstration-scale will be put in place in the UK. A number of device developers exploring options in international markets, were of the opinion that if the right support mechanism is not put in place in the UK, the industry could shift operations to markets

where support is available. A strong home market is seen as a fundamental requirement for the development of the industry in the UK.

Grid access

In the course of CCC's conversations with industry stakeholders, device and project developers consistently ranked grid issues alongside finance as one of the two major hurdles to the development of the industry. This concern prompted the BWEA to commission a study from Econnect on network access as part of the Path to Power project. The issues identified below draw from both CCC's conversations and from the Econnect study.

Almost all of the hurdles faced by the industry in relation to network capacity stem from the mismatch between the location of the UK's wave, tidal and wind resource and its centres of demand. This creates two main issues. The first is the ability of projects to secure connection to the electricity network, with many potential projects seeking to connect to a weak network already near capacity. The second is the cost of a connection and network charges.

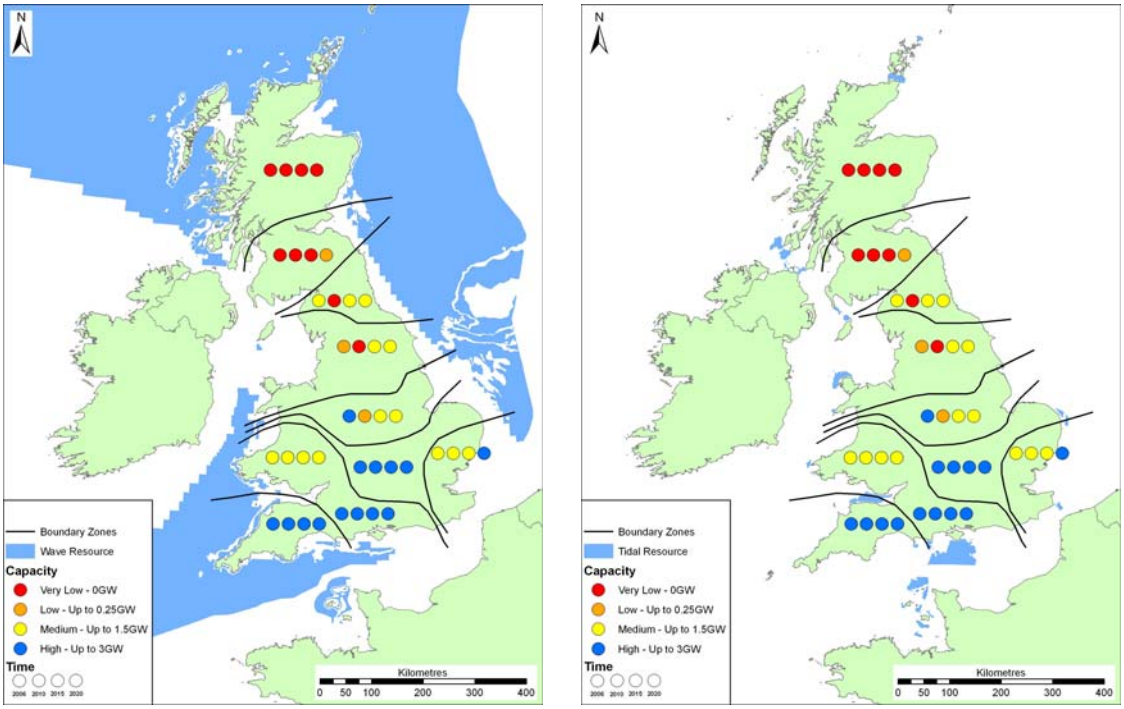
Resource distribution and transmission capacity

The maps in Figure 7[20] show that for offshore wave power, a substantial proportion of the best resource is located off the west coast of Scotland, where grid capacity is extremely limited at present. This is similarly true of the UK's highest tidal stream resource area in the Pentland Firth, off North Eastern Scotland. The picture in the other major areas of resource – South Wales and South and South West England – is more positive. Transmission network capacity in South Wales is high, although the distribution network is weak. In the South West, both the transmission and distribution networks have spare capacity.

[20] The maps have been prepared by ABPmer based on resource information contained in its study for the Path to Power and on Econnect's study of the likely development of transmission network transfer capacity. Details of Econnect's methodology can be found in their report.

