Wave Tidal

ENERGY NETWORK

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COMMUNICATION HUB FOR THE WAVE & TIDAL ENERGY INDUSTRY

FOCUS ON IRELAND
CONTINUING INDUSTRY LEADER

CABLE HARNESSES
SAFETY FIRST

SITE SELECTION & PLANNING
FUTURE PROOFING

Image courtesy of: Fundy Force

The Delta Works on the Eastern Scheldt: until now the primary aim has been storm-surge protection; in the future it could be power generation too.

DUTCH MARINE ENERGY AIMS TO CREATE A NEW GOLDEN AGE

From 14th century dikes to 20th century megastructures, The Netherlands has more experience in managing the power of the sea than any other country. Now its marine innovators are using this expertise to integrate ocean energy technology with water-management infrastructure

It's a distinctly Dutch approach with global potential: harnessing the power of the sea while managing it too. It could prove a double win: managing rising sea levels while reducing fossil-fuel dependence.

MUCH TO OFFER

The Netherlands may be relatively unknown in the world of ocean energy, but the country's innovators believe it has much to offer. For one thing, while much of the interest elsewhere is on offshore and deepwater wave power, the focus in the Netherlands is close to home.

"If you look at the kinds of devices that are being developed by the Dutch wave power industry, the focus is on low-head, near-shore locations," explained Piet Ackermans, Chairman of the EWA, the trade organisation for the Dutch ocean energy industry. *"In the Netherlands, we try to optimise devices for low head and low velocities."*

The other major difference between the Netherlands and elsewhere lies in the country's focus on combining power generation with storm-surge protection. This is a logical extension of the Netherlands' low-lying topography. When one-third of your country should be underwater and two-thirds is prone to flooding, sea defence is top of minds. This accounts for the history of dike building and empoldering that goes back to the 14th century and includes the enclosure of the Zuiderzee, in the 1930s, and the near 50-year Delta Works project to protect the land around the Rhine-Meuse-Scheldt delta, begun in response to the 1953 North Sea flood.

A VIBRANT SECTOR WITH A DISTINCT PHILOSOPHY

The Dutch ocean energy sector is small, vibrant and growing. The EWA has 35 members: 15 industrial partners, 15 knowledge partners and five project developers. They range from large companies through SMEs to start-ups and from tidal, wave and osmotic technologies to OTEC.

Within these technologies, Dutch companies are focusing on devices with a capacity from 50-100KW at the lower end, to 3-4MWe at the upper end and on modular systems to achieve higher installed capacity. *"Unlike in other countries, where the focus is on developing huge devices – with huge installation and service costs – the philosophy of the Dutch industry is to start small, learn and grow to the larger devices,"* Piet continued. *"Small devices cost less to install and operate than big ones further offshore, so we try to go from small to bigger; that's typically Dutch,"* he added.

EXPORT POTENTIAL

The other thing the Dutch are doing is thinking about export potential from the outset. With an estimated maximum domestic installed capacity of just 200-300MWe, there is a clear need to think global as well as local – delta regions and existing and potential storm-surge barriers around the world. The EWA's slogan, 'Energising sustainable deltas', sums up the mindset of EWA. Deltas are typically heavily populated and industrialised, so they need to be protected against storm surge, plus they need structures to manage water and shipping, among other aspects.

Bird's-eye view of the Delta Works storm surge barriers in the province of Zeeland

"So why not produce the power they need within the delta itself, where you need it, instead of producing it far away in the mountains or out at sea?" stated Piet. In other words, combining storm surge structures with energy production gives you a double win.

ON THE CUSP OF A BIG LEAP FORWARD

It's an appealing concept, but can it be brought to fruition? The Dutch ocean energy industry is tiny in renewables' terms but the next three to five years promise some huge leaps forward. Ten river runoff projects, five tidal barrier projects, one osmotic energy project and a number of OTEC projects are already running or set to begin. In terms of technological and commercial readiness, most Dutch projects are in the TRL 7-9 range and turbine capacities are in the hundreds of kilowatts to low megawatts. *"We have had many studies, but now we are really moving into building projects and having demonstration projects in the Netherlands really could prove the big breakthrough for five or six different devices.*

"We have about 40 projects in the pipeline with a total installed capacity of about 50MWe, so we are on the point of breaking through with real devices and results," Piet concluded.

OPTIMISM

The EWA flags up another reason for optimism: a supportive development environment. While subsidies and feed-in tariffs remain thorny issues, the country's two leading technical universities, TU Delft and TU Eindhoven, are world leaders in coastal and marine engineering and mechanical and electrical engineering respectively.

Dutch research organisations TNO and Deltares offer modelling expertise that covers near-field and far-field modelling of estuary currents, and the country boasts mature specialist ship building and marine servicing industries. Plus, the Netherlands has centuries of expertise in land reclamation and dredging.

A WIN FOR PEOPLE AND PLANET

If the Dutch focus on combining marine and civil engineering with ocean energy production proves workable at scale, it could help provide secure baseload power where it's needed, while at the same time protecting vulnerable deltas around the world from rising sea levels. Could we be on the edge of a new Dutch Golden Age?

