

Business Plan  
Marine Generation Innovations, LLC

April 21, 2015

|                             |   |
|-----------------------------|---|
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# 1 Executive Summary

Marine Generation Innovations is a high tech startup in the renewable energy sector with a winning team of five partners: Robert Brown, our Chief Financial Officer, is a certified public accountant and certified engineer; Jan Krawczyk, our Chief Executive Officer, has experience in the marine energy generation industry, and holds a Masters of Engineering with Renewable Energy; Blake Hawkins, our Chairman, has experience with a successful high tech startup together with Fearghal Mac Giolla Easpaig, our Chief Technical Officer - the two also hold an MBA from Harvard, and an MEng in Electrical Engineering, respectively; Dimitar Tashkov, our Chief Operating Officer, is a chartered process engineer with significant experience in industry. Together we have the skill set necessary to start a business in this rapidly changing industry.

Our initial product will be a pair of permanent magnet generators for use in submerged, flooded energy generation, especially useful in deep sea. Similar, sealed products exist, but their design is stagnant. MGI products will be cheaper to maintain and provide more efficient energy generation, and will continue to improve over the years. Our initial customers will be the owners of existing deep sea generators, who are looking for improved product to reduce maintenance costs. As the industry advances, further innovation will provide a more enticing price margin, and we expect new customers to react enthusiastically.

We are looking for an investment of £750,000 which will fund procurement, employees, our first prototype, and indeed even our first production installation. We also foresee a minimum growth of 200% in five years.

## 2 General Company Description

Marine Generation Innovations, LLC is a high-tech electrical manufacturing company targeting the renewable energy generation sector. Specifically, Marine Generation Innovations owns patent rights in the United Kingdom for innovative, water-submerged, flooded generators, which allows to fully harness UK's natural marine energy potential. We intend to conduct research, as well as design and manufacture devices for 500kW and 1MW units to be sold within the UK, and later abroad. As our company progresses and enhances its reputation, we plan to develop higher capacity generators in a bid to exploit the ever-growing renewable energy market.

At Marine Generation Innovations we believe that technical innovation can lead to groundbreaking efficiency improvements in existing solutions, and that fully submerged generators are the future of marine turbines as cost falls and human interaction can be reduced as well, allowing a greater level of automation.

We aim to provide a clear and viable alternative to sealed energy generators so that customers may make their own decision about which solution is best for them, and we plan to achieve this by thoroughly testing our product, and building them with genuinely competitive properties, especially in terms of operability, reliability, durability, and availability.

We believe that the best business in this sector is the reliable one with clear metrics and reliable products. By providing efficient tools that behave exactly as advertised, we feel that we can build a good relationship with our customers, thus producing industry-leading products this year and in each year following, and through that help to fully establish marine renewables as safe, reliable and economically sound energy source.

Fully submerged, flooded generators are designed to withstand great environmental hazards so that they may last longer without human intervention. Maintenance cost reduction is useful for everyone, but we plan to analyse our customer needs to more accurately select those who can benefit from maintenance cost improvements.

Renewable energy generation is unmistakably the most important urban issue of our decade, and not a fad that will dwindle into obsolescence. The UK government cites that wave and tidal energy have the potential to meet a fifth of its sum energy demand today, and our technology addresses this market by improving on existing generators. By improving generators potentially used in such an industry, we identify hundreds of potential customers and millions in potential profit. Another major advantage is that existing sealed-style generators have foreseeable obsolescence - they have a limited lifetime and require human intervention for replacement and repair. We believe that in this highly competitive market, businesses will be considering generator alternatives each year.

One advantage we have in being undergraduate university students is that we're well acquainted with bleeding edge research in various subjects, and have very widespread academic knowledge, including renewable energy and electrical engineering.

We believe that we can secure a major primary investment from a venture capital group due to the reliability of our business plan, and turn a profit without needing any further investment. Because of this, we believe a limited liability corporation is the ideal choice for us, providing some protection for investors and ourselves, without being forced to pay major taxes related to risk. We also have no interest at this time in an initial public offering.

### 3 Products and Services

MGI is a sea-immersed direct-drive permanent magnet AC generator. Marine Generation Innovations, LLC offers MGI with a range of 500kW (MGI-500) and 1MW (MGI-1000) rated models suited for different tidal, barrage and wave energy applications across the UK. We are capable of custom design of the outer casing in order to ensure perfect fit with any type of stand. Our services include production, start-up of completed system, remote servicing and maintenance as well as expertise throughout the operation period of our products. If requested by the customer we will organise subcontractors for providing other needed parts and components, transport, installation at site and connection to the grid.

Thanks to innovative technological solutions used in the MGI Product line, the generators have improved operability (4.8%), reliability (10%), survivability (2.6%) and availability (5%) comparing to currently existing technology. It is all due to our unique *flooded* design which significantly improves cooling of coils and other components of the generator. It removes the danger of seal wear-off or damage which is a great threat to generator operation in conventional technologies; removes the need for pressurised oil in the system which is a source of potential spillage and water pollution in case of seal fault and therefore makes our product environment friendly.