Figure 7: Wave and tidal resource and grid accessibility in the UK (2006 to 2020)[21]

Wave ***Tidal***



In general, network availability in Scotland and Wales is limited to 2020 by the large volumes of wind power expected to be built, despite the expected decommissioning of a number of nuclear and thermal plant and planned or forecast upgrades to the grid. The scale of the problem in Scotland caused by wind farms seeking connection is indicated by the BETTA queue: a list of all wind farms that have applied for grid connections in the region in application date order. Some 13.5 GW of potential wind capacity currently is awaiting connection, with expected connection dates stretching to 2015 and beyond.

The only factors likely to mitigate this somewhat bleak outlook are if more thermal plant than expected shuts down and if the expected volumes of wind generation fail to materialise, although the Econnect study already applies a 40% probability of completion to the current queue of wind projects, based on historical data.

These grid constraints apply only indirectly to projects connected to the distribution network below a certain size threshold defined in the Grid Code. At present, this threshold is set at 5MW in northern Scotland and 30MW in southern Scotland. Below these thresholds, potential generators must negotiate access with the local Distribution Network Operator (DNO). Anecdotal evidence suggests that although this creates pockets of opportunity for connection, in general the problem remains acute for generators of any scale.

[21] The wave resource includes both deep water (depth >50m) and shallow water (depth 25 – 40m) with an annual mean wave power > 10kW/m of wave crest. The tidal resource includes both deep water (depth > 30m) and shallow water (depth 20-30m) with a mean peak spring tidal current speed > 2m/s. (ABPmer, (2006) Path to Power: Stage 3 report)

If this problem is not resolved, the UK will be unable to access it best wave and tidal resources at any scale, which is likely to cap deployment levels well below the industry's potential.

Cost

The weak grid in many areas of large wave and tidal resource and the distance between the resource and the centres of demand mean that any marine renewable generator connecting in these areas will face high charges. Generators must:

- Pay for own connection to the network.
  - Costs of connections to the distribution network must be paid partly up-front and partly through Generator Distribution Use of System (GDUoS) charges according to a formula.
  - Costs of connections to the transmission network look set to be spread over time, rather than paid up front, as set out in the Government's recent response to the DTI/Ofgem consultation on regulation of offshore electricity transmission[22].
- Pay for their use of the network through GDUoS if they are connected to the distribution network and Transmission Network Use of System (TNUoS) charges if they are connected to the Transmission Network. TNUoS charges are locational and highest in regions such as Scotland where generation is furthest from the centres of demand. In the South West, in contrast, TNUoS charges are negative.
- Provide security, known as Final Sums Liability (FSL) to cover the cost of any upgrades required to the transmission network as a result of their connection. Although these costs are ultimately socialised, albeit locationally, through TNUoS, FSLs can present a significant hurdle to generators looking to connect, especially if the developer does not have the required credit rating.

Together, these charges can have a substantial effect on the financial viability of projects, particularly where these are transmission-connected.

Planning and permitting

In the course of CCC's interviews, industry stakeholders identified a number of specific planning and permitting hurdles to the development of the wave and tidal industry. Their concerns and others are well covered in ABPmer's Stage 2 report as part of the Path to Power project. However, the overriding theme was that, in order for large-scale deployment of wave and tidal technologies to occur the industry will require clarity over the planning and permitting process for large arrays and significant projects and that this will take time and resources to achieve.

[22] DTI (2006) Regulation of Offshore Electricity Transmission: Government Response to the joint DTI/Ofgem Public Consultation

Quote – "The picture on permitting is confused. The Scottish Executive is pressing ahead on SEA. The DTI have no such timetable. DEFRA are pushing marine spatial planning. There doesn't seem to be a coherent strategy. We need a clear transparent timetable what happens after the demonstration stage." Technology developer[23]

Current arrangements

At present, the planning and permitting arrangements for demonstration-scale projects are governed by the DTI's recently-published guidance on consenting arrangements.[24] This has been well received by industry for providing clarity and adopting a pragmatic approach appropriate for an early-stage industry. However, the guidance currently applies only in England and Wales. The Scottish Executive plan to consult on similar consenting arrangements for offshore renewables in late 2006.

Future requirements

Most of the hurdles identified in the course of the discussions with industry stakeholders focused on the need to ensure that a longer-term planning and permitting framework is in place in time so that the industry's development is not delayed. Many of their concerns centred on the requirement for a Strategic Environmental Assessment (SEA) in areas of resource in England and Wales. As highlighted, the Scottish Executive is already conducting a desk-based SEA on a strategic level for Scotland.

