

LICENSING AND ENVIRONMENTAL ISSUES OF WAVE ENERGY PROJECTS

Frank Neumann^a, James Tedd^b, Miguel Prado^c, Iain Russell^d, Sofia Patrício^a, Veronica La Regina^a

^a Wave Energy Centre, Av. Manuel da Maia, 36, r/c Dto, 1000-201 Lisboa, PT

^b SPOK Consult, Blegdamsvej 4, 1. tv, 2200 København N, DK

^c Teamwork Technology, De Weel 20, 1736 KB Zijdewind, NL

^d Wave Dragon Ltd, Sutherland House, Pembroke Dock, UK

Abstract

The major non-technical barrier for large-scale wave energy implementation is the wide range of licensing issues and potential environmental concerns, in addition to significant National/regional differences in licensing procedures and permit requirements. Whereas some pilot plants have had a special standing or facilitated access to operating licenses due to their experimental character, the move of wave energy projects towards commercial applications implies complex procedures for obtaining licenses both with respect to the construction and deployment and operation phases, as well as concerning ocean space use and environmental concerns. Despite recent efforts to streamline European EIA (Environmental Impact Assessment) in general, potential project developers are far from having a clear view of present and future requirements concerning these barriers on a trans-national level. Different National settings and traditional use of ocean space, as well as different levels of advance in terms of legislation and procedural effectiveness make it extremely difficult to set out implementation strategies for ocean wave energy technologies. The paper includes a brief experience review from pilot plants and exemplarily presents the ongoing permitting process of the Wave Dragon in Wales. Comments on future park-scale application issues are made based on the present situation in different countries.

Key words: Wave Energy, Environmental issues, Licensing issues, Large-scale barriers

1 Introduction

Legal issues concerning permitting of structures at sea in general, and ocean energy installations in particular, are likely to be the highest non-technical barrier to overcome on the development towards park-scale ocean energy implementation. On one hand, many regions that are interesting for intensive large-scale harvesting of wave energy have not experienced major economical activities except fishing to date. On the other hand, rising awareness of environmental issues and the possibility of undesirable secondary effects can substantially slow down or even impede the implementation of such technologies, as the wind energy experience in some regions has shown. Apart from the "negative" impact

that a number of legislative situations may have on large-scale ocean energy, policy measures can also be the major driver for the technology branch, when clear market penetration instruments are enforced by the government. Both in the UK, but also in Portugal, such measures, despite being of entirely different nature, have certainly contributed to the presently high level of activities. Apart from direct support mechanisms like feed-in tariffs, grants, favourable credits and tax rebates, such measures can be mainly effective on streamlining existing legal constraints.

1.1 Significance of the Topic

It is well understood that information regarding recent and ongoing activities and

policies in other countries could substantially encourage commitment to the sector on a governmental and industrial level. Lacking knowledge and familiarity about practices and policies elsewhere in the world and their evaluation of success, is a typical constraint for many governmental actions, delaying substantially a potentially positive decision.

Already on the WAVENET (<http://wave-energy.net/index3.htm>) workshop in Brighton in autumn 2002, a discussion was initiated to increase international collaboration on this matter (Sorensen, L. Kjeld Hansen, 2002). In order to address this issue, there is presently being discussed setting up an interactive country matrix, containing information on legal issues and procedures, including the role of EIA, as well as financial incentives in ocean-energy relevant countries. The initiative taken by the Wave Energy Centre (Portugal) and Powertech Labs (Canada), has been financed by the Researcher Exchange component of the CA-OE project and shall serve the wider ocean energy community. Discussion will be initiated to support it on IEA-OES level (Implementing Agreement on Ocean Energy Systems of the International Energy Agency) and through the RTN (Research Training Network) Wavetrain, which is expected to give some valuable contribution, mainly within the context of the work presented in this paper.

When approached early enough and supported by the professional community directly involved in Wave energy development, it is believed that the development that took the wind industry 25 years, could be streamlined to less than half this time for ocean energy permitting. On one hand, the problems to be approached are of similar nature and a precedence exists, on the other hand there is increased pressure for renewables being a clear political priority. How the socio-economic importance of this

renewable technology branch, and in particular its relationship to EIA and political decisions, can be measured, is discussed in La Regina et al. (2006), a paper presented at the same venue.