Pricing for generators: Early estimates indicate that production MGI-series generators will be available to the customer for approximately £4,350 per kW capacity. Given the inherent reduction in cost-of-energy and extended lifespan of the design relative to conventional generation, this represents a competitive price for a quality product with several exclusive customer benefits. Fees for expertise and servicing of the generators will vary.

## 4 Marketing Plan

### 4.1 Economics

Facts about your industry:

- **What is the total size of your market?** It is estimated that around 10MW of wave and tidal stream devices are currently being tested here in the U.K.[1], widely considered a world-leader in marine technology, a view that is reinforced by the fact that the 10MW is more than the rest of the world combined. There are world-class facilities available for testing in real sea conditions in Orkney and Cornwall, at the European Marine Energy Centre (EMEC) and at Wavehub respectively.
- **Current demand in target market** The U.K. Government is legally obliged to achieve 15% of its energy consumption from renewable sources by 2020[2]. Good progress has been made thus far, with the European Commission's 2013 progress report stating that renewable resources contributed to 4.2% of energy consumption[3]. It is expected that tidal energy can play a significant role in the coming years in meeting the 2020 target. In order to hasten and boost the development of renewable energy technologies, Renewables Obligation and Feed-In Tariffs were introduced, which provide monetary incentives for both large-scale and small-scale renewable energy generation respectively.
- **Trends in target market—growth trends, trends in consumer preferences, and trends in product development** The world's first tidal stream farm is currently being developed in the Pentland Firth here in Scotland by MeyGen, and this project aims to have an installed capacity of 400MW[4]. MeyGen's parent company Atlantis Resources recently announced that they had secured a funding package in the region of £50m from a variety of backers, including both the Scottish and U.K. Governments, the Crown Estate and Highlands and Islands Enterprise[5]. Additionally, plans are underway to develop a 320MW installed capacity tidal lagoon in Swansea Bay, a project which could provide 14 hours of reliable generation every day[6].
- **Growth potential and opportunity for a business of your size** The Department of Energy & Climate Change estimate that between 200 and 300MW of energy may be in use by 2020, and up to 27GW by 2050[7]. At present, 20% of the U.K.s electricity demand could potentially be met by marine energy, representing an installed capacity between 30 and 50GW.
- **What barriers to entry do you face in entering this market with your new company?**
  - **High capital costs** Cost of machinery and procurement of goods will require high capital costs.
  - **High production costs** Rent for the manufacturing plant and subsequent assembly of products could prove to be expensive.
  - **Training and skills** We will need a skilled labour force to assemble our product
  - **Shipping costs** Our shipping costs could be considered expensive as we will be partaking in worldwide procurement
- **And of course, how will you overcome the barriers?**

- **High capital costs** This is where the majority of funding raised will be allocated
- **High production costs** Industrial premises will be rented on an annual basis, with the possibility of moving to a larger premises if the need arises, whilst machinery will be purchased outright
- **Training and skills** Our workforce will be accustomed to the manufacturing and assembly process, and training will be provided if necessary
- **Consumer acceptance and brand recognition** We plan to gain the support of our clients and earn noteworthy brand recognition by providing outstanding products and an excellent follow-up customer service
- **Shipping costs** We have found that procurement can be carried out more cheaply by using international companies rather than sourcing our goods locally, which proves to be more expensive

- **How could the following affect your company?**

- **Change in technology** Any growth in technology will be welcomed and considered a valuable asset to our company, as this will open to door to new innovative products, and we intend to be at the forefront of any cutting-edge technological advancements
- **Change in government regulations** At present, the government is committed to reaching its 2020 targets, with an eye on its goal of an 80% reduction in greenhouse gas emissions by 2050[8]. We expect any change in government regulations will be even more ambitious, which will suit us as it will lead to an increased demand and focus on renewable energy, and we plan to capitalize on that
- **Change in the economy** Regardless of any change in the economy, the government has pledged to meet the aforementioned targets and these commitments must be upheld. In the three year period from 2010 to 2013, the U.K. Government invested £100m in tidal and wave technology, with another £500m expected between 2014 to 2020[9]
- **Change in your industry** We consider it highly unlikely that the government should change their focus from investment in renewable energy to a different industry in order to meet their 2020 target, and as a result we do not consider this a legitimate concern

## 4.2 Product

- MGI Product line generators
  - Features
    - \* High operability
    - \* High survivability
    - \* High reliability
    - \* High availability
    - \* Sufficient power source
  - Benefits
    - \* Power security and Independence
    - \* Possible profit source

