



ENVIRONMENTAL MANAGEMENT PLAN

Deliverable n°: D7.7



EC-GA n°

295977

Project full title:

Demonstration of a floating wind turbine system for power generation in Mediterranean deep waters

Deliverable N° D7.7

Document name: Environmental Management Plan

Responsible Partner: RSK

Due Date of Deliverable: February 2018

WP: 7

WP leader: RSK

Task: W7.7

Task leader: David Watson

Version: 00

Version date: 2018

Written by: Anastasia Polyakova /Angela Lowe

Checked by: Rachel Bendell

Approved by: David Watson

Dissemination level: PU

Document history:

Version	Date	Main Modification	Written by	Checked by	Approved by
00	February 2018	Draft Issued for Review	Anastasia Polyakova/Angela Lowe	Rachel Bendell	David Watson
01	2018	Final			

TABLE OF CONTENTS

1. Executive Summary	3
2. Definitions.....	4
3. Introduction	5
3.1 PURPOSE OF THE EMP	5
3.2 SCOPE OF THE EMP	6
3.3 ENVIRONMENTAL MANAGEMENT INTERFACES.....	7
4. Project Information	8
4.1 PROJECT DESCRIPTION	8
4.2 SITE LOCATION	9
4.3 PROJECT PROGRAMME	11
5. Policy, Legal and Administrative Framework	13
5.1 APPROVAL CONDITIONS.....	13
5.2 COMPULSORY LICENCES (NON-EXHAUSTIVE LIST)	13
5.3 INTERNATIONAL GUIDELINES.....	15
6. Roles and Responsibilities.....	16
7. Environmental Specifications: Detailed Design Phase	18
7.1 DETAILED DESIGN OF THE PROTOTYPE	18
7.1.1 GENERAL REQUIREMENTS	18
7.1.2 SAFETY FEATURES	18
7.1.3 FURTHER SECURITY REQUIREMENTS	18
7.2 MICROSITING.....	19
7.2.1 GEOPGYSICAL REVIEW	19
7.2.2 CULTURAL HERITAGE REVIEW.....	20
7.3 PROJECT SCHEDULE.....	20
7.4 TRANSPORT ROUTE	21
7.5 ADVANCE NOTICE TO PUBLIC.....	21
8. Environmental Specifications: Assembly and Installation	22
8.1 ONSHORE ENVIRONMENTAL MANAGEMENT	22
8.1.1 SHIPYARD ACTIVITIES	22
8.1.2 FABRICATION OF CONCRETE FLOATING PLATFORM.....	22
8.2 COMMUNITY RELATIONS AND NOTIFICATIONS	23
8.3 GENERAL REQUIREMENTS FOR VESSELS	24
8.4 NAVIGATIONAL SAFETY	24
8.5 MARINE POLLUTION PREVENTION	25
8.5.1 AIR EMISSIONS	25
8.5.2 NOISE AND VIBRATION	25
8.5.3 FUEL AND CHEMICAL STORAGE AND HANDLING.....	26
8.5.4 OIL SPILL CONTINGENCY PLAN.....	26
8.6 MANAGEMENT OF OFFSHORE WASTES AND DISCHARGES.....	27
8.6.1 SOLID WASTE	27
8.6.2 VESSEL DISCHARGES	27
8.7 SCOUR PROTECTION MANAGEMENT PLAN.....	29

8.8 MARINE ECOLOGY	29
8.8.1 PHYTOPLANKTON.....	29
8.8.2 MARINE MAMMAL MANAGEMENT	29
8.8.3 INVASIVE SPECIES.....	30
8.8.4 ECOLOGICAL MONITORING.....	30
8.9 CULTURAL HERITAGE MANAGEMENT	30
8.10 EMERGENCY RESPONSE PLAN	31
9. Environmental Specifications: Operation (Testing)	32
9.1 COMMUNITY RELATIONS	32
9.2 NAVIGATIONAL RESTRICTIONS.....	32
9.3 MARINE POLLUTION PREVENTION	33
9.4 WASTE AND DISCHARGES MANAGEMENT	33
9.5 SCOUR PROTECTION MANAGEMENT PLAN.....	33
9.6 MARINE ECOLOGY	33
9.7 EMERGENCY RESPONSE PLAN	33
10. Environmental Specifications: Decommissioning	34
10.1 GENERAL REQUIREMENTS.....	34
10.2 EMERGENCY RESPONSE PLAN	35
11. Environmental Monitoring Programme	36
11.1 GENERAL REQUIREMENTS.....	36
11.2 PRE-CONSTRUCTION SURVEYS	38
11.2.1 ESTABLISHING BASELINE CONDITIONS.....	38
11.3 INSTALLATION MONITORING	38
11.3.1 SHIPYARD RUNOFF MONITORING	38
11.3.2 MARINE MAMMAL OBSERVATION	38
11.3.3 SEDIMENT SUSPENSION MONITORING	39
11.3.4 POST-INSTALLATION SURVEY	39
11.4 DECOMMISSIONING MONITORING	39
11.5 REPORTING	39
11.6 KEY PERFORMANCE INDICATORS	39
12. Environmental Awareness and Training	41
13. Verification Inspections and Audits	42
14. Action Tracking System (ATS)	43
15. Record Keeping.....	44
16. References.....	45
Appendix A: Environmental Mitigation Measures and Commitments	46
ENVIRONMENTAL MITIGATION MEASURES.....	46
ENVIRONMENTAL COMMITMENTS.....	47

1. EXECUTIVE SUMMARY

The Executive Summary will be completed in the Final version of Deliverable D7.7, this draft of D7.7 contains few differences from D7.5.

2. DEFINITIONS

ATS	Action Tracking System
Contractors	includes any construction and maintenance contractors and their subcontractors
EBRD	European Bank for Reconstruction and Development
ECN	Ecole Centrale de Nantes
EIA	Environmental Impact Assessment
EHS	Environment Health and Safety
IFC	International Finance Corporation
IMO	International Maritime Organisation
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978
MEC	Marine Energy Converter
MMO	Marine Mammal Observer
OSCP	Oil Spill Contingency Plan
Project	Assembling, installing, testing and dismantling of the FloatGen prototype
Prototype	(in the context of FloatGen project) a demonstrator floating Vestas V802MW wind turbine installed on Ideol's ring-shaped floating foundation, installed at SEM-REV test site
SEM-REV	offshore test site 12 nautical miles off the coast of Le Croisic, France, operated by ECN
SOPEP	Ship Oil Pollution Emergency Plan
UXO	Unexploded Ordnance

3. INTRODUCTION

Deliverable D7.7 provides an update of the Environmental Management Plan following the installation and a short period of operation of the Floater. Using observations made during the installation and operational periods the information requested in the Questionnaire has updated to reflect the effects which floating wind turbines may have on the environment, that had not previously been considered. Data on these same parameters are then also collected for other offshore wind farm developments to allow comparison.

This deliverable is effectively an update of D7.5 which was issued before the installation of the Floater, hence in this draft of D7.7 (issued ahead of the reporting deadline for the FloatGen project, and ahead of installation) is very similar to the final version of D7.5.

3.1 PURPOSE OF THE EMP

The FloatGen project's objective is to demonstrate the technical and economic viability of floating wind turbines, which offer expansive developmental potential into previously unviable deep waters with untapped wind resources. A test site (SEM-REV) has been allocated by Ecole Centrale de Nantes (ECN) on the French Atlantic coast offshore from the city of Le Croisic, where a prototype floating wind turbine will be installed and tested. See more detailed description of the FloatGen project in Chapter 4 'Project Information'.

The FloatGen project is subject to SEM-REV facility requirements, presented in D4.5 'SEM-REV Test Site Requirements' (ECN, 2014) and mitigation measures identified in SEM-REV EIAs (CREOCEAN, 2010; 2013), summarised in Appendix A: Environmental Mitigation Measures and Commitments. In addition to which applicable local, national, European and international legislation and regulations, codes and practices that specify design, construction, operation and decommission requirements apply.