1.2 Environmental Issues

The Environmental Impact Assessment will be an essential element in large-scale ocean wave energy consents. If not approached well in advance of a potential park-scale development, the result could be a number of acceptance issues and even substantial delays in the decision by the authorities to permit or reject development.

Due to their distinct characteristics it is necessary to explain and investigate these in the EIA, because not all device types have identical implications for the environment. Despite providing a clean reliable source of energy, an artificial device placed out to sea, on the seabed or at the shoreline will affect the marine environment in some way. A detailed technical knowledge of the relevant conversion technologies would be required, and this is not necessarily present in the responsible authorities for defining EIA procedures and requirements.

The Wavetrain project, is creating general guidance for the environmental impact assessment of wave energy parks. First step is a site-by-site evaluation of available information using the pilot plants as case studies. It is highly important to develop a generic understanding of common sensitive aspects related to the interaction of large-scale parks with marine life and other ocean uses. These are predominantly impacts upon the landscape, the cables to transmit electricity to shore, fishing and shipping activities, marine habitat, coastal erosion, noise, visual impact and potential emissions.

1.3 Licensing Issues

Typically, pilot plants have had a special standing with respect to licensing

procedures, both due to their demonstrative character and small dimensions, but also due to the lack of clear procedures for this kind of structures. These experiences are valuable for understanding how far a legal framework has been established and to what extent interpretation can play a role. However their meaning for large-scale deployment is rather limited. Although it might, in some cases, be possible to benefit from special treatment in the early phase of technology implementation, it is necessary to consider the wider implications and requirements of large-scale electricity production by wave energy. Licensing aspects relevant for large-scale ocean energy conversion comprise the following:

- Specific legislation for ocean energy plants / parks (including offshore wind)
- Offshore installations in general
- EIA requirements / procedures (Ocean Energy specific and/or potentially applicable)
- Property issues / use of ocean space
- Navigational safety requirements / constraints
- Fishermen's issues / conflicts
- Other priorities / competing uses (e.g. Petroleum)
- Water extraction / interaction with aquatic resource
- Particular legislation for construction/deployment phase
- Liability and other compulsory insurance
- Time limit of licenses and removal issues
- Criteria for license allocation
- Powerlines (overhead or buried; subsea and land)
- Access roads and other peripheral installations

2 Country Practices

In order to keep the present paper focused, a closer look is given only to the two countries where prototype projects with suitability for

park-scale deployment are presently under way. In Portugal, real scale wave energy projects have been deployed in recent years, and presently a vision of how to conduct the transition to large-scale development exists. A brief overview is given on past experience, as well as an outlook to where the present situation is to lead. The case of the UK is presented using the recent experiences of the Wave Dragon team, who co-author the present paper.

2.1 Portugal: Past and Future

In Portugal, three relevant projects have been concluded to date, the Pico OWC, the AWS pilot plant and the Pelamis farm, which will be deployed in summer 2006.

Pico OWC / Azores

The European OWC pilot plant on the Island of Pico, Azores, was planned in the years before 1995 with construction completed in 1998. By that time, and in particular in the Azores autonomous region, the licensing of such a device and its evaluation with respect to environmental issues was new to the authorities. As EDA (Electricidade dos Açores) was a project partner, some facility in obtaining the required permission can be assumed. However, the regional authorities showed their serious concern regarding the environmental acceptability of the plant, which proved very difficult to overcome. To date, and mainly due to the short operational periods of the plant, there are no systematic observations regarding environmental issues. This is being changed under the present refurbishment project (see Sarmiento et al., 2006), where both acoustic (air) and hydrophone measurements are scheduled for the next test phase in 2006.

AWS pilot plant; Póvoa de Varzim

The learning experience from the test phase of the 2 MW AWS pilot plant in summer/autumn 2004 is outlined in Gardner (2005). Regarding licensing issues and EIA

requirements, there still was no baseline for practice, however a law existed that enabled an officially valid procedure: the Port and Harbour Institute (IPTM) was required to grant the offshore operation license, based on a 'Portaria' especially created for the purpose, which had to be undersigned by 5 ministers. Once the project was considered positively by the government, this was a relatively fast process. Overall the process that AWS had undergone was trail-blazing for more recent actions and present ongoing discussions. An EIA was not required due to the size and character of the undertaking. Observations on environmental issues were only sporadic due to the short time of the test period, however in fact the structure was extremely well accepted by shellfish and small fish. Dolphins were observed in the direct vicinity of the plant during the tests. Despite their scarceness, the observations indicate that at least for this technology not only negative impacts should be considered for park-scale deployment (limited areas with no access for net-fishing may have a habitat protection function).