Strategic Environmental Assessment

An SEA is required for all offshore commercial projects, as defined by the EU Directive 2001/42/EC. The DTI views the start of the SEA process for England and Wales to be some distance away, as not enough is known about key issues surrounding wave and tidal energy that would require more understanding before the process of an SEA can be initiated.[25]

Many respondents were concerned about the length of time an SEA is likely to take and therefore about the need to start the process of an SEA (scoping, generic studies, identifying the requirements for device monitoring etc.) early in order to be ready for the deployment of large arrays and to enable a marine renewables SEA to feed into any process of marine spatial planning. It was also felt that formally beginning the SEA process now would have a positive signalling effect for the industry and help bring a range of stakeholders together in preparation for larger-scale deployment of the industry.

[23] Bond Pearce (2005) Path to power: Stage 1 report, Pg 5.
[24] DTI (2005) Guidance on consenting arrangements in England and Wales for a pre-commercial demonstration phase for wave and tidal stream energy devices (marine renewables)
[25] DTI (2005) Guidance on consenting arrangements in England and Wales for a pre-commercial demonstration phase for wave and tidal stream energy devices (marine renewables), Pg 8

Environmental Impact Assessment

The requirements of an Environmental Impact Assessment (EIA) are linked to the process of an SEA, as the SEA helps to define the issues and the level of detail that an EIA would need to consider for project-level proposals. In essence, an SEA could help to reduce the requirements of an EIA and restrict them to site- and technology-specific issues. As the issue of an EIA is inextricably linked to the SEA process, an SEA would need to be in place before further guidance on the EIA requirements for significant projects could be provided.

Monitoring

Monitoring is of vital importance at all stages of deployment, but even more so at the initial demonstration stage, where it can also be most expensive. It will help to provide an understanding of the impacts of wave and tidal energy generation on the marine environment that can help inform SEAs and EIAs and allow actual effects to be tested against those predicted in an SEA.

Consultations with many marine stakeholders highlighted a high level of uncertainty that arose from a perceived lack of understanding of the actual impacts likely to arise from developments. This was related to gaps in data for marine activities and systems linked with the uncertainty engendered by the multitude of potential technology designs for devices.

Marine spatial planning

Marine spatial planning is a process by which the sustainable use of marine resources can be planned and managed. It is envisaged that SEA will be incorporated into any MSP to understand the impacts of marine renewables alongside other users of the sea.

A plan to develop an MSP is a likely outcome of the Marine Bill, currently under consultation, with a draft Marine Bill expected in November 2006. While industry is positive about an MSP as it could provide greater certainty over where specific activities can occur, it is worried that the process will be overly prescriptive and rigid in the identification of potential areas for deployment, which would be detrimental to an early stage industry. In addition, there are concerns that the gap between preparation of an SEA and an MSP should not lead to a hiatus in the installation of wave and tidal projects.

Stakeholder buy-in

While stakeholder buy-in was not viewed as a hurdle by the industry stakeholders, the importance of ensuring that all stakeholders are engaged from the project design stage was mentioned by both the industry and other marine stakeholders. This would be important to ensure that projects were not delayed once consent had been granted and construction activities had been initiated.

Site selection and leasing

At present, the Crown Estate grants leases to demonstration-scale wave and tidal projects on the basis of a business plan. In order for large-scale arrays and significant projects to be installed, a more systematic approach with longer-term leases and a structured approach to site expansion will be required. This will need to be balanced against risks to the Crown Estate of site sterilisation, decommissioning costs and adverse environmental impacts.

5. Recommendations

In response to the hurdles identified during the course of the Path to Power, outlined below is a list of recommendations that CCC believes have the support of a broad range of industry stakeholders, are pragmatic and, together, if implemented, would create a path to power for the industry. Some of them require urgent action, others require action now to prevent a hiatus at a later stage and still others need be acted on only in future.

Strategy for the wave and tidal industry

A consistent theme in our conversations with stakeholders was the need for the Government to demonstrate its commitment to the wave and tidal industry. To this end, CCC recommends that statements on many of the recommendations outlined below could be drawn together in a single strategy document, setting out the Government's belief in the industry's potential and the actions being and to be taken to help the industry realise that potential.

Such a strategy document would provide a strong signal to the industry and its current and potential future backers that the Government recognises the potential contribution that the wave and tidal industry can make, has identified hurdles on the industry's path and is committed to working with the industry to overcome them.

Financing

The recommendations on financing include reviewing the details of the MRDF and providing follow-on support to avoid the creation of a funding gap between demonstration scale projects and large arrays.

Review the details of the MRDF

Applications for the first round of the MRDF were due on 8th May 2006. Once the DTI has assessed the level and quality of the tenders, it should review the details of the MRDF, particularly in light of the issues raised by stakeholders and set out earlier in this report.