In particular, the goals of this EMP are to:

- help the FloatGen project:

- increase understanding of the marine environment surrounding the installed prototype
 - identify impacts on the marine environment
 - avoid, manage and mitigate detrimental environmental and social impacts
 - realise and enhance positive social and environmental impacts
- provide a mechanism for FloatGen project to achieve compliance with the SEM-REV test site requirements and legal obligations
- describe requirements that all Project personnel including Contractors shall meet, as applicable, to ensure that all relevant commitments made in the EIA are fully implemented.

As such, the objectives of the FloatGen EMP are to:

- summarise regulatory requirements
- allocate requirements and commitments into the project phases as described in the sections below
- describe how adherence to the commitments will be monitored and audited
- describe how non-conformances will be reported and addressed.

This EMP is a 'live' document and as such shall evolve as the project progresses; this adaptive approach is consistent with the continual improvement approach of ISO 14001, the international environmental management system standard.

3.2 SCOPE OF THE EMP

This EMP covers the following stages of FloatGen project, which are:

1. Detailed design
2. Installation (assembly at the shipyard, transportation to the mooring site, connection to export cable)
3. Operation (testing) and
4. Decommissioning.

Outside of the scope of this EMP are the following activities:

- design and fabrication of the wind turbine tower, nacelle and blades, dynamic cable, anchor, mooring lines and other components of the test prototype
- transportation of wind turbine components to and from the shipyard by road
- recycling or disposal of the prototype structures once they have been decommissioned and delivered back to the shipyard.

3.3 ENVIRONMENTAL MANAGEMENT INTERFACES

The regulatory requirements and commitments made in the offshore test site EIA are being managed by SEM-REV through the development of an Environmental Management Plan (SEM-REV EMP). FloatGen, as a user of the SEM-REV facility, shall comply with applicable requirements of the SEM-REV EMP into which the FloatGen EMP has been incorporated. The SEM-REV EMP covers both mandatory monitoring required to comply with consents and permissions, and complementary monitoring to research additional potential environmental impacts.

The mandatory monitoring covers the following environmental stressors and receptors: generation of noise; electromagnetic fields; benthic habitats and communities alongside the electrical cable and on the test site; record keeping of every product and material used; tracking in XYZ position (3D movements) of the electrical cable and its protective mattresses.

The complementary monitoring covers; the physio-chemical component (i.e. hydro-sedimentary dynamics, sediments quality, sacrificial anodes dissolution and water temperature increase); biological component (i.e. bio-fouling, fish and pelagic invertebrates, marine megafauna) and human components (i.e. sea usage and safety/security vs marine traffic).

4. PROJECT INFORMATION

4.1 PROJECT DESCRIPTION

The FloatGen project's objective is to demonstrate the technical and economic viability of floating wind turbines, which offer expansive developmental potential into previously unviable deep waters with untapped wind resources.

A schematic of the prototype floating wind turbine developed by French company Ideol is shown in Figure 4-1. The floating foundation of the turbine comprises a square-shaped concrete platform with a central opening attached to the seabed via anchors and catenary mooring lines. An adaptation of Vestas V80 2MW wind turbine is affixed to the floating foundation. A dynamic cable transmits the generated electricity to a sub-sea junction box, which passes the electricity onshore via a sub-sea static cable.

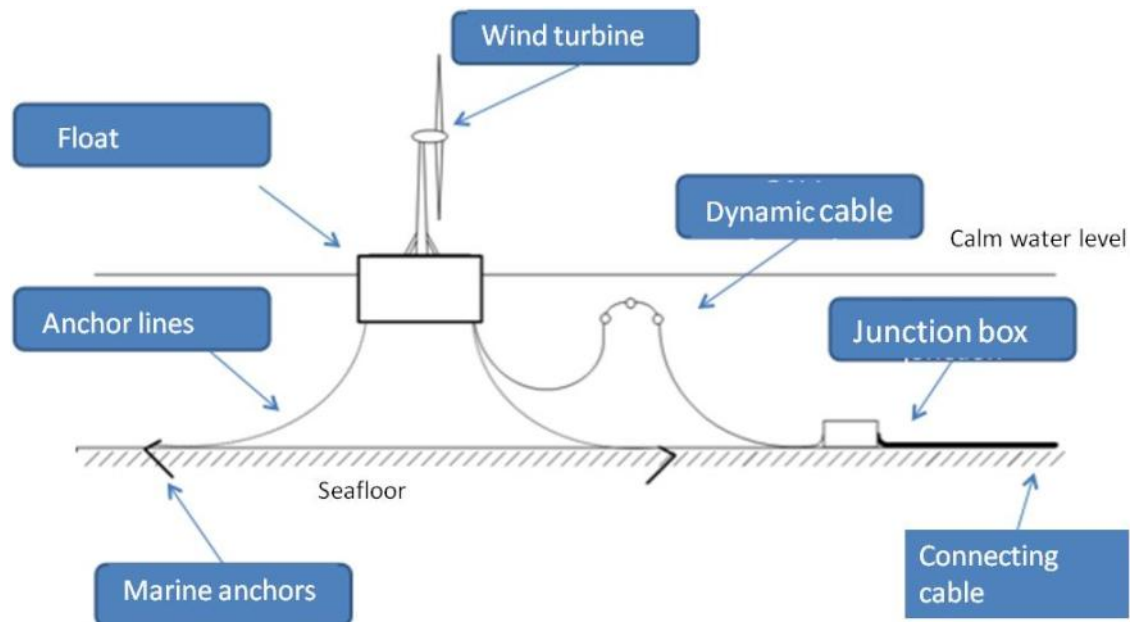


FIGURE 4-1: SCHEMATIC OF A FLOATING WIND TURBINE (CREOCEAN, 2013)

4.2 SITE LOCATION

A test site (SEM-REV) has been allocated by Ecole Centrale de Nantes (ECN) 12 nautical miles from the city of Le Croisic on the French Atlantic coast (Figure 4-2). The SEM-REV test site consists of a 1km² offshore zone in 33 -36 m deep water, a high voltage electrical export power cable, a subsea connection system, a dynamic cable, and an onshore electrical substation connected to the national grid. The demonstrator floating 2MW wind turbine will be installed at the SEM-REV site by Ideol in 2018 as part of the FloatGen project. Ideol's foundation was manufactured by Bouygues Travaux Publics in the port of Saint-Nazaire.

The site is also able to accommodate other floating marine energy converter (MEC) technology and other developers have applied to ECN to use the SEM-REV test site in the future. In 2017 two new technologies developed by Geps Techno and Pytheas Technology were selected for testing at the SEM-REV site.