- \* Environment-friendly image
- Consultancy
  - Features
    - \* Professional approach
    - \* Industry standard methodology
    - \* Help with evaluating the best choice
  - Benefits
    - \* Ease of mind
    - \* Convenience
- Servicing and Maintenance
  - Features
    - \* On-site servicing and maintenance for most common issues
    - \* In-house servicing for possible serious damages or faults of any cause
  - Benefits
    - \* Minimising outage
- Complex management of subcontractors
  - Features
    - \* Choosing best subcontractors for given project
    - \* Coordinating overall progress and execution
  - Benefits
    - \* Convenience for organisation
    - \* Efficient in time

### 4.3 Customers

- **Industry (or portion of an industry)** Our target customer base are those companies with a strong interest in developing renewable energy, specifically those specialising in tidal and wave energy. At present, there is approximately 10MW of tidal and wave stream devices being tested in the U.K., which is more than the rest of the world combined[1]. According to the U.K. Government, wave and tidal energy have the potential to meet a fifth of the U.K.'s current electricity demand, which lies somewhere between 30-50GW[10].
- **Location** As we are a Scottish based company, our initial marketing will be targeted towards renewable energy companies here in the U.K., as we expect tidal energy development to progress exceptionally well in the near future and we plan to enhance our reputation at a domestic level before expanding further afield.
- **Quality, technology, and price preferences** It is our goal to offer our customers only the highest standard of leading-edge technology at enticing prices that are competitive with traditional sealed generators.



- **Purpose** Our customers are not restricted to startup companies looking for a component to develop their own technology, as we will also offer replacement generators to existing tidal schemes whose own generators have failed.
- **Method of ordering** Initial contact will be done over phone and through e-mail, although considerable face-to-face consultation will be necessary in order to gain an accurate understanding of the task at hand, as well as setting up shipping methods and rates, subcontracts and services.

## 4.4 Competition

Our primary competition includes established and upcoming manufacturers of generators for tidal stream power applications. Some examples include:

### 4.4.1 Andritz Hydro Hammerfest

An established manufacturer currently active in the European renewable energy sector, Andritz Hydro Hammerfest are currently involved in several notable projects. By 2016, three Andritz 1.5MW units are scheduled to be deployed in the first phase of the MeyGen tidal farm project, with a further array of ten 1MW units planned to be installed in the Sound of Islay[11]. Both of Andritz's available models present potential competition to the MGI-1000 for mid-to-high capacity installations.

ANDRITZ HYDRO GmbH,  
Eibesbrunnengasse 20,  
1120 Vienna,  
Austria

### 4.4.2 Scotrenewables

Scotrenewables' 2MW SR2000 turbine is currently the highest-capacity tidal stream turbine available[12], and will compete with the MGI-1000 for high-capacity applications. The Orkney-based company does not produce stand-alone generators or low-to-mid capacity turbines.

Hillside Office, Hillside Road,  
Stromness,  
Orkney  
KW16  
United Kingdom

### 4.4.3 Marine Current Turbines, Limited

The Marine Current Turbines 1.2MW SeaGen installation in Strangford Narrows, Ireland was the first tidal stream unit deployed on a commercial scale. At 600kW per turbine, these generators will primarily compete with the MGI-500 in low-to-mid capacity applications[13].

Bristol & Bath Science Park,  
Dirac Crescent,  
Emersons Green,  
Bristol,  
BS16 7FR  
United Kingdom

## 4.5 Competitive Analysis

The UK is bound by the EU’s Renewable Energy Directive to develop 15% of its domestic energy consumption from renewable sources by 2020[14], and a further goal of 27% (of total EU demand) has been agreed upon by EU countries for 2030[15]. As such, there is clear incentive in the form of government grants for the development of further renewable capacity. Competition for this funding should be expected from developers of alternative renewable sources, and the crowding-out of tidal stream technologies by wind, solar or other forms of generation would have an adverse effect on Marine Generation Innovations’ potential market.

Additionally, the pricing schemes employed by suppliers of traditional fossil fuel, thermal, and nuclear power will impact the relative profitability of renewable energy and, by extension, the purchasing power of our customers and demand for our product.

| Factor             | MGI | Strength  | Weakness                                | Andritz Hydro | Scotrenrenewables | Marine Current Turbines | Importance to Customer |
|--------------------|-----|---|---|---------------|-------------------|-------------------------|------------------------|
| Price              | 2   | Increased Customer Profitability                        | Higher Initial Cost                     | 1             | 2                 | 2                       | 2                      |
| Quality            | 1   | Highly Specialised Design                               | Performance Affected by Turbine Quality | 1             | 1                 | 1                       | 1                      |
| Selection          | 2   | 500kW and 1MW capacity variants                         | Lack of intermediate options            | 1             | 3                 | 3                       | 3                      |
| Reliability        | 1   | Unsealed design; reduced rate of failure                | -                                       | 2             | 2                 | 2                       | 1                      |
| Durability         | 1   | Anti-foul coating, elimination of high-failure elements | -                                       | 1             | 1                 | 3                       | 2                      |
| Availability       | 1   | Reduced maintenance downtime                            | -                                       | 2             | 2                 | 2                       | 1                      |
| Expertise          | 2   | Specialised design                                      | Small team, young company               | 1             | 1                 | 1                       | 2                      |
| Company Reputation | 3   | Valuable IP, Innovative                                 | New to market; unproven                 | 1             | 1                 | 2                       | 2                      |
| Location           | 1   | High potential for tidal power                          | Remote from non-EU tidal hotspots       | 2             | 1                 | 1                       | 2                      |

