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WP **3**	Deliverable **3.1**

Review of the state of the art and future direction of the Survey, Deploy and Monitor policy

Deliverable 3.1

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Contents

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RICORE Project Synopsis

The aim of the RiCORE project is to establish a risk-based approach to consenting where the level of survey requirement is based on the environmental sensitivity of the site, the risk profile of the technology and the scale of the proposed project. The project, which has received funding from the European Union's Horizon 2020 research and innovation programme, will run between January 1st 2015 and June 30th 2016.

The consenting of offshore renewable energy is often cited as one of the main non-technical barriers to the development of this sector. A significant aspect of this is the uncertainty inherent in the potential environmental impacts of novel technology. To ensure consents are compliant with EU and national legislation, such as the Environmental Impact Assessment and Habitats Directive, costly and time consuming surveys are required even for perceived lower risk technologies in sites which may not be of highest environmental sensitivity.

The RiCORE project will study the legal framework in place in the partner Member States to ensure the framework developed will be applicable for roll out across these Member States and further afield. The next stage of the RiCORE project is to consider the practices, methodologies and implementation of pre-consent surveys, post consent and post-deployment monitoring. This will allow a feedback loop to inform the development of the risk-based framework for the environmental aspects of consent and provide best practice. The project will achieve these aims by engaging with the relevant stakeholders including the regulators, industry and EIA practitioners, through a series of expert workshops and developing their outcomes into guidance.

The impact of the project will be to improve, in line with the requirements of the Renewable Energy Directive specifically Article 13 (1), consenting processes to ensure cost efficient delivery of the necessary surveys, clear and transparent reasoning for work undertaken, improving knowledge sharing and reducing the non-technical barriers to the development of the Offshore Renewable Energy sector so it can deliver clean, secure energy.

Executive summary

The main aim of the RiCORE project is to ensure the successful development of Offshore Renewable Energy (ORE) in the EU Member States by reducing the cost and time taken to consent projects of low environmental risk through the development of a risk based approach to the consenting of projects which standardises the assessment of key components of environmental risk from ORE deployment.

This will be achieved through comparing and contrasting current consenting processes in Member States in order to determine the extent to which a risk-based approach (i) is already taken, (ii) could be taken or (iii) is not possible due to current legal and/or administrative systems.

The starting point will be the “Survey, Deploy and Monitor Licensing Policy Guidance” (SDM) that was pioneered by Marine Scotland, and the project will look separately at the potential utility of a risk based approach to reduce time and cost in securing consents during both pre- consent surveying and post- deployment monitoring. The consenting of offshore renewable energy is often cited as one of the main non-technical barriers to the development of this sector. The SDM policy is a tool to provide regulators and developers with an efficient risk-based approach for taking forward wave and tidal energy proposals, facilitating a phased/staged development approach (avoiding sensitive environments).

This deliverable addresses a review of the state of the art of the SDM policy in order to set the basis for its further development to all relevant technologies in the ORE sector, including the adaptation of the policy as new technologies in TRL near to 5-9 emerge (e.g. floating wind) and the insertion into partner Member State policies.

The deliverable provides the description of two case studies as examples (Hywind Floating Wind Demonstrator and Meygen Tidal Turbine Array), in order to illustrate the implementation of the SDM policy.

Following the description of the SDM policy and the analysis of the case studies, the deliverable identifies some issues which could be considered for further improvement and development.

The deliverable will be complemented by further discussion among the expert workshops within the RICORE project.

1. INTRODUCTION

At a global level, there is an urgent need to develop competitive low carbon energy to meet increasing energy demand whilst reducing the impact of anthropogenic driven climate change. Offshore renewable energy (defined as offshore wind, wave and tidal energy) has a key role to play as part of the overall energy mix of the European Union as Member States strive to meet their renewable energy targets (23% in France, 16% in Ireland, 31% in Portugal, 20% in Spain and 15% in the UK). Development of this innovative sector in balance with other key sectors (fisheries, aquaculture, shipping, etc.) is consistent with the EU Blue Growth strategy and associated national policies, and other national and regional marine plans (e.g. 'Harnessing our Ocean Wealth' in Ireland, which seeks to double the value of Ireland's ocean wealth to 2.4% of GDP by 2030).

In 2014, the European Commission published a Communication on Blue Energy and the action needed to deliver on the potential of ocean energy in European seas and oceans by 2020 and beyond. In this, the Commission identified five issues that require attention over the short to medium term in order to help the sector to scale up and become cost-competitive with other forms of electricity generation. These issues are technology costs, transmission grid infrastructure, consenting procedures, environmental impacts, and grant and revenue support. The RiCORE project will directly address consenting procedures and environmental impacts and will build on existing knowledge from European projects such as SOWFIA project (Simas *et al.*, 2015), EquiMar project (Simas *et al.*, 2009; 2010a; 2010b) and SI Ocean project (Macgillivray *et al.*, 2013) which have identified the regulatory framework as a key non-technical barrier to the early development of the marine renewables sector. Specifically, uncertainty about the appropriate application of environmental legislation, which can further prolong consenting processes (adding cost and delay), will be a key focus area of the project.

In order to ensure the timely exploitation of our oceans and future sustainable development of offshore renewable energy, the path from device demonstration through to commercialisation must be able to proceed as efficiently as possible. Currently the environmental effects and impacts of ORE devices on the marine environment, and the effects of the environment on devices, are significant areas of uncertainty. The scarcity of data on the environmental interactions of new technologies often means they are characterised as a threat, subsequently requiring extensive supporting environmental information which can be costly both in financial terms and also in the time taken to obtain the necessary consents.

Data and information on environmental effects are being derived from time-limited single device demonstrations at sea, usually in test centres, or from specific aspects of the consenting process, namely studies to support Environmental Impact Assessment (EIA). The latter varies considerably in scope and intensity both within and across Member States, meaning that little integration can be made across the experiences to date: different methodologies and timeframes are utilised and this reduces the ability to draw firm conclusions or trends from environmental impact information which therefore limits the ability to address this issue on a European scale.