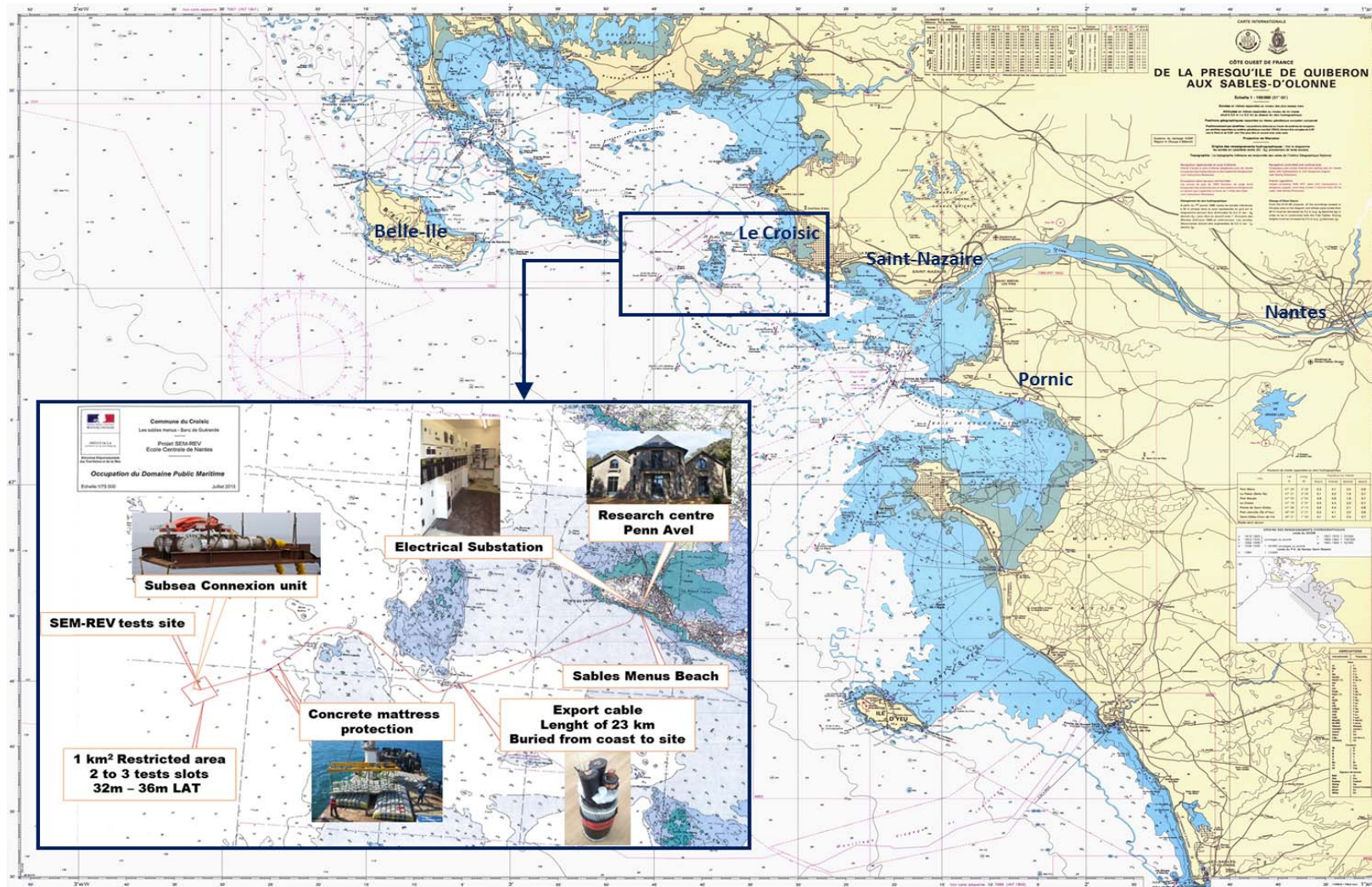


FIGURE 4-2: SITE MAP (BASE MAP: SHOM / FIGURE EDITING : CENTRALE NANTES)

4.3 PROJECT PROGRAMME

For the purposes of this EMP, the FloatGen project will entail the following activities:

1. Detailed design in accordance with test site requirements (ECN, 2014), including
 - a. Selection of mooring design
 - b. Selection of materials for system components
 - c. Design of dynamic cable connecting the MEC to the SEM-REV static export cable via the subsea termination unit, including the umbilical configuration and the corresponding ancillary equipment
 - d. Optimisation of installation timing
 - e. Seafloor surveys (e.g. geophysical (including: sonar, bathymetry and UXO data collection), geotechnical survey for anchor placement, cultural heritage, ecology, etc.)
 - f. Selection of biofouling coatings for sub-sea structures (if required)
 - g. Cathodic protection design (18 anodes installed on floater)
2. Installation
 - a. Fabrication of concrete floating platform at the port onto floating barges. Flooding in a dock to disengage the floating barges and floating platform towing back to quay
 - b. Installation of the turbine tower onto the platform, assembly of nacelle and blades onto the tower using onshore crane
 - c. Installation of anchors and mooring line using an anchor handling tug and a remotely operated underwater vehicle (ROV)
 - d. Installation of a dynamic cable using a cable lay vessel
 - e. Transportation of the floating wind turbine to the mooring site using tugboats
 - f. Connection of the floating turbine to moorings and dynamic cable
 - g. System test and commissioning
3. Operation (testing of prototype)
 - a. Testing routines and monitoring (mandatory and complementary monitoring and surveys as detailed in the SEM-REV EMP). Access by test operatives may be required but mostly completed remotely
 - b. Routine preventative maintenance carried out in accordance with manufacturer's recommendations every six months. Turbine accessed by a crew transfer vessel

- c. Unplanned maintenance in case of equipment failure on an ad hoc basis. For major repairs (e.g. change of gearbox) the structure (float and turbine) is disconnected from moorings and dynamic cable and towed back to port by a tugboat

4. Decommissioning

- a. Testing routines and monitoring (mandatory and complementary monitoring and surveys as detailed in the SEM-REV EMP). Access by test operatives may be required but mostly completed remotely
- b. Dismantling and removing the wind turbine and float and transportation to port using a tugboat
- c. Complete removal of all above seabed structures, including marine anchors, moorings and potentially dynamic cable. N.B. Several decommissioning options are being considered, it is possible the dynamic cable may remain in situ.

5. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

5.1 APPROVAL CONDITIONS

The FloatGen project will be managed in accordance with (non-exhaustive list):

- The applicable requirements of the approval for testing of wind turbines on the SEM-REV test site, as issued on the 23 December 2013 (2013/BPUP/099)¹ (see D7-4, Section 4.2)
- Arrêté n°2014/022 regulating the navigation, station-keeping, mooring, trawling, dredging and diving on the SEM-REV site and over a portion of SEM-REV export cable layout
- Arrêté du 13 novembre 2009: Decree taken by the prefect concerning the wind turbine marking application
- Arrêté n°2014/BPUP/001 approving the concession convention between ECN and the French Estate, concerning the use of a portion of the Maritime Public Domain in front of the “Le Croisic” municipality
- Décision ministérielle du 16 mai 2013: Ministerial decision taken the 16/05/2013 concerning the experimental wind turbine marking
- Generic environmental measures identified in the EIAs for the SEM-REV test site (CREOCEAN, 2010; 2013) (see Appendix A Environmental mitigation measures)
- Specific environmental commitments summarised in the ‘SEM-REV Test Site Requirements’ report (Deliverable n°: D4.5, 15 November 2014) (see Appendix A Environmental commitments)
- Any further specific regulation processes summarised in the ‘SEM-REV Test Site Exploitation Rules’ (Deliverable n°:5.3, 15 April 2015)
- The SEM-REV EMP.

5.2 COMPULSORY LICENCES (NON-EXHAUSTIVE LIST)

FloatGen is responsible for securing all applicable licences and shall provide a copy of these licences to SEM-REV prior to commencement of installation as stated in Section 6.2.5 of D4.5 SEM-REV Test

¹ Arrêté n°2013/BPUP/099: authorizes the Ecole Centrale de Nantes to extend the SEM-REV test site to include the use of Floating Wind Turbines offshore of the territory belonging to Le Croisic municipality.

Site Requirements (ECN, 2014). These mandatory licences include, but may be not limited to, the following:

1. Construction licence
2. Airfield licence: The MEC must meet the requirements of the Civil and Military Agencies for safety during transport to site
3. Maritime transport licence: the prototype must meet the requirements of the Maritime & Coastguard Agency and other regulatory requirements for navigational safety during transport to site and operation on site
4. Sea operation licence: the prototype must meet the requirements of the Maritime & Coastguard Agency and other regulatory requirements for navigational safety during its operation and comply with safety rules for offshore platforms
5. Decommissioning licence: a commitment to decommission the prototype in addition to securing financial resources to fund decommissioning
6. HSEQ management plan application: FloatGen shall return a signed version of the QHSE management plan provided by SEM-REV (included in the ECN deliverable D5.3)
7. For Ideol activities, a global FloatGen project HSE plan (reference G02-PL-HSE-7421-00) is in place
8. A project HSE plan will be issued by the installation contractor for the hook up and operation and maintenance phases
9. Other applicable legislation.

