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Anticipated coastal impacts: What water-users think of marine renewables and why☆

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ABSTRACT

This article explores the physical coastal impacts that are anticipated by coastal water-users in the lee of the Wave Hub marine renewables test facility (Cornwall, UK). In depth, semi-structured interviews were analysed using a grounded theory approach in order to explore contemporary anticipations as well as the process of opinion formation that has occurred for participants. The interviews focused on anticipated impacts to inshore wave conditions, beach sedimentation, rip current formation and beach safety. The results indicate that participants constructed their anticipations by weighing their perceptions of the technology against their perceptions of the coastal environment. A conceptual model is presented which allows the degree of anticipated coastal impact to be predicted, by categorizing technologies and coastal environments in terms of their perceived properties. The model indicates that wave energy deployments which are perceived to be large scale, close to shore, wide, stationary, or extracting high percentages of energy are likely to invoke anticipations of significant or severe coastal impacts. Conversely, those which are perceived to be small scale, far from shore, narrow, moving, or extracting low percentages of wave energy are more likely to invoke anticipations of insignificant or no coastal impact. Interestingly, the level of anticipated impact was most often based on device properties such as form or siting, and was rarely influenced by device extraction efficiency. The implications for future marine renewables deployments are discussed.

1. Introduction

The UK government plans to install sufficient renewable energy capacity to supply 15% of the UK's gross energy consumption by 2020 (H.M. Government, 2009). This has been incentivised by EU targets to help mitigate climate change and improve energy security (Commission of the European Communities, 2008). Marine renewable energy (wave and tidal) is calculated to have a large exploitable capacity in the UK, with wave and tidal energy capacity at 50 TWh/y and 21 TWh/y respectively, equating to approximately 20% of the UK's present electricity needs (Carbon Trust, 2011). Marine renewable energy (MRE) is hoped to provide a significant contribution to the UK's renewables mix in the long term, potentially providing 20% of the UK's electricity demands by the year 2050 (H.M. Government, 2009).

Despite these targets, the uptake of renewable energy has been slower than was hoped, and it has been widely observed that local opposition from stakeholders and the general public has created a considerable barrier to terrestrial projects in the UK (Walker, 1995; Bell et al., 2005; Devine-Wright, 2005; Wolsink, 2006; Wüstenhagen et al., 2007; Haggett, 2008; McLachlan, 2009). Additionally, the physical separation of offshore installations from communities has not allayed concerns or opposition as might have been expected (Bailey et al., 2011). It is apparent that visual, sound and other proximity dependent impacts are far from the only issues that can rouse opposition to renewable energy projects. With the optimistic EU and UK targets for MRE installation, the occurrence of public and stakeholder oppositions to projects is likely to be an ongoing issue that will need to be dealt with case by case; in particular, interactions with coastal stakeholders are likely to increase if this relatively new sector expands at the target rate.

1.1. Wave Hub controversy

The Wave Hub (WH) facility in Cornwall (see Fig. 1) is a marine renewables test site, predominantly designed for the purpose of

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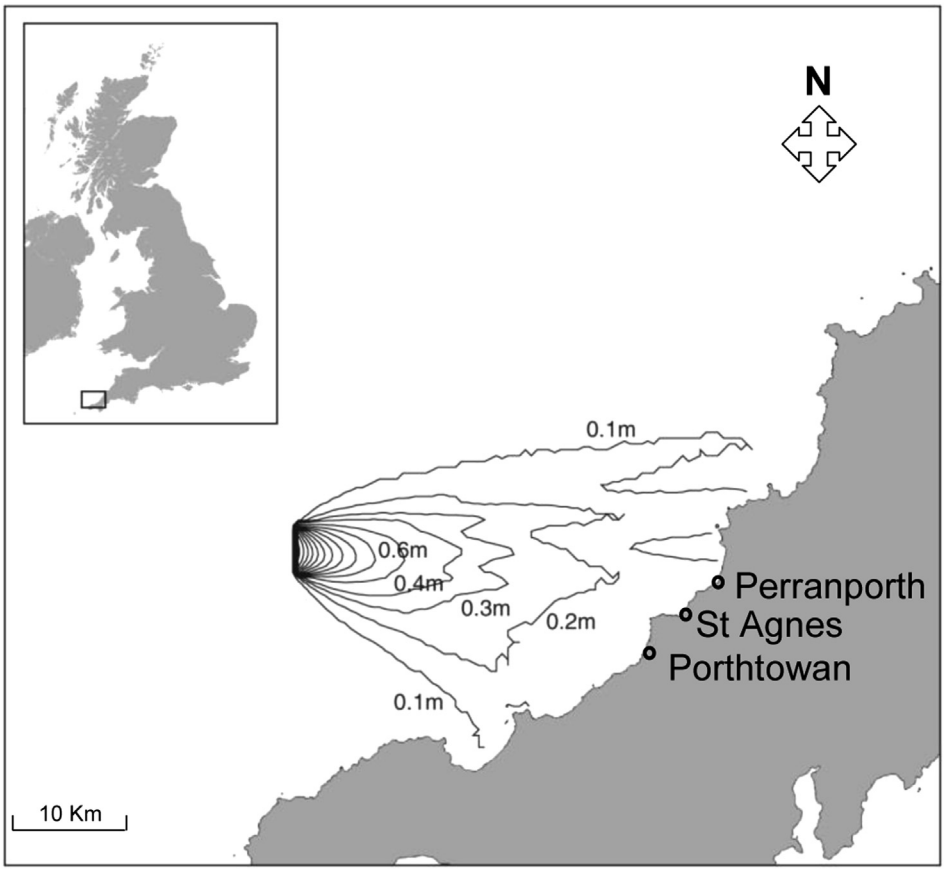