One potential solution is to adopt **a risk-based approach to consenting** prototype and first iteration devices and arrays in their receiving environments. This approach has been pioneered by Scottish Government through the development of the **Survey, Deploy and Monitor (SDM) Policy** for wave and tide harnessing projects.

The draft SDM licensing policy guidance was developed as a result of the findings of the 2007 Marine Renewables Strategic Environmental Assessment undertaken by Marine Scotland. The draft guidance was included in Marine Scotland's consultation on marine licensing in September 2010 and was published on Marine Scotland's website in 2012[1].

[1] http://www.gov.scot/Topics/marine/Licensing/marine/Applications/SDM

The intention of the guidance is to provide first and foremost regulators, and secondly developers, with an efficient risk based approach for taking forward marine renewable energy (wave and tidal) developments. It applies to pre-deployment and post-deployment of devices. It currently only applies to ocean energy devices (wave and tidal), however, there may be potential to apply the policy for licensing floating offshore wind developments, if there are unknown environmental impacts.

The guidance proposes a phased approach to the licensing of wave and tidal developments. Developers, following pre-deployment monitoring, undertake deployment and monitoring of a test device or demonstration arrays before seeking consent for larger arrays.

The general approach encourages a more flexible, fit for purpose application process based on three main factors: environmental sensitivity – how important is the development site with regard to ecosystem, wildlife use or marine historic environment; scale of development – a single device or small array or large development; and device risk – are regulators having to consider a turbine type which could be considered high risk because of a lack of knowledge about impacts, or is it a structure that should be considered as low risk.

For marine renewable schemes identified as having the lowest potential environmental risk, the survey, deploy and monitor policy proposes relatively limited pre-deployment testing and site characterisation surveys, thereby facilitating early deployment and collection of the empirical data on environmental interactions that can inform licensing elsewhere. Conversely, for schemes considered as having the highest potential environmental risk, pre-deployment testing and site characterisation requirements are more extensive, helping to ensure safeguard of sensitive species and habitats, as well as compliance with the requirements of the Birds and Habitats Directives.

SDM aims to enable flexibility in the Marine Scotland approach to site characterisation and monitoring in relation to the environmental impacts of marine devices. Regulators, and statutory advisors such as Scottish Natural Heritage (SNH), are able to discuss the relative risks associated with different developments in different locations, and take a balanced and proportionate view of the significance of the environmental issues raised in each case. With the growing and competing demands for marine resources, it aims to reduce the complexity of marine management and ultimately improve the regulatory framework for marine renewables. In parallel, on 25 March 2015 the National Marine Plan (NMP)[2] was adopted. This Plan has been prepared in accordance with the EU Directive 2014/89/EU which came into force in July 2014. The Plan covers the management of all the marine activity of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles).

[2] http://www.gov.scot/Topics/marine/seamanagement/national

2. OBJECTIVES

The overall objective of the present deliverable is to undertake a review of the SDM policy in order to set the basis for the further development of this policy to other novel technologies and its insertion into partner Member State policies.

This review will focus on the identification of points of improvement or further development of the risk based approach promoted by the SDM policy taking into account that this approach will cover other new technologies different from wave and tide (e.g. wind) in TRL near to 5-9.

The present deliverable will set the basis for further discussion between the expert workshops within the RICORE project.

3. THE SDM POLICY

The policy is based upon 3 main factors:

1. Environmental Sensitivity (of the proposed development location)
2. Scale of Development; and
3. Device (or Technology) Classification.

It is recognised, however, that there will be circumstances where these three parameters alone do not adequately define the risk posed to a particular receptor or receptors, and the licensing process(es) may require greater understanding of potential impacts than will be furnished through the provisions herein. A flexible approach to application of the policy will therefore be pursued, using it as a guide, rather than applying it rigidly in every situation, and thereby ensuring that statutory licensing requirements are still met.

3.1 Environmental Sensitivity

Environmental sensitivity for the purposes of this policy, relates to designated areas, protected species, and protected habitats and other relevant environmental factors. Marine Scotland will undertake an assessment of the relative environmental sensitivity of the proposed location of a renewable energy project, based on the environmental sensitivity maps showed in Figures 1 and 2. These maps combine data from 19 different environmental datasets, enabling areas of relatively higher and lower sensitivity to be distinguished. The maps should be considered as indicative only (i.e. it is possible that at a local scale specific sites may have a relatively greater or lower sensitivity than is shown). They are relevant only to ocean energy (wave and tidal) development and those factors which might influence the duration of site characterisation studies. They are neither an overall assessment of a site’s environmental richness or biodiversity nor of its complete environmental sensitivity or sensitivity to other forms of development. The maps will be subject to revision and upgrade as more datasets become available and/or existing ones renewed.

Following any discussions deemed necessary with the developer, Marine Scotland will assign an overall assessment of High, Medium or Low environmental sensitivity.

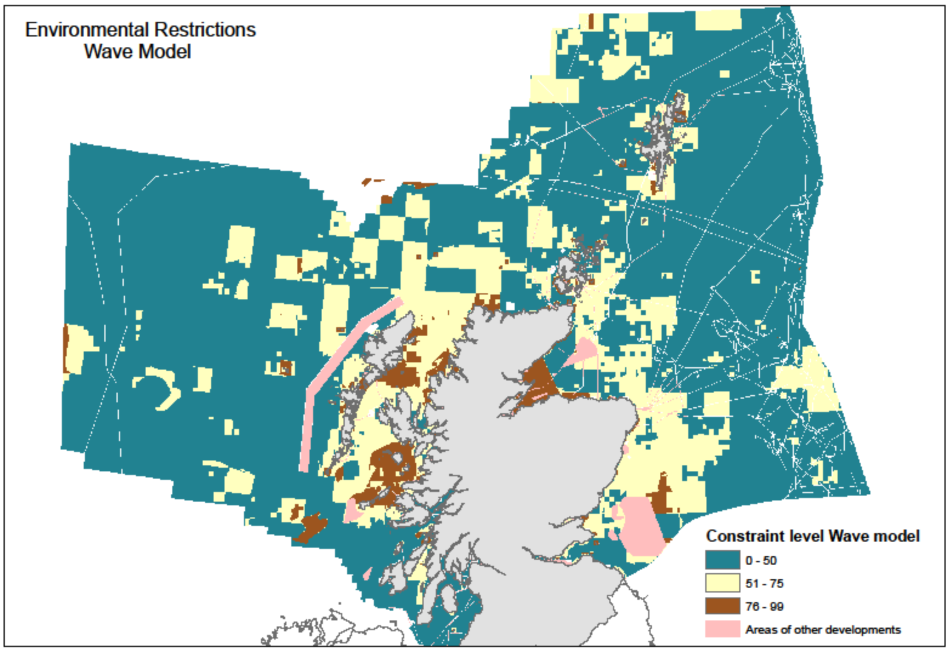

Figure 1. Environmental risk map for wave energy projects, showing areas of low (green), medium (yellow) and high (brown) environmental risk.