Announce a support mechanism to bridge the funding gap

The introduction of a support mechanism to bridge the funding gap to the RO is both critical and urgent. Our conversations with stakeholders highlighted two key requirements for a follow-on support mechanism:

- **A preference for revenue rather than capital support.** In general, respondents felt that revenue support was a more appropriate way to incentivise larger-scale installations.
- **The support should be set at an appropriate level.** Such a level would need to be sufficient to create a market pull, overcoming the risks of an early-stage industry and

recognising that, perhaps out to 2015, the industry is likely to be prevented from tapping the best resources at any significant scale by grid constraints.

The Path to Power has not analysed the best form a further support mechanism might take, but a broad range of options for changes to the Renewables Obligation to take account of the varying requirements of different technologies have been proposed recently and at least two studies of these and other potential options are in progress at the moment:

- A study commissioned by the Carbon Trust examining the different policy frameworks for mass generation renewables technologies in the UK. This includes the identification and assessment of the potential options to change the framework to address the barriers to deliver the 2010 target and 2020 aspiration. The study also tests the implications of the different policy frameworks on a small number of technologies, including wave and tidal; and
- A Scottish Executive consultation study examining the level of financial support that is required by marine technology developers in order to operate on a commercial basis and assessing how this level of support may be achieved. This study has been commissioned in the context of a consultation on banding of the Renewables Obligation Scotland.

Discussion is consistently focused on two generic types of potential mechanisms:

- Multiple ROCs and technology banding
- A feed-in tariff

Multiple ROCs and technology banding

There are currently a number of proposals in circulation for ways to amend the Renewables Obligation (RO) to provide different levels of support to different technologies. One way of doing this would be to establish 'technology bands' and offer multiple ROCs within them in order to reduce the bias in the system towards generation options that are currently low cost such as onshore wind. Additional ROCs for marine renewables could offer an option for getting marine energy generation closer to commercial viability at current costs.

Feedback from the industry was divided on this and other ROC-based options, but considered it to have a greater chance of speedier implementation than a feed-in tariff, and possibly greater certainty as it would built within the RO, which is currently in place until 2027. Whilst industry feedback suggests that this option would not significantly alter the RO as the installed capacity eligible for support would be a small percentage of the total RO, this option has secured little support from the wider renewables industry. In particular, our interviews with utilities, who increasingly are getting involved as project developers and therefore the potential drivers of the industry, suggest that this is not a favoured option.

Feed-in tariff

Feed-in tariffs are characterised by a specific price, normally set for a period of several years, paid to generators. These schemes have the advantage of investment security, the possibility of fine-tuning without affecting prior investments, and can be set at different levels for different technologies. However, a feed-in tariff involves a risk of over-funding and consequent inefficiencies.[26] In addition, while a number of industry stakeholders identified this as a preferred option, there was recognition it could take longer to introduce than an amendment to the RO.

Climate Change Capital believes that whatever support mechanism is implemented, it should be judged on:

- Its speed of implementation
- The certainty of the cash flows it provides
- Its stability over the long-term
- Its level
- Its efficiency in terms of costs to consumers/taxpayers and administrative simplicity

In addition, almost all respondents stated a preference for a consistent mechanism across the UK and the consequent need for the Scottish Executive and DTI to work together on the implementation of the mechanism.

Although none of the participants in the Path to Power has analysed the economics of wave and tidal energy, it is instructive to look at the level of support offered in other countries to see the type of level that might be sufficient to bring forward investment in the UK. Portugal, for example, has put in place a feed-in tariff of €230/MWh for wave and tidal installations. The cost to the consumer/tax payer is limited by establishing a cap of 50MW on the total installed capacity that would be eligible for support.

Section 4 outlined the need for a further support mechanism to be put in place as soon as practicable. However, the timing for the introduction of a mechanism requires careful co-ordination.

The options for a further mechanism will need to be analysed in the light of other proposals, in particular for amendments to the RO. It therefore seems prudent to await the results of the two existing studies and using their results to narrow down the options for further analysis. At present, CCC understands that both studies should be published by late summer 2006.

