

2012-03-01

SOWFIA Project - Work Package 2

Interim Report

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<http://hdl.handle.net/10026.1/10904>

Streamlining of Ocean Wave Farms Impact Assessment (SOWFIA) Project

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Deliverable D.2.4

Interim report on barriers, accelerators and lessons learned
from all wave energy site experiences

March 2012



SOWFIA project synopsis

The Streamlining of Ocean Wave Farms Impact Assessment (SOWFIA) Project (IEE/09/809/SI2.558291) is an EU Intelligent Energy Europe (IEE) funded project that draws together ten partners, across eight European countries, who are actively involved with planned wave farm test centres. The SOWFIA project aims to achieve the sharing and consolidation of pan-European experience of consenting processes and environmental and socio-economic impact assessment (IA) best practices for offshore wave energy conversion developments.

Studies of wave farm demonstration projects in each of the collaborating EU nations are contributing to the findings. The study sites comprise a wide range of device technologies, environmental settings and stakeholder interests. Through project workshops, meetings, ongoing communication and networking amongst project partners, ideas and experiences relating to IA and policy are being shared, and co-ordinated studies addressing key questions for wave energy development are being carried out.

The overall goal of the SOWFIA project is to provide recommendations for approval process streamlining and European-wide streamlining of IA processes, thereby helping to remove legal, environmental and socio-economic barriers to the development of offshore power generation from waves. By utilising the findings from technology-specific monitoring at multiple sites, SOWFIA will accelerate knowledge transfer and promote European-wide expertise on environmental and socio-economic impact assessments of wave energy projects. In this way, the development of the future, commercial phase of offshore wave energy installations will benefit from the lessons learned from existing smaller-scale developments.

Grant Agreement number: IEE/09/809/SI2.558291
Project acronym: SOWFIA
Project title: Streamlining of Ocean Wave Farms Impact Assessment

Deliverable D2.4

Interim report on barriers, accelerators and lessons learned

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March 2012

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Executive Summary

The success of a wave energy project development lies in various aspects. One of them is whether or not the licensing process is appropriate for this kind of project. Identifying the barriers and accelerators within the wave energy project development processes is a key requirement towards making recommendations for streamlining of ocean wave farms impact assessment.

As part of the Work Package 2 of the SOWFIA project, a Workshop was held and questionnaires were conducted across Europe in order to gather EU-wide experience of the consenting process. As a result of the findings of the Workshop, the questionnaires are focused particularly on the stakeholder involvement in the process and the role they might have regarding the projects development. This report analyses the conclusions obtained in the Workshop and the experiences described in the questionnaires to identify from real project developers' experiences the barriers and accelerators of the consenting process and suggest recommendations for the streamlining of the procedure. The analysis of the questionnaires has been structured by country. The countries analysed in this report are those in which at least one questionnaire was submitted. These countries are the United Kingdom, Ireland, France, Spain, Portugal, Sweden, Norway and Denmark.

The recommendations for the streamlining made in this report will be used as a basis for future Workshops in the SOWFIA programme of work with the clear objective of refining the recommendations from project developer, stakeholder and regulating authorities perspective in order to make realistic and effective guidelines for improving and streamlining impact assessment and project approval processes both at European and National levels.



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1. Introduction

In October 2010, the SOWFIA project (Streamlining of Ocean Wave Farms Impact Assessment) was launched. The SOWFIA project draws together partners from across Europe that have an interest in streamlining impact assessment for wave farm developments.

This deliverable is part of the Work Package 2, aimed to identify non-technological barriers and accelerators of the Impact Assessment process among EU Member states and import the lessons learned to date in wave energy developments in Europe. Information has been gathered through a series of workshops, interviews, surveys and meetings.

Within this framework an analysis of the workshop and questionnaires conducted in previous deliverables (D2.2 & D2.3) has been carried out to extract from developers' experiences the common barriers and accelerators to wave energy development in each country and compare them in order to reach recommendations for the streamlining of the impact assessment across all EU Member states. This report does not intend to be an exhaustive list of the non-technological barriers and accelerators to wave energy development as this was one of the outputs of the EU IEE WAVEPLAM (2007 – 2010) project. Rather, it aims to analyse information gathered from real experience of recent wave energy developments and described in D2.2 and D2.3. This analysis aims to describe the procedures experienced for the development of marine energy installations in each country and identify what the challenges are and what commitments should be made by policy makers and regulators if wave energy is to be brought to the forefront of the renewable energy market.

The countries analysed are those in which surveys were conducted. We can observe that more data is available for analysis from those countries that have been more active in the development of wave energy projects. In these countries, the procedure is clearly defined whilst the analysis of the countries with less information is based on the experience of a smaller number of project developers. The countries for which the analysis is carried out are the United Kingdom, Ireland, France, Spain, Portugal, Sweden, Norway and Denmark.

The layout of this document consists of the analysis of the Workshop A ("Real Experience to Date in Wave Energy Development"), followed by the analysis of the questionnaires ("Site and technology developers, project financiers and authorities questionnaires") divided by country. A summary of both analyses follows, comparing the main aspects from a general view, and can be used as a preview for the last section. Recommendations for the streamlining of the ocean wave farms impact assessment are given in the last section of the report expressing the suggestions of the SOWFIA project team at this interim stage of the project.



2. Analysis of the Workshop A (“Real Experience to Date in Wave Energy Development”)

Workshop A aimed to examine the findings to date on the challenges faced by the wave energy industry, to address whether the situation has changed, whether more information is needed, and what can be learned from this experience so as to facilitate development progress. Representatives from the main wave energy test sites in Europe were invited to share their experiences on development of wave energy projects. Other speakers invited to take part in the Workshop included people with relevant experience in licensing procedures, environmental studies, R&D or financing of wave energy projects.

The opinions and perspectives captured during the Workshop can be largely attributed to the current scale of the industry. Experiences are based on product development (device and components) as opposed to project development, which by definition includes larger and more numerous devices. Concerns related to the costs associated with environmental studies and Environmental Impact Assessments (EIAs), for instance, will be of less significance to large developers than they are to the developers of smaller projects that are currently active as the cost of EIA is a larger proportion of the overall cost than it would be for large scale projects.

While many participants at the workshop expressed the view that current legislation was fit for purpose, it could be argued that current consenting regimes are more appropriate to larger developments such as wave farms rather than the smaller demonstration scale projects currently experienced. It is accepted within the EIA process that environmental impacts will vary according to the nature, size and location of a development, and this needs to be reflected more accurately in the consenting regimes applied to wave energy developments. There is a clear need for a pragmatic and calculated-risk approach to operate now. This can obviously be reviewed and amended at a later date as developments become larger and potentially more environmentally significant. Such an approach encapsulates the principles of adaptive management, an iterative process of decision making in the face of uncertainty, with the aim of reducing that uncertainty over time through system monitoring.

Sea trials at established test centres should be subject to less rigorous consenting requirements. It is also felt that test centres should provide technical guidance and specifications for device testing. It can be seen in the messages extracted from the sessions held within the Workshop that it was strongly advocated that test centres, and smaller sized developments, should be subject to less onerous EIA procedures. Established test centres can facilitate this by taking a more proactive approach to relevant environmental studies, as is the case in EMEC where an environmental characterisation report already exists and is available to all developers coming to use their facilities.

On a similar vein, participants were of the opinion that the ‘one-stop-shop’ administrative model was successful and something to be aimed for, yet those who had experience with such a facility found that, in reality, it was not always a truly integrated one-stop-shop. If such a model is to operate effectively it must integrate all sectors and all processes. It cannot apply to one industry in isolation or to merely certain elements of the process (e.g. EIA only) but needs to incorporate all elements of the consenting process i.e. sea-based consents, land-based consents and electrical consents.



It was also acknowledged during the workshop and within the SOWFIA project that addressing environmental knowledge gaps, particularly in relation to baseline conditions, is something that needs to be looked at in more detail. There have been suggestions that such work should be funded on a pan-European basis, perhaps through research funding, though it is accepted that there are issues with timelines and responsibilities in this regard. It is critical that mechanisms to enable data and information transfer and re-use are created so that not every prospective developer has to repeat the same surveys in the same location. Arguably this is what happens at the moment and, again, could be scale-related.

