Guernsey Renewable Energy Team

Regional Environmental Assessment of Marine Energy

July 2011

COMMERCE AND EMPLOYMENT
A STATES OF GUERNSEY GOVERNMENT DEPARTMENT

Guernsey Renewable Energy Team – An Announcement

The shadow Guernsey Renewable Energy Commission (GREC) was created in 2008 and was tasked with enabling marine renewable energy development within Guernsey and Herm waters. At the end of October 2010 the States of Guernsey approved the Renewable Energy (Guernsey) Law 2010 for submission to the Privy Council for Royal Assent. With the enabling legislation imminent shadow GREC has completed the first phase of putting together a regulatory environment and now the shadow GREC has been replaced by a group within the Commerce and Employment Department to be known as the Renewable Energy Team (RET).

The Guernsey Renewable Energy Team is made up of the original members of shadow GREC, two members of the Commerce and Employment Board and a representative from Sark's General Purposes and Advisory Committee of the Chief Pleas. The reason for this change is twofold;

1. To help to create the right legislative and commercial environment to take the programme forward;

2. To discontinue the use of "shadow GREC" to avoid any potential confusion between the roles of shadow GREC (now RET) and the role of GREC as the regulatory body once it is formally constituted under the Renewable Energy Law.

As such, references to GREC throughout the REA documents fall into the following areas:-

- Work undertaken thus far by the "shadow GREC" (e.g. the REA) and work still to be undertaken prior to the formal establishment of GREC as the regulator (e.g. amendments to the REA and future surveys) which will henceforth be taken to be RET;

- Work to be undertaken following the formal establishment by the Renewable Energy Law of GREC as the regulator (e.g. Issuing of licences and leases) which is to remain as GREC.

For simplicity, all Images with references to GREC in this document can be read as RET. Also any reference within the document can be read as RET although there may be some areas where the work streams will be carried forward by GREC once it is formally constituted.

For further information regarding RET, the change from shadow GREC to RET and the work that has and is being done please visit the Guernsey Renewable Energy website – www.guernseyrenewableenergy.com.

GUERNSEY RENEWABLE ENERGY TEAM

REGIONAL ENVIRONMENTAL ASSESSMENT OF MARINE ENERGY

Version 1

Contents Amendment Record

This report has been issued and amended as follows:

Rev	Description	Date	Signed	Signed	Signed
1	Draft for initial GREF review	18/05/10	C A Green C A Green GREC Project Manager		
2	Draft REA for Consultation	30/07/10	N Day GREF Chairman	R Babbé GREC Chairman	C S McNulty Bauer Minister, Commerce & Employment Dept
3	Post consultation REA for public release	31/07/11	N Day GREF Chairman	R Sillars RET Chairman	

GUERNSEY RENEWABLE ENERGY COMMISSION

REGIONAL ENVIRONMENTAL ASSESSMENT OF MARINE ENERGY

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Foreword

Tackling climate change is a key challenge facing our generation. It is important to move away from producing energy from fossil fuels and to find alternative renewable sources that will provide us with energy security in the future. Here in the Channel Islands, there is an opportunity to contribute towards meeting these challenges through the production of renewable energy from our seas.

The Bailiwick of Guernsey is situated in the English Channel, thirty miles west of France's Normandy coast, and is well positioned to harness the power of the sea. Potential exists to generate both tidal and wave energy; the area has some of the strongest tidal currents in the world and receives powerful waves from the Atlantic Ocean. Furthermore, the Channel Islands are very close to Continental Europe, with both Guernsey and Jersey having a direct submarine cable link via France to the European Electricity Grid.

The States of Guernsey has decided to establish the Guernsey Renewable Energy Commission (GREC) to promote and control the development of renewable energy projects in the seas around Guernsey. A key aspect of the renewable energy work is the production of a Regional Environmental Assessment (REA) to examine the likely environmental effects from the development of wave and tidal power production. The results of the REA are presented in this document. Also available for consideration is an abridged version of the investigation, which is presented in the separate Non-Technical Summary. The document has been prepared in collaboration with the government of the neighbouring island of Sark, and the Guernsey Renewable Energy Forum (GREF). The REA has benefitted from extensive input from locally based experts in a variety of environmental technical disciplines.

The REA is a strategic document, prepared to assist the States of Guernsey to plan for the introduction of renewable energy to the Bailiwick. It will be used to establish consenting and licensing regimes to control development, and to inform our requirements for more detailed surveys and studies to be undertaken in the future. This version of the document has been issued for consultation purposes, and members of the public and technical specialists are encouraged to provide feedback, so that this can be incorporated into future revisions to the document.

There has been a lot of information and media coverage recently on climate change, greenhouse gas emissions, and developments in the marine renewable energy field. However, it should be borne in mind that most technologies are still at the stage of prototype testing, and it is not anticipated that the Island will see any energy from tidal or wave power until 2015 at the earliest. Work is ongoing within the States of Guernsey to establish our future energy policy, and the contribution that can be made by marine energy. It is important that Guernsey is ready and able to benefit from these new technologies when they become commercially available. It is likely that the cost of oil (and therefore all energy) is likely to increase considerably in future decades and Guernsey will benefit from having its own source of dependable, secure energy generation both for our own domestic use and for export.

The REA has identified the potential environmental impacts of different types of generation devices, together with mitigation measures that may be used to monitor and control development activities. If properly implemented, the deployment of renewable energy devices and associated cable connections will not have an unacceptable effect on wildlife, or on the coastline and seas around our shores.

This version of the REA has been issued for the primary purpose of consultation. By providing feedback on this document, or the abridged Non-technical Summary, you will be helping us in our continued efforts to develop renewable energy within our waters for the benefit of all who live and work here.

Carla S. MCNULTY BAUER
Minister, Commerce and Employment Department

Executive Summary

Background to the REA

The Bailiwick of Guernsey is situated in the English Channel, thirty miles west of France's Normandy coast, and is well positioned to harness the power of the sea. Potential exists to generate both tidal and wave energy; the area has some of the strongest tidal currents in the world and receives powerful waves from the Atlantic Ocean.

The States of Guernsey's Energy Policy Report, published in June 2008, recommended the formation of the Guernsey Renewable Energy Commission (GREC) to progress the creation of local renewable electricity generation on a large (macro) scale. The Energy Policy Report of June 2008 recommended that the States should investigate targets to reduce the emissions of carbon dioxide by 30% on 1990 levels by 2020, and by 80% by 2050, and to generate 20% of electricity from local renewable sources by 2020.

GREC has undertaken investigations into the feasibility and promotion of marine renewable energy developments within the Territorial Waters (within three Nautical Miles) of the islands of Guernsey, Herm and Sark. A key aspect of GREC's work has been producing a Regional Environmental Assessment (REA) which examines the likely environmental effects from the development of wave and tidal power production.

The REA is a strategic study that will underpin the development of marine environmental planning policy and will inform subsequent project specific Environmental Impact Assessments to be undertaken by individual energy developers. The results will be used to prepare and deliver the States of Guernsey's strategy for the development of marine energy generation facilities and associated infrastructure in Guernsey's waters.

Purpose

In the UK, it is a legal requirement to produce a Strategic Environmental Assessment (SEA) for all spatial plans and development programmes. However, there is not presently a legislative requirement to perform a SEA as Guernsey falls outside the scope of both UK and EU laws. Although the document will be referred to as a Regional Environmental Assessment (see below), GREC has decided to adopt the general principles of the SEA framework in order to demonstrate transparency and to facilitate ease of understanding for potential developers.

The purpose of the REA is not simply to inform policy makers and the public of the possible environmental impacts of pursuing such targets. The important value of the REA is in its use as a tool to manage environmental risk. As a result, not only can appropriate mitigation measures be applied, but also Guernsey and Sark can

properly benefit from reductions in greenhouse gas emissions and the security of supply that would be afforded by marine renewable energy.

The REA has been undertaken to provide a strategic assessment of the potential effects that marine renewable energy devices (wave and tidal) will have on the environment of Guernsey, Herm and Sark.

The REA aims to identify, evaluate and describe the likely significant effects, both positive and negative, of developing marine renewable energy. In keeping with UK best practice, the Precautionary Principle has been used throughout the assessment. This means that where there is uncertainty relating to potential effects, or a lack of information on which to make accurate predictions, then the assessment has assumed a 'worst case' scenario.

Scope

The REA has taken account of shoreline wave, near-shore, tidal stream and potential combinations of the devices. The REA has also considered the impacts of infrastructure that is necessary to connect devices to shore, including electrical cables and shore-based control equipment. It was decided to exclude both tidal range and offshore wind devices from this initial report.