Dutch Energy from Water Association - EWA

This feature is sponsored by EWA, BT Projects and Tidal Technology Centre Grevelingendam (TTC-GD)

SCAN/CLICK WEBSITE

AN ECONOMIC FACILITY FOR TESTING 'BLUE BARRIER' TECHNOLOGIES

With its bespoke facilities and flexible design, the Dutch Tidal Technology Center (TTC) will ease a major industry bottleneck for the lack of test facilities for 'blue barrier' tidal technologies when it opens its doors in 2018

A blue barrier combines the technology of a storm surge barrier with a tidal array. Energy-wise, blue barriers channel tidal waters to turbines to ensure the full use of the tidal flows available. Blue barriers therefore represent a third type of hydrokinetic energy system, alongside conventional hydropower and free-stream offshore tidal energy.

BLUE BARRIER FACILITY

The idea behind TTC, which is being built at Grevelingendam, in Zeeland, is to help blue barrier innovators move from promising computer models and tank tests to validated real-world data and to do so without having to secure backing for large-scale demonstrations, which is an often-significant hurdle. Instead, owners of emerging technologies will be able to test, certify and showcase their ideas in a blue barrier facility that is fully operational while being realistic in terms of cost and scale for startup companies and early phase innovations.

NETWORK

TTC forms part of the Delta Works, the network of surge barriers in the southwest of The Netherlands. On opening, the facilities will comprise three test channels varying from three metres wide to 10.5 metres wide, monitor logs and data logs for verification and validation, plus four proprietary demonstration turbines.

Ranging from 0.5MWe to 1MWe, and generating a combined output of 2.5MWe, these turbines will be available to research institutes and universities for their own research. They will also power up to 2,000 nearby homes.

BENEFITS

The setup is ideal for monitoring the impact of tidal energy facilities on morphology and tidal flow patterns, their environmental impact and a host of other variables. For this, TTC works closely with research institutes and other relevant bodies.

The installed turbines are also easy to access from the land. This offers several benefits compared with deep-sea installations, including much lower installation costs, faster installation, quicker repairs and easier maintenance. All these characteristics increase turbine uptime and reduce overall operating costs.

FUTURE

As for the future, the plan is to also make TTC the perfect place to demonstrate how power storage systems could deliver stable and reliable 'on demand' output.

Concepts currently being discussed include water-buffering, flywheel technologies, battery systems and collaboration with Power-to-Gas systems.

Tidal Technology Center Grevelingendam (TTC-GD)

SCAN/CLICK TIDAL TECHNOLOGY CENTRE

PLUG AND PLAY HYDROPOWER FROM RIVERS

EQA Projects is gaining attention, prizes and orders with its gravitational and current-driven hydropower solutions based on that centuries-old energy-conversion concept, the water wheel

The EQA-River, for example, is a plug and play floating hydropower installation. Designed to be placed wherever there are decently flowing waters, it generates electricity at economical rates and provides a continuous and reliable source of environmentally friendly energy. Thanks to its efficiency and ease of placement, it can be used to both provide power in remote locations and to help local municipalities meet their goals for sustainable energy production.

SUITABLE SITES

The device can be employed in stream velocities of between 1.7m/s and 7m/s – typical sites include watercourses, creeks, bridgeheads, industrial water systems and dam runoff channels.

Thanks to a low rotational speed, the EQA-River's waterwheel is 100% compliant with NEN 8775, a proposed Dutch fish safety norm for turbines and hydropower installations. The installation also rises and falls with the river level, so it never obstructs the flow of the water and automatically lifts itself out of the water should tides, waves or water velocity be too high, if there has been an incident of some kind, or if there is no demand for energy. The same built-in sensors, reporting in real-time, further provide water managers with a better understanding of a stretch of water – or even a whole system when multiple EQA-Rivers are employed.

EQA-BOX

Another EQA solution, the EQA-Box, uses falling and flowing water to generate sustainable energy at existing hydro infrastructure. Basically, any suitable location can be equipped with an EQA-Box to generate micro-scale hydropower. These include pumping stations, sewage treatment facilities, sluices, inlets and outlets, industrial water systems, waterfalls and other falling and flowing waters.

INTEGRATION

The EQA-Box is plug and play and can be integrated into a water system while using existing operational systems and software. It can also be expanded to include fully automatic water management software for autonomous operation.

All EQA products (the company also markets a 'smart weir') are mostly made from recycled plastics, so also finding a new use for a material that might otherwise end up polluting our oceans.

EQA Projects

SCAN/CLICK WEBSITE FLYER FLYER

LOCAL GENERATION FOR LOCAL USERS – A NEW MODEL FOR RIVER ENERGY

Renewable energy innovator BT Projects holds a special position in the Dutch marine energy sector

The company, formed in 2014, supports developers of emerging solar, wind and marine energy technologies and is the driving force behind the country's Tidal Technology Center (see story elsewhere in this issue).

