The BLUETEC Project

Layman’s Report

Funded under LIFE+ Programme

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BLUETEC: a project funded under LIFE programme

Tidal energy is one of the largest untapped sources of renewable energy in the world. Tidal cycles, which are mainly driven by the phases of the moon, are highly predictable and reliable. This means that it is always known beforehand how much electricity a tidal device will produce.

The tidal industry is still in an early phase of development. The BLUETEC project, funded under the LIFE programme, has demonstrated the technical feasibility and cost effectiveness of a full scale floating tidal platform. Bluetec showcased a technology and design for the turbines on a floating structure that can be upscaled, in an economy of scale, to produce electrical energy cost-effectively.

The BLUETEC project ran from September 2010 until March 2016. During this long period, major advancement and learning in the development of floating solutions for tidal energy, leading to the final modular design, which is being tested and exporting electricity in near Texel (Netherlands).

This design is the result of years of continuous development, learning, and overcoming many obstacles. While the platform was initially designed for vertical axis turbines, the collaboration with some of the world’s leading turbine suppliers has led to the decision to integrate the more efficient horizontal turbines. Another important lesson has been to go step by step in the development path.

Bluewater’s Tidal Energy Converter (BlueTEC) is a floating support platform for tidal turbines. Unlike conventional bottom founded designs, BlueTEC offers significant advantages by accommodating most of the critical equipment above the waterline, where it is dry and protected, allowing for easy access for inspection and repair.

Bluewater developed BlueTEC during several years of R&D and testing. The main focus during the development process was on:

- Low manufacturing and marine installation costs (low CAPEX)
- Low maintenance costs by providing easy access for minor inspections and repairs; the cost of access typically consumes up to 80% of operating costs of other solutions (low OPEX)
- Higher energy output compared to other devices

By providing more energy at a lower cost, BlueTEC aims to improve the cost per MWh of the electricity produced (€/MWh). Lower costs and higher production levels combine into a powerful proposition that will help to make tidal energy projects commercially attractive.
The main advantages of BlueTEC are highlighted in the following fact sheet (more info on the website)

BlueTEC Modular Product Factsheet

Multiple configurations with different turbines possible

Unique advantages of the BlueTEC system
- Clean, predictable electricity from the tides
- Flexible, modular, floating units: robust and cost-effective
- 200 kW, 500 kW and future 2.5 MW versions
- Low cost, grow with minimized risk
- Modular, worldwide transport by container
- Electrical equipment remains safe and dry inside floating unit
- Direct access and visibility to inspect, repair or replace vulnerable electronics
- Easy local assembly, installation and removal
- Dry power cable connection
- Independent of water depth

A worldwide benefit
The system is offered completely including platform, turbines, power cable, mooring system. Providing clean and predictable energy to local communities, cooling facilities, lighting for schools, offering structural benefits for local economies in remote areas. Tidal works well together with solar energy - thanks to constant tidal movements, energy storage costs are minimized

Realistic Farm Development
Starting farms development with an initial array of BlueTEC 500 kW units means using today's proven technology, requiring low initial investment and low grid capacity; proving the site, using the results for follow-up investment allowing develop of the full utility scale farm using our larger 2.5 MW units.
While the aim is to scale up to large platforms of 2-5MW, the final strategy has been to focus on smaller and affordable units will accelerate the learning process through replication, mass manufacturing and operations of a large volume of smaller units, reducing the initial cost of energy. This is found to be extremely difficult with the large MW units due to the high investment required at high risk. A good example is the one from the Danish wind industry, starting with farms with kW scale turbines before moving into MW scale, compared to the US industry failing trying to move straight into MW scale). There are similar observations with the tidal industry in the last years.

**Texel: BlueTEC Modular Demo**

This ambitious project originally aimed to deploy a platform with multiple turbines at a highly energetic site in the European Marine Energy Centre (EMEC) in the Orkney Islands, it was later decided to take an intermediate step and deploy first a platform with a single turbine in a closer location with a more controlled environment in the Tidal Testing Centre (TTC) near the island of Texel (Netherlands). The project in Texel has provided allow the consortium to learn and validate not only the platform and turbines performance, but also to improve the installation and O&M strategies before the first arrays are deployed in more energetic sites. This strategy has proven to be cost-effective and to accelerate the learning process.

![Image](image1.jpg)

*European Marine Energy Centre (EMEC) in Scotland (left) and Tidal Testing Centre (TTC) in Netherlands (right)*

Bluewater has partnered with a group of leading offshore companies to realize the first unique floating tidal energy platform. The inauguration of this first BlueTEC platform, took place on the 9th of April in Den Helder. The platform is commissioned and is generating clean electricity from the tides in the Wadden Sea of The Netherlands. It is of an innovative modular design.

This first BlueTEC will serve as a demonstration platform targeted at remote locations worldwide, such as islands in Indonesia, Philippines and the Pacific. It is also the start of further development of higher capacity tidal energy platforms, to be deployed in large farms.

The platform is installed offshore the island of Texel and connected to the Dutch electricity grid. It is meant to stay there producing electricity for several years, allowing multiple turbines to be tried out.

The unique cooperation between Bluewater, Damen, Van Oord/Acta Marine, Tocardo, Schottel Hydro, TKF, Vryhof, NIOZ, Nylacast and Tidal Test Centre bundles extensive experience in the maritime and offshore industry, in the field of design and operation of mooring platforms, shipbuilding, offshore dredging and installation, tidal turbines, power cables, anchors, research at sea and synthetic materials.
The BlueTEC platform is developed for cost effective installation, operations and maintenance of tidal turbines. It accommodates all vulnerable electronics equipment inside the unit, where it is dry and protected, yet allowing for easy access for inspection, maintenance and repair. The platform can be disconnected from the moored location and taken to a local port for heavy repair when needed. This makes it a truly unique product. It is also the first time that a complete, integrated tidal system is offered to the market.