In doing this the REA considered in detail the following areas:

Physical Marine Environment *Geology* *Marine Processes* *Water Quality*
Marine Biological Environment *Benthic Ecology* *Pelagic Ecology* *Birds* *Marine Mammals*
Marine Human Environment *Commercial Fisheries and Mariculture* *Recreational Fishing* *Marine and Coastal Historic Environment* *Existing Submarine Cables, Electrical Grid and Connectivity* *Shipping and Navigation* *Tourism and Recreation*
Other Topics *Noise* *Air Quality* *Landscape and Seascape Character*

Objectives

As described in the Scoping Document of October 2009, the main objectives of the REA are:

- To assess, at a strategic level, the potential effects of marine renewable energy devices on the environment

- To advise and support the States of Guernsey in the development and implementation of its strategy for marine renewable energy
- To inform the future development of planning guidance for marine developers
- To provide information for use in the development of a separate Marine Spatial Plan for Guernsey
- To form a vehicle for public and stakeholder engagement

Outputs

Based on the above objectives, the main outputs of the REA process are:

- A record of the baseline situation, based on available information
- Identification of gaps and inconsistencies in the baseline data and the need for further survey work, studies and ongoing monitoring
- Commencement of ongoing consultation
- Assessment of the generic effects of marine renewable devices on the marine environment
- Recommendation of generic mitigation measures to avoid, reduce or offset any significant adverse effects on the environment

Project Overview

Initial studies into the waters surrounding the Channel Islands, such as the Tidal Stream Resource Assessment prepared by Robert Gordon University, demonstrate that there is a potentially valuable resource in the waters around Guernsey, Herm and Sark.

In collaboration with the government of Sark, and with technical specialists from Guernsey and the UK, who have formed the Guernsey Renewable Energy Forum (GREF), GREC has now completed the REA. This REA has been prepared for the purpose of consultation with the public, technical specialists and stakeholders.

To help meet Guernsey's renewable energy targets, the focus of the REA has been on the development of large commercial sites. GREC is not looking for companies to test or develop designs for wave or tidal devices in its waters. It plans to only accept proposals from developers with a pre-tested, working device, with arrays that would contribute electricity to the Guernsey grid or to overseas markets.

The area of study for this REA covers the territorial waters (within three nautical miles of the shore) around Guernsey, and Sark. The other boundaries to the study are the oceanographic parameters under which current tidal and wave technologies are intended (and able) to operate in.

GREC has met with developers of marine renewable energy devices to learn about the operating characteristics of the devices and their potential environmental effects. Developers have also been invited to join GREF in order to continue to offer their advice.

A small number of development scenarios have been devised. These scenarios reflect the potential size of the marine energy resources that exist within the waters around Guernsey, as well as Guernsey's targets for renewable energy. A feasibility study has been produced in support of the REA to act as a technical reference for environmental specialists in the delivery of their analyses.

- *Maximum development scenario (230MW)* **-** This would utilise the resources to a maximum potential, and could include several large (>40MW) arrays. These could be located at sites that benefit from high velocity tidal flows such as the Big Russel, to the north of Guernsey and to the south-east of Sark, together with wave energy arrays to the north-west of Guernsey

- *Minimum development scenario (100MW)* - This allows for the minimum deployment that would meet Guernsey's renewable energy targets in the medium term future, and would require two 50MW tidal arrays.

The development scenarios did not specify actual development sites, as it was considered that to do this would have pre-judged the results of the REA, and prevented the authors from giving consideration to the sensitivities that exist throughout the whole of the study area. Site selection or 'Zoning' will be undertaken on completion of further strategic investigations and consideration of policy.

Different device technologies require different footprint areas and space between devices for deployment and safe effective operation. However, to allow the visualisation of the likely footprint of the arrays that could be deployed, the following was used:

Example tidal array:

A 50MW array, comprising up to 50 individual devices, would be expected to occupy approximately 0.5km^2 of the sea-bed. The array would probably be arranged as two to four rows of devices, aligned at 90 degrees to the primary flow direction.

Example offshore wave array:

A 20MW array deployment area, comprising up to 50 individual point absorber (buoy) devices, or a smaller number of larger devices, would be expected to occupy approximately 8.0km^2 of the surface of the sea, including the space between the devices. This array would probably be arranged as a 2 x 4 km rectangle, aligned so

that the longest edge of the deployment area would face the primary wave direction.

Summary of Key Findings

Data Gaps

The assessment has found a number of areas of investigation that are hampered by a lack of knowledge. As the REA is a desk-study, it is acknowledged that some of these cannot be addressed within the scope of the study. Further investigative work has been recommended for future stages of the environmental planning process. The main reasons for data gaps are:

i. Lack of baseline information.

ii. Lack of information with regard to likely deployment sites.

iii. Lack of information regarding device characteristics.

iv. Lack of information regarding the devices' response to potential impacts.

The data gaps that have been identified on an area by area basis are identified as future studies and surveys are incorporated into an Environmental Action Plan (EAP) and a Regional Monitoring Plan (RMP) in Appendix K and L respectively.

Impacts

The following locations were highlighted as being of significance with regards to the specific areas noted.

Bird breeding – Cliff areas are identified on all of the islands as actual and potential breeding sites.

Grid connections – Telecommunication cables are shown connecting Guernsey to the UK and France. There is also a power cable on the east coast of Guernsey, which connects to France via Jersey.

Tourism / Landscape– Areas of coast on all of the islands are identified as having important landscape value.

Commercial fishing– The most important areas for commercial fishing are focused over sand banks. The Boue Blondel to the west of Guernsey is an important fish spawning ground. The Great Bank off the east coast of Guernsey is extensively fished, as are the sandbanks to the south and north of Sark.

Geology– In the context of sediment dynamics, the critical areas of the Guernsey REA include the channels of the Big and Little Russels, where there is the highest potential for tidal generation. Although there is a general understanding of the sea bed geology and sediment distribution in these areas, the specific relationships

between this and the deployment of energy devices on sedimentation is not yet established.

Marine mammals– There is a dolphin feeding ground off the southern tip of the Great Bank, which mostly comprises mackerel. There is also a seal haul-out site at the Humps, north of Herm, which supports a resident population of seals. There are believed to be resident populations of common dolphins off the north of Sark and the north and east coasts of Guernsey.

Marine and coastal historic environment– The areas identified as being of greatest importance are: the area surrounding Vazon Bay on the west of Guernsey; outside Guernsey Harbour; between Herm and Jethou; and to the north of Herm. These areas have been identified as having a high concentration of wrecks.

Navigation– The area through the Little Russel is the key shipping channel into and out of Guernsey. Less sea traffic uses the Big Russel, although it is still an important route.

Recreational fishing – Key sites are the Great Bank to the east of Guernsey and the north coasts of Herm and Sark.

There were no clear thresholds that emerged from the assessment. However, the analysis of several of the disciplines was hampered by a lack of baseline information, as well as a lack of prior industry experience of multi-device arrays. Therefore, the REA has concluded that the cumulative effects of multiple devices, or multiple arrays, are unknown at present.

Mitigation

The primary mitigation measure would be the careful selection of deployment areas to reduce the visual impact as much as possible. This should be followed by careful design of devices to minimise visual impact. It is clear that some devices are more visible than others, and this may preclude the selection of certain types.

On completion of site selections and initial enquiries from developers, detailed visual assessments of specific device proposals should be undertaken to inform project specific requirements. Developers should be encouraged to optimise their designs to minimise visual impact.

Monitoring and Action Plans

The production of the REA has included the preparation of two key documents: the Regional Monitoring Plan (RMP) and the Environmental Action Plan (EAP). These may be used to manage the delivery of future investigations and the delivery of project-level mitigation measures. The documents identify the environmental survey work, studies and practical measures that should be undertaken through the development of actual projects, from their inception to decommissioning.

The RMP and EAP identify the organisations most likely to be responsible for the implementation of each of the actions. However, it is acknowledged that effective delivery of environmental mitigation can only be achieved through close collaboration between all parties involved. With this in mind, it is likely that tasks will be shared, by agreement, among the States of Guernsey, Sark and prospective developers.

The Regional Monitoring Plan

The RMP lists scientific investigative work to be undertaken throughout the development of marine renewable energy facilities. This includes strategic-level investigations from project conception, which cover the whole study area, to project specific post-construction monitoring work, which will confirm the performance of individual arrays of generators and the effectiveness of mitigation measures undertaken.

The Environmental Action Plan (EAP)

The EAP lists physical measures that could be taken to protect the environment during the design, deployment, operation and eventual decommissioning of generator arrays, depending on the nature and location of development.

