1.1 Introduction

1.1.1 Combination type

**Combines:** Floating shipping terminal and wave technology

**Space share type:** Multi-use platform (MUP)

1.1.2 Company description

Float Incorporated is a corporation providing services that include research, design and development of marine oriented products and specializes in very large floating platforms. Float Incorporated is a marine technology company with proprietary and patented marine technologies that are capable of changing the way mankind uses the three quarters of the earth’s surface that is covered by water: how and where the world generates its electrical energy; moves its waterborne cargos; protects its ports and port cities from erosion; provides urban coastal expansion possibilities; and ways it can clean farm its oceans.

Float Incorporated’s immediate objective is to make known to the world, as expeditiously as possible, the availability of these marine technologies and the understanding of how to implement and use them properly.

Our primary marine technology of interest is the **Pneumatically Stabilized Platform (PSP)** which permits the construction of stable, floating, reinforced concrete foundations of unlimited size for any use on any body of water deep enough to float them.

Another of our marine technologies is the **Rho-Cee WEC**, a broadband, impedance-matched wave energy conversion (WEC) structure that efficiently transforms the hydrodynamic power of waves at sea into usable electric energy. The Rho-Cee WEC utilizes renewable energy-potent deep-water waves and is designed to be solidly supported by a PSP with numerous ancillary functions.

Finally, our **Potential Energy Storage (PES)** system permits the conversion and storage of captured energy, by the Rho-Cee WEC, in the form of compressed air within the confines of the PSP’s cylinder interstitial volumes.
Applications for PSP and Rho-Cee WEC include, but not limited to the following OFFSHORE FLOATING PLATFORM CONFIGURATIONS:

- Airports
- Ports & Harbors
- Wind, Wave, and Ocean-Current Array Farms
- Marine Aquaculture
- Breakwaters
- LNG Liquefaction and Regasification Facilities
- Oil & Gas, Drilling, Production and Storage Facilities
- Desalination Plants
- Nuclear Power Plants, Fuel Reprocessing Plants & Storage Facilities
- Marina and Resort Islands
- Expansion of Coastal-Urban-Areas

The synergetic combinations of two or more of these or other applications on one platform, results in superior economic investment cost savings. Except in wave protected waters, functions like these cannot be economically and practically constructed offshore without the use Float’s proprietary technologies.

Float Incorporated has their home office in San Diego, California, USA with European Union representation in France, and in the near future, a Float Incorporated European Union office in MaREI - Cork Ireland.

1.1.3 Combination project description

Floating multi-purpose platform using Pneumatically Stabilized Platform (PSP) and Rho-Cee Wave Energy Converter (shipping + waves)

The Floating shipping terminal will contain 20 berths (8 berths for ultra-large container ship (ULCS) vessels, 8 berths for Short Sea Shipping vessels and 4 service berths). Security Port will be fitted with TEU carriage lifting capacities that are variable, i.e. 1-TEU per lift; 3-TEUs per lift; or 4-TEUs per lift. This precludes the necessity to expand the Float Inc. Security Port until overall TEU volumes arrive at 70+Million TEUs per year. Initial TEU handling capacity estimated at 17+Million TEUs (1-TEU lifting); 52+Million TEUs (3-TEU lifting); 70+Million (4-TEU lifting).

The Wave Energy will consist of 73.48MW rating from 500 Rho-Cee Wave Energy Converters

1.1.4 Current status

- Floating shipping terminal: TRL5.
- Wave energy: TRL5 by end 2018.

1.1.5 Strategic Roadmap to commercialisation

Pilot testing (“proof-of-concept”) will be at Galway bay, with a small floating structure and 10 wave energy units. Pre-commercial and commercial deployment is planned on south coast of Ireland, with increased number of both floating units and wave energy devices.
1.1.6 Map images

Figure 1: Map Description - Left is Galway Bay, Ireland Right is Mizen Head M3 Buoy offshore Ireland

1.2 Technical Brief with Planned Phases of Development

PSP Platform Images

Air Exchange
1.3 PSP & Rho-Cee WEC marine technology overview

Offshore wind and wave power can be remarkably complementary. Given an extended, stable floating platform to share, important economies of renewable power production and energy storage are possible. The Pneumatically Stabilized Platform (PSP) embodies such a platform. Developed with DARPA support and proved in model scale, the PSP will achieve its at-sea motion stability and structural loads mitigation by decoupling the “hull” from ocean wave pressures through the partial use of air buoyancy.

In addition to supporting an array of wind turbines, the PSP deploys along its seaward edge the “Rho-Cee” Wave Energy Converter (pC), termed the “Impedance-Matched Terminator”; comprising a nested set of tuned Oscillating Wave Column absorbers, resonant across a selected frequency band. By means of impedance matching, highly efficient wave energy absorption is demonstrably achieved. As the characteristic impedance of ocean waves is small (denoted ρC, the product of water mass density and wave celerity—hence the name), the system’s to-be-matching input impedance must be that presented by a resonant response.
Recent analyses have shown, however, that the overall availability of incident energy is more severely limited by economic considerations rather than by physics. This conclusion results from an optimization effort employing a “cost model” that includes the levelized cost of capital for WEC structure, power take-off equipment and maintenance. The important structural cost is dependent on size, which is, in turn, related to the square of the greatest wave period whose energy is intended to be efficiently absorbed by the system. The approximate minimum in cost per unit of absorbable energy is found where the maximum wave period accepted is that defining the peak of the annual energy spectrum. Yet to be explored is the effect of “clipping” - the calculated limitation of accepted wave heights for damage avoidance.

The PSP and Rho-Cee WEC are constructed, modularly, in pre-stressed reinforced concrete, which is found degradation-free in long term exposure to seawater. All equipment subject to maintenance, replacement or inspection is “in-the-dry” – fully accessible to platform-resident personnel on foot, dry-shod. With integral foundations, WTs deployed upon such a floating platform can be positioned offshore in more persistent winds and in the greater water depths favourable to the WECs; avoiding bottom losses.

Heavy weather access to the platform is enabled by its breakwater effectiveness from the wave attenuation characteristics provides platform stability and leeward calm water zone. Both WEC and WT sources may store compressed-air potential energy in the internal volumes of their common supporting PSP structure, where it may be charged and tapped by equipment that is already part of the PSP’s air-buoyancy control and distribution system.