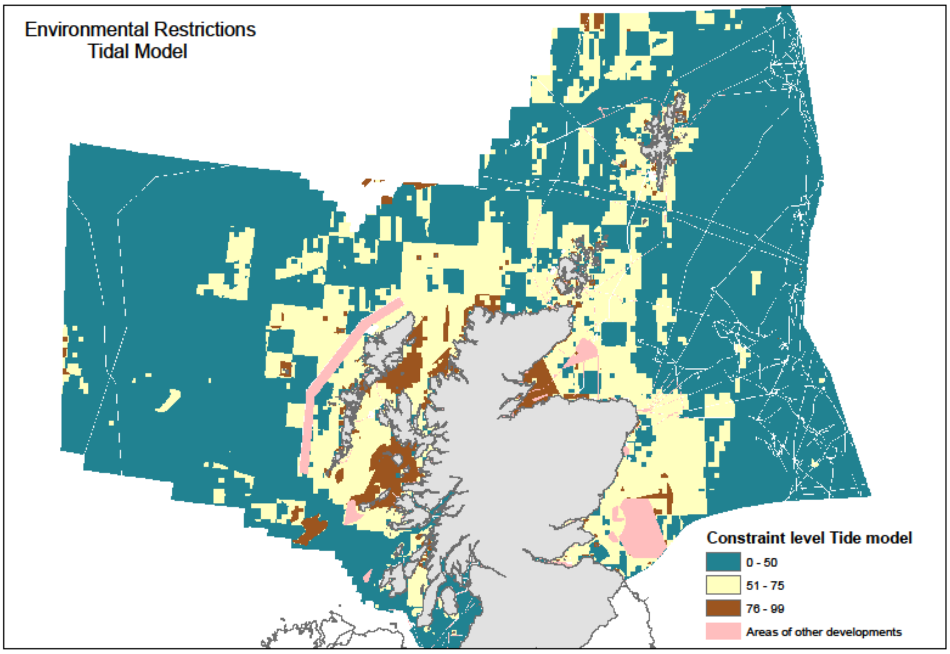

Figure 2. Environmental risk map for tidal stream energy projects, showing areas of low (green), medium (yellow) and high (brown) environmental risk.

3.2 Scale of Development

Relevant measures of the scale of development are based on the proposed total installed generating capacity in megawatts (MW) of the development. The scale of the development will be assessed on a three point scale, as below, with associated assessment as Low (L), Medium (M), or High (H):

Scale	Criteria	Assessment
Small Scale:	Up to 10MW	L
Medium Scale:	More than 10MW, to 50MW	M
Large Scale:	More than 50 MW	H

3.3 Device (or Technology) Risk

Device (or Technology) Risk is an expression of how the device or technology (including moorings or support) is installed, moves, behaves and interacts with the surrounding environment and is a broad assessment of the potential effects of the device on marine life. Table 1 contains some examples of environmental hazards which will be considered. It has been derived from the report '*A Review of The Potential Impacts of Wave And Tidal Energy Development on Scotland's Marine Environment'* commissioned by the Scottish Government and issued by Aquatera[3].

The developer will provide Marine Scotland, if requested, with information to support a robust and demonstrable assessment of the elements of project risk in terms of the hazards listed. Marine Scotland will then undertake a risk assessment using the aforementioned report.

The assessment of overall device (or technology) risk is based on a series of individual assessments of environmental hazards that may arise from the device being assessed. These are each categorised as High, Medium or Low. In order to combine the device risk with the environmental sensitivity assessment and the scale of development, it is necessary to summarise the series of individual assessments into a single device (technology) risk assessment.

[3] http://www.marine-impact.co.uk/

Table 1. Environmental hazards related to the device/technology. Please note that this is not an exhaustive list.

Scale	Environmental hazards related to the device/technology	Assessment of environmental significance (H, M, L)
1	Potential for harmful collision between marine mammals/basking sharks and offshore wave and tidal energy converters and associated moorings/support structures	
2	Potential for harmful collision between diving birds and with the moving turbine blades/hydrofoils of tidal energy converters.	
3	• Direct loss of protected or sensitive sub-littoral seabed communities due to the presence of wave and tidal energy converters and associated moorings/support structures on the seabed. • The potential wider/secondary effects on protected or sensitive sub-littoral seabed due to installation and operation of wave and tidal energy converters and associated moorings/support structures	
4	The potential for release of polluting substances to the sea	
5	• Potential barrier to movement for marine mammals/basking sharks due to physical presence of wave and tidal energy converters and associated moorings/support structures. • The potential for cetaceans / basking sharks to become entangled in mooring lines • Potential risk of entrapment of marine mammals (cetaceans/seals)/ basking sharks from wave and tidal energy converters and associated moorings/support structures	
6	• Potential for direct loss of habitat used by seals/otters due to the installation of shoreline wave energy converters • Direct loss of breeding habitat used by coastal breeding birds due to the installation of shoreline wave energy converters • Direct loss of protected or sensitive littoral coastal communities due to the placement of shoreline/nearshore wave energy converters • The potential wider/secondary effects on protected or sensitive littoral coastal communities due to installation and/or operation of wave and tidal energy converters and associated moorings/support structures	
7	• Operational noise: The potential effects on marine mammals and basking sharks from underwater noise generated by: device operation; and the presence of support structures. • The potential effects on marine mammals/basking sharks from shock/pressure waves generated by wave and tidal energy converters. • The potential effects on marine mammals from above surface noise generated by wave and tidal energy converters. • The potential effects on diving birds of underwater noise and vibration generated by wave and tidal energy converters • The potential effects on diving birds of above surface noise generated by wave and tidal energy converters with generators/air turbines housed in surface-piercing components	

Table 1. (Cont.) Environmental hazards related to the device/technology. Please note that this is not an exhaustive list.