Conclusions

The REA concludes that, if appropriate mitigation measures are taken, the establishment of a generating capacity of 100MW can be achieved with generally minor effects on the environment. However, there are notable gaps in the knowledge that has been available to the study.

Informing strategic planning and project-level decision-making are the key objectives of the REA. The following key issues require consideration.

- There is a need to obtain better information with regard to:
    - Existing benthic-habitat mapping
    - The behaviour of large fish and mammals in response to the presence of devices
    - The feeding behaviour of seabirds
- The severity of potential impacts has been found to be highly dependent on location. The progression of detailed development proposals requires the careful selection of preferred renewable energy deployment zones.

The nature and severity of potential impacts is highly dependent on the mode of operation and the characteristics of the devices to be deployed.

Next Steps

The REA should be considered as a working document. It may be reviewed and updated as necessary to account for additional survey information or the completion of research. As new technologies are developed, they may be assessed and incorporated into future versions of the REA.

The timescale for the deployment of marine renewable energy devices in Guernsey's waters is difficult to determine. It is clear that an exploitable energy resource exists, particularly with respect to tidal energy. However, the time the industry requires to develop devices to the point that they can be manufactured and deployed at commercial scales is unknown. Furthermore, the cost of renewable energy is still high in relation to that produced from fossil fuels, and this may deter early adoption. Discussions with a number of developers indicate that they anticipate readiness for deployment (machines in the water generating electricity) on a commercial scale by 2015 at the earliest.

1. Introduction

1.2. Background

Tackling climate change is a key challenge facing our generation. It is important to move away from producing energy from fossil fuels and to find alternative renewable sources that will provide us with energy security in the future. In the Channel Islands, there is an opportunity to contribute towards meeting these challenges through the production of renewable energy from our seas.

The Bailiwick of Guernsey is situated in the English Channel, thirty miles west of France's Normandy coast, and is well positioned to harness the power of the sea. Potential exists to generate both tidal and wave energy; the area has some of the strongest tidal currents in the world and receives powerful waves from the Atlantic Ocean. Furthermore, the Channel Islands are very close to Continental Europe, with both Guernsey and Jersey having a direct submarine cable link via France to the European Electricity Grid.

We can improve the security of our energy supply by developing a marine renewable energy industry. This will bring employment and other environmental, economic and social benefits to the Bailiwick.

This Regional Environmental Assessment (REA) has been undertaken to provide a strategic assessment of the potential effects that marine renewable energy devices (wave and tidal) will have on the environment. It has been commissioned and undertaken by the Guernsey Renewable Energy Commission (GREC) and the Guernsey Renewable Energy Forum (GREF).

A printed copy of this document is available for inspection at the States of Guernsey's offices at Raymond Falla House and at Sir Charles Frossard House, and at the Guille-Allès Library in St Peter Port. Furthermore, the entire REA, or selected chapters, are available to download from the GREC website (www.guernseyrenewableenergy.com). GREC will be seeking feedback on the REA during a six week public-consultation period to follow the release of the document.

The REA has been prepared in accordance with a Scoping Report that was prepared in October 2009. This report defined the study area and the work involved in the production of this REA.

1.3. Purpose, Scope and Area of Study

1.2.1. Introduction

The REA has been undertaken to provide a strategic assessment of potential effects that marine renewable energy devices (wave and tidal) will have on the environment of Guernsey, Herm and Sark.

The information within the REA report will be used to guide the development of Strategic Planning and Energy Policy. It will also be used to inform the work of regulators and energy developers in their research into the nature of our marine environment, both at a strategic level, and in relation to specific deployment sites. The REA may be used as a basis for the scoping of project specific Environmental Impact Assessments to be provided by prospective developers as part of the planned, environmental-consent application process.

The REA identifies, evaluates and describes the likely significant effects, both positive and negative, of developing marine renewable energy in accordance with the development scenarios described in section 2.4. In keeping with best practice, the Precautionary Principle has been used throughout the assessment. This means that where there is uncertainty relating to potential effects, or a lack of information on which to make accurate predictions, then the assessment has assumed a 'worst case' scenario. Therefore, it should be borne in mind that of the large number of impacts listed, it is unlikely that all of them would occur.

The word 'environment' not only refers to plant and animal life, together with their habitats, but in keeping with globally accepted best practice, it also covers the sea and sea-bed, human beings and their existing health, transportation, resources, industry, culture and landscapes.

1.2.2. Purpose of the Regional Environmental Assessment (REA)

In the UK, it is a legal requirement to produce a Strategic Environmental Assessment (SEA) for all spatial plans and development programmes. This is due to the application of the European Directive 2001/42/EC: "The assessment of the effects of certain plans and programmes on the environment" (the Strategic Environmental Assessment (SEA) Directive).

However, there is not presently a legislative requirement to perform a SEA as Guernsey falls outside the scope of both UK and EU laws. Although the document will be referred to as a Regional Environmental Assessment (see below), GREC has decided to adopt the general principles of the SEA framework in order to demonstrate transparency and to facilitate ease of understanding for potential developers. Further information regarding the EU SEA Directive is provided in the REA Scoping Report 2009.

As an alternative to the SEA, a Regional Environmental Assessment (REA) is defined by The World Bank as: "An instrument that examines environmental issues and impacts associated with a particular strategy, policy, plan, or program, or with a series of projects for a particular region (e.g. an urban area, a watershed, or a coastal zone); evaluates and compares the impacts against those of alternative options; assesses legal and institutional aspects relevant to the issues and impacts;

and recommends broad measures to strengthen environmental management in the region."

This shows that a REA has a similar remit to the SEA. However, a REA does not carry all of the European legal connotations and is not an assessment against policy. This is the reason that the assessment has been presented as a REA rather than a SEA.

1.2.3. Study Area

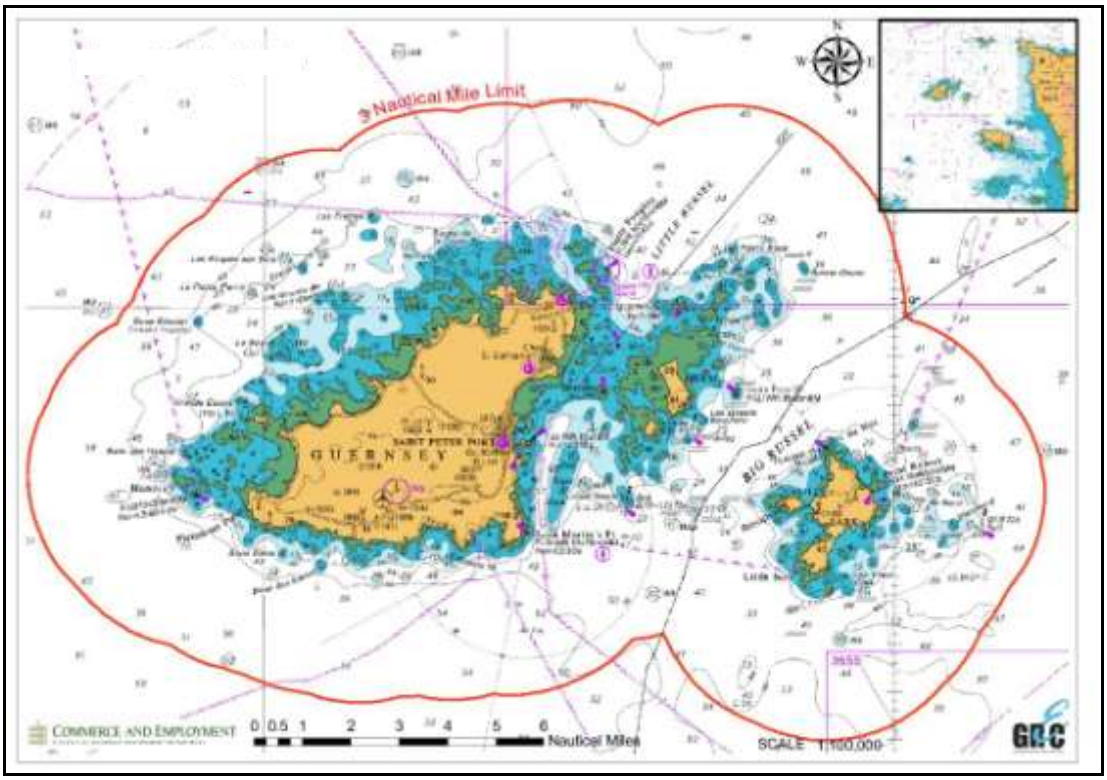
Introduction

The study area that has been covered by the REA includes:

- All of the territorial waters of Guernsey and Sark, to three nautical miles of the coast;
- Intertidal and coastal areas within 200m of the shore (at MHWS) where landfall and connection infrastructure are considered to impact.