The key messages obtained from the discussion sessions regarding the addressing of barriers and accelerators of the ocean wave energy are shown below:

- The ‘one-stop-shop’ administrative system seems to be regarded as successful and a model to be implemented elsewhere. This would also help ensure consistency of requirements (licensing, monitoring etc.) across regulatory authorities as well as other maritime industries.
- Regulators are also learning. Developers need to accept that processes, staff and requirements could all change during the course of a particular development.
- Regulators need to be clear on what they require from developers from the outset of the planning process.
- The obligations placed on developers of small scale developments should be less than those for large scale developments which have potentially more significant environmental effects.
- Joint finance and support mechanisms from the public and private sectors are essential for the industry to progress and develop. This should not be under-estimated.
- There is a need to work more strategically from coordinated environmental studies to input of those with maritime expertise. The creation of strategic development zones could help in this regard. A more strategic approach needs to be facilitated to move the industry forward.
- A formalised scoping exercise is critical in the EIA process as it helps focus developers on the content and topics they need to include in their EIA.
- The current consenting process is not wholly suitable for ocean energy developments but this is changing. It needs to be flexible, adaptive and learn from experience. It is hoped that the implementation of MSP across Europe will assist in this;
- Society at large needs to be made more aware of the benefits of ocean energy.
- At the moment both the manufacturing and supply chain elements of a wave energy project are bespoke. This needs to change and more of an effort should be made to fully engage with suppliers in order to make them more aware of the potential of industry so that they can then adapt to provide a more useful and tailored service;
- There is a need to work on components that can survive the realities of the harsh maritime environment in which devices will need to operate;
- A lot can be learned from the experience of other industries but we need an accessible mechanism through which such expertise and experience can be made available to all. When this relates to data, such data needs to be made available at an affordable cost.
- A robust risk management framework needs to be formulated by regulatory authorities and applied by developers;

- More data needs to be obtained and made accessible and shared across all maritime sectors;
- As project developments are scaled up, studies/research needs to focus more on important interactions. Other environmental parameters should be scoped out at this stage;
- EIAs should be shared (information and data). They should be treated like Health and Safety i.e. it is for the good of the industry. This would be facilitated if baseline studies were publically funded.



Figure 1: Panel Session.



Figure 2: Moderator Tony Lewis.



Figure 3: Breakout session 1.



3. Project Developer Questionnaires Analysis

The analysis of the questionnaires given for the development of the deliverable 2.3 is carried out in this section. It is made by country due to the resemblance between them. This analysis consists of addressing the specific aspects of the wave energy project development procedures in each country, and dividing these aspects between accelerators and barriers to wave energy development.

3.1. United Kingdom

The UK is the country where most projects have been developed. Two of the biggest and most important test sites are located in the UK, the European Marine Energy Centre (EMEC) at the Orkney Islands in Scotland and the Wave Hub (WH) located at the north coast of Cornwall in England. Questionnaires were given to these site developers and also to device developers such as Aquamarine Power, Pelamis Wave Power, Marine Current Turbines and Tidal Generation Limited. The significant wave energy resource that the UK benefits from and its site leasing procedure are some of the reasons that have led developers to set their sights on this country since the exploitation of wave energy began. The UK Government and particularly the devolved Scottish Government have improved their policy regarding the ocean energy, trying to help facilitate the development of projects within their waters.



Figure 4: EMEC situation view.



Figure 5: Wave Hub situation view.

All this interest has led to a significant improvement of the consenting procedure during the past decade. Nowadays, the major consents needed are three (Coast Protection Act (CPA), Food and Environmental Protection Act (FEPA) and the Electricity Act (Section 36)) and in England, Wales and Northern Ireland, the regulators needed to deal with are Marine Management Organisation (MMO), Department of Energy and Climate Change (DECC) and The Crown Estate. In Scotland, consents have been unified into one license named the Marine License, which is regulated by Marine Scotland. This step has accelerated the consenting procedure, allowing developers to deal with just one regulator, whereas in other countries the high number of authorities involved in the procedure is seen as a major barrier to development.

However, the main barrier still remaining is the EIA. Governments are obliged under the EIA regulations to respond to requests from developers for a scoping opinion on outline design proposals; however, there has not been any improvement on requirements for environmental



monitoring activities, as there is not yet sufficient knowledge of which specific environmental studies to require. For the test sites, developers need to fulfil an EIA and the device developers who want to deploy their devices there only need to fulfil an environment assessment regarding the impact that the machine could cause. As environmental monitoring technology improves and activities increase, the body of knowledge on environmental monitoring for wave energy will increase and it is expected that governments will have more environmental information in the future; therefore, the responses to the scoping opinion requests is likely to be more informed. This uncertainty on environmental monitoring also affects the post deployment monitoring phase.



Figure 6: EMEC substation external view.

The UK has the special condition that the Crown Estate owns the waters around the island and it is the regulator in charge of granting leasing of the land. The Crown Estate started leasing lands for offshore wind farms projects in 2000, and its success meant that in 2010 the same procedure was extended for the developing of commercial wave and tidal projects. The first round published by the Crown Estate granting 10 commercial wave and tidal projects in Orkney Island, Scotland, has made a huge impact on the ocean energy industry. However, several concerns have been raised from stakeholders and sea users, about now see how the area is going to be filled with arrays of devices.

The consulting process in the UK is divided by statutory and non-statutory stakeholders, and it begins at the scoping phase. The statutory consultation is held during the process in regular basis whilst the non-statutory stakeholders will be consulted if it is required as was the case for EMEC. The developers have to approach the stakeholders, only some non-statutory consultants such as surfers' organisation have approached developers by themselves, as in the case of WaveHub. The approach is made by developers at national and local level, firstly approaching the most relevant stakeholders. Usually, a list of the main statutory stakeholders is given to the developers by the regulators with the purpose of easing the process; this list varies for each of the development sites. In the case of EMEC, they carried out a wide consultation to identify which stakeholders were relevant and approached them at local and national level. The non-statutory stakeholders are approached for opinion and identified through the scoping process and via

workshops and local consultation meetings. There are no legal requirements to the extent of this consultation. The consultation process has been different between test sites and the other projects. For test sites the consultation with stakeholders has been one of the keys for the success of the project, both EMEC and WaveHub have built a confident relationship between the sites and the stakeholders by a large number of meetings and various events, open days, etc. Due to this close relationship, developers coming to the sites have built on the test sites consultations. This consultation has been easier and overseen by the test site developer, who has been willing to establish contact between stakeholders and developers and help during the consultation process for developers coming to the test site. EMEC have built up considerable experience of identifying the right level of stakeholder engagement for device deployments.

The engagement of stakeholders is something developers have to work on during the whole procedure of project development, trying to understand and attempt to mitigate any concern that they might have. In most cases, this process continues for throughout the consenting procedure and for test sites it remains on-going because, as in the EMEC case, each time a new developer contracts with the test site to deploy a device, the relevant stakeholders are consulted and EMEC organises three parties meetings involving stakeholders, EMEC and developers. In most cases external environmental consultants and navigation experts are hired by developers to join the consultations on environmental sensitivities and the navigation discussions respectively. The high level of this activity in Scotland has caused stakeholders to be overloaded and this issue is now being addressed at Government level. Some of the stakeholders consulted for new developments have expressed no interest in the projects, and declared little interest in future consultation due to the lack of sensitivities in these areas. A strategic mitigation phase was developed for the WaveHub to look into impact on the fishing community. WaveHub developed a monetary fund for the development of fishing activities in the Cornish north coast. On-going engagement continues to depend on requirements and mitigation measures, but typically there will be on-going engagement in various different forms.