Scale	Environmental hazards related to the device/technology	Assessment of environmental significance (H, M, L)
8	• Installation noise: The potential effects on marine mammals and basking sharks from underwater noise generated by: device installation • The potential effects on diving birds of underwater noise and vibration generated by wave and tidal energy converters during drilling activities	
9	• Potential displacement of essential activities of marine mammals/basking sharks due to the presence of wave and tidal energy converters and associated moorings/support structures • Potential displacement of essential activities of marine birds due to the presence of wave and tidal energy converters and associated moorings/support structures • Potential effects of changes in turbulence on foraging success of marine birds due to the presence of wave and tidal energy converters and associated moorings/support structures	
10	Potential for harmful collision or other interaction with migratory fish	

The procedure to undertake this is as follows:

1. Each individual assessment is scored 1, 2 or 3 for Low, Medium and High assessments respectively.
2. The geometric mean of the scores is calculated by multiplying the scores together and taking the tenth root of the product.

   i.e. Geometric Mean = $((X_1)(X_2)(X_3)........(X_N))^{1/N}$

   where

   X = Individual score

   N = Number of scores
3. The overall device (technology) risk is expressed as High, Medium or Low according to the geometric mean, as shown below.

Geometric mean score	Overall risk
1 – 1.60	Low
1.61 – 2.20	Medium
2.21 – 3.0	High

3.4 Application of the Policy

We propose to express the overall risk to the environment posed by the development, taking account of the technology and associated equipment to be used, the size of the development and the environmental sensitivity of the location, as a combined assessment under the three factors discussed above.

The assessment of overall project risk is based on assessments of environmental sensitivity, project size, and device (technology) risk. These are each categorised as High, Medium or Low. It is necessary to summarise these three assessments into a single project risk assessment.

The procedure to undertake this is similar to that explained in the previous section for the device (technology) risk evaluation and is as follows:

1. Each individual assessment (for environmental sensitivity, project size and device technology risk) is scored 1, 2 or 3 for Low, Medium and High assessments respectively.
2. The geometric mean of the scores is calculated by multiplying the scores together and taking the cube root of the product.

   i.e. Geometric Mean = $((X_1)(X_2)(X_3))^{1/3}$

3. The overall project risk is expressed as High, Medium or Low according to the geometric mean, as shown below.

Geometric mean score	Overall risk
1 – 1.60	Low
1.61 – 2.20	Medium
2.21 – 3.0	High

This final project environmental risk will be expressed as low, medium or high and will be used to guide the requirements for pre-application site characterisation and assessment of the environmental interactions of the devices. Rather than a "one size fits all" approach, it is a risk management process with the purpose of applying an appropriate and proportionate approach to licensing which depends upon the circumstances surrounding the development proposal.

This approach takes account of unknown risks and/or the application of precaution in the early years of assessing novel/contentious licences and potentially risky applications, e.g. where device or technology risk is not properly understood or assessed as High, then the overall project environmental risk is more likely to be considered to be High which may then limit the potential to apply efficiencies in the licensing process of development, taking account of the environmental sensitivity and scale of development.

3.4.1 Proposals Assessed As High Risk or Uncertainty.

A large development proposed for an area of higher environmental sensitivity and device risk could have an overall project environmental risk assessment of ‘High’. In such a case, there would be little scope to apply a fast-track approach. A minimum of 2 years site characterisation data would be necessary to support an application. In addition, the developer would normally be expected to undertake testing and impact monitoring of a test device or demonstration array[4] elsewhere, providing the results of studies on wildlife interactions with their device(s) in support of their application.

3.4.2 Proposals Assessed As Medium Risk or Uncertainty.

An overall project environmental risk assessment as ‘Medium’ would require an approach intermediate to that of High and Low risk schemes. The initial presumption would be that 2 years of site characterisation data would be required. However, if Marine Scotland considers after one year that the environmental risk is less than anticipated, or that the data gathered to date have been adequate to inform both the EIA and Habitats Regulation Assessment (HRA)[5] processes, then they would be prepared to discuss relaxation of the requirements for further site characterisation, on receptor-specific or hazard-specific bases. This is known as a 2-1 approach and it is important, for purposes of data quality, that the 2nd year’s studies are not suspended except on the explicit direction of Marine Scotland. An application for a scheme assessed as Medium risk should also normally be supported by impact monitoring data from a relevant demonstration device or devices.

3.4.3 Proposals Assessed As Low Risk or Uncertainty.

A small development proposed for an area of low environmental sensitivity made up of devices with limited device risk would have an overall project environmental risk assessment of ‘Low’. In such a case, if the environmental risk information was

[4] A proposal for a large (>50MW) array should be informed by studies of a smaller ‘demonstration array’; a proposal for a demonstration array should be informed by studies of a single demonstration device (and/or relatively smaller demonstration array).

[5] HRA is the equivalent of the Appropriate Assessment (AA) under Article 6(3) of the Habitats Directive in the rest of Europe.

considered robust or underpinned by strategic survey information we might consider fast tracking the application. Marine Scotland will, in such situations, ask for 1 year of site characterisation data (or equivalent) to inform an EIA, HRA (if this is required) and licence application. It is possible that this survey data may alert the regulator that further data collection is required (e.g. because of unexpectedly high numbers of a protected species). Should that be the case, the EIA and licence application may go forward in parallel with the additional survey work but consent will not be determined until the additional data have been collected and analysed. Impact monitoring of a test device will not be a pre-requisite for assessment of a Low risk application, but developers should be aware that provision of such data will, invariably, facilitate consenting decisions, irrespective of the perceived risk of the scheme in question.