The Rho-Cee Wave Energy Converter (WEC) system to capture/convert candidate site wave energy provides additional electricity generation availability that can be either stored in the form of compressed air within the already-present interstitial spaces of the Pneumatically Stabilized Platform (PSP) and recuperated when required simply by reheating the compressed air. Electricity generated could then be transferred to a connected submarine cable transmitting renewable energy source electricity ashore.

1.3.1 PSP Marine Technology tank testing results

- **Stable with Variable Deck Loads Capabilities** - At-sea motion stability and structural loads mitigation by decoupling the “hull” from ocean wave pressures through the use of air buoyancy, which is both compressible and mobile within the PSP platform cylinders.

- **Wave attenuation** - Tank testing incident wave Heights up to 20 meters
  
  Range of transmitted wave reduction = 50% to 94%
  
  Creates a calm water zone to the leeward of the platform

- **Modular** - PSP cylinders assembled into modules (i.e. 25 cylinders) pre-formed during construction phase
  
  Using seagoing tugs, modules are floated-out and assembled into larger PSP platform segments using current cable assembly systems, similar to those used for the construction of the Viaduct of Millau, France.

  Modules assembly can be accomplished in Sea State 3 level - again using current cable assembly systems as previously indicated.
- Monolithic platform -
  Modular construction and assembly

- Extensible -
  PSP modular construction permits extension of existing PSP without interruption of existing activities onboard

- Long life -
  PSP is constructed of post constraint, reinforced concrete having a useful life exceeding 70-years.

  No dry-docking required, and requires no significant maintenance of the basic hull.

- Results of tank testing permitted Float Inc. PSP marine technology to be included in the US Department of Defense “Mobile Offshore Base” program

Float Inc. PSP Marine Technology Characteristics Validated & Confirmed by US DARPA and ONR tank testing -

US Office of Naval Research (ONR) Model Tank Test Results concerning wave attenuation revealed:

<table>
<thead>
<tr>
<th>Wave Period</th>
<th>Wave Height</th>
<th>Wave Attenuation (% and meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 seconds</td>
<td>0m90</td>
<td>94% &amp; 0m05</td>
</tr>
<tr>
<td>9 seconds</td>
<td>2m50</td>
<td>72% &amp; 0m70</td>
</tr>
<tr>
<td>12 seconds</td>
<td>5m50</td>
<td>50% &amp; 2m75</td>
</tr>
<tr>
<td>16 seconds</td>
<td>10m00</td>
<td>63% &amp; 3m70</td>
</tr>
<tr>
<td>20 seconds</td>
<td>15m50</td>
<td>54% &amp; 7m13</td>
</tr>
</tbody>
</table>

1.3.2  Why Mizen Head is the preferred site

Initial research for a candidate site was to resolve the question of positioning the Float Inc. Security Port to enable the accomplishment of its primary mission - container shipping. The following criteria were utilized to identify the most appropriate candidate site:

- Most centralized offshore position with regards to the European Union Atlantic Arc and core ports.

- The least encumbrance to navigation channels and the most accessible to ocean navigation channels.

- Favourable wave activity, reduced ocean currents, reasonable ocean depths, and nearness to landfall were also verified to obtain the most positive combination.

- The migration of marine mammals, fishing zones, submarine cable installations, ocean floor obstacles were amongst the additional criteria applied and reviewed.
Offshore near buoy M3 at 30 nautical miles from Mizen Head, Ireland became the most promising candidate site, once filtering of a number of other possible candidate sites were completed.

Positioning the Float Inc. Security Port offshore, near buoy M3 at 30 nautical miles from Mizen Head, Ireland, provides the Ultra Large Container Vessels the means to divert from the English Channel navigation difficulties (sailing time being the most important) as well as being capable to access the Float Inc. Security Port via a “calm water zone” to the leeward side of the Float Inc. Security Port.

The Mizen Head, Ireland offshore site is within a maximum of 50-sailing hours for the Short Sea Shipping container vessels to attain the farthest core ports on opposing ends of the Atlantic Arc. This short sailing time replaces the 8 to 12-day sailing time previously used by the ULCS vessels to arrive at their port destination within the Atlantic Arc, resulting in time & cost reductions for all. The currently idle EU Short Sea Shipping vessels could readily be activated and manned by seafarer crews (estimated at 10-crew members per SSS vessel) - another EU positive economic impact favourable for the offshore port utilization.

1.3.3 Technical phased development

1.3.3.1 TRL 5 Test tank modelling TRL 5, TPL 6

Aim: Includes 1:6 scale tank testing:

- Tank testing of PSP in a large test basin (10-meter width) to obtain the best model configuration for Galway Bay, Ireland.
- Tank testing of the Rho-Cee WEC in a small basin to obtain the best model configuration for Galway Bay, Ireland.
- Tank testing of the combined PSP/ Rho-Cee WEC in a large basin (10-meter width) to obtain the confirmation of the best model configuration for Galway Bay, Ireland.

Target deployment in: 2018

1.3.3.2 EU proposed pilot: Pilot Galway Bay TRL 6, TPL 8/9

Aim: offshore R&D testing to confirm & validate combined marine technologies and validate a TRL 4-5 of Float Inc.‘s OFOES.

The Pilot project in Galway Bay, Ireland is to provide “proof of concept” Technical Readiness Level 6 of both Rho-Cee Wave Energy Converter and the Pneumatically Stabilized Platform combined to become the Offshore Floating Ocean Energy System (OFOES).

The pilot floating platform could derive revenue from the following three services, but these are not modelled in the financials for pilot:

- The OFOES can provide a stable platform for marine technologies R&D in addition to becoming a “Hands On” training means for the patented Rho-Cee Wave Energy Converter and associated Power Take Off system (TRIDENT ENERGY) applied.
- The “Hands On” training means would provide University students the most pertinent means by which they could more readily comprehend and utilize their University education in the marine technology field.
- Additionally, those University students that qualify may become future employees for the future Float Inc. Security Port. As such, the capital costs for the pilot Galway Bay TRL 6 would become an investment for the Universities of Ireland teaching marine engineers subjects.