It will be important for the Government to review the response to the MRDF before putting in place a further support mechanism. Given that the second round of the MRDF closes in May 2007 and some time will be required to review the submissions, the

[26] Econnect (2006) Path to power: Stage 3 report, Pg 35

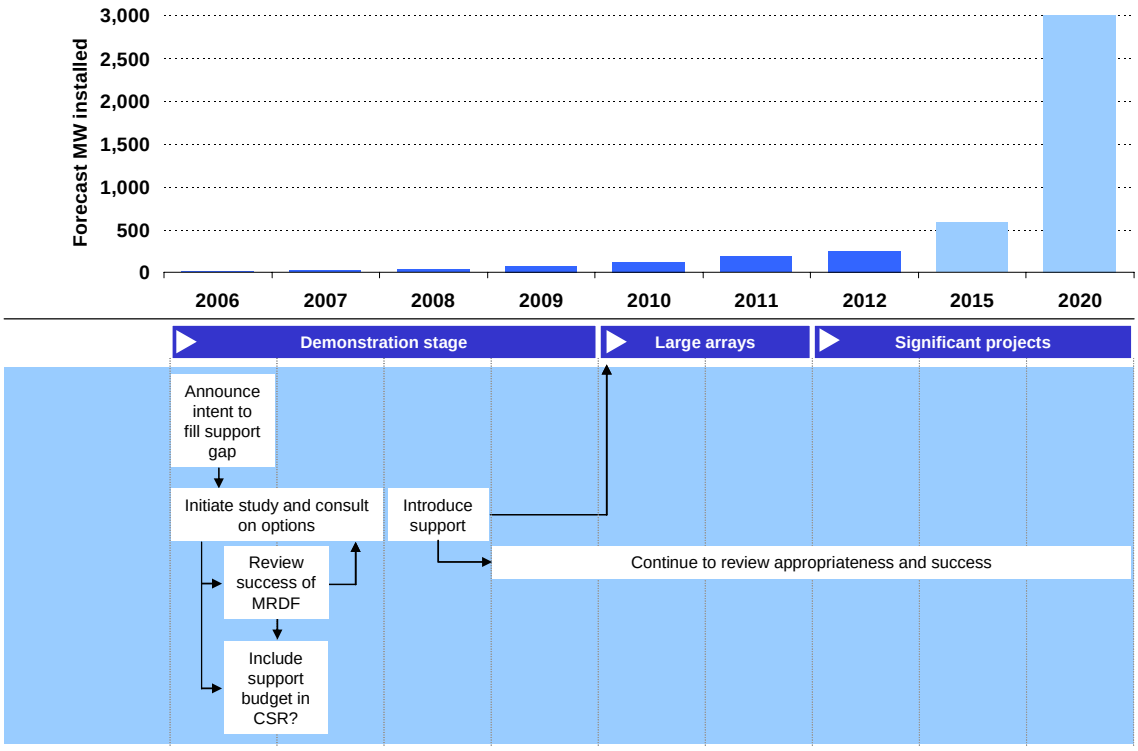
Government is unlikely to be able to form a view based on two rounds of submissions before the end of 2007.

However submissions to the Treasury's 2007 Comprehensive Spending Review (CSR) are due in late 2006. Dependent on the mechanism chosen, it may be important for the DTI to be able to earmark a sum for support by this date and this, in turn, may be dependent on the response to the MRDF, suggesting that the MRDF may need to be subject to a preliminary review based on the first round of submissions.

These factors suggest that the Government should announce a programme of work as soon as practicable to identify a further support mechanism to bridge the funding gap for wave and tidal. This programme could include a study commissioned to analyse promising options, building on the results of the two studies now in progress. The results of this study could lead to proposals put out for consultation and, depending on the results of the MRDF, lead to a number earmarked for wave and tidal power in the CSR. The exact form of the mechanism could then be refined through 2007, with a view to its introduction in 2008. Beyond this, the mechanism should be subject to review for its appropriateness and success.

This potential timetable is shown in Figure 8 below.

Figure 8: Timetable to put in place a financial support mechanism



Grid access

The grid-related hurdles to the development of the wave and tidal industry are all shared, at a larger scale, by the on- and offshore wind industries. As a result, much effort is already being made to resolve the connection and charging problems. In particular, four processes are of major importance:

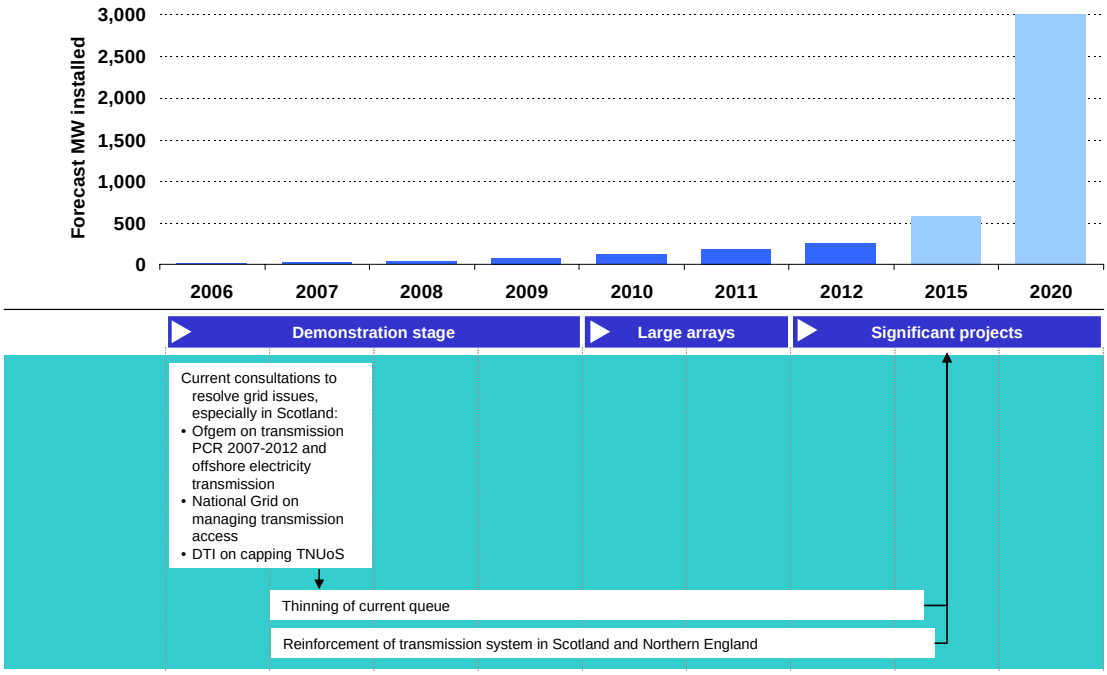
- Ofgem's third consultation on the transmission price control review 2007-2012[27].
- A related National Grid consultation process on managing access to the GB transmission system[28].
- Ofgem's programme of work on the regulation of offshore electricity transmission[29].
- A DTI consultation on capping TNUoS charges for wind generators in remote locations in Scotland to help enable the UK Government to meet its renewables targets[30].

The wave and tidal industry should participate actively in these processes to ensure that their interests are reflected in the outcomes.

If these processes are successful in resolving the queue issues and result in the network reinforcement required, it should allow developers to access the best resources – primarily in Scotland – at scale from the middle of the next decade, as shown in Figure 9 below.

[27] Ofgem, March 2006, Transmission Price Control 2007-2012: Third Consultation
[28] National Grid (April 2006) Managing Access to the GB Transmission System
[29] Ofgem (2006) Offshore Electricity Transmission – Scoping Document
[30] DTI (2005) Adjusting Transmission Charges for Renewable Generators in the North of Scotland

Figure 9: Timetable to resolve grid issues



Ofgem 2007-2012 price control review

The price control review proposes to institute locational revenue drivers to allow Transmission Owners ("TOs") to recover the unanticipated costs of connecting new generation in Scotland. This would substantially increase the flexibility and speed with which TOs could respond to network upgrade needs.

In addition, in connection with the review, Ofgem has established the Access Reform Options Development Group (ARODG) to facilitate industry discussion of how to better manage the BETTA queue to ensure that more robust projects are able to secure a network connection faster, although this might mean changing the structure of the FSL requirement.

Both of these developments should be positive for wave and tidal energy, allowing a more flexible response to demands on the grid, although Ofgem needs to consider the effect that changes to the structure of FSL payments will have on wave and tidal developments at any scale. The industry should seek to play an active role in the ARODG.

National Grid consultation

The National Grid consultation (which closed on 12th May 2006) is designed to address some of the same issues as the Ofgem price control review. However, National Grid's consultation also covers related proposals on:

- How the method for reallocating capacity rights between generators in the queue could be improved beyond the current first-come, first-served method.
- How it may be possible to connect generators before the upgrades necessary to provide them with full firm access have been completed.

The wave and tidal industry should support both of these proposals and should work with National Grid, through the BWEA, to respond to the consultation to ensure that the most favourable proposals are implemented. The latter proposal, in particular, offers considerable potential to allow generators in remote locations quicker access to the network.

Ofgem work programme on regulation of offshore electricity transmission

Although Ofgem's programme to develop the regulation of offshore electricity transmission is at an early stage, it is clearly of relevance for the wave and tidal industry and some potential outcomes will be more favourable than others. In particular, it may be appropriate to reflect some of the changes being proposed to onshore transmission charging, discussed above, in offshore charging. The industry should follow this programme of work and respond as appropriate to any consultations.