Marine Generation Innovations, LLC will supply machines specifically designed for robustness and reliability in the marine environment over a range of capacity ratings. Our flooded generator technology eliminates the downtime and maintenance cost associated with seal failure, resulting in increased availability and lifetime, while reducing operation and maintenance costs with respect to alternative products. Additionally, flexible custom housing options are available for production units, so the MGI product line can be used as a like-for-like replacement for traditional sealed units.

## 4.6 Niche

Marine Generation Innovations aims to become a leader in subsea generation solutions, creating synchronous machines capable of extended operation in harsh marine conditions. The MGI-series is best suited to applications that require full, continuous submersion of a generator over a significant period of operation, especially in corrosive environments and locations where seal failure and decompression of a sealed generator could have an adverse ecological effect.

## 4.7 Strategy

### 4.7.1 Promotion

Marine Generation Innovations will host promotional meetings with potential customers, specifically, communities and local governments of regions which could benefit from marine renewables. We plan to introduce and promote our product at a number of industry-specific Expos / Exhibitions, namely:

- **All-Energy Exhibition & Conference, 6-7th May 2015, Glasgow SECC.**[16] RenewableUK, Scottish Government, Scottish Entrepreneur, Scottish Renewables, EMEC, TidalStream (Triton platform manufacturer, potential partner) represented.
- **THETIS MRE - International Convention on Marine Renewable Energies, 20-21st May 2015, Nantes, France.**[17] EDF, Alstom, Suez, Scottish Development International represented.
- **SEA WORK 2015 - Commercial Marine Exhibition and Forum, 16-18 June 2015, Southampton.**[18]
- **Offshore Energy and Storage (OSES) - International Conference, 1-3 July 2015, Edinburgh.**[19] A networking event in partnership with the School of Engineering, UoE, where new business ideas in the marine sector can be showcased. Technology companies, academia, investors and policy makers represented - a fantastic opportunity to connect with future partners or competitors and get publicity.

All these events have the potential to provide low-cost exposure to our target market with chances of potential government backing.

There are no plans for using media for advertising. Conventional media isn't really useful as an advertisement tool for our niche due to specific nature of our potential customers which are local governments and communities in specific locations.

We want Marine Generation Innovations, Ltd to be seen as a vivid, environment-friendly and reliable provider of marine renewable energy source. The go-to company for finding most advanced and well adjusted solutions.

We believe that in our business it is important to create a professional image consistent with the quality of our products and services. Appropriate logo, cards, brochures and website are proven tools to achieve desired company image.

Due to the nature of our business we are planning to have long lasting relationships with our customers. This would mean post-sale expertise and servicing of our generators as well as possible sale of replacements.

### 4.7.2 Promotional Budget

Given that media advertising is generally ineffective in this industry-oriented market, promotional funds will instead be allocated to the printing of professional business cards and product

brochures and the costs associated with attending trade-shows and expositions. £5,500 has been allocated to cover these expenses.

### 4.7.3 Pricing

At MGI, we aim to offer high-quality products at a competitive price, while nurturing partnerships with our suppliers to build a strong procurement chain. This balanced approach ensures the profitability of all parties involved, from the end-user to third-party suppliers and MGI itself. Given the reduced maintenance costs and high availability of our products, customers will experience higher production rates and lower cost of operation on a long-term scale. Therefore, we believe this pricing scheme offers high value for money.

Large, multi-national corporations with greater in-house resources and higher production capacity may be able to offer a slightly lower initial purchase price. However, the inherently higher maintenance downtime of conventional generation represents an additional cost to the consumer, in terms of maintenance expenses and lost production opportunity, which offset any disparity in capital cost.