Comprises of
- **floating units**: One Pneumatically Stabilized Platform
- **wave units**: estimated 2,812MWh/year (overall 0.40MW rating) from 10 Rho-Cee Wave Energy Converters (4-meter width module over 40 meters wave span x 6 meters leeward). 3 Power take Off (PTO) linear generators per Rho-Cee WEC module.
- **Potential Energy Storage**: estimated 2.00MWh capacity within interstitial spaces of PSP
  - Platform footprint of approx. 40 meter wave span x 50 meter leeward having an overall horizontal surface of 2,000 m²
  - Located: Galway Bay Ireland test site
  - Water depth at proposed location 20 - 40 m
  - Moorings: double-point mooring
  - O/M and access: O/M + access on-board OFOES
  - Target deployment in: 2018

### 1.3.3.3 Mizen initial demonstration TRL 7, TPL 8/9

- Aim: First open sea test
- Comprises of
  - **floating units**: One Pneumatically Stabilized Platform
  - **wave units**: estimated 24,066MWh/year, overall 5.49MW rating from 50 Rho-Cee Wave Energy Converters (5-meter width module over 250 meters wave span x 10 meters’ leeward platform). 9 PTO linear generators per Rho-Cee WEC module
  - **Potential Energy Storage**: estimated 12.5MWh capacity within interstitial spaces of PSP
  - Platform footprint of approx. 250-meter wave front by 50-meter leeward platform, surface total of 12,500 m².
  - Located: M-3 buoy zone offshore from Mizen Head, Ireland
  - Water depth: 150M
  - O/M and access: complete O/M + access on-board OFOES
  - Target deployment in: 2020

### 1.3.3.4 Mizen Commercial farm TRL 9, TPL 9

- Aim: This stage expands the floating unit terminal size to full capacity footprint for the configuration of an offshore commercial market offshore container port application responding to EU Motorways of the Sea – Atlantic Arc. Incorporate the two previously tested Demonstration Models (referenced above) within the commercial market product full scale with inclusion of an LNG terminal having capacities to provide baseload electricity, potable water, and regasification services for the entire platform.
- Comprises of
  - **floating units**: Pneumatically Stabilized Platform
  - **wave units**: estimated 240,665MWh/year – overall 54.95MW rating from 500 Rho-Cee Wave Energy Converters (5-meter width module over 2500 meters wave span x 10 meters’ leeward). 9 PTO linear generators per Rho-Cee WEC module
  - **Potential Energy Storage**: estimated 1,349MWh capacity within interstitial spaces of PSP
  - LNG terminal: To Be Determined – an LNG terminal having capacities to provide baseload electricity, potable water, and regasification services for the entire platform. Estimated Cost: 700 Million Euros.
  - Platform footprint of approx.: 2,500 meters x 800 meters size 1,349,672 m² (134.97 hectares).
- Located: M-3 buoy zone offshore from Mizen Head
- Water depth: -150M
- O/M and access: O/M + access onboard
- Target deployment in: 2022
### 1.3.4 Gantt

<table>
<thead>
<tr>
<th>TRL5</th>
<th>Tank Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRL6</td>
<td>Galway Bay</td>
</tr>
<tr>
<td>TRL7/8</td>
<td>Mizen 1 unit precommercial</td>
</tr>
<tr>
<td>TRL9</td>
<td>Mizen commercial full size, starting at 25% commercial capacity</td>
</tr>
<tr>
<td>TRL9 by 2030</td>
<td>Mizen commercial full size, 75% commercial capacity</td>
</tr>
<tr>
<td>TRL9 by 2040</td>
<td>Mizen commercial full size, 100% commercial capacity</td>
</tr>
</tbody>
</table>

**Table 1: Roadmap to commercialisation**

### 1.3.5 Advantage of combination

**General for both sectors**

Once fully certified and operational, it would become Europe’s first offshore floating platform with an electricity baseload powered by LNG, and configured as an automated container-handling port hub serving the European Atlantic Arc coastline ports, capable of automated reception, weighing, and 100% inspection of all inbound and outbound TEU’s thereby increasing the EU security profile; expediting the inbound TEUs to their country core port and comprehensive networks of European ports and logistics centres via the core network corridors to their member state port destination using LNG powered TEU container vessels – approximate capacity of 2,500~4,000TEUs – capable of sailing at speeds in excess of 20 knots.

The economic advantages of the EU Atlantic Arc automated container-handling port hub are as follows:

- The EU Atlantic Arc port hub would be the central access point (100% TEU inspection, weighing, and EU customs procedures).

- The member state ports would not necessarily be required to perform costly port facility upgrades (automation; gantry cranes; pier extensions; deeper ports; costly land real estate acquisitions. The Short
Sea Shipping vessels (currently setting idle) could be re-activated for service to each EU member state, and additionally the training & hiring of seafarer personnel for the crew manning levels required for each vessel - estimated at 10 seafarers per SSS vessel activated.

- The member state ports along the European Atlantic Arc zone would retain their stevedore personnel numbers and probably increase them as they would not be replaced by automation within their own working port.
- The member state ports would process the inbound TEUs directly onwards within their respective member state destinations in a more direct routing – reducing TIR/railway transport costs; pollution; traffic congestion and time.
- The reduction of road transhipment by 30% to eliminate CO² pollution caused by the tractor/trailer vehicles transporting the TEU to various EU member states.

The EU goal is to eliminate road transhipments. The following LOADSTAT 2014 Market Potential 07March2016 states that 13M TEU are transhipped.

North Europe Main Transhipment Ports 2012 (extract): Full TEUs

- 4 265 000 Rotterdam
- 2 659 000 Hamburg
- 2 504 000 Antwerp
- 2 750 000 Bremerhaven
- 390 000    Le Havre
- 490 000    Zeebrugge

Total: 13 058 000 TEUs transhipped

It is anticipated that Float Inc. Security Port project will reduce EU road transhipment of TEUs by 30% - see web links content - [http://transport.sia-partners.com/increasing-container-traffic-pressuring-port-and-hinterland-infrastructure](http://transport.sia-partners.com/increasing-container-traffic-pressuring-port-and-hinterland-infrastructure)


See also section 6.1 Avoided costs for more details on transhipments.