3.5 Impact Monitoring Requirements

The focus of this policy is on the extent of site characterisation surveys and device testing that is appropriate to inform the consenting process, in relation to the perceived relative environmental risk posed by the development. Reduced data presentation or collection requirements, in relation to lower risk proposals, should facilitate earlier consenting decisions and more rapid build out of overall low risk projects. Impact monitoring, post-construction, of test devices or arrays is likely to be a condition on most consents granted, not least so as to provide the information necessary to support subsequent applications for further, perhaps Medium or High risk, schemes. The nature and duration of this will, however, be project specific and only determined and agreed once consent has been secured.

4. CASE STUDIES

In order to illustrate implementation of the policy, 2 case study examples are provided.

4.1 Case study 1: Hywind Floating Wind Demonstrator

4.1.1 Background

This proposal, by Statoil, is for up to 5 floating offshore wind turbines with each turbine being a maximum of 6 MW, in an area known as the Buchan Deep which is an area of deep water (95 to 120m) located approximately 25 km off the coast at Peterhead, north east Scotland just outside the 12nm territorial sea limit (Figure 3). The total project is under 50 MW, therefore the scale of the project is assessed as 'Medium'. Details on the proposal can be found at the Scottish Government website[6]. Floating wind is not yet formally covered by the established Scottish Government policy. However this case study is intended to illustrate the adaptive potential of the policy to new scenarios, and the associated issues.

4.1.2 Environmental constraints

Baseline understanding of the potential environmental constraints associated with the site indicated that the overall level of sensitivity was medium (Figure 4). The medium rating indicates that the location is not a designated area for protected habitats or species, but is expected to be used by protected species that forage over wide areas. In this example this includes auk species from nesting colonies on adjacent coastline that are designated Special Protection Areas for breeding seabirds.

One of the key environmental constraints for offshore wind is the potential impacts on seabird populations. Figure 5 illustrates the seabird aggregation layer used within the environmental model which was taken from analysis to identify potential areas for seabird protection in the marine environment (Kober *et al.*, 2010). This information indicated the area is not of the highest sensitivity for seabirds.

[6] http://www.gov.scot/Topics/marine/Licensing/marine/scoping/Hywind

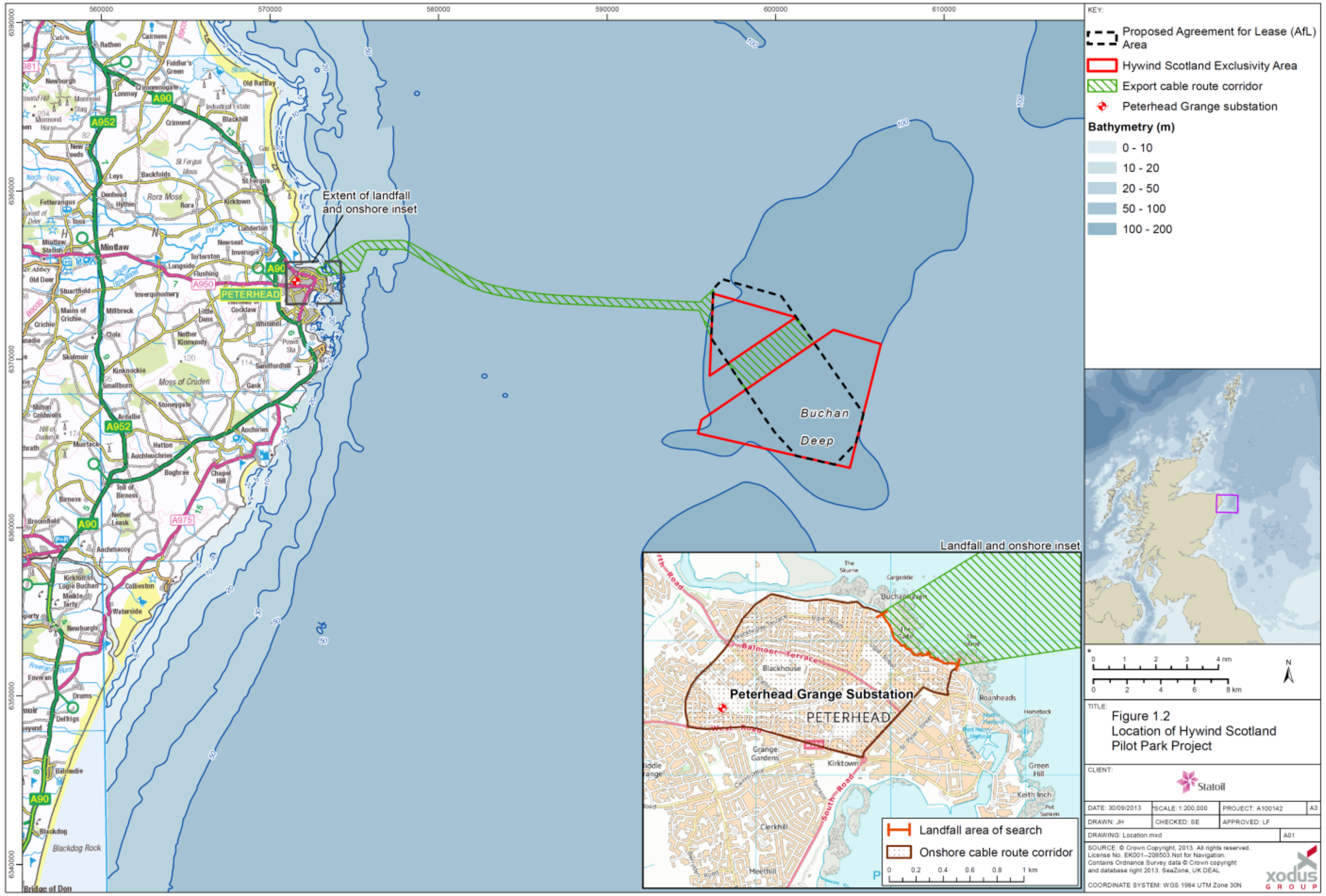

Figure 3. Location of Hywind Scotland Pilot Park Project. Taken from Scottish Government website[7].