The project, all its contractors and subcontractors shall conduct their activities in compliance with national, European and international law. Of particular relevance to the project are:

- The water act (loi sur l'eau) relative to water protection is part of the environmental code (code de l'environnement) under article L214-1. Detailed rules for the application of this law are notified in article R 214-1
- International Convention for the Prevention of Pollution from Ships (MARPOL)
- International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention')

- United Nations Convention on the Law of the Sea (UNCLOS).

5.3 INTERNATIONAL GUIDELINES

Although not a commitment, the project shall endeavour to adopt, as far as practicable, the recommendations of the following international guidelines as a matter of good practice:

- International Finance Corporation (IFC) General Environmental, Health and Safety (EHS) Guidelines
- IFC EHS Guidelines for Wind Energy
- European Bank for Reconstruction and Development (EBRD) Environmental and Social Guidelines.

6. ROLES AND RESPONSIBILITIES

The following roles have been identified as key to the implementation of this EMP. Provisional description of their responsibilities in relation to environmental management is described below.

SEM-REV test site manager is responsible for:

- specifying requirements for users of SEM-REV site
- defining and implementing long-term environmental monitoring (mandatory and complementary) programme of test site and associated infrastructure. Scope includes static cable layout survey, cable electromagnetic field survey, protection mattress position survey, acoustic survey in accordance with the SEM-REV EMP
- control and recording of chemicals and materials used on site.

FloatGen project manager is responsible for:

- providing overall direction on environmental management and implementation in relation to the floating wind turbine
- ensuring adequate resources are available for implementation of this EMP.

FloatGen environmental manager is responsible for:

- securing all necessary permits and licences prior to commencement of each project phase
- environmental performance including ensuring compliance with legal, contract and other requirements
- proposing protocols to monitor the potential impacts specific to the prototype not the site
- preparation of and environmental documentation required by this EMP
- review and approval of contractor's environmental management arrangements to ensure they include the requirements of this EMP
- monitoring of implementation of this EMP
- communicating contents of this EMP to contractors and training them to ensure they understand their responsibilities with respect to environmental performance.

Contractors to be responsible for the following throughout project lifetime (floater construction, mooring/umbilical installation, wind turbine integration, floating wind turbine hook up and decommissioning):

- confirming all necessary construction permits and licences have been obtained prior to commencement of construction
- developing technical procedures, method statements and any environmental documentation required by this EMP associated with the assembly of the prototype
- monitoring implementation of and adherence to relevant requirements of this EMP
- ensuring non-conformances are reported to the environmental manager and dealt with effectively
- conducting construction monitoring where necessary.

Fisheries liaison (ECN) responsible for:

- ensuring effective communication between the fishermen and the project
- ensuring the timely provision of information regarding planned offshore activities, vessel movements or delays in the project area and its surroundings, detailed in Deliverable n°:5.3, section5.2.2 (ECN 2015)
- facilitating dissemination of project information of direct relevance to fishing vessels, such as urgent bulletins in the event of any emergency, presence of marine hazards (e.g. unmarked underwater structures, loss of plant onto the seabed etc), detailed in Deliverable n°:5.3, section5.2.2 (ECN 2015).

7. ENVIRONMENTAL SPECIFICATIONS: DETAILED DESIGN PHASE

7.1 DETAILED DESIGN OF THE PROTOTYPE

7.1.1 GENERAL REQUIREMENTS

FloatGen shall provide the following details concerning the prototype to SEM-REV for review and approval:

1. A complete description of the test prototype and its components.
2. Information on the method for anchoring the prototype, anchors selected must be assessed to be the least detrimental to local hydrodynamics and marine ecological receptors.
3. List of proposed chemicals to be used. Any fluids used will be biodegradable and assessed as being least toxic to the environment. Choice of antifouling and anticorrosion materials must be based on their toxicity, or by preferentially limiting the requirement for such materials through design.
4. Prototype machinery maintenance requirements (frequency, type, offshore/onshore).
5. Methodology for installing, removing and ultimately disposing of the prototype, including provisions for recycling of materials.

7.1.2 SAFETY FEATURES

The prototype wind turbine was designed in compliance with prefect decree 13/11/2009 (Arrêté du 13 novembre 2009) and ministerial decision 16/05/2013 (Décision ministérielle du 16 mai 2013) concerning safety marking of offshore wind turbines.

An individual Automatic Identification System (AIS), which integrates GPS, will be installed on the prototype allowing continuous monitoring of its position.

7.1.3 FURTHER SECURITY REQUIREMENTS

ECN is currently reviewing security requirements for the prototype (N.B. Ideol retains full responsibility for security of the prototype). Once the requirements listed below are established, ECN

will communicate them to FloatGen. These requirements will be incorporated into the final EMP and other relevant documents and implemented throughout the FloatGen project. The following further security requirements apply as follows:

1. Navigation Standards
 - a. Security equipment required onboard professional vessels (within 20 nautical miles)
 - b. Individual protection equipment for sailors
2. Offshore platforms Standards
 - a. Lifesaving equipment require onboard offshore platforms (i.e. life raft, lifejacket, lifebuoys, survival suits)
 - b. Fire-fighting equipment
 - c. Necessary accesses and exit to offshore platforms (personnel access from crew boat to boat landing, main and secondary ladders)
 - d. Equipment required for transfer from the floating wind turbine to crew boats (davit and personnel stretcher).
3. Wind Turbine Standards
 - a. Individual protection equipment required inside a wind turbine
 - b. Fire detection, fire alarm and fire-fighting equipment
 - c. Other protection equipment integrated in a wind turbine
 - d. Necessary accesses and exit for a wind turbine.
4. Training Standard
 - a. Global Wind Organisation (GWO) Basic Offshore Safety training is followed for the personnel involved, including: manual handling, working at height, Sea Survival, fire-fighting.
 - b. Electrical training and confined space training as required depending on personnel duties.

7.2 MICROSITING

7.2.1 GEOPGYSICAL REVIEW

The selection of anchors (6 x 15 tonnes drag-embedment anchors) to moor the floating platform was determined by the characteristics of the seabed at the site. FloatGen have:

- conducted a geophysical survey of the seabed
- determined the most suitable design of the anchors, taking into account both technical feasibility and environmental impact of the anchoring system.

7.2.2 CULTURAL HERITAGE REVIEW

Adverse effects on known archaeological features can be avoided through careful micro-siting of seabed equipment. Prior to installation the marine heritage value of the seabed encompassed by the floating system footprint was assessed based on:

- Records of wrecks and obstructions, known wrecks, documented losses and archaeological finds
- Records of protected wrecks
- Historic records held by onshore and offshore agencies (e.g. coastguard)
- Geophysical survey records
- Any information, including exclusion zones, provided by SEM-REV.

No archaeological or cultural heritage features requiring avoidance through micro-siting were identified within the site.

7.3 PROJECT SCHEDULE

Project activities for the onshore works on Le Croisic Peninsula were scheduled to avoid the restriction relating to the tourist peak season defined as the period between 14th July and 15th August (Section 5.10.2 of ECN, 2014). The schedule will also take into account the schedules of other regular navigation and commercial shipping in the area.

Anchor installation will not have to be timed to take into account the local tidal regime. The selected anchor design is a system of 6 drag-embedment anchors (each anchor weighing 15 tonnes), which will minimise the potential impact of suspended sediments on nearshore marine ecology.

The project schedule was agreed with relevant local authorities prior to commencement of installation activities.

7.4 TRANSPORT ROUTE

Several offshore transportation routes have been identified from the port where the prototype is being assembled to the mooring site, these take into consideration regular navigation activities occurring off the coast of Le Croisic and have been agreed with relevant authorities. The final option selected from these will be dependent upon weather conditions, tidal states and marine traffic at time of deployment.

7.5 ADVANCE NOTICE TO PUBLIC

The project, via ECN, shall disclose to the local stakeholders (such as local authorities, residents and mariners) relevant information on its planned activities, including project description, schedule and agreed transport routes, in advance of construction commencement (Deliverable n°:5.3, section 5.2.2 (ECN 2015)). Such information shall be communicated directly to the relevant authorities, as well as published on the project website, through local press, and by official Notices to Mariners. This information shall be updated if required if project details change.