**Advantages for Wave energy**

1. Sale of electricity generated directly to platform. Guaranteed market and low loss.
2. Electricity balanced with use of compressed air storage as well as base load provided by LNG
3. Reduced cost of installation due to combined construction. The costs incurred from the installation of the Rho-Cee WEC system is a platform-sharing cost. Please note that in the event of extension of the offshore floating platform to accommodate increasing shipping volumes, the Rho-Cee WEC should also be extended to provide additional renewable energy generation that could be made available for use aboard the platform or for transmission ashore.
4. Reduced operation and Maintenance (O/M) due to ease of access. Platform will provide easy access to operate and maintain
Advantages for platform

1. Autonomous supply of clean renewable energy. Balanced by Compressed air storage and LNG.
2. Cheaper electricity than using LNG or cable supply from shore?
3. Rho-Cee WEC and PSP will provide dampened sea states, in the lee of the platform for improved ship docking.
1.4 Business section

1.4.1 Competition

Table 2: Key Competitors

<table>
<thead>
<tr>
<th>Competitor</th>
<th>Key Differentiators</th>
<th>Competitive Threat Rating (1-5)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacGregor</td>
<td>Company develops floating platforms with restrictive use. The wave activity would cause ships alongside to move in at a different cadence than the floating platform as it uses direct displacement marine technology – whereas Float Inc. PSP uses air within the platform to absorb the wave displacement, resulting in a stable platform.</td>
<td>1</td>
</tr>
<tr>
<td>Transhipment Vessel</td>
<td>Ore Fabrica, is a large floating terminal, used to transport bulk cargo from one vessel to another, eliminating the need for the vessel to dock at port. As of yet, bulk cargo is the only type of cargo they are able to tranship. Company utilizes vessels for cross-loading. The results are the same as Macgregor and for the same reasons.</td>
<td>1</td>
</tr>
<tr>
<td>StratMos</td>
<td>Similar project(s) concerning offshore platforms &amp; container transhipment, but seemingly “blocked” by lack of appropriate offshore floating marine technology.</td>
<td>1</td>
</tr>
</tbody>
</table>

*Competitive threat based on companies’ appraisal of perceived threat with 5 being severe competitive threat.

1.4.2 Business Model

It is Float Inc. vision that a SPV will be created to bring together all the necessary knowledge and expertise to make the floating shipping terminal a reality. It is envisaged that companies such as Berger ABAM and APM terminals will form a joint venture with Float Inc. bringing their expert knowledge and experience the SPV. The premise of this SPV will be to deliver wave energy enabled floating shipping terminals fully assembled and operational to its customers, for which the SPV will be compensated for. Along with platform sales, the SPV will provide O&M services.

Table 3: Business Model Canvas Building Blocks
1. **Customer Segments**

- Potential customers include the investors such as the European Investment Bank, Port Owners such as the Port of Rotterdam and Port of Hamburg, Port Operators such as APM Terminals and Hutchison Port Holdings Limited, Shipping Companies such as Maersk Group and MSC. This is not an exhaustive list. It is likely all these customers will each partly invest in the purchase of the floating terminal from Float Inc.

2. **Value Proposition**

- Wave energy for standalone power generation – reduced operating costs for customers (Less Fuel)
- LNG enabled platform allowing for cheaper and more efficient power production without land connection
- Reduced road transport – facilitates shipping of containers by sea rather than on land, reduced emissions
- Automated transfer of containers – decrease container loading/unloading time leading to savings
- Increased ship size – allows shipping companies to progress with the trend of ever larger ships
- Reduced congestion at port – removal of transhipment requirements from large busy ports

3. **Channels**

- Float Inc. will employ a direct selling approach to customers. Float Inc. will own, operate and maintain these channels themselves
- Purely direct marketing channels will be utilised.
- Each module will be constructed at land based dock and transported(towed) to terminal site.

4. **Customer Relationships**

- Float Inc. will be required to build close relationships with the terminal owner and operator in order to evolve long term partnerships. Highly personalised relationships will be required for each customer

5. **Revenue Streams**

- The main revenue stream will be the sale of platforms to customers highlighted previously
- A smaller revenue stream will be the provision of O&M service for customers
- Sources: LOADSTAT 2015 last update: 07/03/2016 and EUROSTAT Pocketbook 2015, section 22
- The following TEU figures are from the total of 13 ports on the Atlantic Arc:
  - 43,789,000 TEUs via vessel transport for year 2014
  - The EU target for a 30% reduction of road transport equates to 13,176,700 TEUs that should be removed from road transport by 2020.
  - The TEU handling capacity range for the Float Inc. Security Port is estimated to be from 17.5Million to 70Million TEU moves per year.

6. **Key Resources**

- Floating platform tech knowledge and expertise
- Intellectual Property (IP) protection and patents
- Access to a dry dock for construction (Foynes)
- WEC manufacturing facilities (Foynes)
- Close proximity to Cork harbour (Land access)
7. **Key Activities**

- Managing the construction process of platform
- Maintaining R&D effort in the future
- Providing O&M services for customer throughout the lifecycle of the platform.

8. **Key Partners**

- Maersk Group, MSC, COSCO (Customer)
- Irish Government, EPA Ireland (Environmental)
- Marine and Renewable Energy Ireland (MaREI)
- Marine Renewable Industry Association (Energy)
- European Community Ship owners’ Association
- Glosten, APM Terminals (Supplier)
- Marine and Renewable Energy Ireland (Design)
- Yee Precast, Trident Energy (Subcontractors)

9. **Cost Structure**

- R&D and Construction division of SPV, representing largest cost. Costs include construction vessels, equipment and overheads.
- O&M division of SPV. Cost include service vessels, equipment and personal.
- Maintaining IP protection in selected jurisdiction

1.5 **Management Section**

Float Incorporated has been primarily staffed by volunteer principals of the corporation and commissioned agents. These, together with the generous help of consultants, have been sufficient during the testing and analysis stages of the PSP and Rho-Cee WEC, but are not adequate for worldwide marketing that these marine technologies merit. Float Incorporated will have to add full-time staff to match the increase in business expected from the internationally marketing of its products. It should be noted that the company currently has a very capable and well trained core as a base for this expansion.

Float Incorporated from time to time has the opportunity to use its expertise to exploit other marine technologies. However, Float Incorporated will concentrate on expanding the PSP, Rho-Cee WEC and PES markets. It will keep abreast of marine sciences and technology advances that could result in future sales. For example, high speed passenger ships, ferry boats and large deep-draft container carriers will require harbour facilities for which the Float’s technologies are uniquely suitable for roll-on /roll-off and container cargo transfer from sea to land.

Unlike strictly service companies, Float Incorporated is not labour intensive, but requires vigorous and effective management. The current team has those characteristics. However, more managers will be required to handle the project’s projected for the future. The majority of the physical work will be accomplished by subcontractors under the direction and control of Float Incorporated.