## 4.8 Sales Forecast

### 4.8.1 Low sales volume ("worst case") forecast

| Product Name | Units Sold |    |    |    |        |    |    |    |        |    |    |    |
|--------------|------------|----|----|----|--------|----|----|----|--------|----|----|----|
|              | Year 1     |    |    |    | Year 2 |    |    |    | Year 3 |    |    |    |
|              | Q1         | Q2 | Q3 | Q4 | Q1     | Q2 | Q3 | Q4 | Q1     | Q2 | Q3 | Q4 |
| MGI-500      |            |    |    |    | 1      |    |    |    | 2      |    |    |    |
| MGI-1000     |            |    |    |    |        |    |    |    |        |    | 1  |    |

### 4.8.2 High sales volume ("best case") forecast

| Product Name | Units Sold |    |    |    |        |    |    |    |        |    |    |    |
|--------------|------------|----|----|----|--------|----|----|----|--------|----|----|----|
|              | Year 1     |    |    |    | Year 2 |    |    |    | Year 3 |    |    |    |
|              | Q1         | Q2 | Q3 | Q4 | Q1     | Q2 | Q3 | Q4 | Q1     | Q2 | Q3 | Q4 |
| MGI-500      |            |    |    |    | 4      |    |    |    |        |    |    |    |
| MGI-1000     |            |    |    |    |        |    |    |    | 5      |    |    |    |

## 5 Operational Plan

Our day-to-day business operations will engage in the research and design of the outlined technology, the final product assembly and its shipment to customers. The production facilities along with the R&D, customer support and all related departments will all be based in the county of Midlothian, Scotland.

### 5.1 Production

The company location is chosen as such primarily due to Edinburgh's proximity to the target offshore market on the north and west shores of Scotland, as well as the presence of large amounts of workforce with the required level of technical, business or legal background. An essential advantage of the proposed location is the partnership we have established with professionals from the schools of Business and Engineering at the University of Edinburgh. For the purposes of minimising lead time via achieving on-time procurement of materials and final product deliveries, Edinburgh offers a strong transport network with easy access to an airport, a harbour and many rail connections. Also, having an international shipment centre within easy reach is an important strategic advantage.

Our company's vision is to build a reliable supply chain of partners whose expertise lies in the manufacture of equipment or machine parts along with the provision of various services essential to the smooth running of our business.

- **Production technique** Our design and assembly activities will follow the methodology of "Six Sigma" design[20] to minimise the number of defects occurring during the manufacturing process along with well-established DFQ, DFT, DFA, DMC, DTUPC[21], which would drive down significantly the costs for inspection and repair. Essentially this will involve the use of parts with known capabilities and employment of experienced process engineers to optimise and control assembly, substantially reducing process variation.
- **Quality Control** Our procurement team will be responsible for supplying the materials to our production facilities whilst ensuring they meet the all the quality requirements and related standards. All goods that go into the generator manufacture will be procured from our network of trusted suppliers with high reputation in their field. Also, once each generator unit is complete, it will undergo a thorough test to ensure it complies to all requirements outlined in the Health and Safety at Work etc. Act 1974 before it gets shipped.
- **Inventory Control** We plan to adopt the "Just In Time" methodology for our business operations, which could result in considerable financial savings due to the maintenance of low inventory volumes and reduction of waste. It, however, relies on a lean operations strategy (accurate sales forecasts) and agile supply chain to ensure each incoming order is not slowed down by any issues like supply of materials or insufficient workforce[22].
- **Product Development** The R&D department will be engaged in developing the current technology further. Detailed electromagnetic, structural and thermal designs will be carried out on the "OPERA" simulation software by Cobham[23]. This will assist our design engineers in conducting an in-depth analysis by modelling the machine's rotor and stator coils while examining the change in performance by substituting the machine's air gap with the properties of salty water. This level of research would allow considerable generator optimisation and proper sizing of the units.

## 5.2 Location

Ideally, our premises would be located within the regulated zonal area of City of Edinburgh Council in order for planning and building permission to be more easily granted. We are looking at potential sites which have:

- Easy access to harbour and major roads
- Available power distribution substation nearby with strong capabilities (high enough short-circuit fault level), having voltage levels of 11kV or 33kV (subject to the ratings of installed electrical machinery on site).
- Access to plumbing and sewage system
- Within easy reach to telecom services

Physical requirements:

- **Amount of space** 2000 - 3000 m<sup>2</sup> (as a starting figure).
- **Buildings:**
  - 1 office building (engineering design, business and management operations)
  - 1 warehouse building (inventory storage)
  - 1 production facility (assembly work)
  - 1 small car parking area (with 20 parking spaces)
  - Freight loading bay
- **Cost for land rental:** £45,000 per annum

The cost associated with renting the land is based on current land rental listings from real estate agencies for the industrial estates in Granton, Leith and Musselburgh[24].

## 5.3 Personnel

- **Number of Employees** 19
- **Type of Labour** Skilled/Professional
- **Pay Structure** Based on typical wage rates from "Spon's Mechanical and Electrical Services Price Book 2015"[25] and average salary data from job/recruitment agencies[26].

| Job Title                     | Type of Labour | Number of Employees | Hourly Rate (£) | Annual Salary (£) |
|-------------------------------|----------------|---------------------|-----------------|-------------------|
| Design Engineer               | Professional   | 2                   | 14.43           | 30,000            |
| Procurement Engineer          |                | 1                   | 13.46           | 28,000            |
| HR                            |                | 1                   | 12.01           | 25,000            |
| Sales Administrator/Secretary |                | 1                   | 9.86            | 20,500            |
| Senior Mechanical Craftsman   | Skilled        | 1                   | 12.90           | 26,800            |
| Senior Electrical Technician  |                | 1                   | 15.92           | 33,100            |
| Mechanical Craftsman          |                | 3                   | 11.84           | 24,600            |
| Labourer                      |                | 9                   | 10.24           | 21,300            |