[7] http://www.gov.scot/Topics/marine/Licensing/marine/scoping/Hywind

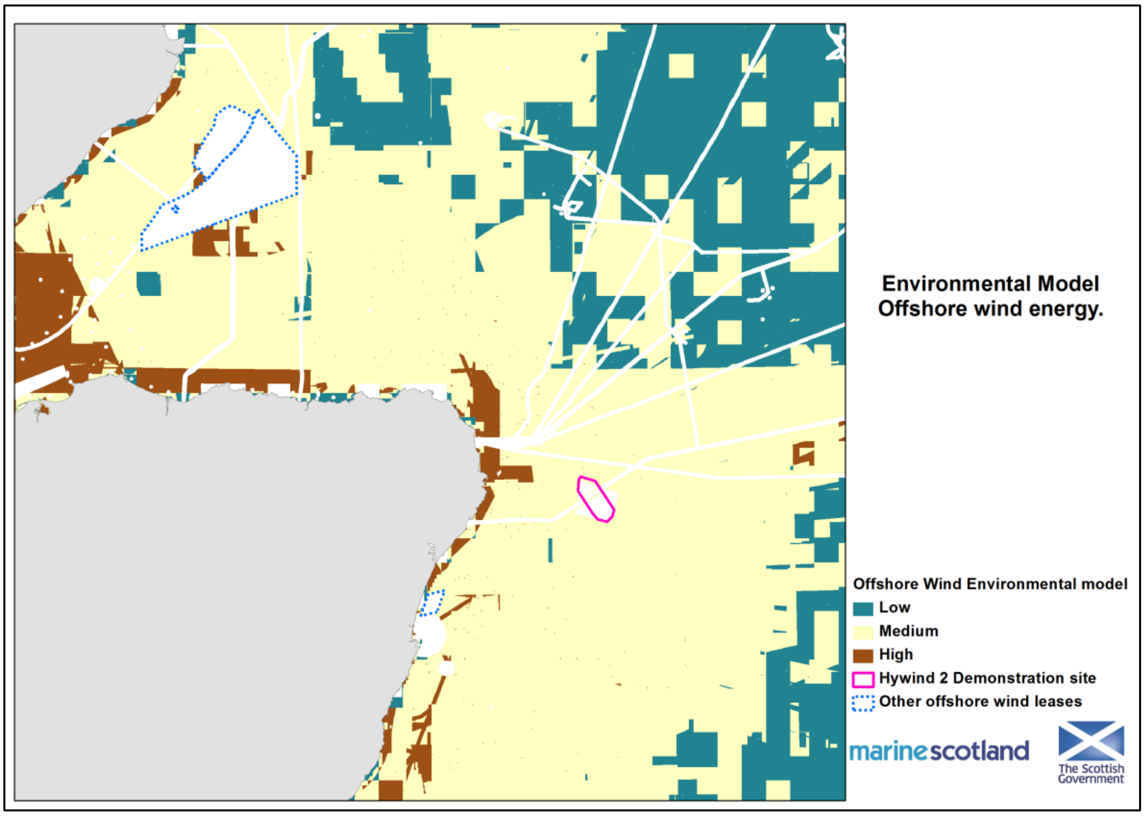

Figure 4. Environmental risk map for offshore wind energy.

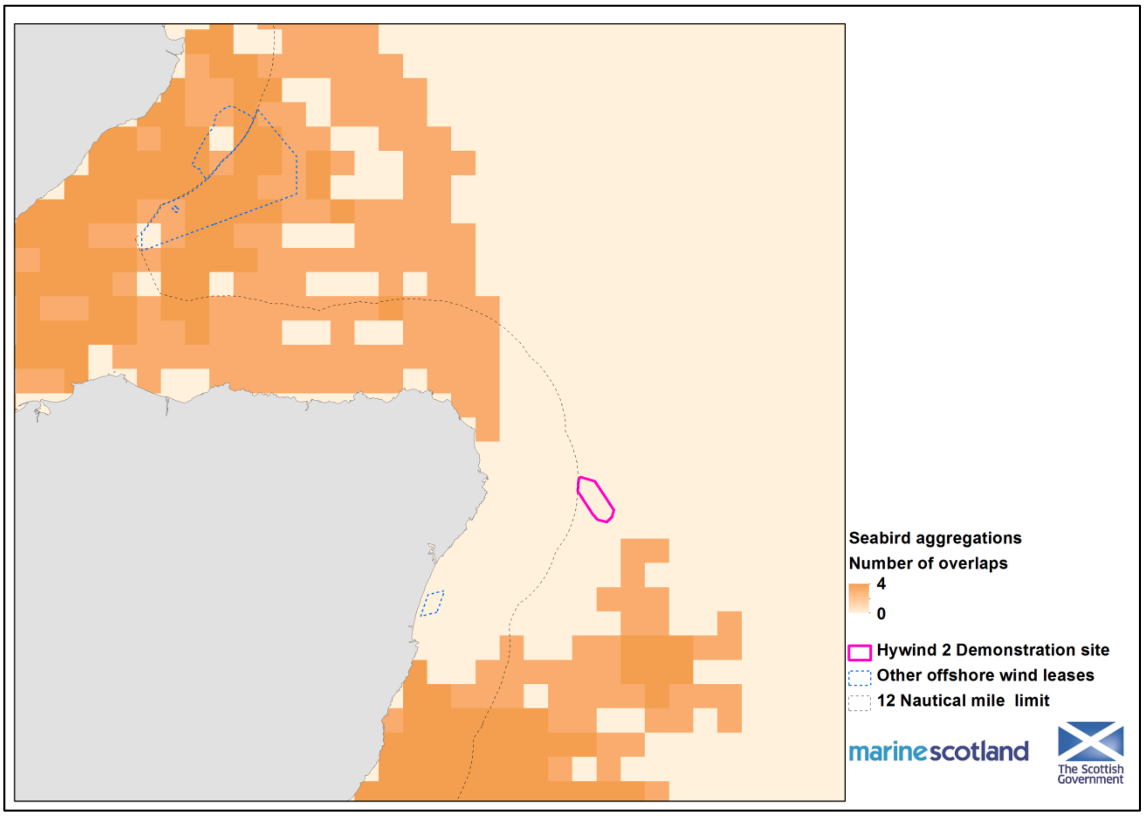

Figure 5. Important seabird aggregations.

