

Proposed Internationalisation of the UKERC Ocean (Wave and Tidal Current) Renewable Energy Technology Roadmap

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Abstract

This paper provides an overview of the UKERC technology roadmap and its proposed internationalization. It describes a route for mobilizing the wave and tidal energy community down a deployment pathway towards targets in 2020.

The roadmap is aimed at providing a focused and coherent approach to technology development in the ocean energy sector, whilst taking into account the needs of other stakeholders. The successful implementation of the technology roadmap depends upon a number of complex interactions between commercial, political and technical aspects.

Although this roadmap is technically focused it also considers policy, environmental and commercialization aspects of the ocean energy sector, in order to display and put in context the influences of these externalities.

Keywords: Roadmap, Technology, International, Ocean

1 Introduction

At present it is technically feasible to achieve international carbon reduction targets utilising a portfolio of supply technologies. However many of the technologies to facilitate this require significant development in order to be cost competitive with existing fossil-fuel based supply technologies. Roadmaps are an effective tool to underpin the identification of priority focus areas and investment requirements to accelerate technology development. Additionally roadmaps can facilitate the creation of international frameworks to accelerate the development and adoption of low carbon technologies.

1.1 Overall road-mapping benefits:

- Roadmaps are an effective tool to underpin the identification of policies and measures

- Focus R&D and business investments to accelerate technology development.
- Roadmaps can facilitate the creation of international frameworks to accelerate the development and adoption of low carbon technologies.
- Can provide a coherent approach and significant engagement with the global market

This proposal responds to the opportunity discussed at the 15th IEA-OES meeting in Brest France for the production an international technology roadmap to underpin, efficiently facilitate and accelerate the progression of the international ocean energy sector. The overall structure of this work would involve compiling and disseminating information on the international and country specific challenges facing the sector in conjunction with potential research and supply chain solutions available in the specific countries. The proposals overall and specific objectives and benefits are listed below:

1.2 Objectives:

- To identify development time lines and key knowledge gaps in Ocean Energy technologies.
- To prioritise research activity in cognisance of the above timelines and challenges.
- Prioritisation of key technology requirements for the efficient and effective progression of the sector.

And thus:

- To influence funding strategies in Energy Research both nationally and internationally.
- To encourage closer collaboration between research organisations and technology developers and the wider potential supply chain.

- Underpin and enhance international collaboration, whilst influencing and guiding both political and business decision makers.
- Underpin the identification of policies and measures, and to focus R&D and business investments to accelerate technology development.
- Facilitate the creation of national and international frameworks to accelerate the development and adoption of ocean energy technologies.

1.3 Overall proposal benefits:

- Enhance international information exchange
- Provide a framework for knowledge sharing
- Stimulate the stakeholders
- Help coordinate international efforts
- Reduce the overall challenges

1.4 Specific proposal benefits:

- Providing overall catalogues of the international technical challenges facing the development of the ocean energy sector
- Provide a high level catalogue of the supply chain solutions and development capabilities
- Bringing together of international challenges and capabilities will facilitate the efficient and effective utilization of the a global knowledge and leverage the acceleration of the sector
- Providing synthesis and identification of common areas. This will avoid international duplication of effort
- Providing opportunities for sector acceleration and invaluable guidance to countries presently without there own dedicated ocean energy roadmap.

2 UKERC

The UK Energy Research Centre (UKERC) [1] is the focal point for UK research on sustainable energy. It takes an independent, whole-systems approach, drawing on engineering, economics and the physical, environmental and social sciences. UKERC is the present author and host of the existing UK Ocean Energy technology road map [2], the deployment strategy of which is displayed in Figure: 1