The platform is targeted at remote locations worldwide, it can be shipped as containers and installed anywhere in the world, to provide clean electricity in remote areas and small islands, replacing expensive and polluting diesel generators. An important advantage of tidal energy is its predictability and consistency, bringing stability to local electricity grids.

Three standard container-sized modules were used to construct the Texel platform which can be assembled locally and installed without sophisticated equipment. The efficiency of containerized transportation combined with uncomplicated assembly means that the platform can be transported and installed anywhere in the world.

Unique advantages of the BlueTEC System

- Designed for remote locations worldwide
- Simple, robust and cost-effective
- Local assembly, installation and maintenance without sophisticated equipment
- Can power local villages, cooling facilities and provide lighting at schools which will change local economies
More information on the BlueTEC project in Texel is included in the BlueTEC website.

Prototype
Texel Tidal Project

A group of leading offshore companies joined together and realized a unique floating tidal energy platform. The platform went from the drawing board to installation in the Wadden Sea within less than six months. It is currently operating and generating clean electricity from the tides into the Dutch power grid. It is of an innovative modular design.

The unique cooperation between Bluewater, Damen, Van Oord, Tocardo, Schottel Hydro, TKF, Vuyk Offshore, NIOZ, Nylscan and TTC bundles extensive experience in the maritime and offshore industry, in the field of design and operation of mooring platforms, shipbuilding, offshore drogging and installation, tidal turbines, power cables, anchors, research at sea and synthetic materials.

BlueTEC in Texel
The modular BlueTEC platform is developed for cost-effective installation, operation and maintenance of tidal turbines. This floating platform accommodates all vulnerable electronics equipment inside the unit, where it is dry and protected, yet allowing for easy access for inspection, maintenance and repair. The platform can be disconnected from the moored location and taken to a local port for heavy repair if that would be needed.

The Texel platform started operations with a single tidal turbine that can produce up to 100 kW. Since early 2016, the platform has been upgraded and fitted with a 200 kW turbine. Next year, the platform will be upgraded further to carrying two and four tidal turbines, reaching up to 500 kW. After that, the platform will be scaled up and fitted with two larger turbines reaching up to 2.5 MW.

www.bluewater.com/new-energy/
BlueTEC operation results successful

Floating tidal energy platform prepares to double capacity

Hoofddorp, 12 October 2015 - The BlueTEC Texel Tidal partnership is proud to announce that the first months of operating the BlueTEC tidal energy platform have been a success. With every tidal flow, the platform supplies electricity into the Dutch national grid. The project partners are now planning the installation of a second, larger turbine.

“Getting the platform from the drawing board to a grid-connected operating reality in just 6 months is amazing,” says Allard van Hoeken, Head of New Energy at Bluewater Energy Services and recent recipient of the first Prince Friso Engineers Award. “The electricity production is conform expectations, the mooring loads are lower than expected and the stability is better than expected. It is a great success.”

Shortly after its launch this summer the platform’s new moorings passed their first serious tests with flying colours as two large storms passed over the area.

With the platform up and running smoothly, the project partners are now looking forward to the next step in its development. “We will install the next turbine – a Tocardo T2 – before the winter. This will double the platform’s capacity,” says Mr Van Hoeken. “A few months after that we will install a second T2 turbine. With two turbines working simultaneously this will double the capacity once again to reach the 400-500 kW mark. This means a proven solution is available on the market. In the meantime we will proceed to even larger units of 2.5 MW each.”

“These units can supply clean energy to islands and remote locations below the cost of diesel generators. In addition, what the industry may only be starting to realise, is that they also pave the way towards large, utility-scale tidal farms. Starting with 500 kW units means using existing technology and a small grid setup, hence keeping the required investment and associated risks to a minimum. In the following step, our 2.5 MW units will be used for full development,” he says.

The BlueTEC platform serves as a demonstrator model. The platform’s ease of maintenance illustrates the advantages of a floating system perfectly: “It has been very easy to solve any issues we came across,” informs Mr Van Hoeken. “We can reach the platform with a small boat, open the watertight door and enter the electronics room, fix and replace something and be back on land an hour later.”

Cooperative partners
The list of project partners includes Bluewater, Damen Shipyards Group, Niron Staal, Van Oord, Acta Marine, Vryhof Anchors, Tocardo, Schottel Hydro, NIOZ, Tidal Testing Centre, Nylacast and the Port of Den Helder. Talking about the close cooperation within the project partnership, Mr Van Hoeken’s enthusiasm is evident: “We are a group of great, strong and motivated partners,” he says. “Where everyone does their best to make it succeed – applying their skills to realise a new way of harnessing clean power.” Further support came from the Netherlands Enterprise Agency and the Waddenfonds programme, in addition to EU Life funding during the developmental phase.

Time for celebration
To celebrate the milestone moment of first electricity generation, the Texel Tidal Project partners are holding an open reception at the forthcoming Offshore Energy Exhibition at the Amsterdam RAI, the Netherlands. This will be an opportunity to meet the various partners and to learn more about the project. The reception is to be held on Tuesday 13 October from 16.00 to 18.00 at the Damen and TKF exhibition booths (#9.023 & #9.017). On Wednesday 14 October, the project results will be presented at the special Marine Energy event from 12.30 – 18.00.

VIDEO
A short video is available at youtube.com: https://www.youtube.com/watch?v=OBqM7j_IQkQ

IMAGES
Photos available at http://we.tl/YqD1JMv1Mk
BlueTEC Texel Tidal platform in operation, producing clean electricity from the tides in the Wadden Sea

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