The study area is illustrated in Figure 1.1 below.

Figure 1.1 – Study area (image – GREC)



Sark

Sark is included as a member of the Guernsey Renewable Energy Forum (GREF), and its waters are within the scope of the REA for a number of reasons. With a population in the region of 600, Sark has limited professional and financial resources and so, for this reason, it makes economic sense to combine its efforts with Guernsey. In addition, Sark is within the Bailiwick of Guernsey (sharing some of its legislation and administration). Although close neighbours with Guernsey, Sark may wish to maintain independent management of its energy resources. It is with the consent of the Sark authorities that this REA includes Sark's territorial waters.

Seaward Extent of the Study Area

The seaward extent of the study area is the three nautical-mile territorial zone off the coasts of Guernsey, and Sark. This is not suggesting that there is no interest in the development of wave and tidal devices outside of this area, but the current territorial limit restricts the jurisdiction of both Guernsey and Sark to control of development to within this area.

A benefit of this restriction is that it has allowed research efforts to be focused, and allowed the production of a useful and accurate REA within the time constraints placed upon the project. The area of study may be extended in the future if Guernsey or Sark's jurisdictions are extended beyond three nautical miles.

Economic issues also drive the three-nautical-mile limit. As development is considered further from land, it is more expensive to connect the devices into the onshore electricity-grid system and the more problematic the devices' maintenance becomes.

1.2.4. Scope

Marine Renewable Energy Devices

The REA has taken account of the following categories of wave and tidal technologies:

- Shoreline wave
- Near-shore and offshore wave (to include all potential device types)
- Tidal stream (to include tidal turbines and tidal fences)
- Potential combinations of the above devices

The REA has also considered the impacts of infrastructure that is necessary to connect the devices to shore, including electrical cables and shore-based control equipment.

Offshore Wind Energy

The assessment of wind energy devices has been specifically excluded from the scope of the REA for a number of reasons relating to their perceived environmental impact and effects on aircraft navigation. As described in the Scoping Report, if offshore wind power were to be considered, there would be a dominance of the analysis of this technology in the REA and this would divert resources away from the preferred technologies (tide and wave). Wind energy can be evaluated at a future date, should it become desirable to do so.

Tidal Range Technology

The assessment of tidal range solutions (eg. barrages, lagoons) has been specifically excluded from the scope of the REA for a number of reasons, again relating to their perceived impact. Furthermore, there are no economically feasible locations in Guernsey for them to be considered. However, should they become more feasible and desirable in the future, they could be evaluated at that time.

Port Facilities

There is much speculative discussion in the renewable energy industry about the port facilities required for the berthing of vessels used in the deployment, operation and servicing of devices. These discussions include the potential need for facilities to provide industrial, or lay-down, areas for the storage and maintenance of devices.

Initial research into the various types of devices that are under development indicates that common practices and their associated port requirements have yet to be established. However, it is likely that many of the devices will require some sort of deep-water port facility as a base of operations close to deployment sites.

At this time, it is not clear whether suitable facilities will be available on Guernsey or whether operators will be required to seek facilities elsewhere. Initial feasibility studies have indicated that the overall commercial viability of marine renewable energy on Guernsey will not be dependent on this aspect. Therefore, for the purposes of the Environmental Assessment, the impacts of increased marine traffic on existing ports, and the requirement for any associated port expansion, will not be included.

1.4. Objectives of the REA

As described in the Scoping Document of October 2009, the main objectives of the REA are:

- To assess, at a strategic level, the potential effects of marine renewable energy devices on the environment, with reference to the development scenarios identified in section 2.4.
- To advise and support the States of Guernsey in the development and implementation of its strategy for marine renewable energy
- To inform the future development of planning guidance for marine developers
- To inform the project-level decision-making process for all stakeholders (including regulators and developers)
- To provide information for use in the development of a separate Marine Spatial Plan for Guernsey
- To facilitate focused investment into the marine renewable energy sector in Guernsey
- To develop a consenting process for the deployment of devices
- To identify synergies and conflicts within the existing consenting and planning policies
- To form a vehicle for public and stakeholder engagement

Note: this REA is not being carried out for the licensing of specific potential sites. That would be the subject of separate future assessments. However, any future assessments may be expected to draw heavily on the information and analysis presented in the REA.

Based on the above objectives, the main outputs of the REA process are:

- A record of the baseline situation, based on available information
- Identification of gaps and inconsistencies in the baseline data and the need for further survey work, studies and ongoing monitoring
- Commencement of ongoing consultation
- Assessment of the generic effects of marine renewable devices on the marine environment
- Recommendation of generic mitigation measures to avoid, reduce or offset any significant adverse effects on the environment
- Documentation of findings from the REA (scoping and environmental reports, public consultation documents, and internal discussion papers)
- Information that may be used in the development of a separate Marine Spatial Plan for Guernsey

1.5. Topics Covered

The following topics, or specialist fields of enquiry, were considered by the REA:

Table 1.1 – List of topics covered in the REA

REA chapter	Title
	Physical Marine Environment
4	*Geology*
5	*Marine Processes*
6	*Water Quality*
	Marine Biological Environment
7	*Benthic Ecology*
8	*Pelagic Ecology*
9	*Birds*
10	*Marine Mammals*
	Marine Human Environment
11	*Commercial Fisheries and Mariculture*
12	*Recreational Fishing*
13	*Marine and Coastal Historic Environment*
14	*Existing Submarine Cables, Electrical Grid and Connectivity*
	Shipping and Navigation
15	*Tourism and Recreation*
16	
	Other Topics
17	*Noise*
18	*Air Quality*
19	*Landscape and Seascape Character*

It was considered important that appropriate skills and experience was brought to bear in the production of the REA. Wherever possible, specialists were sought from within Guernsey or elsewhere in the Channel Islands, whether from the various States departments, or local consultants. If appropriate experience was not available on-island, then certain topics were covered by relevant UK academic organisations or consultants. In this way, knowledge gained in the production of the REA could be retained within Guernsey as much as possible. A full list of authors is provided in Appendix A.

1.6. Structure of the REA

The REA contains 22 chapters. Chapters 1 to 3 set the context of the REA. They provide the background to the project and give the framework within which the REA is delivered.

Chapters 4 to 19 detail the assessments that have been made regarding the specialist environmental topics covered.

Chapter 20 provides a summary of the assessments made in the preceding chapters, and assesses the cumulative impacts that may be presented by multiple arrays of devices within the study area. It also considers the residual environmental effects that may continue after mitigation measures have been applied.

Chapter 21 presents an Environmental Action Plan (EAP) that can be taken forward into the planning and implementation of renewable energy developments. It also gives a Regional Monitoring Plan, which recommends future studies, investigations and survey work that should be undertaken in future phases.

Chapter 22 concludes the REA with the key messages that can be drawn from the analyses. It presents immediate actions resulting from the REA.

The REA is supported by a separate, Non-Technical Summary (NTS). The NTS document presents the information contained in the REA in a simplified and shortened form, so that the key messages can be effectively communicated to the public.

1.7. Scoping Summary

1.5.1. Scoping Consultation

In October 2009, GREC published a Scoping Document that presented proposals for the production of the REA. There followed a 6 week period of public consultation, finishing on 10th December. GREC received 19 responses from a variety of individuals and organisations. There was a consensus that the REA Scoping Report had been produced to a high standard, but there were a number of comments received regarding the detail of the Scoping Report, together with recommendations for modifications to be made. All of the feedback was collated and presented in a Consultation Report, which is available to download on the GREC website (www.guernseyrenewableenergy.com). After consideration, the authors found that they were able to incorporate most of the comments. Where key recommendations could not be accommodated, this is indicated in the summary below:

Development Scenarios – A number of comments encouraged a flexible approach to the interpretation of the 100-MW development scenario (see chapter 2). It was suggested that rather than a large number of smaller deployment sites, two larger arrays might present less impact. This approach was accepted by the authors of the REA. For further discussion of the cumulative effects, see chapter 20 of this REA.

Device Readiness – A number of device developers provided information, clarifying their progress with regard to prototype development and the timescales to deployment of multi-MW arrays.

Cost of Renewable Energy – Several correspondents gave their thoughts on the cost of renewable energy in comparison to conventional energy. They speculated on the provision of subsidies to support renewable energy production in advance of 'parity', the time when conventional energy costs rise to reach those of renewable energy. This is outside of the scope of the REA, but see also section 1.5.2 below.

Scope of REA vs SEA – A UK statutory authority made recommendations that the scope should be broadened to match that of an EU-style SEA. It also recommended that the study should consider the impacts from the development of offshore wind power. The REA authors considered that this would detract from their main purpose, namely to provide an assessment relevant to currently feasible, development proposals and local Environmental Impact Assessment (EIA) policy.