Consultation on capping TNUoS charges

This consultation, which closed in November 2005, proposes that TNUoS charges for wind, wave and tidal generators should be capped at a certain level – perhaps the level of the current highest TNUoS charge – in order to prevent very high charges preventing exploitation of Scotland's renewable resources. The proposal could apply for the Western Isles, Orkney and Shetland or for all of the Scottish Highlands and Islands, although CCC understands that the former is more likely. If implemented, under current legislation the transmission charges could be capped only until 2014, although a bill currently before Parliament is seeking to extend this to 2024.

Again, this proposal would clearly be favourable for wave and tidal. The BWEA has already submitted a response to this consultation and recommended that the power to cap charges be used after careful consideration and with an extension of the time limit to 2024.

Planning and permitting

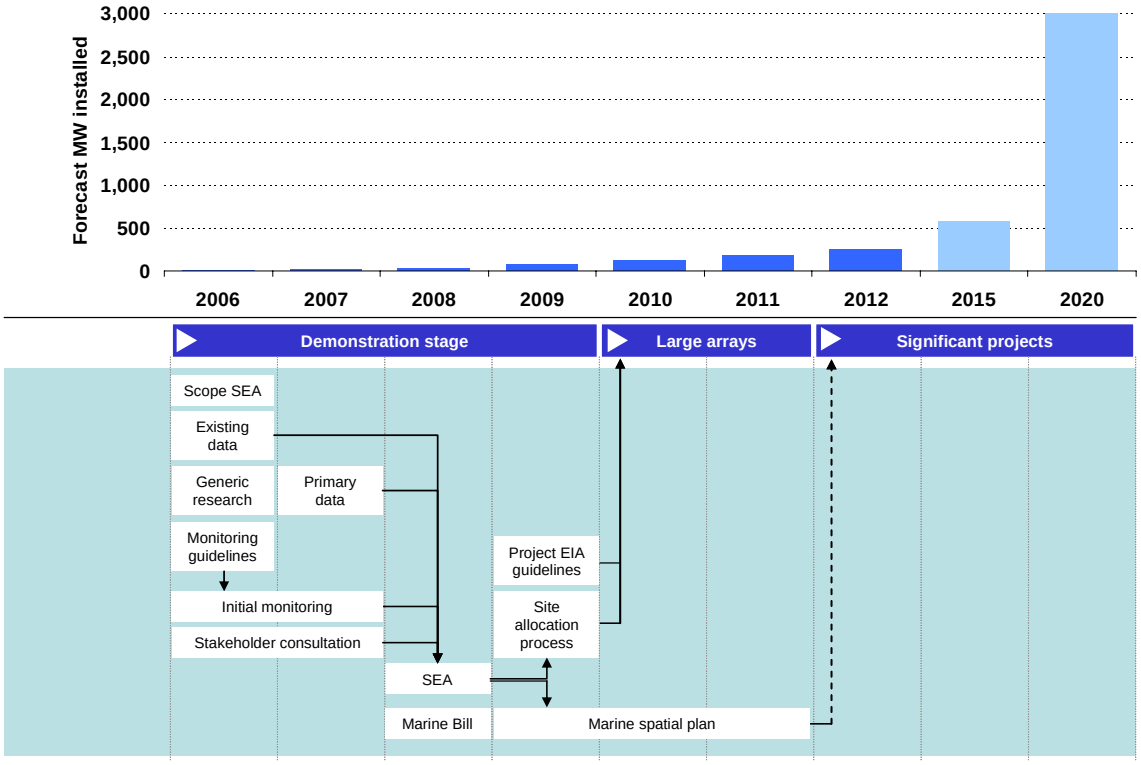
The hurdles relating to planning and permitting suggest that the Government should formally begin preparations for an SEA, or more likely, SEAs, as soon as practicable in order to be able to complete an SEA, and allow completion of work that depends on the SEA, in time to meet the needs of the industry. Beginning preparations for an SEA would involve scoping an SEA's requirements, initiating generic studies and providing guidance for the monitoring requirements of installed devices. ABPmer's estimates suggest that this process of information gathering may take up to three years.