## 5.4 Key Suppliers

- **China Rare Earth Magnet Limited** A leading manufacturer of permanent magnets with anti-corrosive properties, their history includes customers such as Phillips and the Russian Institute for Nuclear Physics[27].
- **Superior Essex, Inc.** A UK company, global leader in the manufacture and distribution of wires and cables for the electrical power industry[28].
- **Custom Coils, Inc.** An experienced California-based manufacturing company specialising in copper wire production for generator/motor windings[29].
- **Schneider Electric UK** A global leader in providing solutions for automation and control, electrical distribution and machinery. They offer a broad range of components for control and automation electronics, AVR, transformers, etc.[30]

Items which are critical to the quality of the final product will be sourced from multiple suppliers to prevent build-up of unwanted delays in the manufacturing process and ensure we keep our promises to deliver a reliable product on time every time.

The creation of such a balanced and flexible supply chain would certainly be a major challenge. However, a clever and effective approach would be to utilise connections from the university and their corporate partners in the first few months and attempt to establish stable business relationships. Any potential fluctuations in material prices may then be addressed by switching to another reputable supplier.

## 6 Management and Organisation

Krawczyk, the Chief Executive Officer, will manage business from day to day. Krawczyk is an experienced project manager and has the greatest familiarity with the technology involved, as well as its limitations. In the event of his unavailability, Tashkov, the Chief Operating Officer, will fill his place.

### 6.1 Board of Directors

- Jan Krawczyk, Chief Executive Officer; Managing Director
- Blake Hawkins, Chairman
- Dimitar Tashkov, Chief Operating Officer
- Robert Brown, Chief Financial Officer
- Fearghal Mac Giolla Easpaig, Chief Technical Officer

We also intend to use Edinburgh University's undergraduate entrepreneurship support, launch.ed, for patent support, patent funding, legal advice, and accountancy advice.



## 7 Startup Expenses and Capitalisation

| Expenses                  |              | Notes  |
|---------------------------|--------------|--|
| Equipment & Outfitting    |              |  |
| Furniture                 | -£2,000.00   | Office furniture, etc.   |
| Equipment                 | -£20,000.00  | Workshop benches, welding equipment, etc.                                  |
| Machinery                 | -£100,000.00 | Coil-winding apparatus, slot insulation machines, lifting equipment        |
| Subtotal                  | -£122,000.00 |  |
| Location & Administration |              |  |
| Pre-opening Rent          | -£3,750.00   | One month's rent   |
| Utility Deposits          | -£11,690.00  | One month's utilities  |
| Legal & Accounting Fees   | -£1,300.00   | Employees Contracts, initial legal advice regarding business policies, etc |
| Prepaid Insurance         | -£350.00     | One month's insurance  |
| Patent Fees               | -£5,000.00   | Initial fee for patent filing  |
| Subtotal                  | -£22,090.00  |  |
| Advertising & Promotion   |              |  |
| Printing                  | -£250.00     | Business cards, product brochures, etc                                     |
| Travel & Trade-shows      | -£5,000.00   | Transportation, board, entry-fees  |
| Other                     | -£250.00     | Signage, etc   |
| Subtotal                  | -£5,500.00   |  |
| Other                     |              |  |
| Contingencies             | -£29,918.00  | 20% contingency margin   |
| Total Expenses            | -£179,508.00 |  |

### Capital

|                             |             |
|-----------------------------|-------------|
| Owner Investment            |             |
| Robert Brown                | £10,000.00  |
| Fearghal Mac Giolla Easpaig | £10,000.00  |
| Blake Hawkins               | £10,000.00  |
| Jan Krawczyk                | £10,000.00  |
| Dimitar Tashkov             | £10,000.00  |
| Subtotal                    | £50,000.00  |
| Investor Capital            |             |
| Requested Investment        | £750,000.00 |
| Total                       | £800,000.00 |

### Summary Statement

|                             |                    |
|-----------------------------|--------------------|
| Sources of Capital          |                    |
| Owners' Investment          | £50,000.00         |
| Investor Capital            | £750,000.00        |
| Total Capital               | £800,000.00        |
| Expenses                    |                    |
| Equipment & Outfitting      | -£122,000.00       |
| Location & Administration   | -£22,090.00        |
| Advertising & Promotion     | -£5,500.00         |
| Other                       | -£29,918.00        |
| Total Expenses              | -£179,508.00       |
| <b>Initial Cash balance</b> | <b>£620,492.00</b> |

## 8 Financial Plan

### 8.1 Profit and Loss Projection

As we already have an in-depth industrial product design, our projection involves a one-month rapid procurement of facilities, materials, and staff, followed by a one-month production of a prototype. Next, we intend to conduct thorough research on the behaviour and properties of our prototype, in order to provide the most accurate data-sheet and marketing metrics possible. At this point, eight months in, we intend to build our grid-connected proof of concept and first sale, which will be quickly followed by a typical technology adoption cycle, for which we expect about 1MW of sales in the first two years.

