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Investment barriers and incentives for marine renewable energy in the UK: An analysis of investor preferences

Simeon Leete [a,*,1], Jingjing Xu [b], David Wheeler [c]

[a] University of Plymouth, Drakes Circus, PL4 8AA, United Kingdom
[b] Plymouth Business School, University of Plymouth, Drakes Circus, PL4 8AA, United Kingdom
[c] Cape Breton University, PO Box 5300, 1250 Grand Lake Road, Sydney, Nova Scotia, B1P 6L2, Canada

HIGHLIGHTS

- Performed a series of in-depth interviews with senior finance and industry actors.
- Examined investor attitudes and policy preferences that may encourage investment.
- VC investors are currently disinclined to invest in early stage device development.
- Policy instability, level of capital and revenue support are key investment barriers.
- Commercialization requires strategic government and industrial partner investment.

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ABSTRACT

Deployment of marine renewable energy (MRE) in the UK is desirable in order to address climate change, meet mandatory EU renewable energy targets and provide significant economic development opportunities, including new export markets. Public funding constraints in the UK mean that substantial investment is required from the private sector to commercialize the industry. By focussing on investor attitudes and behaviours towards wave and tidal technologies, this paper reveals significant observations from the investment community with serious implications for the future of the MRE industry. Through a series of in-depth interviews with individuals from the investment community, device developers and industry support, the research seeks to identify common barriers and incentives to investment. The paper demonstrates that although investors' attitudes are generally aligned, they do appear to have changed over time. Of the participants that had previously invested in early stage MRE device development, none were likely to do so again. It is concluded that this is a function of investors' greater understanding of the scale, and unpredictability of the costs, and the length of time required to develop these technologies. This presents a significant policy challenge for all actors interested in the commercialization of wave and tidal technologies.

1. Introduction

The role of atmospheric carbon dioxide in driving global climate change is now almost universally accepted (IPCC, 2007). Much of the policy focus in addressing this phenomenon has therefore been devoted to driving down worldwide carbon dioxide emissions. Given their greater economic resources and historic contribution in creating the problem, the UK and other industrialised countries must shoulder the greatest responsibility in addressing it. As such, and as part of the wider EU Climate and Energy package, the UK has agreed a binding legal commitment to deliver 15% of energy from renewable sources by 2020.

Being blessed with some of the best wave and tidal resources in the world, marine renewable energy (MRE) is a promising option for the UK generating mix. The UK Department for Energy and Climate Change (DECC, 2010b) estimates the annual exploitable resource to be 50 TWh of wave energy, 17 TWh of tidal stream and over 18 TWh of tidal range energy—or enough electricity to support 20 million homes. The attraction of these rich resources and effective policy support from Government, particularly in Scotland, has enabled the UK to take a leading role in the development of the emerging global MRE industry to date. Estimates for the industry's contribution to the 2020 targets are modest, perhaps 1–2 GW of installed capacity (DECC, 2010b;

* Corresponding author.
E-mail address: simeon.leete@btinternet.com (S. Leete).

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RenewableUK, 2011), reflecting the relatively early stage of development. However the resource estimates suggest the potential for MRE to deliver up to 20% of UK electricity demand when fully commercialized.

After decades of cheap energy from North Sea oil and gas fields the UK has now become heavily dependent on imported fossil fuels to meet its energy needs. International political instability and the depletion of reserves provide significant cause for concern over the cost, and security of energy supply for the UK (IEA, 2011; RenewableUK, 2011). Diversification of the generation mix reduces dependency on any one technology, so increasing the resilience of the system as a whole and its ability to meet the demands of the country (DECC, 2011a). Exploitation of the rich renewable energy resources available in the UK provides an opportunity to secure a long term, stable, domestic generating capability.

Energy from renewable sources also benefits from not being subject to the same variations in cost as those from fossil fuels (DECC, 2011a). Whereas the price of fossil fuels is closely linked to the fluctuating price of oil, renewable fuel sources such as solar, wind and ocean energy are abundant and relatively cheap to harness once the infrastructure is installed. Governments predict the cost of fossil fuel derived energy will continue to increase as hydrocarbon resources are depleted and become more expensive to extract (DECC, 2010a; EIA, 2011). In contrast, the cost of renewable energy is on a reducing trend as greater knowledge and experience bring improvements in cost efficiency (Carbon Trust, 2011). Whilst renewable energy technologies currently have a relatively high levelized cost of energy in comparison to their hydrocarbon counterparts (EIA, 2010) it is anticipated these costs will reduce over time.