8. ENVIRONMENTAL SPECIFICATIONS: ASSEMBLY AND INSTALLATION

8.1 ONSHORE ENVIRONMENTAL MANAGEMENT

8.1.1 SHIPYARD ACTIVITIES

Part of the installation activities, namely fabrication of the floating platform and assembly of the turbine on the platform, occurred onshore at the port of Nantes – Saint Nazaire, which has triple certification under ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007. All standard project shipyard activities, including assembly of the structure and its load out using onshore mobile cranes and other shipyard machinery, shall be carried out in compliance with the port's environmental, health and safety and quality requirements, and therefore have not been included in this document. Additional best practice measures are described below in relation to fabrication of the concrete floating structure, specific for this project.

8.1.2 FABRICATION OF CONCRETE FLOATING PLATFORM

Ideal's floating platform was cast at the port of Nantes – Saint-Nazaire. The following measures were implemented to avoid potential negative impacts on the environment:

- The concrete formula used is designed to be injected into the formwork with pressure pump to ensure the formwork is waterproof and no fresh concrete or water is able to leak into the surrounding environment.
- When pouring concrete into the form, any spills of fresh concrete were prevented by using sealed chutes, or ensuring that all hose and pipe connections are sealed and locked securely. Concrete forms were not filled to overflowing. No concrete spills were reported during construction.
- Concrete wash water was collected and stored in a dedicated container, it was then sent from site to be recycled by a third party contractor.
- Any stormwater that came into contact with uncured concrete was collected, treated and disposed of in a manner to prevent migration or spill of chemicals into the environment.
- No pH monitoring was undertaken during concrete curing.

- All concrete waste, such as sediments, debris, fines, wash or contact water, was not discharged into marine environment.
- All concrete waste was recycled where possible, or disposed of in an environmentally sound manner.
- Clean-up measures were implemented immediately after a spill of fresh concrete or concrete waste has occurred.

These measures were strictly adhered to during the onshore fabrication phase of construction.

8.2 COMMUNITY RELATIONS AND NOTIFICATIONS

FloatGen shall also inform the following stakeholders 10 days prior to the planned commencement of installation activities on the SEM-REV site:

- The Maritime Prefecture
- Maritime and Coastguard Agency (CROSS)
- The Water Police (la Police de l'Eau)
- The North Defence Aerial Zone that coordinates the Piriac Semaphore
- Local administration.

The project shall disclose an appropriate level of detail, including vessel movements and planned activities on the test site.

The following notices shall be issued to public:

- Official notices to mariners
- Information on the project website and local media.

The disclosure scheme is contained in section 5.2.2 of Deliverable n°:5.3 (ECN, 2015).

8.3 GENERAL REQUIREMENTS FOR VESSELS

Vessels engaged in construction or supply of equipment or personnel shall comply as a minimum requirement with the MARPOL Convention for the prevention of marine pollution. The vessels shall also comply with all relevant national, European and local regulations.

8.4 NAVIGATIONAL SAFETY

A layout depicting the access to the prototype shall be provided to SEM-REV. This information shall be transmittable to the Maritime & Coastguard Agency (CROSS).

All construction vessels shall follow a defined route, agreed with the relevant authorities. All installation activities shall stay within the agreed site boundaries. The project vessels shall meet the requirements of the Civil and Military Agencies (Maritime Prefecture) for safety during transport to site; and the requirements of the Maritime and Coastguard Agency and other regulatory requirements for navigational safety during transport to site and operation on site.

The mooring lines will not extend outside the SEM-REV's borders. However, the extent of the anchoring system may be allowed to exceed the size of the slot assigned to the project (especially during the installation phases). A 10m radius tolerance is acceptable for the anchors/dead weight location (in comparison to the anticipated coordinates of their positions inside the SEM-REV test area). The tolerance distance of the positioning was 10m wide and 15m long (according to the orientation of the anchor).

In accordance with decree N° 2014/022, navigation, berthing and anchorage of any non-project vessels or recreational boats are prohibited on SEM-REV test site. Fishing and scuba diving activities are also forbidden on site. An emergency intrusion procedure, illustrated in section 5.4.6.1 of Deliverable n°:5.3 (ECN 2015), is to be implemented by the operating vessel crews in the case of intrusion by a third-party vessel.

8.5 MARINE POLLUTION PREVENTION

In accordance with SEM-REV requirements, the project shall put in place systems and equipment to manage effluents and waste and prevent pollution incidents. Specific pollution prevention measures that will be utilised by the project are described below.

8.5.1 AIR EMISSIONS

The project shall use vessels and equipment that are suitable for the task, modern, well maintained and in good working order. Pre-mobilisation inspection shall be carried out to ensure the vessels are sound and safe. Idling shall be minimised, and equipment shall be turned off when not in use.

8.5.2 NOISE AND VIBRATION

Sources of noise and vibration during prototype installation include operation of marine vessels and equipment, and positioning of infrastructure. Drag-embedded rather than pile driven anchors have been selected reducing potential underwater noise impacts.

Where installation activities have the potential to cause discomfort or disturbance to marine fauna and human receptors due to noise and vibration, the following measures shall be implemented as appropriate:

- Activities shall be generally confined to working hours agreed with SEM-REV and local authorities
- Marine users shall be notified of planned activities through official Notices to Mariners
- Appropriate good practice of noise abatement, as presented in D7.2 'Review of international environmental best practice for floating wind turbine systems' (RSK, 2015), shall be utilised as far as necessary and/or practicable. However the selection of non-piled anchors significantly reduces potential underwater noise impacts on marine mammals and removes the applicability of many abatement measures such as soft start of piling hammer.

8.5.3 FUEL AND CHEMICAL STORAGE AND HANDLING

8.5.3.1 CHEMICALS

Fluids (oils, paints, corrosion protection products) used for the operation of the prototypes shall be non-toxic to the marine environment.

The project shall provide the list of all fluids on board the vessels involved in project activities. The project shall demonstrate to ECN that materials used (such as hydraulic fluids, anti-fouling paints, anti-corrosion products) comply with current standards in accordance with the 'Concession d'utilisation du Domaine Public Maritime' and are non-toxic (bio-degradable) in the marine environment.

The project shall ensure that all chemicals are stored securely in suitable containers in bunded areas, capable of retaining 110% of the storage containers plus 10% of the aggregate tank volume within the containment area, or as otherwise specified by regulatory requirements.

8.5.3.2 REFUELLING AND MAINTENANCE

Construction vessel and plant refuelling and maintenance shall be carried out under controlled conditions at port. Refuelling at sea is prohibited.

8.5.4 OIL SPILL CONTINGENCY PLAN

Spill kits shall be easily available at any location where chemicals/lubricants/fuels and liquid and hazardous waste are stored or handled. The spill kits shall be appropriate to the activities the work team are involved in. All relevant personnel shall be trained in effective use of spill kits.

The project shall develop:

- a Project-specific Emergency Response Plan (ERP) that makes provision for oil spill contingency planning, see Section 8.10.

All spills shall be reported to SEM-REV. Incidents that could have impact on the health, safety, livelihoods and well-being of people and/or have visible impacts (smoke etc.) will be communicated to the public via the emergency response system of SEM-REV.

8.6 MANAGEMENT OF OFFSHORE WASTES AND DISCHARGES

8.6.1 SOLID WASTE

The project shall adopt a waste hierarchy, aiming to minimise waste generation through prevention, reuse and recycle where practicable. Any waste that cannot be reused or recycled shall be disposed of in environmentally sound manner and in accordance with applicable legislation.

All solid waste shall be collected on board the ship in appropriate containers and brought onshore. Waste materials shall be segregated into non-hazardous and hazardous wastes. These wastes will be pre-classified as recyclable and non-recyclable. No wastes shall be thrown into the sea.

Project vessels covered by MARPOL Convention shall develop a Vessel Waste Plan detailing how each type of waste will be stored onboard. Manifests shall be kept on board all construction vessels of all waste streams transferred to shore.