In addition, the Government should set out the regions that will be covered by marine renewables SEAs. Given that the Scottish Executive is already preparing an SEA, which is examining the Western seaboard including Inner Isles, Western Isles and Argyll and Bute; the Solway Firth; and The Northern Isles (Orkney and Shetland), the remaining areas with the greatest wave and tidal potential that still require an SEA therefore appear to be South West England and South Wales

Once preparatory work has been conducted, completion of an SEA itself is expected to take around one year. Once an SEA is complete, the Government should publish guidance on the EIA requirements for large arrays and above and work with the Crown Estate to identify potential sites for development and develop an approach to site allocation. In addition, the SEA could feed into the process of marine spatial planning, but this should not cause a hiatus in the development of the industry.

The Marine Bill is likely to become law in 2008 with a marine spatial planning element, which the SEA will inform, expected to take three years to complete thereafter. Although the timing of some of the elements in this programme is dependent on the present consultation, enough is known to propose a timetable shown in Figure 10. The detailed recommendations behind this timetable are given below.

Figure 10: Timetable for reducing planning and permitting uncertainties



Begin preparations for an SEA now

CCC believes that the Government should begin preparations for an SEA of the most promising areas of resource as soon as practicable. Announcing that preparations for an SEA were in place would send a strong signal to the industry. Beginning background work towards an SEA should ensure that SEAs do not become a hurdle for the development of the industry, that guidance on project-level EIA is clear and focused on site and device-specific issues, and that SEAs are in place for marine renewables to feed into any process of marine spatial planning.

The steps towards an SEA that could be initiated today include:

- Initial scoping, data gathering and generic research
- Introduction of monitoring guidelines
- Consultation with stakeholders

Begin scoping, data gathering and generic research for an SEA
Scoping an SEA now would help guide the process of data gathering, research and monitoring towards an SEA, providing the industry with greater clarity on requirements and potentially saving wasted effort.

Once the scoping is complete, a process could begin of gathering existing data, from work for offshore wind, for example, and of identifying areas of generic research required to fill any broader gaps.

Establish guidelines for device monitoring
Monitoring will inform the process of completing an SEA (recognised by the DTI in the guidance note: "…sufficient knowledge of marine renewables needs to be acquired in order to design a suitable SEA…") and have wider importance to the development of the industry, particularly in its early stages.

In order to feed into the SEA and to provide the industry with clarity, the Government should as soon as practicable:

- **Begin a gap analysis**. Research priorities should focus on gaps in understanding of impacts, which need to be highlighted through a detailed gap analysis.
- **Establish a monitoring regime for demonstration projects**. A rigorous monitoring regime will have to be put in place for demonstration projects to maximise the usefulness of initial project deployment; this could be done through requiring consent conditions to stipulate that the results of monitoring studies are fed back into an ongoing assessment process for a given project.

Such monitoring will require adequate funding; in the short term, the funds earmarked in the MRDF may be sufficient. In the longer term, an arrangement similar to the COWRIE

fund for offshore wind could be phased into any Government funded programme of monitoring.

Begin the stakeholder consultation process

The early involvement of all stakeholders will be crucial to ensure that potential impacts and plans for mitigation are identified at early stages of project design, which will ultimately warrant against future project delays. For this, the industry will need to develop a process by which all stakeholders are consulted.

In addition, an independent process for undertaking research that is widely acceptable to all parties needs to be put in place. The Research Advisory Group (RAG) research programme will be instrumental in achieving this.

Use the SEA to clarify requirements for project EIAs

An SEA will help to clarify a number of issues with respect to individual projects EIAs. Specific recommendations with respect to EIAs are:

- **Issue guidance for next stage of deployment**. Once the SEA is prepared, the Government will need to issue guidance for the next stage of deployment to cater to the needs of the leaders in the market.
- **Minimise EIA requirements**. By completing an SEA, the Government should require EIAs to look primarily at site-specific issues, which would reduce the detail required from individual EIAs.

Marine spatial planning

The implementation of marine spatial planning should not delay the development of the marine renewables industry, nor does it remove the need for an SEA on the timeline set out earlier.

The BWEA has put forth recommendations in their response to the Marine Bill, which CCC believes would allow for a flexible approach to planning within the remit of sustainable development.[31]

Site identification and leasing

In light of the results of the SEA the Government and Crown Estate will need to develop a strategy for site allocation appropriate for the large-scale deployment of wave and tidal devices that adequately enables development while recognising the risks of site sterilisation, decommissioning costs and negative environmental impacts.

[31] BWEA (2006) The Marine Bill – Offshore Renewables Perspective, available at http://www.bwea.com/pdf/Marine-Bill.pdf

At present, the industry should look to participate in the DTI's consultation on offshore decommissioning to ensure that its views are adequately represented. This consultation was launched on 9th June 2006 with a view to producing proposals before the end of the year.