The main concerns raised in the UK from stakeholders are related to navigation and fishing activities. The maritime safety was solved at Wave Hub by moving the traffic separation zone from the site. However, the fishing issues are tougher to solve due to the presence of different organisations and independent fishermen. In addition, some surfers' organisations have raised concerns about the potential reduction of the wave heights caused by the use of WEC devices. WaveHub performed three studies on these effects and it was shown that the reductions were negligible. The creation of safety or exclusion zones has been also an issue because it is regulated by an international law, thus each developer would have to apply for an exclusion zone close to their installation, which could generate continuous changes to the navigation maps. In Scotland, the Scottish National Heritage has raised concerns about the potential for negative environmental impacts of devices such as risk of underwater collision between the device and mammals, displacement of sensitive wildlife species due to the presence of OWC (Oscillation Water Column) devices, and underwater noise that might cause an interruption on the communication between mammals.

Aside the concerns expressed, within the UK, marine energy receives broad public and private sector support as well as strong support from the general public. This is generated by the consideration of the marine energy as a largely indigenous business at the leading edge of a potentially significant global industry; thus a degree of pride that the UK can still lead in new engineering opportunities. A good awareness that a successful industry could generate



substantial economic and social benefits to the nation has also helped; this is acute in regions that have experienced de-population and weak economic growth and prosperity where projects will be sited. Marine renewables are seen as a real light of opportunity to reverse some of the negative trends. Many stakeholders have shown their support in private while their public opinion was often constrained by their activity, job and interest in the area. Most stakeholders show support only after their concerns are solved.

The general public and the other stakeholders are aware of any project since the beginning through various public meetings held by the developer, open days and media coverage on local press. In addition, there are other methods used to engage the locals and general public such as flyers, presentations at schools and clubs of the area, and hiring public relations agencies for continuously updating news and spreading local information. It can be assured that the general public is involved in the project at the same time as the stakeholders. In most cases, the main subject of the information spread by the developer is the potential socio-economic benefits that the project is going to bring to the local community. Highlighting these kinds of benefits is an indirect requirement under the EIA regulations. These benefits are usually submitted through an independent socio-economic study and press releases stating the investment in the local area and how the project is going to affect the economy of the area creating job opportunities or increasing business activities. At EMEC it was not necessary to mention the benefits of the development because the project was developed using public funds and engaged a strong political support in Scotland. However, there have been subsequent reports of the high positive benefit to the local community resulting from the presence of the site.



Figure 7: Pelamis device deployed at EMEC.



Figure 8: Open Centre Turbine deployed at EMEC

Developers agree that WaveHub and EMEC have opened the way through the EIA process for marine parks. The procedure was not clear at the beginning of marine energy, although now WaveHub and EMEC are an example of EIA for biological, visual, coastal and socio-economic impacts. They also agree that the formal procedures are sufficient to address stakeholder concerns. The difference between Scotland and the rest of the UK is significant, the Scottish system is more pragmatic and should provide an example for the rest of the UK,. However, the Scottish system could still be further optimised. The main issues to be addressed are the length, scope and guidance of the monitoring activities. The best industry practice and precedence have been set regarding how to manage stakeholder engagement; although this does not mean that project developers might fail to implement appropriate approaches and may manage these processes incorrectly through either negligence or inexperience; therefore may suffer delays, budget increases or failure receiving consent. Moreover, it has been noticed that the licensing system teams in the UK are under-resourced, which is creating issues of timing for consents and

applications. It takes a long time to see the licensing teams, which is something that really needs to be improved in the future. Nevertheless, developers are in agreement that the system in the UK has made significant improvements in the past decade and hopefully will be further optimised in the coming years.

3.2. Ireland

Ireland is following the steps of the UK and it is improving its ocean energy policy, trying to exploit its great resources in this field. There is no fully developed project yet, although the developing of a test site (AMETS project) in the Bellmullet area is undergoing the foreshore lease application and other projects such as the WestWave project are beginning activities for the site selection. Questionnaires were given to developers of these projects gathering some valuable information for the elaboration of this analysis.



Figure 9: AMETS test site situation.

In Ireland the consenting process consists firstly of licences for surveying activities related to the EIA screening and scoping. Once the scope of the EIA is defined, the elaboration of the report can take a long time depending on the consultation with stakeholders during the assessment. A full EIA has already been completed for the AMETS project, which took almost two years due to a strong consultation with the main stakeholders. The EIA is required for the foreshore lease of the land from the Foreshore Licensing Unit of the Department of the Environment, Community and Local Government. Also, permission from the County Council will be needed.

Consultations with the stakeholders involved have taken place since the beginning of the project. It is important to ensure that main stakeholders are involved in all stages of the project, thus the final product put forward to the consenting process has the backing of as many stakeholders as possible. The consultation process starts with the site selection and continues throughout the EIA and site design processes. Stakeholders were informed at the outset and were consulted on the location of the site, and once the location is established, the general public will be informed and more comprehensive surveying will be carried out. Statutory stakeholders have been approached by the project team formally since the beginning of the project and informally during the process. The informal consultation on-going through the whole procedure is very important and

reflects a wish from the developer to have clear communication channels with all stakeholders; this has been achieved through meetings and the availability of qualified staff to approach at any time to discuss any issue. As seen in the projects currently being developed in Ireland, the stakeholders may be approached at a local or a national level as appropriate, through their main representative on that level. Some of the non-statutory stakeholders have proved their interest in the project by approaching the project team independently (e.g. Surfers organisations) before formal consultation, indicating their concerns and questions about the project.

There have been some major concerns from the fishing industry regarding the reduction of its working area. These have been addressed with a pro-active consultation about the site design. In general, there is a great support in Ireland to this new energy from all sectors of local community and industry due to new job and industry opportunities. The socio-economic benefits are playing a big role in the consultation with stakeholders and their support to the projects. Overall, the projects are being developed for the benefit of the whole Irish industry, creating the foundation for ocean energy industry in Ireland. In addition, the beginning of a new energy industry like this one is an attraction for the relevant stakeholders. There are also some other aspects that are influencing the support of stakeholders, local community and organisations and must be highlighted during consultation such as the proximity of works to the areas of recreational use and interest for tourism, the effects of the project and any safety zone on access to inshore and offshore fishing grounds, and the experience gained in other projects by the developer.

Project developers in Ireland recognise that formal procedures seem to be sufficient to address stakeholder concerns. Furthermore, they consider that informal consultation involving the parties concerned has great value for the consenting process. Also, it has been highlighted that the key for a successful outcome from the stakeholder engagement is approaching them individually. Regarding the engagement with the general public, high media coverage is very important to show openness and willingness to inform and address any issue raised.

3.3. Spain

In Spain there are various projects in the first stages, dealing with permits and authorities, only 3 projects are operational or in the final stage and these have been developed in the north of the country. Information has been obtained from two of these projects, the BIMEP and Mutriku projects, both developed by EVE (Ente Vasco de Energía). BIMEP is a test site for research, demonstration and operation of WECs; and the Mutriku project is a wave energy plant integrated in the breakwater of Mutriku harbour.



Figure 10: Mutriku breakwater view.

The consenting procedure in Spain is a harsh process due to the high number of permits required and authorities involved in the process from the Directorate for Coast and Sea Sustainability (Ministry of Environment) and the General Directory for Energy Policy (Ministry of Industry) to the town hall of the city where the project is going to be developed. There are two types of procedure depending on whether the installation is onshore or offshore. The framework for the offshore processing, which describes the specific requirements to comply with authorisations, permits or licences that must be obtained, is included in the Royal Decree 1028/2007. It sets out all the requirements, which should make it easier for developers to submit all the applications, however, a reduction in the number of applications to authorities is badly needed and should reduce the currently excessive time to obtain permits. For the BIMEP project, this has been very difficult because it was the first offshore wave power project to be developed in the country. The main problem was the EIA process required by the National Government because the authorities could not define the scope of the EIA due to a lack of experience as it was the first project of its kind. A draft of the EIA was made by the developer with the help of stakeholder consultation and was submitted for consideration by the relevant authorities. The Mutriku project was different because the wave energy device is built into a breakwater, and thus the relevant legislation in this case is for electricity generating facilities onshore, for which the framework for the process is included in the Royal Decrees 1955/2000 and 661/2007. However, the steps taken to achieve consent are basically the same as the ones followed for BIMEP. As the energy plant was included in the re-design of the breakwater project, the potential environmental impact of the works involved in construction of the wave energy device were not considered to be significantly different from that involved in the breakwater construction work, thus no major EIA was required in addition to that made for the breakwater. Therefore, including a wave energy project in another project currently being developed was found to save some time and effort, and regarding the EIA monitoring process saved cost as well.