8.6.2 VESSEL DISCHARGES

8.6.2.1 SEWAGE

The project shall ensure that all vessels involved in the project dispose of sewage and grey water according to the minimum requirements of Annex IV of MARPOL 73/78. MARPOL describes facilities aboard vessels for the treatment of sewage and for reception facilities in ports and harbours. MARPOL prohibits vessels in excess of 400 gross tonnes discharging raw sewage within a 12 nautical mile territorial limit.

It is likely that many of the construction or supply vessels involved in the Project will be equipped with a MARPOL approved waste water treatment plant designed to treat sewage and grey water to reduce the levels of BOD, *E. coli*, MPN and suspended solids in sewage prior to discharge.

In this eventuality the contractor shall ensure the following:

- That the treatment plant and holding tanks complies with applicable MARPOL regulations
- That ECN are provided with copies of valid International Sewage Pollution Prevention Certificates for vessels equipped with treatment facilities
- Vessels equipped with compliant treatment plants may discharge treated sewage to the sea provided that the vessel is in excess of 4 nautical miles offshore in accordance with legislation
- Vessels without treatment facilities or with non-compliant sewage treatment facilities must only discharge sewage to the sea if they are in excess of 12 nautical miles offshore in accordance with legislation.

It is the responsibility of the Contractor to ensure that sewage is either treated aboard vessels, and discharged while in open offshore areas (4 nautical miles minimum from the coast), not treated and discharged while in open offshore areas (12 nautical miles minimum from the coast), or pumped out to appropriate shore reception facilities. These procedures should be applied to all vessels involved in the project activities regardless of the vessel size.

8.6.2.2 BALLAST WATER

Where applicable, project vessels and the floating platform (ballast in the float is made of concrete, it contains an automated pump system) shall operate Ballast Water and Sediments Management Plan in accordance with the IMO Ballast Water Directive, and carry a Ballast Water Record Book.

8.6.2.3 BILGE WATER

Bilge water shall be treated to be discharged with less than 15ppm oil in water in accordance with MARPOL Annex 1. All water discharges, including from floating platform which has a bilge system, will be conducted in accordance with the relevant MARPOL 73/78 requirements and provisions and relevant national and local regulations.

8.7 SCOUR PROTECTION MANAGEMENT PLAN

The selection of drag-embedment mooring anchors has removed the potential need for scour protection to be installed therefore a scour protection management plan is not required.

8.8 MARINE ECOLOGY

8.8.1 PHYTOPLANKTON

In order to avoid impacts affecting phytoplankton production, construction vessels shall:

- fully comply with provisions of MARPOL Convention
- apply correct anchor handling to minimise suspension of sediments
- manage vessel discharge as described in Section 8.6.2.

8.8.2 MARINE MAMMAL MANAGEMENT

The potential need for trained Marine Mammal Observers (MMOs) to be present at the site during installation of the prototype was considered during planning stages, however due to the selection of non-piled mooring anchors this is now not deemed to be necessary. The selected design and installation techniques are not considered to involve noisy activities that could negatively impact marine fauna. However ECN have installed fixed hydrophones within the site to monitor and record underwater noise levels associated with installation to inform future environmental impact assessment of other projects deploying similar devices. Ambient underwater noise is recorded for four days prior to installation. Hydrophones will also record presence of cetacean species in the area before and after installation. Marine mammal and ornithological sightings have been incidentally recorded but not by specialist observers.

The potential risk of entanglement of marine megafauna in mooring of marine renewable energy devices varies with animal species and size as well as the degree of tension/rigidity in mooring lines and/or cables. Slack lines are thought to pose a greater risk than taut ones, which offers an opportunity for embedded mitigation at the design stage. An additional operational risk is associated

with lost/abandoned fishing gear attaching to the mooring / chains and subsequently entrapping a range of species. In order to address this, a desk based risk assessment of the mooring system is suggested. The outcome of which should inform the need for the development of a formal procedure for recording and reporting any incidents, and if deemed necessary, routine inspections of moorings as part of wider O&M activities.

Night-time lighting on board the project vessels shall be minimised in order to avoid disturbance to marine fauna and other vessels present in the area, without compromising visual navigation lighting, human safety and ability to carry out project activities in the hours of darkness as required.

8.8.3 INVASIVE SPECIES

Project vessels shall not intentionally introduce or release any alien species into native habitats and exercise diligence to prevent accidental or unintended introductions of alien species. Ballast water procedures shall be adhered to as described in Section 8.6.2.2 in order to prevent the spread of harmful aquatic organisms that may be present in ships' ballast waters and sediments.

8.8.4 ECOLOGICAL MONITORING

The project will conduct ecological monitoring in the project area during and post installation of the prototype in order to ensure that proposed mitigation measures are implemented and to identify any changes that may occur during installation. Ecological monitoring is described in Section 11.3 installation monitoring.

8.9 CULTURAL HERITAGE MANAGEMENT

Chance finds are defined as potential cultural heritage objects, features or sites that are identified outside of or after a formal site reconnaissance, normally as a result of construction monitoring. All chance finds shall be reported to a qualified archaeologist appointed by ECN, who will advise on further actions.

8.10 EMERGENCY RESPONSE PLAN

An emergency response plan shall be developed in conjunction with SEM-REV the final version shall be developed once the floater installation and hook up is complete. It shall specify measures to manage and minimise the environmental impact of an emergency event (e.g. fire, equipment loss, drift). It will include details of how any predicted incidents will be managed, responsibility for managing the incident response, communicating accurate information to the regulatory authorities and emergency services.

The emergency response plan shall incorporate the following requirements:

- Where an incident is likely to lead to pollution, the FloatGen project manager shall immediately take the necessary measures in order to limit the effect of the incident on the environment, and to avoid the repetition of the incident.
- The Water Police (la Police de l'Eau) service and Le Croisic municipality shall be informed within 24 hours of this incident and the undertaken mitigation measures, and within 15 days of the incident of all the corrective measures taken to reduce the risk of accidental pollution.
- The Water Police will be allowed free access to the SEM-REV test site.

9. ENVIRONMENTAL SPECIFICATIONS: OPERATION (TESTING)

9.1 COMMUNITY RELATIONS

Planned maintenance will be scheduled to take place outside of tourist peak season, which is defined as the period between 14th July and 15th August.

The project shall inform the maritime prefecture at least 15 days in advance of its planned maintenance activities. Where there is a need for an unplanned activity on the test site, the project shall notify ECN prior to activities commencing and the relevant authorities as soon as possible. Details of the project activities shall be included into the official Notices to Mariners.

ECN regularly presents the activities of the SEM-REV test site to various local environmental protection associations, such as France Nature Environment (FNE), Bretagne Vivante, Eau et Rivières de Bretagne and Cap Atlantique.

ECN participated in a Natura 2000 monitoring and “LIFE” project on gathering seafood by hand that was established by the regional committee of fisheries and marine farms of the Pays de Loire (COREPEM), and takes part in the environmental working groups set up by International Union for Conservation of Nature (IUCN) and France Energies Marines (institute for energy transition dedicated to marine renewable energies).

9.2 NAVIGATIONAL RESTRICTIONS

In accordance with decree N° 2014/022, navigation, berthing and anchorage of any non-project vessels or recreational boats are prohibited on SEM-REV test site. Fishing and scuba diving activities are also forbidden on site.

The project vessels shall use agreed navigational routes for planned and emergency maintenance.

9.3 MARINE POLLUTION PREVENTION

During the operational phase project vessels shall adopt the similar pollution prevention measures as described in Section 8.5.

9.4 WASTE AND DISCHARGES MANAGEMENT

During the operational phase of the project, wastes generated are likely to be associated with operation of the vessels engaged in prototype maintenance. Requirements for managing waste are specified in Section 8.6 above.

9.5 SCOUR PROTECTION MANAGEMENT PLAN

See Section 8.7 above.

9.6 MARINE ECOLOGY

See Section 8.8 above.

9.7 EMERGENCY RESPONSE PLAN

See Section 8.10 above.