Fig. 1. Geographical location of study area, and a 'worst-case' modelling prediction of wave shadowing from the Wave Hub test facility (adapted from Millar et al., 2007). Contour lines show predicted changes in significant wave height, for unidirectional, monochromatic swell and 0% energy transmission (Reference state: H_s 3.3 m, T_m 11 s, from direction 269° from North).

trialling wave energy converters (WECs) prior to commercialisation. The infrastructure was installed in 2010 (Wave Hub, 2010), and although WECs are yet to be deployed at the site, a number of device developers plan to install full scale prototypes between 2014 and 2015 (Wave Hub, 2013a, 2014). These include point absorber (http://www.seatricity.net/) and rotating mass (http://www.wello.eu/) type WECs. There is also a possibility of floating offshore wind devices being trialled at Wave Hub (Wave Hub, 2013b). During the proposal stages the WH project met objections from commercial fishing, shipping and tourism stakeholders, but of specific interest to this study is the objections raised by the surfing community. The North coast of Cornwall is a popular area for coastal recreation, and during the Wave Hub consultation there was an outcry from a collective of UK surfers concerned about the possibility of a reduction in wave height and wave quality, as well as impacts to sediment transport (Baxendale, 2006; Farwagi, 2006). This group rallied over 500 emails of objection (McLachlan, 2009) via a surf forecasting website, arguing that the project would be better sited elsewhere, as the value of the electricity generated would be far less than the value of the surfing industry in Cornwall considered to be threatened by the project (Baxendale, 2006, 2007). It is unclear whether these concerns were limited to the Wave Hub as a test site, or extended to full commercial deployments that may or may not occur in the future.

Although not all surfers and coastal water-users shared this objection (environmental group 'Surfers Against Sewage' openly supported the WH), it nonetheless raised concern among many of the WH stakeholders. As West et al. (2009) point out, this is not a trivial objection by what appears to be a self-concerned recreational group; there are many coastal communities that are dependent on the economic income from surfing (estimated at £21 million in Cornwall in 2001 (Arup, 2001)), or other water based activities (estimated at £300 million in 2007 (Environment Agency, 2007)). Water-user groups will have both shared and individual concerns about coastal impacts from MRE installations, and despite a disjointed opposition from water-users over the WH, there is a possibility that future proposals could meet a far more collective opposition from this stakeholder group (West et al., 2009). The concerns of water-users with regards to Wave Hub as a test facility need to be fully understood, including the processes through which concerns have come about and have been altered. This will better inform consultation and avoid opposition from this group if commercial deployments are proposed in the future.

1.2. Existing research

A number of studies have investigated public perception of the WH project (McLachlan, 2009; West et al., 2009; Bailey et al., 2011). Although only a test facility, it provides an early glimpse into attitudes towards wave energy and lessons learned at this site may prove extremely useful when engaging with the public in the future. Most studies have attempted to understand positions of support and opposition; in simplistic terms the objections raised by surfers over the WH are already known (see Section 1.1), as they were openly articulated during the conflict and in previous research (West et al., 2009; Bailey et al., 2011). However, there is a