#### Year 1

|                      | Q1           | Q2          | Q3           | Q4           |
|----------------------|--------------|-------------|--------------|--------------|
| Initial Cash Balance | £747,992.00  | £492,926.17 | £471,193.00  | £333,388.55  |
| Cash Inflows         |              |             |              |              |
| Sales Revenue        | £0           | £0          | £0           | £0           |
| Total Cash Inflows   | £0           | £0          | £0           | £0           |
| Cash Outflows        |              |             |              |              |
| Asset Investment     | -£122,000.00 | £0          | £0           | £0           |
| Cost of Goods Sold   | £0           | £0          | £0           | £0           |
| Operating Expenses   | -£35,070.00  | -£35,070.00 | -£35,070.00  | -£35,070.00  |
| Payroll              | -£23,115.50  | -£23,115.50 | -£23,115.50  | -£23,115.50  |
| Taxes                | £0           | £0          | £0           | £0           |
| Contingencies        | -£31,414.00  | -£7,014.00  | -£7,014.00   | -£7,014.00   |
| Total Cash Outflows  | -£211,599.50 | -£65,199.50 | -£137,804.45 | -£137,804.45 |
| Net Cash Flows       | -£211,599.50 | -£65,199.50 | -£137,804.45 | -£137,804.45 |
| Final Cash Balance   | £536,392.50  | £471,193.00 | £333,388.55  | £265,596.30  |

#### Year 2

|                      | Q1             | Q2           | Q3           | Q4           |
|----------------------|----------------|--------------|--------------|--------------|
| Initial Cash Balance | £265,696.30    | £749,021.85  | £611,217.40  | £473,412.95  |
| Cash Inflows         |                |              |              |              |
| Sales Revenue        | £2,174,305.00  | £0           | £0           | £0           |
| Total Cash Inflows   | £2,174,305.00  | £0           | £0           | £0           |
| Cash Outflows        |                |              |              |              |
| Asset Investment     | £0             | £0           | £0           | £0           |
| Cost of Goods Sold   | -£1,553,075.00 | £0           | £0           | £0           |
| Operating Expenses   | -£35,070.00    | -£35,070.00  | -£35,070.00  | -£35,070.00  |
| Payroll              | -£95,720.45    | -£95,720.45  | -£95,720.45  | -£95,720.45  |
| Taxes                | £0             | £0           | £0           | £0           |
| Contingencies        | -£7,014.00     | -£7,014.00   | -£7,014.00   | -£7,014.00   |
| Total Cash Outflows  | -£1,690,879.45 | -£137,804.45 | -£137,804.45 | -£137,804.45 |
| Net Cash Flows       | £483,425.55    | -£137,804.45 | -£137,804.45 | -£137,804.45 |
| Final Cash Balance   | £749,021.85    | £611,217.40  | £473,412.95  | £335,608.50  |

Year 3

|                      | Q1             | Q2            | Q3             | Q4            |
|----------------------|----------------|---------------|----------------|---------------|
| Initial Cash Balance | £335,608.50    | £1,440,264.05 | £1,302,459.00  | £2,268,064.74 |
| Cash Inflows         |                |               |                |               |
| Sales Revenue        | £4,348,610.00  | £0            | £4,348,610.00  | £0            |
| Total Cash Inflows   | £4,348,610.00  | £0            | £4,348,610.00  | £0            |
| Cash Outflows        |                |               |                |               |
| Asset Investment     | £0             | £0            | £0             | £0            |
| Cost of Goods Sold   | -£3,106,150.00 | £0            | -£3,106,150.00 | £0            |
| Operating Expenses   | -£35,070.00    | -£35,070.00   | -£35,070.00    | -£35,070.00   |
| Payroll              | -£95,720.45    | -£95,720.45   | -£96,579.70    | -£96,579.70   |
| Taxes                | £0             | £0            | £0             | £0            |
| Contingencies        | -£7,014.00     | -£7,014.00    | -£7,014.00     | -£7,014.00    |
| Total Cash Outflows  | -£3,243,954.45 | -£137,804.45  | -£3,383,004.86 | -£138,663.70  |
| Net Cash Flows       | £1,104,655.55  | -£137,804.45  | £965,605.14    | -£138,663.70  |
| Final Cash Balance   | £1,440,264.05  | £1,302,459.60 | £2,268,064.74  | £2,129,401.04 |