Pelamis park; Póvoa de Varzim

The permitting procedure for deploying a small park of 3 Pelamis devices in the same area as the AWS pilot plant in summer 2006 was concluded short time ago. By using the same approach as for the AWS pilot plant license, a possibly tedious new procedure could be avoided. Recently the legal framework has changed (late 2005, the water framework directive was implemented in Portugal), however it is not absolutely sure yet whether and to which extent this has implications to future practice. An EIA was done for the small park, although not explicitly demanded that time.

The demonstration zone

In the forthcoming months, a designated offshore (nearshore) area will be defined, in which facilitated grid access and operational

permits are expected to be granted, as well as access to financial benefits. The zone will be extensively monitored, before deployment and after significant scale deployment will have taken place. This model was first proposed by WEC in 2005 as a reaction to the permitting process being a potential barrier for future wave energy implementations. The model has been discussed in similar form in other countries and the decision to proceed was published in a ministerial dispatch on April 10th, 2006.

2.2 UK: Wave Dragon Case Study

Introduction

Wave Dragon Ltd is a Wave Energy Converter (WEC) developer that is deploying a full-scale WEC off the coast of Wales, UK. Since 2003 a 1:4.5 scale model of the Wave Dragon device has been deployed in Denmark and connected to a public power grid. Wave Dargon are currently applying for the necessary consents and permissions to deploy a full-scale 7 MW unit in Wales. The unit should be in the water during 2007 and the plan is then to have it in place for 3 to 5 years as a proof of concept and then take it and a further 10 units and deployed them further out to sea during 2008/09, forming a 77 MW power plant, converting electricity directly from the power of the water. The 7 MW unit has a displacement of 33,000 tonnes and is equipped with 20 individually controlled hydro turbines, each with a directly driven permanent magnet generator (PMG).

Wave Dragon EIA

The site selection for the Wave Dragon deployment was a not a simple task. The site needed to have a wave climate sufficient to test the device, which meant that it would almost certainly be off the west coast of Britain. However, due to the restrictive cost of undersea cabling and the requirement for close study and observation, the site had to

be close to land. This restriction obviously only applies to a single unit deployment not a wave farm. The site also needed to be close to a grid connection of a sufficient power rating as well as a major port (for construction and later service and maintenance), but needed to be out of major shipping lanes. With all of these considerations taken into account the west coast of Pembrokeshire, Wales, UK was chosen. The demonstration site is actually located within the Pembrokeshire Marine SAC (Special Area of Conservation, Habitats Directive) and a full Environmental Impact Assessment is being undertaken. Wave Dragon's strategy, however, has always been to investigate every aspect of the area and the device and so this task would have been undertaken any way. The Wave Dragon EIA process is well underway. A full Scoping Report was issued on the 11th of December 2005 to all Statutory Consultees and interested parties. Baseline geological, benthic, ecological, visual and navigational surveys have all been completed and the results used to design complete surveys to be carried out in the near future. Work is also ongoing on noise and wave modelling.

Consents for Wave Dragon

The EIA is primarily a tool for ensuring that all information is collected and presented to the Competent Authorities when applying for consents and permissions. For this pre-commercial deployment application must be submitted to at least four bodies. The Department of Trade and Industry is the Competent Authority for permission to generate electricity (under Section 36 of the Electricity Act 1989) as is the Department of Environment, Food and Rural Affairs for permission to deploy at sea (under the Food and Environmental Protection Act 1985). Also the Crown Estates as they are the landowners for the offshore area. Planning permission is required for the onshore

works, (in the UK planning permission is a 'land-based' law and so does not extend to the water, thus there is no planning permission required for the deployment of the unit) this will be for the landfall works, the junction box and the cable laying. The application will be made to the National Parks Authority as they are the planning body for the area, however one of the possible substation options is actually outside the National Park and if this option is chosen a separate application for planning permission will need to be made to the Pembrokeshire County Council Planning Authority. The actual process of consents so far has involved the conducting of an EIA and also consultation with Competent Authorities and local and public stakeholders. The underlying ethos is that the content of the Environmental Statement (ES) should not actually come as surprise to anyone, by the time it reaches the desks of the Competent Authorities they should know about it. When these authorities contact the Statutory Consultees, Wave Dragon should already have spoken to them and their concerns and suggestions should already have been taken into account in the ES; the same should be true for members of the public.