Zoning – Several respondents sought reassurance that the REA would not 'pre-judge' the allocation of deployment sites based entirely on the suitability of the marine energy resources. This is the case, and the determination of renewable energy zones will be undertaken as a completely separate task, and following on from the REA.

Cumulative Effects – It was requested that the REA should consider the cumulative effects in combination with existing impacting effects, such as sewage discharge and marine traffic. The REA authors considered that this would be too time consuming and would deflect attention away from the actual impacts of renewable energy, which is the focus of the REA. Existing impacts are considered as part of the current baseline situation. For further discussion of cumulative effects, see chapter 20.

1.5.2. Departures from the Scoping Report of October 2009

The following departures have been made from the proposals made in the Scoping Report.

Protected Sites and Species – The Scoping Document identified these as a distinct and separate topic area. However, after discussion with the authors of the REA, it was concluded that these matters would be covered best by integrating them within the other specialist chapters.

Electromagnetic Fields – The effects of electromagnetic fields (EMFs) are covered within the specialist chapters on marine mammals and pelagic ecology, and a separate chapter has not been required.

Social Aspects – The Scoping Report identified a separate chapter to cover social aspects. This would have covered potential impacts on energy tariffs, energy security, fuel poverty, employment, housing and education. However, during the production of the REA, the States of Guernsey initiated investigations into future energy policy, and it is anticipated that these will include all the matters previously identified to be included within this chapter. Therefore, in order to avoid prejudging the outcome of policy decisions, this chapter has been excluded from the REA. See also section 1.6 below.

1.8. Study Limitations

There are a number of items of general interest or concern that relate to the development of Renewable Energy Policy that, although beyond the scope of the REA, are being addressed through inter-departmental discussions within the States. It is fully acknowledged that the development of renewable energy cannot be carried out in isolation from the other areas of States policy that may be influenced by it. Examples are given below.

- General energy policy
- Energy security
- Instructions to the Office of the Utility Regulator on incorporation of renewable energy into the supply mix
- Feed-in tariffs
- Electricity demand management and grid usage
- Ports and docks, and economic development
- Environmental policy
- Marine Spatial Planning, together with associated changes to planning and development laws
- The consenting of deposits at sea by the Health & Social Security Department (FEPA licences)
- Carbon taxation
- Domestic supply of electricity versus export
- Social policy (vulnerable users and fuel poverty)
- The creation of jobs
- Education
- Health and Safety policy and legislation

Furthermore, the following points should be considered when reading the REA:

- There are gaps in our knowledge of the marine environment. The study area is extensive and there is a limited amount of information available for certain topics and locations. For example, the location and populations of Benthic (sea-bed) species is generally poorly understood.
- There are many types of marine renewable energy devices. These range in their development stage from concept, through prototype/demonstrator, to pre-commercial. For this reason, the study has focused on the characteristics which are common to each type of device. Marine renewable energy devices will be improved as new technologies are rapidly developed over the next decade.
- Our knowledge of the effects of the devices on the environment is not well understood for some topics, such as the noise impacts of devices on fish, birds and mammals.
- Given the above limitations, there are further uncertainties over the cumulative effects of two or more device arrays in any given area.
- The actual locations of wave and tidal power arrays have not been determined. The REA has focussed on generic impacts.

It should be noted that the REA is not being carried out to enable the direct licensing of potential sites. The identification of potential energy-resource sites does not imply the ready consent of applications to deploy devices: any such applications would have to be considered on their merits.

The production of the REA will not relieve developers of their responsibility to provide project-specific Environmental Impact Assessments (EIAs) in support of environmental consent applications. It is likely that these will require the preparation of Environmental Statements, together with more detailed investigations, including surveys.

The REA is predominantly a desk study. Very little new survey work has been undertaken within its scope. Therefore, there remain a number of gaps in the baseline data after the REA's production. These gaps will be addressed either by GREC to enable zoning of potential deployment areas, or by developers during the investigative work necessary to complete their own project-specific Environmental Impact Assessments (EIAs).

The REA has not considered the economic viability of the development and use of Marine Renewable Energy on Guernsey; however, this is being explored through separate workstreams by the States and in support of the discussions on Policy as listed above.

2. Project Description

2.1. Project Overview

The States of Guernsey's Energy Policy Report of June 2008 recommended the formation of the Guernsey Renewable Energy Commission (GREC) to progress the creation of local renewable electricity generation on a large (macro) scale.

GREC has undertaken investigations into renewable energy and has promoted marine renewable energy development within the territorial waters (to three nautical miles of the shore) of the islands of Guernsey, Herm and Sark.

A Projet de Loi was presented to the States in June 2009 to establish GREC as the consenting body for the management of marine renewable energy deployments.

Initial studies into the waters surrounding the Channel Islands, such as the Tidal Stream Resource Assessment prepared by Robert Gordon University (Appendix C), demonstrate that there is a potentially valuable resource in the waters around Guernsey, Herm and Sark.

As described in section 1, a key aspect of GREC's work is the production of this Regional Environmental Assessment (REA) to examine the likely environmental effects from the development of wave and tidal power production. The REA is a strategic study that will underpin the development of marine environmental planning policy.

In collaboration with the government of Sark, and with technical specialists from Guernsey and the UK, who have formed the Guernsey Renewable Energy Forum (GREF), GREC has now completed a draft of the REA. This REA has been prepared for the purpose of consultation with the public, technical specialists and stakeholders.

The purpose of the REA is not simply to inform policy makers and the public of the possible environmental impacts of pursuing such targets. The important value of the REA is in its use as a tool to manage environmental risk, so that appropriate mitigation measures can be applied, and Guernsey and Sark can properly benefit from the reductions in greenhouse gas emissions and the security of supply that would be afforded by marine renewable energy.

GREC plans to hold a public consultation on the contents of this REA, and then to undertake additional surveys prior to the selection of renewable energy deployment zones.

Before the formal allocation of specific sites can occur, it is considered necessary that selected developers should be allowed access to the sites for a period in order

to undertake further environmental surveys and investigations. This would allow the developers to confirm the attributes of a specific area before completing a detailed EIA in support of their environmental consent applications.

This assessment will allow GREC to identify, at the earliest opportunity, any potential conflicts between a strategy for supporting marine renewable energy and other environmental sensitivities. It is intended that this knowledge will allow the proper planning of the marine renewable energy industry in Guernsey's waters.

2.2. An introduction to Renewable Energy in Guernsey's Waters

2.2.1. The Drivers for Renewable Energy

There are six key reasons for Guernsey to adopt a renewable energy strategy:

- To reduce the amount of CO_2 the island produces
- To reduce chemical and particulate pollution
- To meet the targets and legislation of the Kyoto Protocol and the States of Guernsey's 2008 Energy Policy Report
- To increase the security of the island's electricity supply
- To become a centre of excellence in marine renewable energy devices
- For the economic benefits of becoming an electricity exporter

2.2.2. Renewable Energy Policy

The Kyoto Protocol is the landmark treaty adopted by many nations around the world to address concerns regarding Climate Change. It is designed to reduce the emissions of greenhouse gasses (GHGs). The UK adopted the Kyoto Protocol in 1997, and in 2000 Guernsey was added to the UK ratification of the Protocol.

The UK has been set targets to reduce GHG emissions by 12.5% on 1990 levels by 2012 and, as Guernsey is included in the ratification, its emissions are counted as part of the UK total. While Guernsey is only required to be a part of the UK's total reduction of 12.5% (on 1990), the States of Guernsey are committed to reducing the island's own emission by this amount.

In June 2008, Guernsey's Energy Policy Group produced the Energy Policy Report. This set out targets of reducing CO_2 emissions by 30% on 1990 levels by 2020,with an aim of achieving a reduction of 80% on 1990 levels by 2050. In addition to this, the report highlighted a commitment to generate 20% of Guernsey's electricity

from local renewable sources by 2020. The targets were 'noted', but not formally adopted. However, they are seen as realistic and practical targets for Guernsey. This 30% reduction in CO_2 emissions would put Guernsey in a comparable position to the UK's current reduction targets (the UK Low Carbon Transition Plan, July 2009) for 2020 emissions (34%).

Guernsey does not follow any other European, or UK Directives, or targets on climate change, renewable energy or Environmental Assessment. This is because Guernsey is not a normal member of the European Union and has its own government that is independent of the EU and the UK's Government.