The level of stakeholder engagement was found to depend on the place where the project is being developed. For the BIMEP and Mutriku projects there were different responses from stakeholders to consultation. In BIMEP, consultations with the local bodies and stakeholders started once the project was defined. EVE has come up with two different types of consultations, one concerning environmental issues where more than thirty entities were consulted, and the other dealing with the public information process carried out through newspapers, open exhibitions, installation of opinion boxes to gather questions and comments from visitors, etc. As a result of these consultations the environmental impact and the need for compensation for the trade loss in the area occupied by the platform were defined. All the concerned stakeholders were approached by EVE through periodic meetings that started at the beginning of the project. The consultation process for the Mutriku project started also once the project was well defined, engaging stakeholders and locals through campaigns, which provided thorough information about what was being done and about the stage the project was at mainly to challenge the false statements expressed by some local groups.

In general, responses to the BIMEP project have been very positive, especially from the local municipality; though there have been some complaints from the Fishermen's Guild, who were worried about the impact that the presence of the BIMEP platform could cause, and from the Bilbao Port Authority, who was worried about the possible risks to navigation. These concerns were resolved through meetings to reach an agreement on the subjects and more importantly on the economic compensation that the fishermen would receive. All governmental bodies EVE has approached and most political parties have been very supportive of the development of the project. The procedure was not as pleasant for the Mutriku project, which has not had any particular supportive group. The most enthusiastic group has been the maritime section of APPA association, as Mutriku's project is the first wave energy plant installed in Spain; it also has been EVE's flagship project. The most concerned group was the general public, who raised some complaints about the noise the turbines could generate and the location of the breakwater itself. This group even took advantage of an unfortunate incident due to a storm to spread false statements about the project. EVE took action to inform the public about the incident immediately, but the harm was already done. For this reason, it is very important to continuously inform the public about any issue relating to the new technology however small, in order to avoid any misunderstanding. Generally, in Spain there is a positive attitude towards renewables, and authorities are more supportive of these kinds of projects than previously. The only problem is the lack of information authorities have, which is holding back the procedures; once the authorities know more about this new energy industry both consenting and consultation procedures will speed up.

EVE presented its projects as a strategy for the development of a new economic sector in the Basque Country. Also, it has been important to highlight the benefit of BIMEP as a testing and demonstration site of WECs because its goal is to generate knowledge, which is even more important than the economic considerations. The socio-economic benefit in the case of Mutriku's plant is not strong enough to be highlighted because of the low power of the plant and the high level of investment; rather it is classified within a strategic framework to push forward the development of the wave energy industry in Spain. These two projects in conjunction with the ICOE conference held in 2010 in Bilbao are putting Spain in the map of the ocean energy and are setting the steps for the improvement of its development.

Developers find legal proceedings sufficient to address stakeholder concerns and offer them enough guarantees to have the opportunity to express themselves at any time during the whole procedure. This gives the possibility to start the project and to work with stakeholders and authorities to address concerns raised and investigate mitigation measures during the process, which can save time for both sides.

3.4. Portugal

Portugal has high resources for wave energy, which has led to the development of various projects in the country. Two questionnaires were given to the Ocean Plug (Portuguese Pilot Zone) and the WaveRoller project which is located at Peniche. The Ocean Plug is a test site, which was a governmental initiative that started in an inter-ministerial commission for maritime affairs regarding the definition of a National Ocean Strategy established in the national law. It is different from other test sites around Europe because it will allow the technology to evolve from the demonstration to the commercial scale saving money in licensing procedures. AW- Energy found the perfect spot to place its WaveRoller device. The site is not a test site, but is being use for testing the technology and is located near a grid connection, which is perfect for when the technology reaches the demonstration stage.

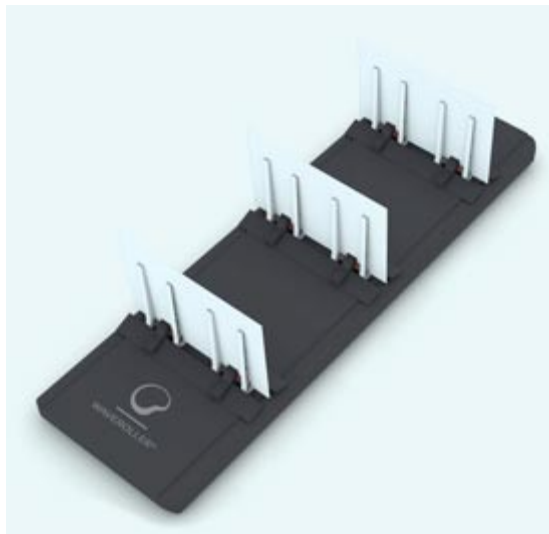


Figure 11: Graphical illustration of WaveRoller 3x100kW prototype.

The consenting procedure follows a Decree of the Portuguese national law. The consents required for project development are: the deployment consent, the grid access consent and the building permit for the land structure. The EIA process has to be carried out according to the Portuguese law, in which it is named Environmental Incident Assessment and does not require stakeholder or public announcements. This procedure does not take much time and effort and definitely does not hold back a project. The project developed by AW-Energy followed the procedure mentioned above, but the Ocean Plug procedure was different, it was designated in the national law in 2008, when it was established that the project would be granted by the public company REN (Redes Energéticas Nacionais, S.A.). The extension of licensing to offshore wind projects has been under study by the Portuguese Government, and a change to the current legal context is planned to be available soon.

The level of stakeholder engagement depends on the project. For the Ocean Plug the main stakeholders are ministries and private companies with economic interest in the maritime sector. However, no formal contact has been made directly with local authorities or the general public for this project, although the project process has been followed by local and national media. These formal contacts have not been carried out yet because of the uncertainties regarding the project development plan for the whole area. It is intended that formal contacts with local authorities, concurrent users and residents will only be fruitful when there is a clear idea on the details of what it will comprise and where the Ocean Plug will be placed. For the WaveRoller project, the local community was involved as the town hall is one of the project partners, thus the engagement with stakeholders has been carried out through the creation of a dissemination room in the building of the town hall and meetings.

The general public have been aware of the developments at local and national levels during the whole procedure through successful media coverage. For the WaveRoller various project seminars were held and the new demonstration stage has been reported in newspapers. Outreach events have been avoided for the Ocean Plug project until reaching a clear definition of some project details.

The statutory consultation process should only involve a number of public regulators at the national level on energy and geology, water use, environment, fisheries and maritime transportation and harbours. This process has not been carried out for the Ocean Plug project yet. For the WaveRoller project, consultation did not include formal participation of the general public as well, but some comments were submitted from various institutions. Recent changes made by the government on the public administration agencies have integrated maritime affairs authorities in a unique ministry. This process will join decision-makers and avoid high bureaucratic consultation processes, promoting also an efficient coordination amongst these authorities. However, some administrative changes are still being implemented. During the consultation of both projects some concerns were raised by groups such as environmental authorities, fishermen, local community and surfers. The environmental authorities often exaggerate the number of studies needed to be carried out to license projects; their concerns about the WaveRoller project were regarding the protected species that use the site on land and also the habitat destruction. However, the project was granted permission for installation, though with some monitoring recommendations. For the Ocean Plug, the legal context could help establishing limits to the required environmental studies, obtained through the access regulation under development. Fishermen concerns are always about the exclusion of their fishing zones and developers need to meet with them until an agreement is reached, which could be either the re-design of the site area or location, or an economic compensation for their loss. Local community complaints tend to be about the site location and the environmental impact that the installation can cause to the local area; however, they have to be educated about the wider benefits of this kind of energy and in the case of the Ocean Plug where more complaints have been raised, stakeholders need to understand that the Ocean Plug is the most important Portuguese natural resource.