10. ENVIRONMENTAL SPECIFICATIONS: DECOMMISSIONING

10.1 GENERAL REQUIREMENTS

The testing of the floating system is intended to continue for 1-2 years. On completion of testing, the floating system will be decommissioned. The approval for testing of wind turbines on the SEM-REV test site No. 2013/BPUP/099 includes the following provisions for decommissioning:

- At the end of the test site operation the facilities will be dismantled and items recovered and recycled.

The decommissioning of the prototype aims to return the site to its initial state. According to the “Concession d’utilisation du Domaine Public Maritime” the developers using the SEM-REV site shall completely dismantle and remove the infrastructures established and hosted on SEM-REV concession and cover the corresponding costs. It is yet to be determined whether this will include complete removal of mooring systems and/or foundations, the mooring system is ECN property and is likely to be reused for future projects at the site.

Financial dispositions will have to be taken concerning the decommissioning of the prototypes tested on site. The Developer shall leave to the “Caisse des Dépôts et Consignation” (CDC) a deposit equal to the total amount of the dismantlement in order to ensure the prototypes removal.

The nature of decommissioning works shall largely be similar to the assembly and installation activities, but in reverse order. During decommissioning, the project shall implement the measures described in Section 8 Environmental Specifications: Assembly and Installation, with addition of the following:

- Any hazardous or potentially polluting fluids or materials shall be removed from the nacelle in so far as risk assessment identifies them as posing a potential hazard to the environment during turbine dismantling
- Turbine components maybe overhauled and reused

- Recovered material such as steel from the towers or other components would be recycled where possible and other materials disposed of in an approved manner.

10.2 EMERGENCY RESPONSE PLAN

See Section 8.10 above.

11. ENVIRONMENTAL MONITORING PROGRAMME

The ECN monitoring programme for the SEM-REV site includes the following:

11.1 General requirements

11.2 Shipyard runoff monitoring

11.3 Installation monitoring

11.3.1 Control of chemicals and materials used on site

11.3.2 Monitoring of the acoustic impact

11.3.3 Monitoring of the sediment suspension

11.3.4 Monitoring of the status of benthic communities

11.4 Operation monitoring

11.4.1 Monitoring of the water quality

11.4.2 Monitoring of the acoustic impact

11.4.3 Monitoring of the hydrodynamics and sediment dynamics

11.4.4 Monitoring of the status of benthic communities

11.5 Action tracking system

11.6 Decommissioning monitoring

11.6.1 Monitoring of the water quality

11.6.2 Monitoring of the acoustic impact

11.6.3 Monitoring of the sediment suspension

11.6.4 Monitoring of the status of benthic communities

11.7 Reporting and audits

More detail on each of the above bullet points can be found in the following sections.

11.1 GENERAL REQUIREMENTS

One of the objectives of the FloatGen project is to assess and validate the environmental impacts of installation, operation and decommissioning of an innovative offshore wind turbine combined with a

floating structure performing in waters over 40m depth. A monitoring programme studying the effects of the prototype on the environment is therefore an integral part of the FloatGen project and will be carried out by the developer.

Furthermore, the Approval for testing of wind turbines on the SEM-REV test site No. 2013/BPUP/099 includes the following requirements for monitoring:

- Annual monitoring of the position and depth of burial of the export cable and the status of any concrete protection mattresses
- Monitoring of the acoustic impact of the prototype operation on marine organisms
- Monitoring of the status of benthic communities, every year until the end of the “Concession d’utilisation du Domaine Public Maritime” and after decommissioning, at the test site and in the vicinity of the export cable
- Monitoring and control of chemicals and materials used on site.

Complimentary monitoring for FloatGen, not just the SEM-REV site, will also be undertaken (as detailed in Section 3.3).

The monitoring programme will be updated within two months of any changes in legal and/or other requirements or changes within the Project.

The monitoring programme described in this chapter shall be carried out by FloatGen project. A more comprehensive monitoring programme will be carried out by ECN and will include cable layout and electromagnetic surveys, protection mattress survey, acoustic survey, survey of the electromagnetic field produced by dynamic cable, landscape impact survey and scouring survey (Section 4.8.1 in ECN, 2014). Details of the ECN SEM-REV monitoring programme are provided in SEM-REV EMP.

The project shall:

- allow ECN to carry out the necessary surveys
- inform ECN of characteristics of the project that could have an impact on the environment

- implement every useful measure if the survey highlights an unacceptable impact which was initially underestimated
- ensure that the data is collected in such a way that it can be compared with the ECN long-term monitoring programme
- share the results of its own monitoring with ECN.

11.2 PRE-CONSTRUCTION SURVEYS

11.2.1 ESTABLISHING BASELINE CONDITIONS

Existing baseline data collected for the SEM-REV EIAs (CREOCEAN, 2010; 2013), and additional geophysical surveys completed in 2010 (by Astérie) and 2014 (by InVivo), have been reviewed and are deemed sufficient for monitoring purposes. Where any additional baseline data is required, permission to collect additional data will be requested from ECN who will review this request and inform the Project of its decision within 10 working days.

11.3 INSTALLATION MONITORING

11.3.1 SHIPYARD RUNOFF MONITORING

All control measures and procedures outlined in Section 8.1.2 were adhered to during onshore fabrication of the concrete floating platform.

11.3.2 MARINE MAMMAL OBSERVATION

The design and installation techniques are not considered to have potential to negatively impact marine megafauna through underwater noise impacts therefore it is not deemed necessary for MMOs to be present during prototype installation. However ENC will be deploying fixed hydrophones within the site to record underwater noise levels associated with installation and also the presence of cetacean species in the area. Marine mammal and ornithological sightings have been incidentally recorded but not by specialist observers.

11.3.3 SEDIMENT SUSPENSION MONITORING

During installation of the prototype suspended sediments shall be monitored using analysis including grain/ particle size and organic matter concentrations before and after the installation phase. Monitoring shall be undertaken at different distances from the underwater works.

11.3.4 POST-INSTALLATION SURVEY

The project may use the results of post-installation engineering survey to record the condition of the seabed. The project shall ensure that no restrictions on marine area usage remain in place other than those already agreed upon.

11.4 DECOMMISSIONING MONITORING

Requirements described in Sections 11.3.2 and 11.3.4 shall apply during decommissioning phase of the project.

11.5 REPORTING

Results of the monitoring activities shall be reported to ECN. Where a non-conformance has been identified, it will be recorded in an Action Tracking System, and the means of rectification of such non-conformance shall be agreed with ECN.

11.6 KEY PERFORMANCE INDICATORS

The project will collect the data concerning its performance listed in Table 11-1. On project completion the data shall be analysed, and lessons learned shall be used to improve future projects that will utilise the prototype floating wind turbine technology.

TABLE 11-1 FLOATGEN KEY PERFORMANCE INDICATORS

No.	Measure	Target
1	Percentage of inspections completed versus planned	100%

No.	Measure	Target
2	Volume of waste reused, recycled and landfilled	40%
3	Open non-conformances	0
4	Non-conformances, by type	Measure
5	Number of spills of oil, fuel and chemical spills	0
6	Amount of fuel consumed to run vessels and equipment	Measure
7	Number of complaints received from the public, broken down by categories (e.g. noise, navigational safety, visual impact, etc.)	Measure
8	Training delivered in accordance with planned training activities	100%
9	Value of materials and services purchased locally	Measure

12. ENVIRONMENTAL AWARENESS AND TRAINING

The project shall ensure that all personnel, including contractors and subcontractors, who perform or manage project work that may have a significant impact on the environment are trained appropriately. Such training will include information on sensitive receptors (both environmental and social), potential impacts of project activities and mitigation measures that the project commits to implement in order to avoid or mitigate such potential negative impacts.

Personnel responsible for conducting monitoring and inspections shall be trained to carry out these activities effectively.

Records of training undertaken will be kept and made available to ECN or a relevant authority for inspection upon request.