Whilst no direct fixed relationship exists between technology maturity and funding source, Fig. 1 shows the typical funding sources available to developers at each major development lifecycle stage. The graphic also shows the increasing scale of capital requirement at each development stage and reducing dependence on Government support mechanisms. With investment in the region of £35 m required to get a full scale prototype in the water, and an additional £50 m needed for the first 10 MW farms (DECC, 2010c; RenewableUK, 2010), the scale of the capital challenge is clear to see.

Considerable progress has been made by the leading developers to demonstrate reducing costs. For example, Aquamarine Power's Oyster device has reduced from £35 m per MW for Oyster 1–£12 m per MW for Oyster 2, with an anticipated £7.5 m per MW for the proposed Oyster 3 device (McAdam, 2010). However, global new investment in ocean energy is on a downward trend with a 44% drop between 2009 and 2010 (UNEP, 2011). With the current constraints on public funds in the UK, it is essential that private capital is accessed in order to accelerate development and deployment of the technology.

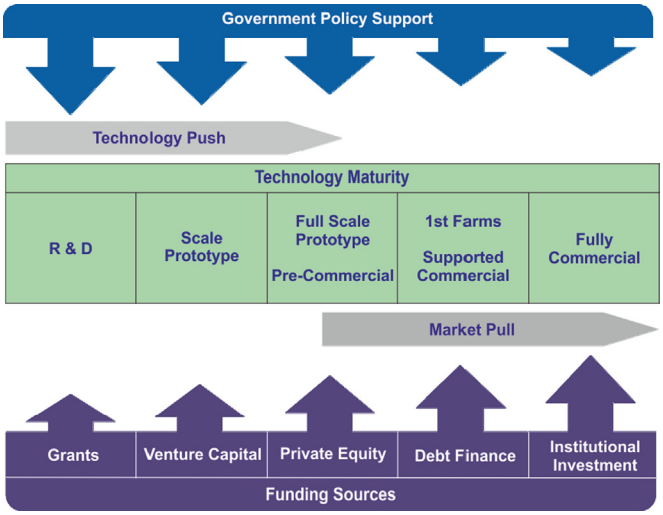

Fig. 1. Funding sources through the development lifecycle stages (Adapted from Wüstenhagen and Menichetti, in press).

There is an opportunity to tackle climate change, improve energy security for the UK, and seize an export market estimated at up to £6.1 billion a year (RenewableUK, 2010), delivering badly needed jobs and new income to the UK economy. Given the scale of investment required and high risk nature of these developments, private investors are unwilling to invest at the current level of technological maturity. State of the art testing facilities and a host of the leading device developers make the UK perfectly poised to play a major role in this market, but it is unclear whether the political will and the financial capacity is in place to achieve this. This in contrast with jurisdictions such as Canada, where investment of over $500 m is estimated in the next five years (OREG, 2010).

The relatively small scale of marine energy deployment in comparison to other renewable technologies, including offshore wind, makes it difficult to draw conclusions from academic studies on renewable energy investments to date. This research aims to fill that gap by performing a robust analysis of investors' perspectives towards investment in MRE specifically, and the regulatory environment in which it operates. The aim of the research was to support the industry and policy makers by:

- Providing a greater understanding of the key current drivers underpinning investment decisions.
- Investigating how these may have developed over time.
- Exploring how barriers to investment may be reduced in the future.

This paper will first provide a summary of the relevant literature, followed by an explanation of the research methodology, design and the practical method. The key themes established through the interviews are then detailed prior to discussion on how these may impact investment decision and policy making. Finally the conclusions and recommendations developed from the research are presented.

2. Literature review

2.1. Public policy and financial support mechanisms

The need to mobilize private finance is clearly fundamental to the development of renewable energy in general (Mathews et al., 2010). However although investors see the emerging marine energy industry as exciting and potentially profitable, most are resistant to investing at this stage (Kreab Gavin Anderson, 2010). Limited capital funds available are being directed to projects with lower risk profiles and clearer returns. Previous studies (Foxon et al., 2005; Green Investment Bank Commission, 2010; Wüstenhagen and Menichetti, 2012) all identify the critical funding gap, the so called 'valley of death', as available finance is not sufficient to scale up from prototype to full scale deployment. A number of suggestions and recommendations have been proposed as to how a Green Investment Bank could be structured to support renewable energy development (Caldecott, 2010; Ernst & Young, 2010; Green Investment Bank Commission, 2010), however the focus is almost entirely on the more commercial technologies. Whilst some of the financial instruments suggested might be adaptable to support less mature, and so riskier marine energy