Float Inc. is currently at an important juncture in its business future. With its PSP technology ready for site-specific engineering and construction it is ideally positioned to capitalize on the growing demographic demand for floating real estate. With Rho-Cee WEC ready for scale model testing in an atmosphere rife with desire to find efficient sustainable energy, the world should jump at the chance of harnessing the power of waves to supplement other less practical means of capturing energy. However, without sufficient financial resources it will likely take years before this market is significantly penetrated. It is possible that this delay will allow a competitive technology to develop that currently does not exist. This business plan has been designed to avert such a circumstance.
The capitalization required for this plan is divided into two categories. The first covers the costs of marketing and staffing until Float Inc.’s revenues are sufficient for it to stand on its own until the revenue catches up with the expenses. The second, a real property trust, provides the capital for participating with commercial developers as an incentive to expedite their PSP projects. This will insure an early end to the reluctance of engineers and developers to be the first with a new technology. The initial launching and deployment will also initiate world-wide publicity.

At some point in the future Float Inc.’s Board of Directors will consider the advantages and disadvantages of a public offering of stock. This may become desirable if sales exceed expectations to the point that cash flow becomes a problem. In that case the funds would be used to bridge the gap between project concept and project fruition. Surplus funds could also be used to establish research centres and production facilities in select areas of the world. These would serve the particular problems endemic to the region, i.e., earthquake-proof foundations for housing in Turkey, man-made islands for Japan, offshore oil and gas production platforms in the North Atlantic, desalinization facilities in Saudi Arabia. These would also serve as political bases for securing local government contracts and, through regional representation, enhance platform sales.

Figure 2: Management structure

The above organisational chart is the management structure that is proposed for Float Inc. moving forward. At the moment majority of these positions are TBD (To be Determined) along with the Board of directors to be appointed. Currently, the following are people involved in Float Inc. along with their positions:

- Donald A. Innis, CEO
- Neal A. Brown, Senior Vice President, FEO, CTO
- Susie B. Bryant, Treasurer
- Franklin E. Martin, Logistician
- Joaquin Sebastian Peral, Project Engineer
1.6 Market Section: Market Share from 2020 until 2040

1.6.1 Market Analysis

The main concerns within the EU in relation to maritime traffic is the reduction of unnecessary movement of containers and goods while increasing efficiency and streamlining services. This is highlighted by the European Commission’s Motorways of the Sea (MoS) project. Here, the objective of MoS “is to achieve a full integration of maritime transport operations in the global logistic chain as this will allow for a seamless integration of transport operations supporting European external trade (75% of Europe's external trade is performed by maritime transport) and internal trade (40% of Europe's internal trade)”. The MoS project aims to achieve its objectives by reducing land transport of freight, increase freight transport efficiency and improving accessibility to peripheral regions. Along with MoS another factor that is influencing maritime container traffic is the ever increasing size of container ships. According to the World Shipping Council, the average size of container ships within the EU has increased from just under 8,000 TEU in 2010 to over 11,000 TEU in 2015. This is placing more strain on ports to handle these ships which is leading to port congestion.

![Figure 3: Market Analysis: TEU](image-url)
In the above graph, The Float Inc. Security Port project aims to gain 73% of the entire North European Atlantic container market (SAM) by 2040. The terminal will be fully commissioned by 2024, and operate at 25% capacity initially. By 2030, it aims to triple its capacity to capture 60% of SAM, and 73% of SAM by 2040.

TAM and SAM is based on TEU forecasted figures from 2013 per the following document: European Commission Memo, Europe’s Seaports 2030: Challenges Ahead. This document indicates a 50% growth is expected from 2013 until 2030 in TEU containers within Northern Europe. This growth rate has been used to calculate the total TEU for 2030. TAM and SAM for 2020 and 2040 have been calculated using the same yearly growth rate as for 2030.

1.7 List of investors and sources of funding

1.7.1.1 Investors potential

- MAERSK GROUP - terminal berths
- APM TERMINALS - automated cranes; MVGs; screening system(s); weighing system(s)
- CMA CGM GROUP - terminal berths
- MEDITERRANEAN SHIPPING COMPANY - terminal berths
- BergerABAM - construction of Float Inc. Security Port
- Waller Marine - LNG construction & management
- European Union member states served by Atlantic Arc & Float Inc. Security Port facility
  - Participation could be based upon proportional rates of usage - renewable annually
- EU member states joint venture as the Float Inc. Security Port facility can be considered as an EU Project of Common Interest.
- Float Inc. Security Port berth(s) could be made available for public bidding as a rental or purchase action.

1.7.1.2 Grant funds required and potential sources

Pilot Funding grants

- Received Grants - €1.3MILLION EUROS (DARPA + ONR USA)
- Potential Grants - €10MILLION EUROS – SEAI, IRELAND

NB: The Pilot project in Galway Bay, Ireland is to provide “proof of concept” Technical Readiness Level 6 of both Rho-Cee Wave Energy Converter and the Pneumatically Stabilized Platform combined to become the Offshore Floating Ocean Energy System (OFOES). The test floating platform could derive revenue from the following three services, but these are not modeled in the financials for pilot:

- the OFOES can provide a stable platform for marine technologies R&D in addition to becoming a “Hands On” training means for the patented Rho-Cee Wave Energy Converter and associated Power Take Off system (TRIDENT ENERGY) applied.
- The “Hands On” training means would provide University students the most pertinent means by which they could more readily comprehend and utilize their University education in the marine technology field.
- Additionally, those University students that qualify, may become future employees for the future Float Inc. Security Port. As such, the capital costs for the pilot Galway Bay TRL 6 would become an investment for the Universities of Ireland teaching marine engineers subjects.
1.8 Risk section

1.8.1 Commercial Risk Analysis

1.8.1.1 Hazards description


❖ Hazards were colour coded (risk matrix 1-25) depending on risk magnitude revealing
  ➢ 37 High (red),
  ➢ 56 Medium (orange) and
  ➢ 9 Low (green).

❖ Issues and causes described for each hazard, including the effect (-/+ of multiple industry and technology co-location.

❖ A ranking (1-5) used to quantify Consequence and Likelihood with resultant risk magnitude for each hazard.

❖ Risk response strategy proposed and residual risk magnitude quantified for each hazard.