Aside of the concerns raised about the projects being developed, there has been major support from authorities. The two most important political parties have showed public support to the Ocean Plug, although, the main supportive groups have been developers and Portuguese industries. Local authorities have also been very supportive due to the expected number of business and job opportunities that can be created for the local community. A proposal has been



suggested by Ocean Plug that part of the taxes paid by the developer could be returned to the local community to ensure progress of a number of local services. In addition, the possibility of hiring fishermen as transportation for the offshore works has been considered. A strategy is being prepared by the Ocean Plug team project to inform stakeholders about the planning.

Project developers have highlighted the socio-economic benefits that their projects provide to the local community; it has been done through various public events or in the case of the WaveRoller project by including them into the Environmental Incidence Study, which has been available for public consultation. The management body (ENONDAS) for the Ocean Plug are open to providing information about the development progress of the site.

As mentioned above, stakeholder outreach on the Ocean Plug project has still to be implemented, though the informal contacts that have been realised with local authorities suggest that a good level of communication can be expected at the end. However, due the lack of information on the project, it is possible that problems can still arise with some local groups such as fishermen. From the WaveRoller survey, it is found that authorities did not handle permit applications quite clearly and there was not good communication between them, which increased the expense of the project. However, in general it can be said that the legal procedure regarding the installations in Portugal is quite clear and the relations with authorities are very cooperative, though an improvement regarding the transparency of the consenting process can speed up the whole process.

3.5. Sweden

Sweden is a country where few projects have been developed but with a clearly defined legal procedure. One questionnaire was received for the Lysekil test site. Sweden is experienced in wind power installation, which can help the wave energy developers through the procedure. The Lysekil site is currently operational and has consent for 10 generators until 2014, where it has permits for the launching of a maximum of 30 buoys. At the time of the survey, 25 buoys have been deployed for environmental effects assessment. Activities such as fishing have been forbidden in the area until new fish studies are carried out in 2012.

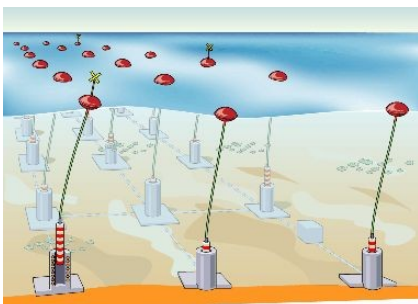


Figure 13: Graphical illustration of Seabased wave plant.



Figure 14: Biology buoys used in Lysekil project.

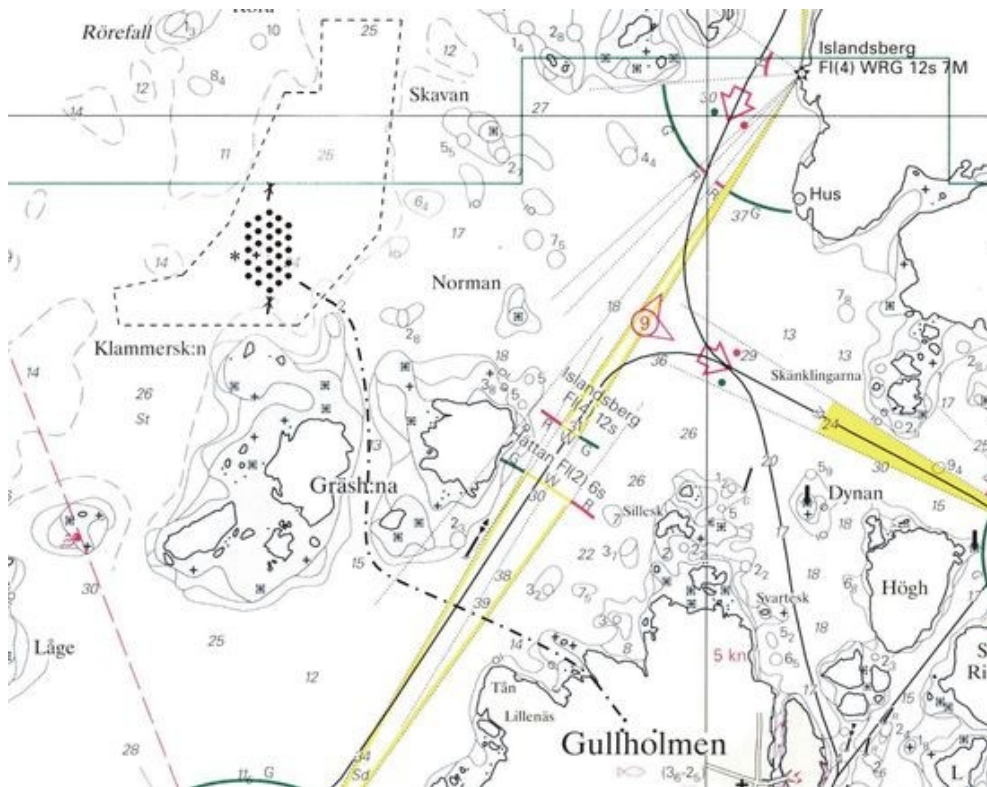


Figure 15: Lysekil test site location.

The consenting process in Sweden depends on the size of the project. Due to the small size of the Lysekil site and the absence of any commercial activity or opposing interest, the major consent for the leasing did not require a full EIA. The elaboration of the EIA depending on the size and conditions of each project helps to accelerate the industry by speeding up the procedure for the development of smaller projects. Other minor permits were requested for the Lysekil project such as consent for beach protection, a building permit for an observation tower and a special permit for video surveillance; these permits are specific depending on each project. Local and regional authorities have acted as regulators of the consents, which can be advantageous because they are in close contact with the area and know better the requirements needed than government entities. The authorities have been informed since the beginning of the project and in the case of the Lysekil site they showed an unexpected support due to the benefits to the local business. The local community has also been also involved since the early stages of the project, which demonstrates openness of the project developer and creates a bond between the project and the locals. During the Lysekil project, there was a special focus on private properties surrounding the site in summer time when the area gets more crowded.

In general, stakeholder engagement is carried out through formal procedures and due to the lack of any further information there is no other method that can be followed. Therefore, project developers are the ones that approach the stakeholders, there has not been any independent approach from stakeholders, though during the Lysekil project many of them showed interest and followed the project closely through media. For this project there have been only positive attitudes, people in Sweden rather wave energy over windpower, which is not very popular. However there was an issue with a local fisherman who was active in the intended area, but the problem was solved by shifting the site accordingly. The project information was uploaded continuously to keep everyone interested aware of every new step that was taking place, which

helps to engage the general public and stakeholders. Also, time and effort were given to provide satisfactory answers to those who contacted the project team with doubts or questions. As seen in almost every project, an open communication and willingness to be there to inform at any time and tackle any enquiry, is the key for a successful engagement with stakeholders and locals. In addition, this communication has to begin with the consenting process. For instance, the two years that it took for the consenting procedure for the deployment of the equipment in the Lysekil site was sufficient to spread all the information available about the project. Media coverage helped through newspapers, tv and radio. Moreover, the interest in renewables by that time in Sweden enhanced the general interest.

During the development of the Lysekil project there were mostly positive attitudes towards the development, no complaints were raised except for one concern raised by a fisherman organisation regarding the sea life in the area and the repercussions that the device could cause. No NGO responded to the consultation, though many other entities did without any criticism. It was very helpful for the goal of the project to follow up the marine environmental concerns, because the environmental studies performed were an important part of the project success. Local politicians and commercial interests who liked very much the project future plans showed high support. Furthermore, locals have been very positive and many find wave power as a valuable replacement for windpower. Climate change and a cheaper electricity bills are not an attraction in Sweden due to the great contribution that Swedish renewables are already making.