4.1.3 Device (or technology) risk

Section 3.3 sets out how overall device risk has been calculated based on the range of environmental hazards and the assessment of environmental significance for wave and tidal technologies. In the Scottish context, this procedure has not yet been applied specifically to floating wind. The environmental risk map for floating wind (Figure 4) is currently based on the environmental sensitivities alone, without specific consideration of the hazards arising from the interaction between the technology, scales of deployment and the environmental constraints. In the case of Hywind, the understanding of overall risk for floating wind was principally informed by comparison with experience from conventional offshore wind technologies. Collision risk is generally regarded as a key hazard, which will still be the case for turbines placed on floating structures.

4.1.4 Application of the SDM policy

The medium scale of this floating wind demonstration project effectively led to a 2-1 approach being adopted, as described in 3.4.2. After 1 year of pre-consent survey had been undertaken by the developer to inform the EIA and consenting process for all receptors (benthic habitats, marine mammals and seabirds), a review of the need for further survey effort was undertaken. High numbers of seabirds were recorded on site during the post-breeding season dispersal period, including moulting auks that are unable to fly. Marine Scotland took the decision under the policy to focus additional survey effort on this potentially sensitive period, to ensure the robustness of the overall conclusions of the EIA. This example illustrates the adaptive flexibility of the SDM policy to focus on and address specific concerns. **The developer has not yet submitted an application for consent, so this project does not yet provide an example of applying post-consent monitoring**.

4.2 Case study 2: Meygen Tidal Turbine Array

4.2.1 Background

This proposal is to generate up to 86 MW from over 60 tidal turbines located in the Inner Sound of the Pentland Firth, off the northern coast of Scotland, between Caithness on the Scottish mainland and the island of Stroma. More details can be found in MeyGen project website[8]. The MeyGen Tidal Energy Project is to be developed in two distinct phases, consistent with Scottish Government Policy: the initial phase will involve the deployment of no more than 6 turbines in 2016. Utilising a 'Survey, Deploy and Monitor' approach, the initial array will provide information on the interactions between the array and the environment, increasing the knowledge for subsequent phases. Phase 1 will be monitored to increase knowledge and reduce uncertainty for the development of Phase 2.

4.2.2 Environmental constraints

The location of the Meygen proposal was identified as having an overall high environmental sensitivity (Figure 6). This was principally driven by the size of the proposal, the potential collision risk associated with the Technology and the close proximity to seal haul-out sites which are shown in more detail on Figure 7. This close proximity, combined with a declining population trend for harbour seals, became a key consideration.

4.2.3 Device (or tehnology) risk

The hazard of greatest environmental significance was assessed to be the potential for collision by marine mammals, with the proximity to seal haul-outs identified as being a key issue. The combination of proximity to environmental constraints, scale of proposal and the potential hazards associated with tidal turbines resulted in an overall risk calculation of high. This high ranking has informed subsequent planning.

[8] http://www.gov.scot/Topics/marine/Licensing/marine/scoping/MeyGen

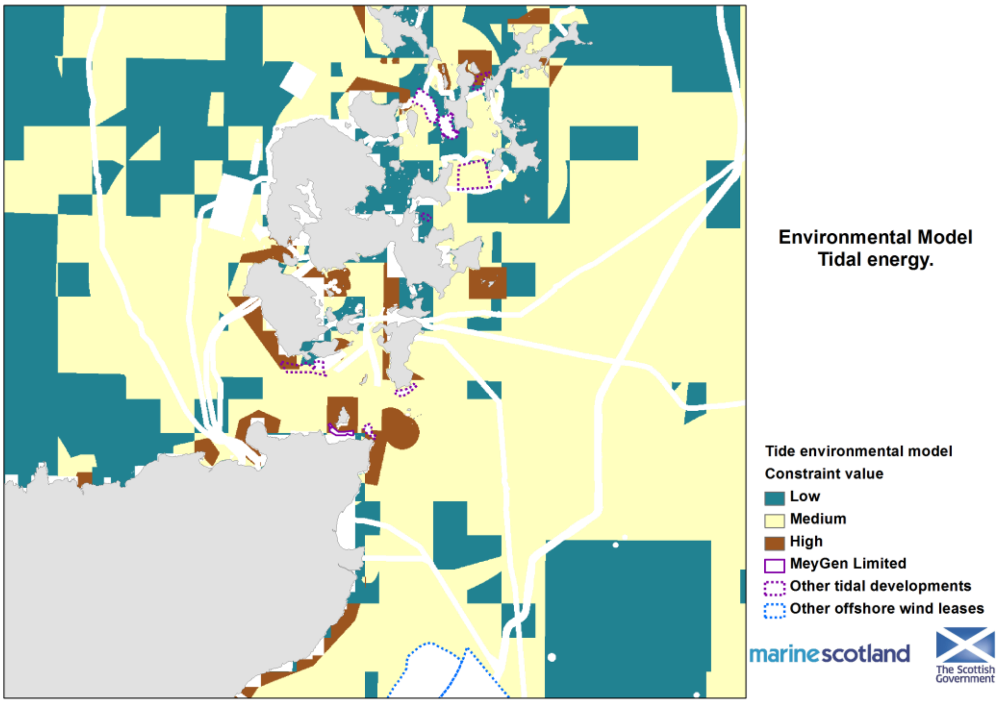

Figure 6. Environmental risk map for tidal energy.