Figure 9: Hazards before mitigation

1.8.1.2 High risk (red) hazards identified pre/post mitigation

Table 11: Identified Hazards
<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Issue</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operation (all stages)</td>
<td>Pre-construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical issues</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Site problems and Licensing</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Insurance issues</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weather conditions</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Logistical issues</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Unavailability of necessary infrastructure</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Operational</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Component/system accidental damage</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Maintenance and logistics issues</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Health and Safety/Access to emergency response</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Environmental impacts</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Decommissioning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device removal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Environmental impacts</td>
<td>1</td>
</tr>
<tr>
<td>2. Economic and Political</td>
<td>Market dynamics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commodity prices, currency fluctuations, inflation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Competition</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Unable to enter market due to competition</td>
<td></td>
</tr>
<tr>
<td>3. Financial</td>
<td>Financial support</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Financial support not available, insufficient or withdrawn</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Lack of interest from investors due to current low freight rates</td>
<td>1</td>
</tr>
<tr>
<td>4. Environment</td>
<td>Contaminants</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Impacts on water quality</td>
<td></td>
</tr>
<tr>
<td>5. Socio-economics</td>
<td>Displacement</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Reduction of local economic activity</td>
<td></td>
</tr>
</tbody>
</table>
1.8.1.3 Commercial High Risk Response

Operation (all stages)

Description: “Site problems and licensing” issues relate to site compliance from environmental perspective, among which the location of the proposed site in a migration sea mammals route. We have also considered the risk of failing to align with the licensing procedures due to the combination of two industries at the same location. All of these issues could result in higher costs and delays.

Risk response: Pre-planning as early as possible for a thorough EIA study can help avoid such issues. Site risks will be pre-identified (prior to the design phase) and thoroughly reduced to enable the adoption of the candidate site as an authorized zone. Navigational, marine migration, fishing zones, hazards, etc. will be taken into consideration and resolved prior to permit issuance.

If necessary an alternate candidate site may be acceptable, but would require total review and acceptance prior to design and construction of Float Inc. Security Port & Wave platform.
Employing an experienced Environmental Manager and working with marine environmental specialist contractors that have extensive local knowledge of the site will ensure that high quality environmental data will be gathered. Extending the candidate site from buoy M3 (M3 weather station buoy located 30 Nm Southwest of Mizen Head) should help to obtain a better overall marine profile and will reduce permitting & licensing delays.

**Description:** During construction phase adverse weather conditions and logistical issues (e.g. availability of specialist vessels) may prevent access and shorten construction time windows. This could affect the floating terminal construction and/or combination sectors (e.g. wave energy) resulting in delays and extra costs.

**Risk response:** The modular design of the floating platform will allow conducting construction and assembly of floating platform modules in sheltered area (i.e. at shore) and tow to deployment location using experienced contractors with specialist vessels capable to operate on offshore environment will extend installation time windows. Construction and maritime operations will be planned to coincide with the summer months reducing the risk magnitude even further.

**Description:** A particular construction risk is that the electrical grid infrastructure is not in place or that the infrastructure is insufficient to allow for a grid-connection on-shore for electricity export. This could result in higher costs and significant delays.

**Risk response:** Engage early with electricity utility companies to establish source of funding for onshore infrastructure costs taking into consideration this service-connected product reduces the overall electricity necessary locally to be generated and transmitted. In the event the onshore electrical grid infrastructure location would result in excessive expenditures - as an alternate choice, the wave energy converted to compressed air may be stored within the interstitial spaces of the Float Inc. Security Port/PORTUNUS platform and up to 20MW of equivalent power could be utilized on-board the container hub – thusly creating a cost savings of LNG use for on-board baseload electricity.

**Description:** At operational stage the biggest risks are associated with failure at component or system level due to reliability (e.g. mooring due to extreme weather, fatigue, fouling, corrosion, weakening of structures) together with maintenance and logistics issues. The latter can potentially cause downtime and breakdowns, insufficient infrastructure and insufficient technological performance. Other risks include environmental impacts due to physical (e.g. cargo handling) or chemical (e.g. accidental spills) causes could result in higher costs, fines and delays. At decommissioning stage environmental impacts due to disturbance of established habitats on the submerged structures or inexperience with the process/costs associated with removal of structures has also been highlighted.
as potential issues. The consequences above can be amplified further due to factors such as distance from emergency response, inexperienced/low skilled workforce.

**Risk response:** Extensive testing at component and system level will need to be done including extensive mooring testing. Complete Failure Mode and Effect Analysis of all components will be performed so that all failures will be properly understood. Downtime may be reduced by deploying experience and resources (vessels) from other mature offshore sectors. Implementation of strict emergency response plans, employing experienced staff in key positions (i.e. H&S/Environmental Managers/teams) and ensuring high awareness regarding offshore H&S issues at all personnel levels will keep the identified risks at reduced frequency levels. During decommissioning knowledge that would have been gathered from many decades of operational experience coupled to the experience transferred from the offshore sectors (Oil & Gas, shipping) will also help mitigate the associated risks.

**Economic and Political**

**Description:** Commodity prices, currency fluctuations and inflation are issues identified that can result in higher costs and/or lower revenue generated affecting the different sectors of the combination. The identified causes include applied price forecast (i.e. long-term price forecast and divergence in the expectations for trade prices), poor sensitivity analyses, exposure to market risk and high inflation/currency fluctuations (with impact on value of cash flows relative to up-front investments).

**Risk response:** It is important to ensure that residual risks from individual sectors are not transferable to others in the MUP combination. Individual companies involved will be carrying out extensive due diligence/audits on each other’s business plans and financials and these results can be incorporated to adjust own projections.

**Description:** There is a risk of the project failing to be executed due to the inability to enter the intended market because of competition. Wave energy is competing against fossil fuels, nuclear industry (export electricity to shore) and other renewables (onshore/offshore), which will require wave energy to become more economical in the future.

**Risk response:** To support the energy needs on-board OWC wave energy will be incorporated in the core design of the floating structure. In this way it will take less space than other offshore renewables (e.g. offshore floating wind farm) which would have to be deployed at the expense of offshore proximate space.

Regarding the competitiveness of the wave energy generator, the combination of Rho-Cee WEC and Pneumatically Stabilized Platform create a highly stable, monolithic floating platform upon which the question of survivability is favourably enhanced (one of the unique
selling points) due to the marine technology combinations inter-actions, i.e. Rho-Cee WEC + PSP together.