Discussion

The UK has had a legally based structure of national planning development since the enactment of the Town and Country Planning Act 1947, although for specific areas of development the history is much longer. This has created a structured and practiced method of planning and development consent, which even in the marine environment has an established history. The 23rd June 2005 was the submission date for applications for the 23rd Offshore Oil and Gas Licensing Round; even offshore wind announced its 2nd Licensing Round in July 2003. For the latter process the UK Government conducted a

Strategic Environmental Assessment (SEA) on several sites, designated them and opened the areas for a call for tenders. The licensing system was simplified by the Energy Act by extending the powers of the Crown Estates to effectively give them 'ownership' of these Renewable Energy Zones and make them the 'one-stop-shop' for consents. The problem Wave Dragon is facing is that this process has never been conducted before in the UK for offshore wave power and so they are effectively trail-blazing the UK consents process. With respect to deployment, the Danish Prototype benefited from a simplified planning process as it was a test / demonstration process. There is in fact a similar exemption that exists within UK law under Electricity Act, but this is only for single units of less than 1 MW. Wave Dragon in the UK is therefore a victim of its own size. In reality, however, this exemption effectively only means that a smaller unit would not 'necessarily' have to conduct a full EIA, although the location within an SAC would have made this compulsory anyway.

3 Conclusions

The UK system is a practiced one and thus is fixed and predictable; yet highly inflexible. In Portugal, for example, after a series of meetings and consultations, AWS took 3 days to get a Portaria (Licensing Permission) signed by the Authorities that allowed them to deploy the Archimedes Wave Swing. This would not be possible under the UK system. So far well over half a million pounds has been spent and the consents are not submitted until the end of June. The industry is only 3 to 4 years away from deploying large MW offshore wave farms and a decision is required on where to open the sea for wave and tidal energy. Were the necessary finance to be in place, especially incentives for the demonstration phase on arrays, this would help but practical strategic aids such as environmental baseline studies

of the 'Wave and Tidal Renewable Zones' also need to be provided. It would aid the environmental monitoring if this baseline were started several years before deployment. Finally, a 'one-stop-shop' simplified consent procedure, such as the one that has been successfully applied in Denmark, for large scale prototype demonstrators would save huge amounts of time and money. In Portugal, efforts are ongoing to define at least one of these zones by end of 2006. Concerning the UK situation, an SEA for Marine Renewables leading to 'Round One for Wave and Tidal' power is considered to be required. If this is done, the development that took the wind industry 25 years could be compressed into 10 years of development for Wave and Tidal devices.

Acknowledgements

The authors acknowledge Marie Curie Action, (WAVETRAIN) Contract Number: MRTN-CT-2003-505166.

Bibliography

- J. Cruz, M. Alves, A. Sarmiento, A. Brito-Melo, F. Neumann: *Estudo Comparativo entre Tecnologias de Aproveitamento de Energia Eólica e Energia das Ondas (Comparative Study of Wind and Wave Energy)*; ENER'05, Figueira da Foz/Portugal, 2005
- F Gardner: *Learning experience of AWS pilotplant test offshore Portugal*; 6th European Wave and Tidal Energy Conference: 30.08.-02.09.2005; Glasgow/UK
- V. La Regina, S. Patrício, F. Neumann, A. Sarmiento: *The Role Of Socio-Economic Impact Assessment (SIA) and Environmental Impact Assessment (EIA) For Understanding Benefits From Wave Energy Deployment*; invited paper for WREC-IX, 19.08-25.08.2006; Florence, Italy
- H.-C. Sørensen, L. & R. Hansen, K. Hammarlund (2003): *Social, Planning and Environmental Impact*; Final Report (E), European Thematic Network on Wave Energy
- A. Sarmiento, A. Brito-Melo, F. Neumann: *Results From Sea Trials In The Owc European Wave Energy Plant At Pico, Azores*; invited paper for WREC-IX, 19.08-25.08.2006; Florence, Italy