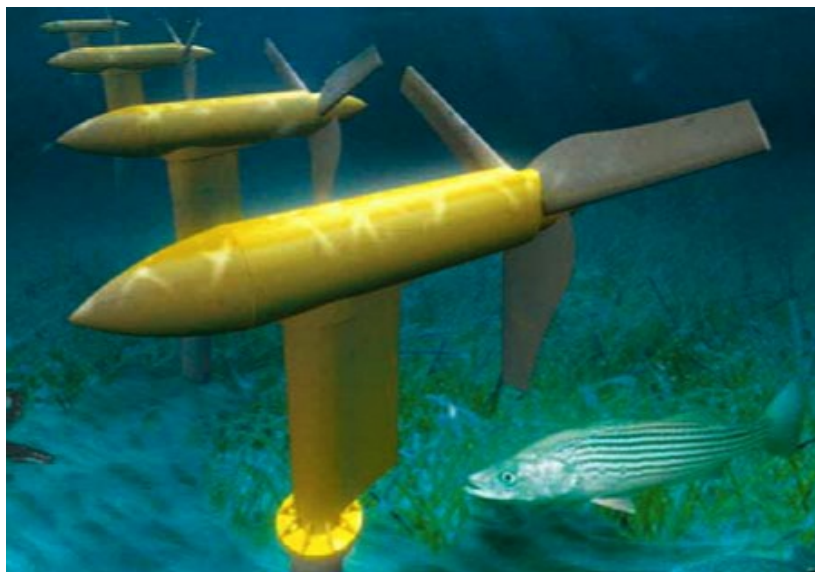


Figure 16: Graphical illustration sea life within tidal energy farms.

The socio economic benefits of the test site in Lysekil were highlighted at the beginning of the development pointing as the main attraction the creation of new job opportunities in the area. This was particularly attractive due to the lack of available jobs in the area and because tourism has become a seasonal issue, this was stressed since the beginning of the project to engage the locals and public organisations, and was done by public meetings and through press and media. Therefore, the benefits that the projects are going to bring to the community are the main aspect needed to be highlighted in the release of the project information.

In Sweden it is considered that the procedures are sufficient to address stakeholder concerns and give them a strong say during all the stages of the project. For the Lysekil project developers the



consenting process was easier and faster than for a large and commercial project due to the small size of the test site. Also, being a test site might have helped throughout the process. Stakeholders are more permissive with this kind of project perhaps because its goal is investigation and not the exploitation of the area no matter what. The application process was quite acceptable for the size of the project and could be managed by small number of the officials and locals involved. The absence of national authorities speed up the process and their participation could be one of the barriers why in some other countries the consenting procedure takes a long time.

3.6. Norway

In Norway there have not been many wave energy development projects at the time of writing this report. One questionnaire was given to the developers of the Maren project, which is a test site at Runde for use during a period of 2-5 years. The consent application involved for this test site encompassed two WECs, a subsea transformer and the laying of a 2.5 km subsea cable. Although the two WECs, sub-sea transformers and cables were deployed in 2009, the site is not operational at the time of writing (March 2012).



Figure 17: Runde test site location.

Consent application for the installation was sent for formal consultation to various bodies such as the local municipality, the county administrative board, Directorate of Fisheries as well as other authorities and public stakeholders. The information about the application was also published in the regional and local newspaper, which contributed to public awareness and showed openness to the general public. This is a good strategy to generate positive attitudes towards any project. It took seven months for the consent to be granted, which is a reasonable timescale compared with other countries.

Statutory consultation was made holding a continuous dialogue with various stakeholders such as the Norwegian Coastal Administration, local inhabitants, individual fishermen and fisheries organisations, etc, throughout the whole procedure but especially during the site identification and consent application phases. Local stakeholders were involved very early in the process

through contacts from the consent application team. Responses from stakeholders were taken into consideration when the different sites were being evaluated and to identify the most appropriate site and its specific location. Most of the stakeholders responded to the consultation within the formal consent process. The site developer especially targeted the local organisations of fishing, trawling and birds, because these stakeholders had the highest interest in the area. The approaches to these stakeholders were generally made at a local level, which suggests that no national authority is going to be involved during the consultation process unless the size of the project overwhelms the local authorities.

The Maren project raised some concerns from some stakeholders such as fishermen and the coastguard agency. Aside of the common concern about exclusion of fishing areas, there is a concern about the navigation through the area; therefore, it is quite important to place the test area away from the shipping lanes and lighthouse zones, and mark the zone properly according to the existing regulation. These concerns were dealt with during the consultation for the site identification. In addition, local inhabitants complained about the impact the site could cause to the area and the County Administrative Board also highlighted that the test site is close to a bird protection area, which caused the restriction to visit the site from March to August, when bird migration usually happens. However, the County Administrative Board in conjunction with the local municipality expressed their support on the project declaring the positive contribution that the project development is providing for the public welfare. For this project it was not needed to highlight the socio-economic benefits due to the size of the site and the short period it would be operational. However, it has been noted that the project could act as an artificial reef, attract fish and therefore, tourism too.

The site developer has indicated that it was a quick and smooth process to obtain planning consent, and only limited amount of concerns were raised, which were resolved. In addition, the developer stressed the importance of having good local contacts and the possibility to talk and discuss with stakeholders informally, in order to gain acceptance of the project and make sure the stakeholders concerns are addressed to the project team. It is important to use local people to handle the informal consultation because they know the area and the people better and can build up confidence more easily.

3.7. Denmark

Denmark is a country with a mature knowledge in onshore and offshore wind energy, which has made easier the introduction of marine energy. Questionnaires were received from WaveStar it for its projects in Nissum and Hanstholm, where single units of 100 kW were deployed with permits of 5 years and the obligation of decommission afterwards. These sites were already test sites before the development of the project; thus the legal procedure was shorter and uncomplicated, it only took 3 months and needed the permit from the Coastal Directorate (now within the Ministry of Energy). The only other agreement needed for the development of these projects was with the local utility company. Based on this experience, it could be said that the legal procedure in Denmark is very short and easy. This is due to the fact that the sites were previously used as testing areas and the projects were of a relatively small size. It is expected that the consenting process could be more complex for larger projects as it experienced during the development of large offshore wind farms like Horns Rev.

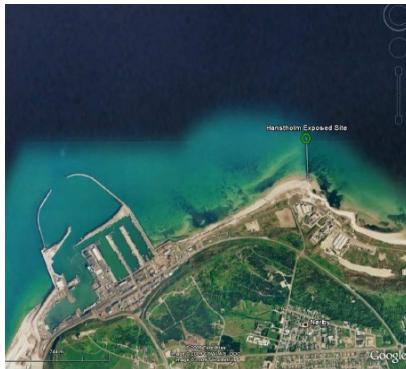


Figure 18: Hanstholm test site situation.



Figure 19: WaveStar installed at Nissum test site.

The local community were not formally included in the consent process. However, there was a great local engagement with local authorities, businesses and public in general. There were large efforts to engage and show the facilities to the community, such as flyers, homepages, social networks, guiding tours, etc, which have been really appreciated. The general public have always been aware of any project through information meetings held to different audience and target groups, and through local and national media coverage. Local authorities and independent organisations have been in charge of that, such as the Folkecenter, which is a non-governmental organisation for renewable energies, for the Nissum project; and the local ministry for the Hanstholm project.

Stakeholders were not formally needed to be included within the process due to the size of the projects and the fact that the sites were originally test sites for wind power. In addition, the general positive views from authorities and the public helped. However, some negative comments from non-believers of wave power were submitted and some concerns from fishermen organisations were raised. There was no concern related to the environment issues due to various reasons such as the small and local impact that one device could cause, locations being re-used from earlier wind projects and the decommissioning of the installation after five years. Local politicians and commercial interests are supportive about the development of clean energy projects, particularly with the idea of a future offshore industry being located in the areas where the projects are being developed, which would create job opportunities. Promoters estimate a creation of 40,000 jobs from green energy. These socio-economic benefits were highlighted during every project through meetings, internet, flyers, etc. Furthermore, other organisations such as National Government and local inhabitants have been very positive and supportive about every project that has been developed. These activities have been also very helpful to Universities for studies on the subject; this collaboration with universities has been considered to be of great importance to achieve success.

It can be assured that the legal procedure in Denmark is very pragmatic for small scale test sites, without unnecessary bureaucracy. For such projects, the procedure is appropriate, although open and communicative relationship with the public, relevant stakeholders and governmental institutions is seen as essential in order to create a good atmosphere around the project.