13. VERIFICATION INSPECTIONS AND AUDITS

In order to ensure that the provisions of this EMP are implemented effectively, the project shall:

- Conduct documented routine inspections, where possible, which will entail walk-around inspections of all project activities to visually assess implementation of mitigation measures specified in this EMP
- Conduct an audit at least annually, or more frequently if required (e.g. if inspections have identified recurrent non-conformances)
- Record any findings and non-compliances in an Action Tracking System and agree with ECN the means by which such non-compliance shall be rectified.

It is noted that the ECN may carry out verification monitoring of project activities.

14. ACTION TRACKING SYSTEM (ATS)

The project shall develop an action tracking system (ATS) that shall record any actions that are required:

1. to rectify any non-conformances identified during audits, inspections, other monitoring activities
2. to address feedback received during the project, including that from:
 - a. third parties such as the public, ECN
 - b. project personnel (including contractors and sub-contractors)
3. to ensure any improvement suggestions are captured and realised.

Every action within the ATS should be SMART:

S – specific – the action should clearly state what needs to be done

M – measurable - it should be clear when the action is considered complete

A – assignable – have an agreed actionee (the action should be agreed with the nominated actionee)

R – realistic – the action should be achievable within the timeframe agreed with available resources

T – timebound – have a deadline for completion agreed with the actionee.

Where relevant, actions should be assigned to not only correct an issue (corrective action) but also prevent such an issue (preventative action) occurring again in the future. Each action should be tracked until it is completed and the status recorded in the ATS. The contents of the ATS will be reviewed regularly:

- to identify any trends in actions raised with the aims of identifying underlying issues that may need improvement
- to chase any overdue actions that may be listed in the ATS.

15. RECORD KEEPING

The project shall keep all monitoring data, training records and records of inspections within its document control system. All above listed records shall be made available to ECN upon request.

16. REFERENCES

Arrêté du 13 novembre 2009: Decree taken by the prefect concerning the wind turbine marking application.

Arrêté n°2013/BPUP/099: authorizes the Ecole Centrale de Nantes to extend the SEM-REV test site to the use of Floating Wind Turbines offshore the territory belonging to Le Croisic municipality

Arrêté n°2014/022: regulates the navigation, station-keeping, mooring, trawling, dredging and diving on the SEM-REV and over a portion of SEM-REV export cable layout.

CREOCEAN. 2010. Impact Assessment for the Construction of Experimental Marine Infrastructure for Recovery of Wave Energy. Doc: 1-09134-R.

CREOCEAN. 2013. Impact Assessment to Request Extension of SEMREV Approval for Floating Wind Turbines. Doc: 1-12008-R.

Décision ministérielle du 16 mai 2013: Ministerial decision taken the 16/05/2013 concerning the experimental wind turbine marking.

ECN. 2014. Deliverable N° 4.5 SEM-REV Test Site Requirements.

ECN. 2015. Deliverable N° 5.3 SEM-REV Test Site Exploitation Rules.

RSK. 2015. Compilation of environmental regulations and obligations for floating wind turbine systems (Deliverable N° 7.4).

RSK. 2015. Review of international environmental baseline for floating wind turbine systems (Deliverable N° 7.2).

APPENDIX A: ENVIRONMENTAL MITIGATION MEASURES AND COMMITMENTS

ENVIRONMENTAL MITIGATION MEASURES

The EIAs produced for the SEM-REV test site (CREOCEAN, 2010; 2013) provide generic environmental mitigation measures to which developers planning to use the SEM-REV test site should adhere, as listed below. The developer must:

- Have systems and equipment in place to manage effluents and waste and prevent pollution incidents.
- Provide advance information to local stakeholders (residents and users of the site) regarding the equipment installation and testing phases through notifications on the website, informing the mayor, local press, and by maritime notifications.
- Submit a complete description of the test prototype and its components.
- Submit information on the method for anchoring the prototype along with an assessment of scour risk. Anchors selected must be assessed to be the least detrimental to hydrodynamics and wildlife.
- Ensure that the prototype is fitted with GPS so that its position can be continuously monitored.
- Ensure that the prototype meets environmental constraints. Any fluids used will be biodegradable and assessed as least toxic to the environment. Choice of antifouling and anticorrosion materials must be based on their toxicity, or by preferentially limiting the requirement for such materials through design.
- Specify prototype machinery maintenance requirements (frequency, type, at sea / on land)
- Define the methodology for installing, removing and ultimately disposing of the prototype, including provisions for recycling of materials.
- Define their liability for navigation incidents (e.g. collision), and pollution incidents.
- Clarify the proposed monitoring programme for the prototype.
- Study the environmental effects of the prototype on the environment.
- In accordance with the SEM-REV permit, assess the effects of noise associated with operation of the prototype on marine organisms.

ENVIRONMENTAL COMMITMENTS

In addition to the generic mitigation measures outlined in the SEM-REV EIAs, the 'SEM-REV Test Site Requirements' report (Deliverable n°: D4.5, 15 November 2014) provides more specific environmental commitments (and technical commitments) based on the recommendations of the different state services. Developers planning to use the test site should adhere to these requirements. The environmental commitments are listed below.

In terms of environmental impact the developer must:

- Allow the organisation (ECN) to carry out necessary measurements at applicable site infrastructure and the marine energy convertor.
- Identify any prototype specificity that could lead to an environment modification.
- Implement further measurements if the survey highlights an unacceptable impact that was initially underestimated.
- Conduct a post-experiment survey following prototype removal in order to identify and understand the way the marine environment has changed/responded (or not) following the 2-3 years experimentation phase.
- Select a marine energy converter mooring system which has lowest impacts to both flora/fauna and the hydrodynamics of the area (ECN will verify conformity).
- Assess the risk of scouring at the base of the mooring structure.

In terms of installation and operation the developer must:

- Obtain approval from the organisation (ECN) for all operations on the SEM-REV site.
- Meet the requirements of the Civil and Military Agencies (Maritime Prefecture) for safety during transport to site; and the requirements of the Maritime and Coastguard Agency and other regulatory requirements for navigational safety during transport to site and operation on site.
- Consult with the North Defence Aerial Zone that coordinates the Piriac Semaphore in order to define the installation process for the floating wind turbines.
- Ensure that necessary precautions are taken to avoid the discharge of polluting products to sea.
- Limit operations in the period 14th July to 15th August (if practicable) to limit impacts on tourism.

- Provide a list of all fluids on board, permit testing of acoustic transmission frequency and power estimates, respect the height above the sea level, the maximum blade-tip velocity and the type and dimensions of moorings.
- Demonstrate that materials used on site (i.e. fluids, anti-fouling paints, anti-corrosion products) comply with current standards in accordance with the 'Concession d'utilisation du Domaine Public Maritime' and are non-toxic (bio degradable) in the marine environment.
- Return a signed version of the QHSE management plan provided by the organisation.

In terms of accidental pollution incidents the developer must:

- Take necessary measures to limit its effect on the environment, and to avoid repetition of incidents.
- Inform the water policy service and "Le Croisic" municipality within 24 hours of an incident and the mitigation measures which have been taken.

In terms of decommissioning the developer must:

- Carry out complete demolition of the infrastructures established and hosted on the SEM-REV concession (including complete mooring systems and foundations) and recover/recycle.
- Leave to the "Caisse des Dépôts et Consignation" a deposit equal to the estimated total amount of decommissioning costs in order to ensure the removal of the prototype can be completed.

In terms of hazard identification the developer must:

- Carry out qualitative and quantitative risk analysis to assess risks regarding technical, human and environmental aspects of the prototype during installation, operation, maintenance and decommissioning. If the resulting risk is high the developer must propose mitigation measures in order to minimise the risk. The favoured method for risk analysis is the Formal Safety Assessment approach chosen by the International Maritime Organisation.

In terms of civil liability the developer must:

- Provide a copy of the prototype's Civil Liability regarding damage it could cause to environment, ships, other prototypes, people, or ECN facilities, during installation, operation, maintenance or decommissioning phases. Civil liability needs to cover all operational modes and maintenance works which the developer will use during those phases.