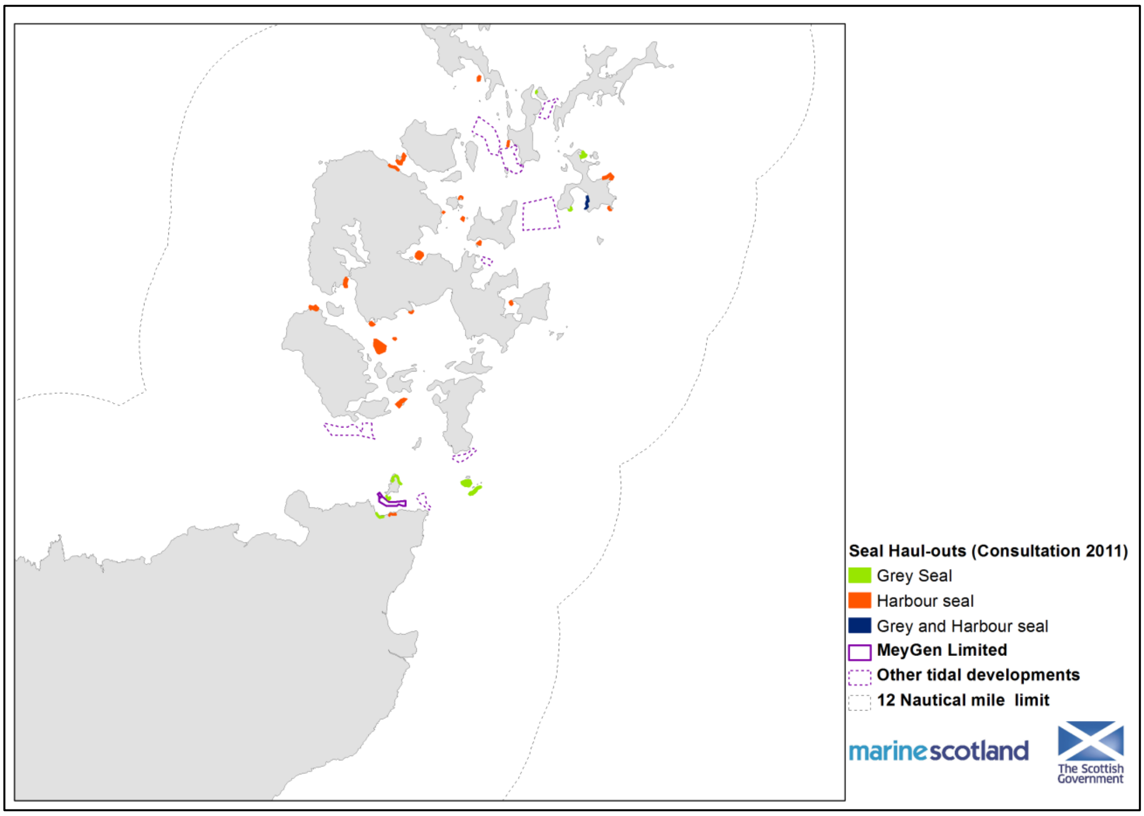

Figure 7. Seal haul-out sites in Pentland Firth.

4.2.4 Application of Survey, Deploy and Monitor Policy

As the total size of the project is over 50 MW, it did not qualify for only 1 year of pre-consent survey effort. The developer undertook pre-consent surveys spread over two years for mobile species such as marine mammals and seabirds[9]. Owing to potential concerns regarding collision risk to harbour seal Marine Scotland have phased the consent, with the initial phase being limited to no more than 6 turbines.

Post-consent monitoring is being developed to ensure targeted studies are able to measure the behaviour of mobile species in proximity to the operational turbines. Ultimately the intention is to more fully quantify the risks to harbour seal, and other mobile species, from collision. Further phases of the project will be permitted to proceed once the post-consent monitoring conditions and associated updated risk assessments have been completed. The Meygen project will be the first example of a commercial tidal array development. Whilst not an example of applying the 1 year SDM policy at the pre-consent phase, this is an example of risk-based management by the regulator in the context of new technologies and uncertainty regarding the environmental impacts. **As such it illustrates how the post-consent monitoring element of the SDM policy is intended to work in practice**.

The MeyGen Environmental Statement[10] recognised that there was little data currently available and its application to the assessment of a commercial array of turbines was limited. MeyGen's consent conditions required evidence to demonstrate that collision risk was acceptable before future turbines were installed. Therefore, MeyGen proposed to follow the Scottish Government's Survey, Deploy and Monitor approach to reduce the uncertainty around particular impacts with the installation and operation of the first small array installed within the Project, in years one and two (i.e. 2015 & 2016) allowing a better definition of avoidance rates and to better understand the possible impact of the full array.

[9] http://www.meygen.com/the-company/reports-and-documents/
[10] http://www.scotland.gov.uk/Topics/marine/Licensing/marine/scoping/MeyGen

Where impacts cannot be fully quantified (e.g. turbine collision risk), MeyGen is committed to developing a marine mammal, bird and fish monitoring programme. This programme will seek to measure the behaviour of species in proximity to the operational turbines using a multi-instrument/multi-scale approach e.g. simultaneous deployment of active acoustic, passive acoustic and optical devices. It will also inform the potential requirement for future mitigation and ensure no significant impacts on marine mammals.

Monitoring of the initial phase of turbines will be used to review the conclusions of the impact assessment, which will inform further installation and also provide information for the subsequent consent applications and EIA for future phases of the project. Where monitoring indicates that additional mitigating measures may be reasonably required, MeyGen is committed to put these in place.

5. SCOPE FOR IMPROVEMENT AND FUTURE DIRECTION

Following the description of the SDM policy and the analysis of the case studies, aspects which could be considered for further improvement and development are identified. These are:

a) Extend the risk-based approach to post-consenting processes. Consequently, the point *3.4 Application of the policy* should be rewritten in order to include post-consent monitoring needs and scope depending on the risk of the device-project.

b) Update the criteria for the evaluation of the scale of the project taking into account new technologies (specifically offshore wind).

c) Environmental Sensitivity: establish a set of common criteria for the evaluation of the environmental sensitivity of a specific location and the methodology to do that.

d) Technology risk: update and review of the expected environmental impacts of the different technologies in order to set a common list of criteria for the technology risk evaluation.

e) The SDM policy establishes the need to undertake some environmental characterisation of the device/project location as part of the pre-consenting process. Also, a useful guide would need to include some guidance on the methodology for this monitoring, both in the pre- and post-consenting phase of the project.

f) To introduce the aspect of uncertainty in the risk based approach. Assessments become difficult when uncertainties on environmental impacts are high, and in some cases decisions may over-emphasize environmental concerns by adhering to the precautionary principle. Assessment methods which effectively and transparently target uncertainties are therefore required.

g) Evaluate the possible compensating effect between the different environmental hazards when the device (or technology) risk is calculated according to the methodology explained in the section 3.3 and explore the possibility of weighting environmental factors.

6. REFERENCES

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