4. Analysis

4.1. Regulators

In general, it is observed that there is a lack of information available to Regulators about the impact that a wave energy project development might have in the area proposed and this limits their ability to make timely decisions on the applications. In addition, authorities do not have a large amount experience of granting permits for these types of projects; therefore, it can be said that the regulators are in a new territory in dealing with this new energy industry.

Granting consent for test sites is more difficult due to the unknown technology that will be deployed once the site is operational. Authorities are concerned because without knowing the kind of technology that will be deployed there is no possibility of knowing the impact that it would cause. However, test sites have more support from stakeholders than commercial projects, which may accelerate the process. The reason for such support could be that test sites aim for research and investigation for the improvement of the technology whilst commercial projects aim for the development of a profitable exploitation of the water resources of the area. There is a need for greater cohesion across test sites that could ease dealing with regulators and stakeholders during the consultation process for future projects. Test sites are very important to educate authorities. It has been shown that amongst all the types of technology, the OWC devices seem to get consent granted more easily than the others.

The consent process is different in each country, so we cannot make a general conclusion about these. However, we can differentiate which country has developed a better system and its efficiency. In the UK the consent procedure is quite clear, particularly in Scotland, where Marine Scotland is in charge of the whole process, including regulation of the consultation with stakeholders and specifying all the requirements needed to be fulfilled in a single license: the Marine License. The Marine License not only covers any consent, including the Crown Estate permit given by its commissioners, it also provides a full guidance for the applicants. This is processed through their “one-stop-shop” system which has resulted in a much easier process. For the rest of the UK, the licensing procedure is the same as in Scotland; and it is intended that the Marine Maritime Organisation (MMO) will regulate all the consents, although this process is still under development. The UK legal regime is well implemented, and will further improve with Maritime Spatial Planning. Regarding the stakeholders engagement, the developers are expected to manage discussions with the local communities.

In other countries the legislation is not as clear as in the UK. In Spain, the consenting process is guided by a Royal Decree which regulates offshore marine activities but does not specify between them. The process is considered a one-shop-stop as in Scotland with the clear difference of the large amount of authorities involved in the consenting process. The biggest problems are related to the navigation authority.

In Portugal the system is quite similar, although the developer only needs to deal with national authorities, which have been proved as an accelerator of the process. All the wave energy projects developed in Portugal have obtained consent within one year. The FLOW project, for instance, took 4 - 5 months of consenting process, with the involvement of government ministries and semi-state organisations. The WaveRoller project team considered the consenting process for one unit as easy from a global point of view, for the demonstration project (more

units) it took more time (3 years), although it could have been caused due the changes of the responsible authorities.

The EIA requirements are not specified in these last countries, which can make the process either very long due to the uncertainties shown by the authorities or very short due to the lack of knowledge about it.

In Sweden and Norway local authorities are the ones in charge of granting consent. Only large commercial sites are likely to attract the interest of national authorities due to the impact that they might cause. Developers feel that this makes the legal procedure very pragmatic and short because local authorities and organisations are more involved and have more knowledge about the area, which can speed up the procedures. The same is happening in Denmark, where small projects have been developed and have shown a pragmatic short legal procedure. The fact of developing test site projects in areas which have been granted for installation before for green energy (such as wind energy), and the small scale of the test sites help the projects to be shorter and uncomplicated, although this is likely to change for the development of a larger projects. Sweden as well as Scotland has a good regulatory procedure, although both have the potential to be further optimised.

The Environmental Impact Assessment is a main issue in every consenting process, especially its scope, which is one of the key parts where the regulator can facilitate the developer's approach to the EIA process. Environmental considerations are an essential part of the pre-scoping consultations. Governments are obliged under the EIA regulations to respond to requests from developers for a scoping opinion on outline design proposals; however, there is still a gap in knowledge on environmental monitoring activities, which means that the Governments do not necessarily know which specific environmental studies to require. Therefore, in most cases the site developer has to make a minimal EIA to fulfil general requirements and if an organisation or stakeholder then asks for a specific assessment, it would be carried out in addition. Nowadays, environmental monitoring activities are improving as more studies are carried out and experience is gained and it is expected that governments will have more environmental information in the future; therefore, the responses to the scoping opinion requests are likely to be much more extensive. This affects device monitoring after the deployment; monitoring before deployment would be preferable but due to lack of information and uncertainty on impacts and monitoring technologies, there is often the requirement within the EIA consent to monitor the device after the deployment in order to have the potential to assess, control and mitigate any environmental impact of the device.

In addition, navigation issues were identified as something that differed in the consenting process of various countries. Safety to navigation should not be compromised because of the installation of a new activity. In this sense, busy navigation routes will likely have to be avoided by commercial deployments and will strongly condition the implementation at least in these early phases. The establishment of adequate and reliable signalling systems by navigation authorities may help solve the problem.

There are differences between local and national consenting. In Spain, regional governments have set wave energy targets, but marine space allocation is regulated by the national government. In Portugal, the national targets could be achieved if the projects were considered of

national interest. In other countries, wave energy targets are either not established yet, as in Sweden, or remain considered within the ocean energy policy, as in France.

The view of the consenting procedure is very different for the developer and the regulator. The developer will wish to avoid mistakes so that they can get the approval as soon as possible. The regulator wants to be sure it has all the information needed to make and stand by its decision, particularly in relation to the potential impacts (environmental, benefits, impacts on targets and the future, etc.).

4.2. Stakeholders

In all cases assessed, engagement with the stakeholders is regulated initially by the authorities, who provide the developer with a list of statutory stakeholders, and is made by holding meetings and providing them with enough information about the project. Usually, the engagement of the statutory stakeholders is relatively straightforward. However, engagement of the non-statutory stakeholders such as Fishermen associations, Surfers groups, environmental entities, marine transportation companies, and in general the sea-users, requires a higher level of compromise and consideration of their concerns, in order to obtain their support for the project.

Meetings and events usually continue even after any issues are resolved, with the purpose of keeping in touch and sharing news on the project so that agreements can be upheld and a supportive atmosphere around the project created. It is beneficial if the general public and other stakeholders are made aware of the development and progress of projects from the outset. Where developers have provided information about every stage of the project, the general public and stakeholders are able to express their opinions and concerns based on real facts. The common methods of communication with the general public are public meetings, open-days where people can visit the site, informing the local inhabitants through the local council, media coverage through press and television, social networks and distribution of flyers, etc. Sometimes the information given by the developer is not enough, and in these cases, developers hire environmental consultants and navigation experts to join the meetings in order to solve any doubt that the public or stakeholder could have. This is an option that some device developers have chosen for the stakeholder consultation at EMEC, Scotland.

Common concerns across Europe have been identified. The main organisations who have expressed their complaints are Fishermen and navigation bodies. The reductions of fishing areas as well as the risk of navigation or even the exclusion of it in these areas are their main concerns. Other organisations have raised some concerns in most of the countries such as surfers worried due to the possible reduction of the wave heights caused by the presence of WEC devices or environmental organisations concerned about the impact in the area and the sea-life around the device. In Sweden, for instance, the biggest conflict has been with the military and fishermen.



Figure 20: Surfers associations are concerned about the reduction of wave heights.

The consulting procedure is more efficient in those countries where statutory stakeholders are clearly defined and where there is an authority in charge of regulation. The consultations usually begin with the scoping process and are on-going even when the project is completely operational as in some test sites such as EMEC. These consultations have the intention of solving the uncertainties and concerns that stakeholders might have, and advise the developer through the legal procedure. Stakeholders are approached by developers, and only in some cases such as at WaveHub, some non-statutory stakeholders have approached the developer team independently, such as surfers or local organisations. These consultations between the stakeholders and the developer can be short or time consuming, there is the possibility that because of these unresolved uncertainties the project gets delayed more than it should be, which could increase costs.