It is widely considered that the introduction of the electricity supply cable from France (via Jersey) to Guernsey has resulted in reduced CO_2 emissions from Guernsey's energy consumption. Guernsey is moving towards increasing its electricity import in order to meet 2012 commitments; however, due to market prices and Guernsey Electricity Ltd (GEL)'s current obligation to provide electricity at the cheapest rate, Guernsey is generating part of its electricity from fossil fuels rather than relying entirely on imported continental electricity. As a result, 2006 emissions were higher than those of 1990. This has led to the need for actions to be taken to reduce GHG emission from electricity production.

The introduction of renewable energy to Guernsey should improve the security of the island's electricity supply and, in the long term, its price. In addition, renewable energy has the potential to make Guernsey an electricity exporter because of the anticipated high demand for renewable energy offshore and the relatively small consumption on the island.

Work is currently being undertaken to establish more detailed policies relating to the selection of renewable energy sites and the allocation of these to appropriately qualified developers. Policy is also needed to establish a payment mechanism for renewable energy, which could be used in either domestic or overseas markets.

2.2.3. Commercial Sites versus Test Sites

As mentioned previously, there are a large number of wave and tidal devices that are still in the stages of development. The implication of this is that a number of developers may be looking for test or demonstration sites rather than commercial developments.

The aim of the REA is to assess the effect on the environment from commercial-scale marine renewable energy devices. Test and demonstration developments do not generate significant amounts of electricity as a rule. In the UK, there has already been significant public-sector investment in order to create test demonstration sites in the Orkney Islands and at the Wave Hub facility in Cornwall.

To help meet Guernsey's renewable energy targets, the focus of the REA has been on the development of large commercial sites. GREC is not looking for companies to test or develop designs for wave or tidal devices in its waters. GREC intends to only accept proposals from developers with a pre-tested, working device, with arrays that would contribute electricity to the Guernsey grid or to overseas markets.

2.3. Renewable Energy Devices and their Operating Requirements

2.3.1. Introduction

The area of study for this REA covers the territorial waters (within three nautical miles of the shore) around Guernsey, and Sark. The other boundaries to the study are the oceanographic parameters under which current tidal and wave technologies are intended (and able) to operate in. The technologies include:

- Wave energy devices, such as overtopping, hydraulic and air-driven devices, which would be sited on the shoreline, near-shore or offshore
- Tidal stream energy, such as turbine technology and oscillating devices, which would be sited at locations of strong tidal flows

GREC has met with developers of marine renewable energy devices to learn about the operating characteristics of the devices and their potential environmental effects. Developers have also been invited to join GREF in order to continue to offer their advice. In addition, a pre-feasibility study has been prepared to provide technical inputs to the REA (see Appendix E).

2.3.2. Tidal Energy

Tidal-flow energy has developed in a number of ways.

Horizontal-axis turbines work in the same way as wind turbines, but are driven by the flow of water rather than air. As the density of water is much higher than air (over 800 times), the turbines experience larger forces, which allows for smaller rotor diameters.

Vertical-axis turbines also exist, but until recently there has been a lack of prototype examples. These have the advantage that they use up less water depth than similar sized horizontal-axis devices.

Oscillating hydrofoils work by the tidal current flowing either side of the wing, resulting in its lift. The lift effect can be applied in the opposite direction because the hydrofoil changes its angle through its oscillating cycle. The motion can then be used to drive fluid in a hydraulic system, and is converted into electricity by a small

hydraulic turbine. The motion can either be in an up-and-down plane , or side-to-side.

Venturi-effect devices work through a funnel-like collecting device within a duct. This sits in the tidal stream and concentrates the flow through, or past, a turbine or other generator system.

Technologies for tidal-stream energy devices generally require current speeds to reach approximately 2.5m/s at peak spring tides. Lower speeds can become uneconomical, whilst speeds that are too high may pose risks to the devices. There are some limitations on the depth of water in which these devices can be sited, although this technology can exploit shallower waters.

Tidal energy devices can be broadly divided into shallow or deep-water devices. However, there are no clear, differentiating criteria because some devices can be altered in size to allow the extraction of power from deeper waters. Additionally, the system for fixing the devices to the sea-bed can be altered to allow for varying environmental conditions.

The common methods of attachment of devices to the sea bed are:

- Sea-bed mounted – the device is attached to the sea-bed around its base
- Gravity base – the device is fixed by a massive weight, which may have additional fixing
- Pile mounted – the device is attached to a pile penetrating the sea floor
- Floating –
    - Flexible mooring – the device is tethered to the sea-bed allowing freedom of movement
    - Rigid mooring – the device is secured using a fixed system
    - Floating structure – the device is mounted to a platform that can move in relation to changes in sea level;
- Hydrofoil-inducing downward-force – the device has a number of hydrofoils mounted on a frame to induce a downward force from the tidal flow

It is important to note that the REA has not assessed the environmental effects of any individual device, but has instead focused on general device types.

2.3.3. Wave Energy

There are a variety of devices utilising different methods to harness wave energy; converting their movement in response to wave action into electrical energy.

Attenuator (hinged floating surface devices) – Energy is produced by the motion of the jointed sections of an extended structure. This is generally a floating device, which is aligned parallel to the wave direction.

Point absorber – Energy is absorbed in all directions by the device with power generated in one of a number of forms. This is generally a floating structure with its motion restricted by a mooring system.

Oscillating wave surge converter – Energy is produced by wave surges. The movement of water particles oscillates an arm on a mounted pivot joint. These are generally bottom-mounted devices.

Oscillating water column (OWC) – Water pressure is used to drive air through turbines. The device is partially submerged with an open "collector" below the water surface, which allows wave water to enter and exit the device. This wave action moves the air through a turbine in both directions because of changing pressure. The turbine generally rotates with air flowing both ways. The rotation of the turbine is used to generate power.

Overtopping devices – Water is directed from waves into a reservoir above sea level. This sometimes has collectors to concentrate the wave energy. The water is then returned to the sea through turbines beneath the reservoir, which generate power.

Submerged pressure differential – The motion of the waves causes the sea level to rise and fall above the device, resulting in pressure changes. The device responds to the alternating pressure by pumping fluid through a system and generating electricity. These devices are typically located near shore, attached to the sea-bed.

Wave rotors – These are a form of turbine driven by waves. They are generally bottom-mounted devices located near shore.

It is important to note that the REA has not assessed the environmental effects of any individual device, but has instead focused on general device types.

Wave energy devices generally require significant wave heights (at least 1.5 meters). The amount of power produced increases with wave height until the device reaches its maximum capacity. Above this, no additional wave energy can be captured by the device, but the stresses on the device and mooring systems increase.

2.4. Development Scenarios

A small number of development scenarios have been devised. These scenarios reflect the potential size of the marine energy resources that exist within the waters around Guernsey, as well as Guernsey's targets for renewable energy. A feasibility study has been produced in support of the REA to act as a technical reference for environmental specialists in the delivery of their analyses.

There is a good opportunity for renewable energy to be developed in the waters around Guernsey in terms of its geographical location, available device types and likely future technologies and improvements. The path that the industry is likely to take consists of three key stages:

- Installation of prototypes
- Development of small arrays
- Commercial farms

Currently the majority of the tidal power industry is at the design stage, with some companies being at the prototype stage of development, and a few companies having created working small scale devices. Only a few full scale models have been constructed and are providing power. Wave technology is at a similar stage, although slightly more advanced, with more companies having full commercial-scale models providing power to the grid. However, the focus of this REA is on commercial developments and as such it is not looking at providing a test facility.

Giving consideration to the outline resource assessment provided at the time, two potential development possibilities were defined in the REA scoping report.

Firstly, a maximum development; and secondly, the minimum development required to meet the proposed targets for 2020 (approximately 100MW installed capacity).

- **Maximum development scenario (230MW) -** this would utilise the resources to a maximum potential, and could include several large (>40MW) arrays. These could be located at sites that benefit from high velocity tidal flows such as the Big Russel, to the north of Guernsey and to the south-east of Sark, together with a number of wave energy arrays to the north-west of Guernsey

The originally proposed minimum development scenario (comprising up to 100MW) indicated up to six separate small sites, as shown in the Scoping Report of

October 2009. However, feedback received from the public consultation, and information emerging from the further work by Robert Gordon University into the available tidal-energy resource, caused the authors of the REA to reconsider the minimum scenario. It was considered that a reduced environmental impact would result if the minimum scenario were to comprise a smaller number of larger arrays, but with the same total installed capacity. Therefore, the revised minimum scenario is :

- **Revised minimum development scenario (100MW)** - This allows for the minimum deployment that would meet Guernsey's renewable energy targets in the medium term future, and would require two 50MW tidal arrays.

The development scenarios did not specify actual development sites, as it was considered that to do this would have pre-judged the results of the REA, and prevented the authors from giving consideration to the sensitivities that exist throughout the whole of the study area. Site selection or 'Zoning' will be undertaken on completion of further strategic investigations and consideration of policy.