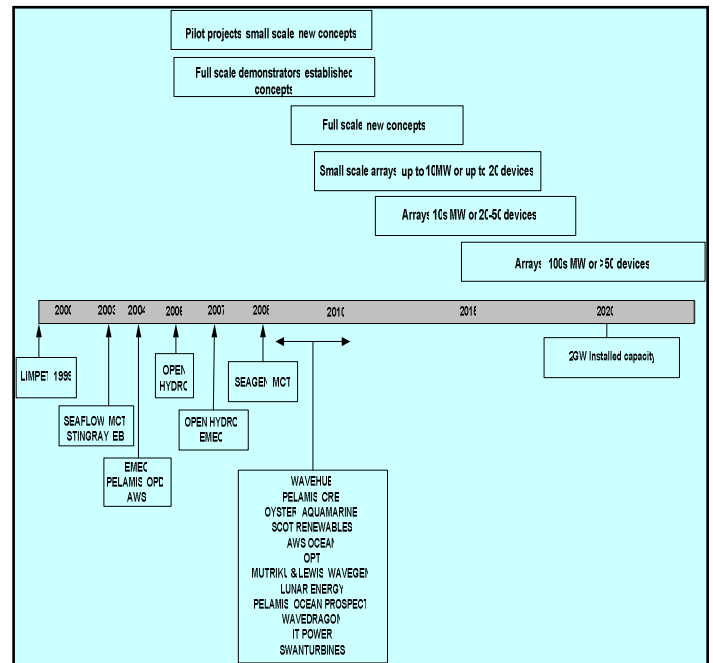


Figure: 1, Deployment Strategy

The details of this peer reviewed road-map document can be found on the UKERC website (www.ukerc.ac.uk). This document has already been utilised by a range of UK and international organisations.

2.1 Road mapping method used:

As it is proposed (later in this document) to build on the existing road-mapping work and its methodology the following section gives a brief overview of the UKERC methodology and approach. A Battelle approach was used in this road-mapping work and used the following high level steps

- Step 1 : Vision Setting
- Step 2: Analyse current *Landscape*.
- Step 3: Route and process
 - Deployment Scenario
 - Commercial Strategy
 - Technical Strategy

The overall process was consensus based, consisting of a series of stakeholder workshops and interviews. The UKERC “meeting place” service was used to professionally facilitate the workshops. This service would also be used in this international proposal.

Step 1: Vision Setting

- To exploit energy from waves and tidal currents in an environmentally and socially responsible way, aiming for an installed capacity of 2GW by 2020 in UK waters.
- To stimulate policy and funding instruments to overcome barriers to deployment.
- To establish a commercially viable industry supported by an extensive supply chain and thereby build skills capacity at all levels.
- To become competitive with other energy sources by 2020.

Step 2: Analyse current Landscape.

The landscaping work consisted of identifying the knowledge base and capabilities assessment in the following areas:

- Applied Research
- Development & Demonstration
- Facilities and infrastructure
- Support Networks

The following Figure 2 is an example of some of the funding distribution analysis work that was undertaken

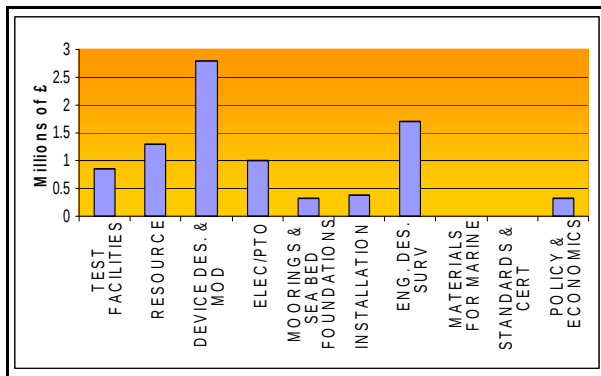


Figure: 2, Funding distribution example

Step 3: Route and process

Although fully dependent on both the deployment and commercial strategies, the underpinning technical strategy is the focus of the roadmap. The technical strategy has been divided into 12 themes referred to as Technology Working Areas, which represent the technology development chain in ocean renewable energy devices (Figure: 3). Each of these areas are detailed in the full roadmap.

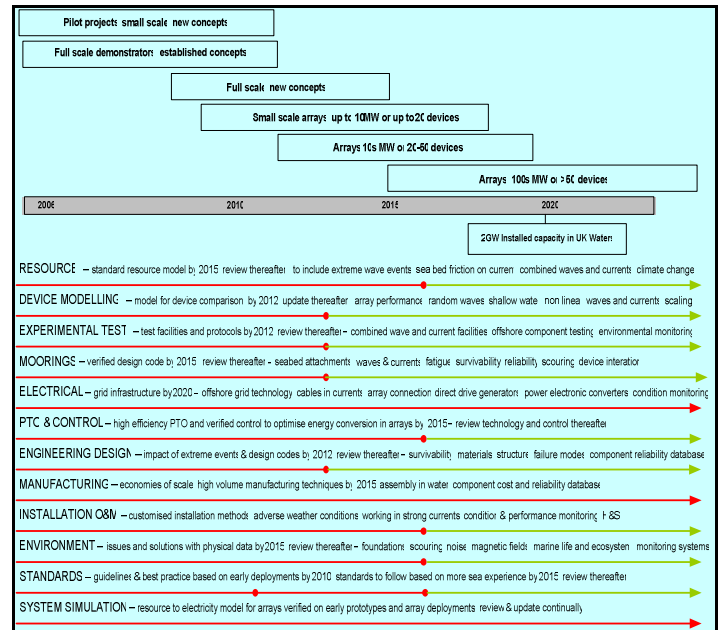


Figure: 3, Technical Strategy

3 International Technology Roadmap Proposal

Scope:

- Wave and Tidal stream
- Technology challenges and solutions focused

Objectives:

- The creation of international frameworks to accelerate the development and deployment of wave and tidal energy technologies.
- Focus R&D and business investments to accelerate technology development
- To identify existing research and supply chain capabilities that meet the international needs of the sector
- An effective tool to underpin the identification of policies and measures for wave and tidal energy technologies

3.1 Steps towards an International roadmap:

As indicated in preceding section it is suggested that the international roadmap builds on the existing road-mapping work and again utilising the Battelle method. This is expanded upon in following section.

Step 1: Vision Statement: the construction of an international vision for the development of the ocean energy sector in the wider future energy mix. It is suggested that this Vision Statement is defined in collaboration with the IEA-OES implementing agreement and wider stakeholders for the corresponding countries.

Step 2: Analyse the current Landscape.

Defined as a capabilities assessment including details of:

- Existing, underpinning research.
- Development & Demonstration projects.
- Research Facilities and test centres.
- International and national networks.
- Supply chain capabilities.

Again it is suggested this is done in collaboration with the associated IEA-OES implementing agreement, in order to identify who and what exists and is being done internationally in order to add context to the overall development of the sector. This will require significant international interaction. The IEA-OES members can play a key role in representing the views of the various national stakeholders they represent as can the relevant trade associations.

Step 3: Route and destination

▪ Deployment Scenario:

It is suggested that this activity is conducted utilising an engagement/workshop process for each of the relative technologies.

▪ Commercial Strategy

The commercial strategy will be required to fulfill the deployment strategy and consists of several themes, covering all aspects of the development cycle for an emerging technology. For example:

- Provision of test infrastructure and test facilities.
- Streamlining of planning and legislative frameworks.
- Planning and development of an appropriate supply chain.
- Development of National and Internationally accepted Standards
- Analysis and potential reinforcement of the existing electrical grid infrastructure.

This will be an interesting area to internationalise as although some of the areas are country specific, such as national standards all area will benefit from international lessons learnt.

• Technical Strategy

Although dependent on both the deployment and commercial strategies, the underpinning technical strategy is the focus of an R&D roadmap. The technical strategy would be divided into themes or Technology Working Areas (TWAs), which represent the technology development chain in the emerging technologies. Many of the identified technology challenges relating to this analysis cross international

borders. However, country specific challenges will need to be identified,

3.2 Example: Country specific challenges;

- Potential for neutrally buoyant ice collision in countries such as Canada, or mooring and foundation solutions for countries only with deep water resources.

In addition to international identification of challenges there will be the important opportunity for the identification of solutions to these challenges from both the engineering and research bases in the varying countries. As well as providing solutions to the ocean energy sector it would create the opportunity for the development of valuable IP development opportunities for each countries respective supply chain

3.3 Examples of wider solutions and benefits:

- Overcoming the challenge with the modelling of turbulence and its effect on tidal turbines match well with large scale Canadian flow tank infrastructure and knowledge currently used for the testing of fishing nets
- Global challenges with resource assessment could be matched with the existing New Zealand expertise in this area

Additionally countries with aspirations only to be technology providers will be made aware of the international challenges and opportunities available

4 Conclusion

Overall the paper has provided a description and overview of the proposed extension to the UKERC roadmap. It is hoped that this dissemination will provide invaluable feedback to ensure the success of this future work and the efficient and effective progression of the ocean energy sector.

5 References

Acknowledgements

The authors acknowledge the input from the broad range of stakeholders that made the existing UKERC roadmap possible

References

- [1] UK Energy Research Centre (UKERC) undertakes world-class research addressing whole-systems aspects of energy supply and use.
- [2] Mueller, M. & Jeffrey, H. (2008): *UKERC Marine (Wave and Tidal Current) Renewable Energy Technology Roadmap*