Financial

Description: Financial support was identified as the category where almost all red financial hazards are found. Potential issues identified around lack of (or removal of) investment which could be triggered due to a number of possible causes:

- many wait-and-see investors who do not invest due to risk of losing development costs and due to little benchmark data
- lack of experience and knowledge (i.e. Life cycle stage S0) may discourage the reluctant investors to assume unknown risks
- wrong sensitivity analyses and price forecast; Bridge financing problems arise (e.g. from exposure to market changes); change of business climate; Applied price forecast;
- public sector support: unexpected phase-out or change of policy/terms/rules, delays in payment
- finance instruments related problems (e.g. Risk Capital, Mezzanine/Corporate/Project/Participation/Consumer/3rd Party – Finance); Poor lending appetite from banks due to low economic climate; lender fail to comply with financial legislation/regulation (Basel III, Solvency II)
- Financial insecurity may lead shipping companies to sell their holdings in terminal operations and other non-core businesses to focus on their core activities, disintegrating thus the Deep Sea Shipping value chain;
- In view of the sector’s reduced profitability and also due to the overall economic climate, access to finance from the bank sector has become (and might become even more) difficult;
- Poor world economic development
- Volatile demand for trade goods
- Supply overcapacity of transportation industry

Risk response: In order to inspire investor confidence in the absence of benchmark data, clearly demonstrable results will be communicated across from studies undertaken during TRL stages transition. Moreover, working with highly reputable contractors and project developers experienced in delivering naval architecture major projects and extensive due diligence working with investors will help avoid some of the risk hazards. Finally working with expert contractors and advisors tasked with detailed assessment and offsetting of financial risks will be important for such a large project.

Environment

Description: The only hazard identified under this category is relating to potential impacts on water quality resulting in higher costs for the operation. Causes are due to possible sediment and water quality contamination from port construction and operational activities. Including accidental chemical and physical pollution, spills, cargo handling and stormwater runoff impacts:

- toxic impacts on fauna
- food chain
• human health impacts

**Risk response:** Employing experienced staff and teams around Environmental and H&S management tasks and planning and implementing adaptive management/offset strategies as applicable will mitigate against this risk. Also liaising with local authorities ensuring adequate emergency response capacity is in place and at close proximity and the experience and best practices from Oil and Gas as well as Port operations in the vicinity is a clear advantage.

**Socio-Economics**

**Description:** The only hazard identified under this category is related to the reduction of local economic activity (local / regional / national impact) as a direct consequence of the project. Some of the potential impacts on local economies include:

• Loss of attractiveness of tourism & recreation territory; construction site visible over length of coastline used for recreation by local people and visitors
• During operation reduced water quality affects nearby tourism/recreation activities. Sediment accumulation could reduce water quality (limiting flushing).
• Increase of level of noise and visual pollution due to additional transport both at sea and land; new distribution routes around towns and villages
• Possible decrease of nearby property value; living area becoming less desirable

**Risk response:** The possible reduction of local economic activity could be offset by increased trade and government revenue originating from the project. In addition, the project will generate local employment, which could improve social conditions and stimulate the economy locally.

**Health and Safety**

**Description:** Red risk identified under several subcategories which could lead to personal injury including:

• Access & Egress (Falls/Crushing/falling into sea during transfer, Personnel stranded due to vessels inability to dock and transfer / helicopters ability to operate during adverse weather)
• Confined Spaces (injury/loss of consciousness/asphyxiation from temp. increase, release of dangerous chemicals, oxygen displacement, drowning due to ingress of water, fire or explosion)
• Electrical Safety (electrical shock, heat build-up/burns, fire and/or smoke, arc flash eye damage/burns, explosion from rupture of components, electrocution from HV switchgear related to wave devices)
- Fire (Direct - burns, smoke inhalation, Indirect –fall/sea entry during escape, falling objects, on board access vessels causing incapacitated or abandoned vessel at sea)
- Lifting (during construction and assembly, lifting of major components offshore, failure of lifting equipment, lifting tools and minor components from access vessel)
- Navigation (vessel collision, Interference with shipping routes, System drifting from defined position into shipping traffic)
- Remote Working (Injury unnoticed, Lack of management supervision, Transit time to obtain treatment of injury)
- Subsea Operations (entrapment, falling objects, decompression sickness, use of tools underwater)
- Unexploded Ordnance (Detonation of UXO during survey, installation, cable lay, operation)
- Working at Height (falls, dropped objects)

**Risk response:**

- **Access & Egress**
  - This is a well-known risk experienced in other more established sectors such as offshore wind turbine crew transfer. Offshore wind and Oil/ & Gas best practices will be followed. Application of IMO, SOLAS Lloyds Register requirements will be met prior to being classified as operational. In practical terms:
    - Operational windows will be set following close monitoring of weather and with considerations of severe weather forecasts. Apply strict safety procedures during transfer and impose operations limitation at severe weather conditions
    - Transfer area will be carefully design and fitted to minimize risks.
    - Vessels will fit to classifications to be used for transfer of personnel and designed for this purpose.
    - Transferred personnel and vessels crew adequately trained.

- **Confined Spaces**
  - Reduce the number of confined space in design phase and apply strict ventilation conditions whilst working in confined space
  - Conduct a thorough risk assessment for confined space entry including identification of measures that avoid the need to work in the confined space and elimination of sources of danger to people who will enter the space
  - Permanent measures in place to restrict entry and when these spaces are used for certain operations to be carried out under well-defined procedures (including, training supervision, Communication systems, test and monitor the atmosphere, purging hazardous gases or vapours from the space, fire prevention etc.) in accordance with national and international regulatory and policy making bodies such as IMO and SOLAS
  - Unless or until a confined space has access procedures defined for safe use it will be treated as a potentially hazardous confined space.
• Electrical Safety
  o Ensure that the design enables safe commissioning, operation and maintenance. Ensure having competent people involved at each stage of the design process
  o Residual risks are identified, communicated and mitigated through safe systems of work
  o Tasks carried out in accordance with national and international regulations with adequate provision on infrastructure and procedures in place, including installing electrical equipment in secure space, provide safety equipment for staff working with or in proximity to electrical equipment and apply strict safety procedures when working with or in proximity to electrical equipment
  o Application of IMO and SOLAS requirements. Best Practice for HV working for maintenance of wave energy generators.

• Fire
  o Fire prevention and protection systems (e.g. high temperature alarms) from early design stages to reduce potential future risk exposure. Maintenance requirements of the fire protection system also considered including condition monitoring and scheduled inspections for early warning of equipment deterioration.
  o Emergency fire response procedures will be in place.
  o Safe systems of work in accordance with national and international regulations (e.g. Health and Safety at Work, Personal Protective Equipment, Work Equipment Regulations etc.) including Application of IMO and SOLAS requirements. Ensure control of hot work that can introduce a source of ignition, such as welding or grinding.
  o High standards of housekeeping and maintenance avoid the build-up of combustible materials, and ensure that any leaks are repaired in a timely manner. Hidden locations, such as the inside of ventilation ducting, should also be considered, in order to ensure that these do not accumulate combustible dusts.