## 8.2 Break-even Analysis

|                                |                |
|--------------------------------|----------------|
| Profit per MW                  | £1,242,460.00  |
| Start-up Expenses              | -£747,992.00   |
| Operating Expenses             | -£1,672,753.16 |
| Total Expenses                 | -£2,420,745.16 |
| Break-even Sales Capacity (MW) | 1.95           |

## References

- [1] Renewable UK, "Wave and Tidal Energy". [Online]. Available: <http://www.renewableuk.com/en/renewable-energy/wave-and-tidal/> [Accessed 07-Mar-2015]
- [2] EUR-Lex, "Directive 2009/28/EC of the European Parliament and of the Council". [Online]. Available: <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028> [Accessed 08-Mar-2015]
- [3] Ec.europa.eu, "Progress reports". [Online]. Available: <http://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports> [Accessed: 08-Mar-2015]
- [4] Meygen.com, "The project". [Online]. Available: <http://www.meygen.com/> [Accessed: 08-Mar-2015]
- [5] BBC, "Pentland Firth turbine firm MeyGen signs 10-year power deal", 17-Sep-2014. [Online]. Available: <http://www.bbc.co.uk/news/uk-scotland-scotland-business-29230800> [Accessed: 08-Mar-2015]
- [6] Tidal Lagoon Swansea Bay, "The Project". [Online]. Available: <http://www.tidallagoonswanseabay.com/proposal-overview-and-vision.aspx> [Accessed: 08-Mar-2015]
- [7] Department of Energy & Climate Change, "UK Renewable Energy Roadmap" July 2011.[Online]. Available: <https://www.gov.uk/government/publications/renewable-energy-roadmap> [Accessed 08-Mar-2015]
- [8] UK Government, "Low carbon technologies", 12-Oct-2012. [Online]. Available: <https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies> [Accessed: 17-Mar-2015]
- [9] Department of Energy & Climate Change, "Delivering UK Energy Investment", July 2014. [Online]. Available: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/331071/DECC\\_Energy\\_Investment\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331071/DECC_Energy_Investment_Report.pdf) [Accessed 17-Mar-2015]
- [10] UK Government, "Wave and tidal energy: part of the UK's energy mix". 22-Jan-2013. [Online]. Available: <https://www.gov.uk/wave-and-tidal-energy-part-of-the-uks-energy-mix> [Accessed 07-Mar-2015]
- [11] Meygen.com, "About Phase 1A — MeyGen", 2015. [Online]. Available: <http://www.meygen.com/about-phase-1a/>. [Accessed: 15- Mar- 2015].
- [12] Scotrenewables.com, "SR2000", 2015. [Online]. Available: <http://www.scotrenewables.com/sr2000>. [Accessed: 20- Apr- 2015].
- [13] Marineturbines.com, "Welcome to MCT", 2015. [Online]. Available: <http://www.marineturbines.com/>. [Accessed: 15- Mar- 2015].
- [14] Gov.uk, "Low carbon technologies - Policy - GOV.UK", 2012. [Online]. Available: <https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies>. [Accessed: 17- Mar- 2015].

- [15] Ec.europa.eu, "2030 framework for climate and energy policies - European Commission", 2015. [Online]. Available: [http://ec.europa.eu/clima/policies/2030/index\\_en.htm](http://ec.europa.eu/clima/policies/2030/index_en.htm). [Accessed: 17- Mar- 2015].
- [16] All-Energy 2015 Conference. Available from: <http://www.all-energy.co.uk/Home/RegisterFREE1/>
- [17] THETIS MRE - International Convention on Marine Renewable Energy. Available from: <http://thetis-emr.com/en/>
- [18] Sea Work 2015 - Commercial Marine Exhibition. Available from: <http://www.seawork.com/>
- [19] OSES 2015 - Offshore Energy & Storage Conference. Available from: <http://www.see.ed.ac.uk/drupal/oses/>
- [20] Underwood I., "Engineering Design Analysis and Manufacturability", University of Edinburgh, 2013
- [21] Alan Brownlee, "Design for Quality", Selex ES, February 2015
- [22] Lloyd A., "Supply Chain Management 4", University of Edinburgh, 2015
- [23] Cobham plc, "OPERA Simulation Software". Available from: <http://operafea.com/>
- [24] Ryden Commercial Property Consultants, Edinburgh. Available from: <http://www.ryden.co.uk/>
- [25] Spon's Mechanical and Electrical Services Price Book, CRC Press 2015, p. 679 - 690
- [26] Average Sector Salaries, Reed UK. Available from: <http://www.reed.co.uk/>
- [27] China Rare Earth Magnets Limited, available from: <http://www.permanentmagnet.com/>
- [28] Superior Essex, Inc. Available from: <http://superioressex.com/default.aspx>
- [29] Custom Coils, Inc. Available from: <http://www.ccoils.com/index.html>
- [30] Schneider Electric. Available from: <http://www.schneider-electric.com/site/home/index.cfm/uk/>