The purpose of considering a range of scenarios was to identify if there were any clearly defined thresholds in the scale of development, beyond which a large and unacceptable environmental impact would be caused. To reflect this, the authors were asked to remain vigilant to the occurrence of such thresholds within their specialist investigations and across disciplines. For further discussion, see Chapter 20 of this REA, which considers cumulative impacts.

The above development scenarios were assessed in terms of the significance of the effects on each of the environmental topics defined in Chapters 4 to 19.

Different device technologies require different footprint areas and space between devices for deployment and safe effective operation. However, to allow the visualisation of the likely footprint of the arrays that could be deployed, the following was used:

Example tidal array:

A 50MW array, comprising up to 50 individual devices, would be expected to occupy approximately 0.5km^2 of the sea-bed. The array would probably be arranged as two to four lines of devices, aligned at 90 degrees to the primary flow direction.

Example offshore wave array:

A 20MW array deployment area, comprising up to 50 individual point absorber (buoy) devices, or a smaller number of larger devices, would be expected to occupy approximately 8.0km^2 of the surface of the sea, including the space between the devices. This array would probably be arranged as a 2 x 4 km rectangle, aligned so

that the longest edge of the deployment area would face the primary wave direction.

Associated Infrastructure:

Any type of energy-generation array will need to be connected to an electricity demand in order for it to generate useful energy and for charges to be made for that energy. This is achieved by electricity export-cables (150-300mm in diameter) laid along the surface, or buried under, the sea-bed. The cost and technical challenges associated with the deployment of cables are significant within the overall business of managing an array and the disturbance caused by cable laying activities can contribute significantly to the overall impact of a project on the seabed.

An array may include sub-sea equipment to achieve a satisfactory connection between the individual generator devices and the main export cable to shore.

Onshore infrastructure components will also include landfall arrangements to cross a beach or foreshore, filtering and control equipment, and connection to the local grid.

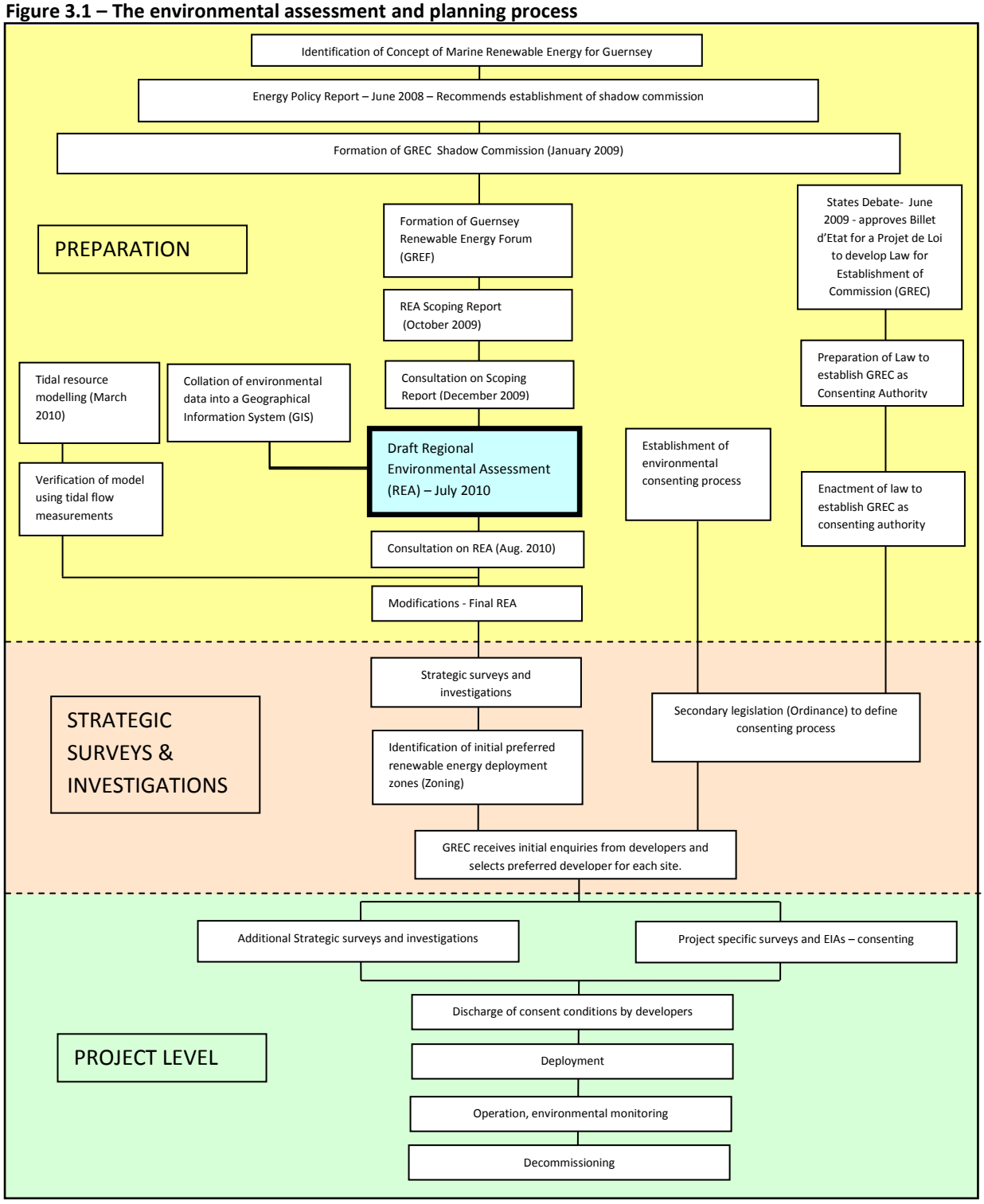
For further information on cables and other infrastructure, reference should be made to Appendix E – Pre-Feasibility Technical Report.

3. The Environmental Planning Process

3.1. Overview

The development of the REA fits within a strategic process to identify, assess, monitor and control environmental impacts from marine renewable energy, as shown below:

Figure 3.1 – The environmental assessment and planning process



The REA (this document) is a key stage in that it is the first major item of environmental assessment work. It will act as the main vehicle for the public's engagement with the idea of developing renewable energy facilities in the seas around Guernsey. The information contained in this REA will feed into important future activities that are necessary for the effective planning of projects. Some of these activities are described later in this chapter.

The Energy Policy Report of June 2008 recommended that the States should investigate targets to firstly, reduce emissions of carbon dioxide by 30% on 1990 levels by 2020, and by 80% by 2050; and secondly, to generate 20% of electricity from local renewable sources by 2020.

The purpose of the REA is not simply to inform policy makers and the public of the possible environmental impacts of pursuing such targets. The important value of the REA is in its use as a tool to manage environmental risk, so that appropriate mitigation measures can be applied, and Guernsey and Sark can properly benefit from the reductions in greenhouse gas emissions and the security of their electricity supplies that would be afforded by marine renewable energy.

3.2. The REA Process

3.4.1. The REA Framework

As described in the REA Scoping Report (October 2009), the following framework provides an outline to the approach of the REA. The REA framework is divided into four parts:

A. Establishing the scope of the REA

B. Assessing the effects of the marine renewable energy devices

C. Producing the environmental report

D. Consulting on the results of the REA

The production of this REA report signifies completion of Stages A to C above. For further information on the process, reference should be made to the REA Scoping Report and Appendix D.

The remaining stage of the REA process, Stage D - Consultation, will follow the release of the draft REA, as shown below.

3.4.2. Consulting on the Environmental Report (Stage D)

The tasks to be undertaken in this future stage are described in table 3.4.

Table 3.4: Framework for consulting on the environmental report

Task	Description
Task D1: Consult on the Draft Environmental Report	▪ Consult the regulatory bodies, stakeholders, academics, commercial organisations, community groups and members of the public
Task D2: Respond to Consultation Exercises	▪ Provide advice to the States of Guernsey, GREC and GREF on the consultation processes and how they affect development of the renewable strategy for marine energy. ▪ Identify how the consultation responses can enhance the REA process
Task D3: Informing the Development of Policies	▪ Provide advice and support to assist with the renewable strategy and planning guidance for marine energy developers ▪ Provide advice and support to inform development and implementation of other initiatives
Task D4: Client and REA Steering Group Feedback	▪ Produce a Post-Adoption Statement documenting how the findings from the REA process have been used to inform and support the development of the renewable strategy for marine energy and planning guidance for marine energy developers

3.3. Marine Spatial Planning and Zoning of Renewable Energy Deployment Areas

As is described in the concluding chapters of the REA, In order to successfully mitigate numerous potential environmental impacts, renewable energy deployment sites should be chosen very carefully. This should consider not only the extent, strength and suitability of the energy resources available, but also other legitimate uses of the sea, together with ecological sensitivities.