• Lifting
  o Ensuring that all cranes are designed and certified for offshore use. Ensure compliance to regulatory requirements using lifting equipment suitable for the purpose of the intended use, in terms of properties such as materials of construction, accessibility, protection of personnel, and withstanding the effects of high wind.
  o Giving thorough consideration to lifting requirements at floating terminal early design phase including equipment that matches the capabilities of foreseeable vessels. Adopt best practices in the lifting operation
  o Carrying out thorough early planning of lifting operations, so that firm vessel requirements can be established;
  o Selecting the most appropriate cranes for the tasks of routine/non-routine, heavy/light, restricted/unrestricted (by weather) operations. Adopt standards set by IMCA, DNV, Noble Denton
  o Ensuring that the suspended load will not pass over locations where people will be present during the lifting operation
Advance contingency planning in place to cope in case of problems such as interruptions in power and communications systems, failures of load-bearing components, and unexpected problems with the parts to be assembled.

**Navigation**
- Systems will be in place to monitor the position and ensure visibility of floating terminal to sea users (day/night/radar)
- Potential vessel collision will be considered during the design stage. Likely effects on the structure, means of recovery after a collision. Design to ensure no unnecessary level of risk present to vessels or people.
- A Navigational risk assessment will be considered as part of the consenting process.
  - Combination of management and physical systems such as lights and markings
  - Marine traffic survey will be undertaken for the site and activities in adjacent sea areas (transit routes, ports and anchorages, fishing grounds, archaeological sites, military activities, oil and gas installations)
  - The need for safety zones will be implemented if identified as necessary in the consenting process;

**Remote Working**
- The effects of remoteness will be considered when planning work such as lifting (LOLER), work in confined spaces, the use of hazardous substances, and work at height.
- Thorough planning, to ensure that the necessary resources are in place to support the RW tasks, and foreseeable incidents that may occur.
- All necessary work, equipment, consumables, and means of waste disposal are provided, with appropriate spares as necessary.
- Competence and equipment to manage foreseeable situations will be in place up to the point where additional help will be available.
- Effective communication with all personnel working in diverse areas of the floating terminal.
- Location of all personnel and vessels known/recorded at all times: personnel tracking systems including procedures that require manual reporting over radio, RFID (Radio Frequency Identification) contactless swipe cards, and GPS systems.
- Each offshore work party under suitable fitness (i.e. no underlying health conditions) and competent with skills such as first aid and rescue, to ensure self-sufficiency and preservation of life in the event of an accident, until further support is in attendance.
- Suitable supervision and audit arrangements in place (i.e. ensure safe working practices)

**Subsea Operations**
- Comprehensive risk assessment of detailed plans for the operations will be undertaken, to identify hazards at every stage of the diving operations. Necessary mitigation measures will be in place including
  - ensuring the competence of personnel involved in planning diving operations
  - appointment of competent diving contractor and team
  - provision of information/findings of risk assessments or details of known hazards in the project location to the dive contractor and team
Detailed legal, technical and procedural requirements will be in place for any diving work. Subsea operations will be kept to a minimum. Strict safety procedure will be enforced and diving operations will be forbidden during any ship movement in vicinity or whilst meteorological conditions are above sea state 3 and wind Beaufort 4. Wherever possible operations will be assisted or conducted by ROV. Provision of facilities and support in the event of an emergency, including rescue and medical care.

**Unexploded Ordinance**

- Historical records of UXO will be examined for the site (in terms of previous military action and subsequent activities) and a risk assessment carried out to inform the level of survey needed. Studies will determine nature and probability of UXO being present, and how they may be affected by the proposed works.
- Geophysical surveys, seabed soil properties and met ocean conditions (i.e. determining potential depth of burial and mobility of UXO), visual inspection (by ROV or diver) may be necessary in order to make a thorough assessment that may affect a decision.
- If an unacceptable risk from UXO identified, then options will be considered including:
  - Design alterations of the floating platform in order to avoid carrying out operations in the affected areas, e.g. mooring, routing cables.
  - Suitable specialist Explosive Ordnance Disposal (EOD) contractor engaged to undertake safe disposal of UXO on the site, prior to other offshore works being undertaken.

**Working at Height**

- During detailed design of the floating terminal structures and equipment assess whether foreseeable tasks can be carried out without the need to work at height;
- Where an unavoidable need to work at height is identified, the design will ensure that the risks are minimised such as adoption of measures (e.g. fall-arrest systems, fixed fall-arrest systems on ladders, anchor points for use with equipment for work positioning) to reduce the risk of serious injury.
- Follow standard guidance to assess the risks of work at height, and, so far as is reasonably practicable, take steps to avoid those risks, according to a clear hierarchy:
  - Avoid work at height
  - Where work at height cannot be avoided, use work equipment or other methods to prevent falls from occurring
  - Where the risk of falls cannot be eliminated, take suitable measures to minimise the distance and consequences of a fall

1.8.2  Pilot Risk Analysis
1.8.2.1  Pilot High Risk Response

Galway Bay candidate site for the 40mx50m OFOES station has been designed to correspond to previously issued information of the candidate site chosen by MaREI for an offshore floating station. In that circumstance, Float Inc. presumes that all risk assessment questions have already been
assembled and resolved as their recent tender seemingly indicated. More information is available upon request from MaREI.

Description: The risks identified for the commercial scale operation also stand for the pilot but at a lesser extend in proportion to the size of the operation. In addition, hazards of technological nature may suffice which will need to be resolved in the detailed design and testing stages.

Risks related to technical issues and costs associated for resolution of these can pose a risk for the project to become uneconomic (components/system; e.g. automated rail system for container handling, module-connecting technology, innovative mooring technology, wave energy conversion technology). Within these, a major issues lie with a non-feasibility of the joining of multiple modules and non-feasibility for mooring

Risk response: The mooring technology for anchoring the platform securely to the seabed has been trialled by the offshore oil industry (http://maritime-executive.com/article/worlds-largest-semi-submersible-rig-delivered). PETROBAS of Brazil also succeeded in anchoring their platforms in a similar manner (http://www.halliburton.com/public/solutions/contents/Deep_Water/related_docs/Brazil%20Deep_water%20Map%20Final%20-%20English.pdf). The technology costs proposed herein are in line with resulting savings: greatly reducing on/off-loading times, which results in reducing the TEU container vessel in-port time and increases the port overall TEU container vessel berthing/TEU volumes, otherwise known as major asset rentability levels.