Although consultation is a formal obligation within the legal procedure, it should begin informally as soon as possible to show sensitivity and gain the favour of the stakeholders. Due to the results obtained, the strategy of engaging stakeholders since the beginning of the project has been a complete success and it reduces the time needed to obtain approval and the associated licence.

4.3. Public Opinion

Public opinion is very important in every development. It has been shown that a strong engagement with the general public and local stakeholders can speed up the consultation procedure. The general public and local stakeholders are usually aware of any project since the beginning through various public meetings held by the developer, open days and media coverage on local press. In addition, there are other methods used to engage the locals and general public such as flyers, presentations at schools and clubs of the area, and hiring public relations agencies for continuously updating news and spreading local information.

It is apparent from most of the studied cases that the general public is involved in the project at the same time as the stakeholders. Although it is an EIA requirement to have a public

consultation after submitting the environmental assessment, it has been proved that this should be done from the very beginning of the project. In some cases, public engagement has begun as a consultation for the location of the site. The main subject of the information spread by the developer is the potential socio-economic benefits that the project is going to bring to the local community. Highlighting these kinds of benefits is an indirect requirement under the EIA regulations. In the UK, these benefits are usually submitted through an independent socio-economic study and press releases stating the investment in the local area and how the project is going to affect the economy of the area creating job opportunities or increasing business activities.

In most cases, the general public have been very supportive of the projects due the benefits that they will generate for the local area. However, as seen in Mutriku with the development of an OWC within a breakwater, some public groups can turn unreported information against the developer changing the view of the general public.

4.4. Environmental Issues

Concerning the environmental impacts of wave energy installations, although it is thought that they will not be dramatic; there is a great deal of uncertainty both about the nature and extent of the impacts of a commercial scale deployment of devices.

The most significant environmental uncertainties related to wave and tidal energy are the implications of energy extraction at a large scale, and also the environmental effects on the sea-life around the device, which can be caused by the possible impact of mammals with the device or the under-water noise that the machine produces that interferes in the communication between mammals.

Test sites and pilot projects will be able to collect valuable information on this regard, and generate knowledge on how to avoid or mitigate the effects on the surrounding environment. Studies that have been commissioned in recent years have come too late for the early deployments and projects, as the information from such studies was not available before early development of the new industry. This has made the consenting procedure tougher for the development of the first projects in marine energy.

There are two actions by which authorities can help with environmental issues; these are to reduce environmental impact assessment requirements for the construction of test sites and pilot projects as their impact will be minor and they are essential learning opportunities for the monitoring of impacts, and to provide existing information on the environment in the areas of interest for the developer.

4.5. Finance

The test sites around Europe have been funded by local and national Government funds, and in some cases also with the help of the European funds. Governments see these projects as a key strategy to create a marine energy industry in the region, which it is hoped will provide the area with socio-economic benefits, such as creation of new jobs, increase in the local business

opportunity and high monetary injection in the economy of the country. The funding is mainly implemented by the programme of the department of energy in each Member State, which endeavours to provide a basis for industry investment, job creation and export of electricity, goods and services. There are some cases, such as the Ocean Plug in Portugal, where whilst the installation is funded by the Government, the site is managed by a private company and regulated by a public entity. Developers and other entities of the private sector need to persuade and attract private investors.

The elements that Government strategy should be based on are, administrative support in terms of procedures and methods, capital grant support, test facilities and infrastructure for early stages of the new industry and Feed-in-Tariffs and other financial incentive instruments for industry development.

There are several reasons for withdrawal of funding that has been observed in some cases, and these include lack of funds, changed priorities, etc. Usually there are various entities involved in the funding of a given project and while some leave the project at some point, others do not participate until the project is shaping up well. One important uncertainty is the technological risk involved in the possibility that the wave energy sector does not move forward once the investment is made. This is the major reason why private companies are hesitant about making large investments in an immature energy and why public funding at this stage is badly required. Also the investors do not like the uncertainty of the EIA process.

4.6. Other

It is noted that the necessary technical equipment, components and supply chain are not yet completely ready or suitable for commercial scale devices and even standard equipment and components have struggled to survive the realities of the ocean environment in some cases.



5. Recommendations

This section builds on the previous recommendations on non-technological barriers made by the Waveplam project (2008-2010) and summarises recommendations from the analysis of the still existing or new barriers as experienced by the sector in recent years, gathered through the SOWFIA workshop and questionnaires.

Regulatory framework & regulators attitude:

- Delimit national, regional and local jurisdictions regarding wave energy consenting procedures. If possible, give all the authority to one of the jurisdictions mentioned above. This has been shown to make the process uncomplicated and faster.
- Build a One-Stop-Shop procedure for licensing wave energy farms, but ensure that it truly acts a one-stop-shop for developers without the need to make additional applications.
- Establish deadlines for consenting approval. Be aware that delays in receiving consenting means increasing project cost to wave energy developers and this is critical in the demonstration and pre-commercial phase of this emerging industry.
- Judge EIA in a strategic way: Build your decisions on already existing experiences in wave energy EIA. For example: Join a data base of historic wave energy EIA (such as SOWFIA, Annex IV IEA-OES), have an open dialogue with other countries regulators, etc. Use test centre as learning source.
- Use acknowledged experience to avoid every prospective developer having to repeat the same surveys regarding environmental issues.
- Establish a mechanism that allows project developers to exchange knowledge of wave energy experiences and also facilitate transfer of experiences from other offshore sectors (oil & gas, offshore wind, etc.).
- Set specific targets for wave energy (do not use overall marine renewable energy targets, it will not benefit the wave energy industry as it is still not competitive with offshore wind). Set the objectives at national level (not effective if only at regional or local level).
- In case of doubt on potential environmental impacts, use the “Adaptive Management” procedure as implemented by Marine Scotland.
- Maintain an open dialogue with the developer, to allow any concerns, including those raised by stakeholders and the general public, to be addressed in a timely manner.
- Avoid being over demanding: make sure the requirements on the wave energy industry are commensurate with those on other industries with activities in the marine environment.
- Always remember the benefits that this industry could bring to the country where it is placed. Weigh up every decision taking into account positive impacts before making them.
- Participate in the national standardization committee for establishing environmental standards (such the Spanish initiative).
- Be flexible and constantly involved with the updates of the sector, recognising that wave energy is a new industry and regulators must facilitate the progress and give recommendations for its development.
- Adapt the requirements of the legal procedure depending on the size of the Project. Less demanding requirements for demonstration projects and small arrays.



- Take an active role in filling potential gaps regarding environmental impact knowledge, e.g.:
 - Create a fund to pay for the required monitoring administered by national or local governments.
 - Use European research funds to guide academic environmental research (through universities).
- Help developers to promote the benefits of ocean energy for society awareness.
- Find an element of quantifiable risk in the current licensing process in order to move forward. This can be based on logic and experience. Afterwards, it would need to be reviewed and amended accordingly, as wave energy developments become more significant, for instance, arrays, farms, etc.

Developer attitude towards regulators, stakeholders and the general public:

- Endeavour to engage and talk with regulators from the outset of a new project.
- Work with local communities from the very beginning of a new project, to communicate the aims and potential benefits of the project. The need to engage all stakeholders in order to gain their support, prevent possible conflicts and controversial issues. This refers not only to supportive public opinion but also to support from local shipyards, port authorities, suppliers, fisheries, other marine space users, the national electricity network, etc.
- Target the communication style and method to the particular stakeholder group. Empathy and understanding of the project from the general public is what developers should be aiming for.
- Be open and honest in communications with the public; accept that some areas are uncertain if there are knowledge gaps.
- Manage public expectation in a proper and realistic way; do not over emphasise the potential benefits.
- Collaborate with the wave energy industry: be aware that failure of other project developers could have a negative impact on your project, and their success could help yours.
- Inform the public of the benefits of wave energy, in terms of sustainability, energy security, and local employment. Regarding large projects, this is crucial.
- Be aware of the importance of public perception of wave energy, it could be one of the most important issues that have to be dealt with, as it was for oil & gas and offshore wind industries when they started.
- Engage technology and equipment suppliers as partners rather than product vendors. It is the best way to make sure that they get really involved in your R&D or demonstration project.