In the UK, there is much interest in a developing specialism known as Marine Spatial Planning. DEFRA has suggested that the definition of Marine Spatial Planning should be: “A strategic plan for regulating, managing and protecting the marine environment that addresses the multiple, cumulative and potentially conflicting uses of the sea".

The Scottish Coastal Forum (SCF) gives marine spatial planning the definition as: "Two fold: (a) to secure sustainable and integrated development which balances and, where appropriate advances, economic, social and environmental objectives, and considers the implications of the ecosystem approach; and (b) to allocate space in inshore waters in a rational manner which minimises conflicts of interest and maximises synergistic relations".

This REA has collated available environmental data and stored it on a Geographical Information System (GIS). This allows presentation of spatial data quickly and effectively by allowing layers containing specific data to be selectively displayed and printed. These tools will allow the most powerful marine energy resource areas to be overlaid with environmental data to determine the best deployment areas. While useful to the important task of the zoning of renewable energy deployment areas, the GIS overlaying will not be, in itself, a Marine Spatial Planning activity.

Therefore, it is proposed that the REA's data will be used as the basis of a formal Marine Spatial Planning project to be taken forward separately from the work of GREC. It is anticipated that this planning project will be progressed in Guernsey by the Environment Department of the States of Guernsey and will require extensive consultation between departments within the States of Guernsey and with the public.

The Marine Spatial Planning project should aim to establish priorities for the use of various areas of the sea around Guernsey. The delivery of this REA is in no way dependent on the completion of a Marine Spatial Plan.

3.4. Licensing and Consenting Process for Marine Renewable Energy

3.4.1. Territorial Waters

The deployment of marine renewable energy devices within Guernsey's territorial waters currently requires a licence or consent for:

- The placement of a structure in the sea
- Site leases

Under the Food and Environmental Protection Act (FEPA) (Guernsey) Act 1987 - Deposits in the Sea, a licence is required for the placement of any marine structure (or any 'deposit') within Bailiwick waters. The issuing of the licence considers the need to protect the marine environment, the effects on human health, and prevent interference with legitimate uses of the sea. As well as this, licences may be revoked should there be any perceived breaches to the terms of the licence.

The sea bed and waters around Guernsey and Sark belong to the Crown, represented by The Queen, as the Duke of Normandy. Throughout the coastal waters of the UK, this is managed through the Crown Estate. However, the Crown Estate does not extend to the Channel Islands, and leasing of the sea bed is arranged through Her Majesty's Receiver General (HMRG) in the States of Guernsey.

There is a Coastal Protection Act in Guernsey, but this does not reflect the content of the UK Coastal Protection Act and there is no directly equivalent legislation in

place. Currently, an equivalent CPA development licence is not required in Guernsey.

The Pollution Act (2004) controls potentially polluting activities on land, and it is planned that this will be extended to the seas around Guernsey.

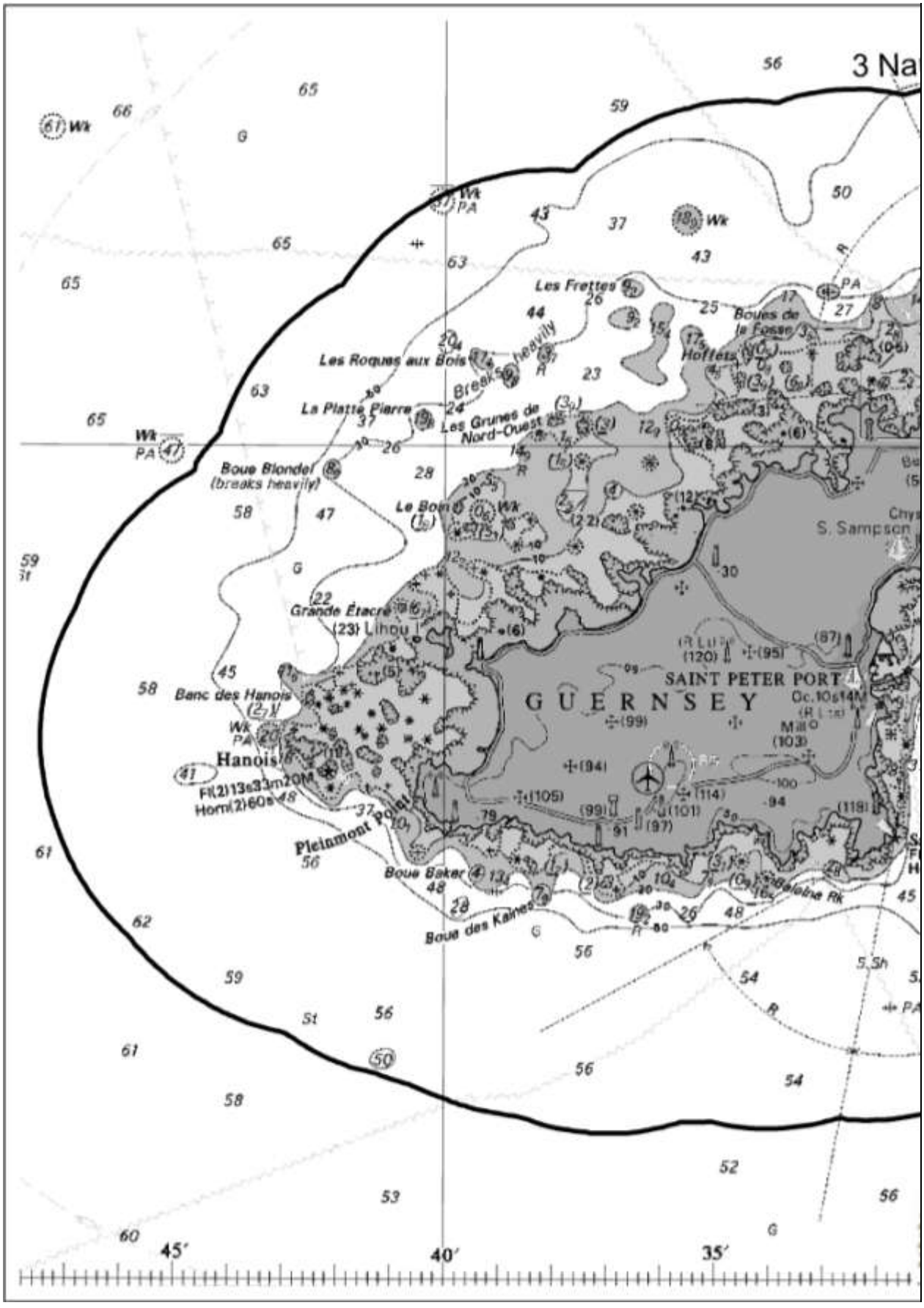
In the UK, maritime safety is managed by the Marine and Coastguard Agency (MCA), with support from key stakeholders such as Trinity House (lighthouses, marking and lighting) and the Chamber of Shipping (representing owners and operators of vessels). On Guernsey, these roles are undertaken directly by the Harbourmaster.

It is clear that, although some aspects of the deployment of devices could be covered by existing legislation, there remain significant gaps in the current legislation. Therefore, draft primary legislation has been prepared to allow GREC to control and provide environmental consent for Marine Renewable Energy Developments. This is expected to be enacted in Spring 2011. GREC will coordinate with the Health and Social Services Department (HSSD), the Environment Department and the Harbourmaster where its activities overlap with current legislation to provide a single point of contact for developers.

Further to this, secondary legislation (ordinance) will be prepared to define the detail of the consenting process. A draft environmental consenting procedure has been established by GREC, which may be used as the basis of the ordinance.

3.4.2. Beyond Territorial Limits

There is currently no legislation in Guernsey relating to the production of energy by wind and water-driven generators outside of the three-nautical-mile territorial limit. Guernsey is looking to extend the territorial limits to 12nm. However, at this time, the area beyond three nm around Guernsey, Herm and Sark has not been considered by the REA.


3 Na
GUERNSEY
SAINT PETER PORT
S. Sampson
Les Frettes
Les Roques aux Bois
La Platte Pierre
Les Grunes de Nord-Ouest
Boue Blondel
(breaks heavily)
Le Bon
Grande Étacre
(23) Lihou
Banc des Hanois
Hanois
Fl(2)13s33m20M
Horn(2)60s
Pleinmont Point
Boue Baker
Boue des Kaines
Boues de la Fosse
Hoffetz
Oc.10s14M
Mill
Wk
PA
Heavily
Breaks
45'
40'
35'