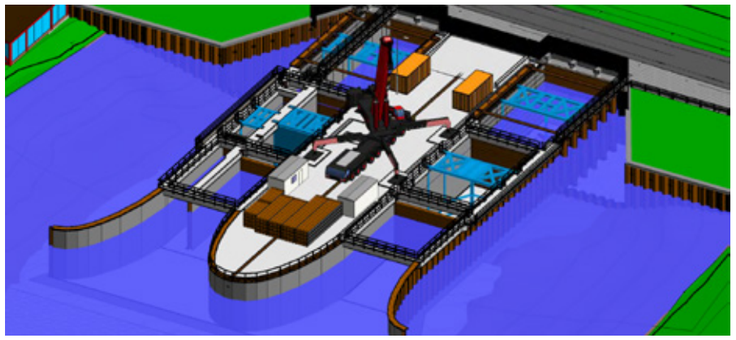
RETHINKING BUSINESS MODELS

Just as significant, though, is the work BT Projects is doing on rethinking business models, with river energy a good example. Rather than trying to interest the major utility companies, BT Projects advocates local generation for local users, based on cooperative-based financing, ownership and operation.

"One of our goals is to build the social aspects around renewable energy," explained Menno Broers, MD of BT Projects. *"River energy projects (in The Netherlands) are small scale and so most logically focused on local energy needs. These kinds of projects fit better with cooperative ownership."*

IMPORTANT CONSIDERATIONS

Local involvement can also help accelerate the industry in other ways, he says: *"We see growing concerns about hydropower and fish mortality and it is true that the old dams and old river energy systems are very unfriendly for fish."* Menno continued: *"However, we also know that it is possible to create fish-friendly turbines and installations – but people need to see them to be convinced. Small-scale, cooperative projects can demonstrate that it is possible, which can further help to accelerate the industry as a whole."*



THEORY TESTING

These theories will begin to be put to the test in 2018 with the start of two river-energy hydropower projects, in the Dutch towns of Doesburg and Tiel. In Doesburg, two five-metre-wide turbines will be placed in a weir in the Oude Ijssel river. These fish-friendly turbines are expected to produce 250KW each, enough to power 500 homes. The Tiel project foresees placing a turbine in a sluice in the Amsterdam-Rhine canal. This will provide power to 800 homes in the surrounding area.

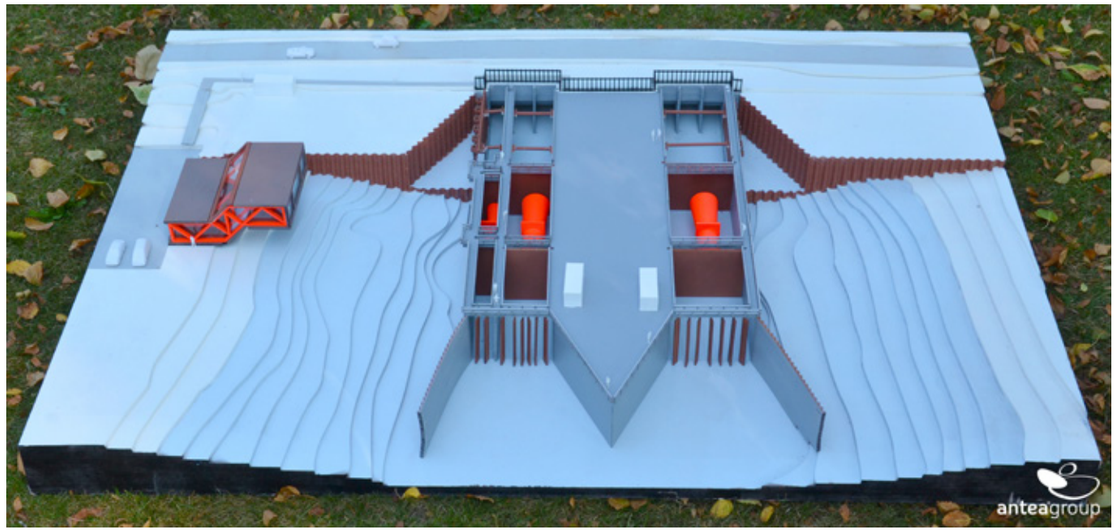
These projects, along with the opening of the Tidal Technology Center plus others exploring energy storage, offshore tidal and new wind and solar technologies, promise to make 2018 an exciting year for BT Projects and Dutch renewables.

BT Projects

SCAN/CLICK BT PROJECTS VIDEO

INTEGRATED DEVELOPMENT IN TIDAL ENERGY PROJECTS – FEASIBLE, ACHIEVABLE AND MANAGEABLE

People have been attempting to generate energy from the tides for centuries, but varying yields and the major investments required have prevented the technology from making any real breakthroughs – this is about to change



New technology and insights are making tidal energy more promising than ever. Antea Group's 3,300 engineers and consultants are making major efforts around the world to make this sustainable form of energy feasible, achievable and manageable.

COMBINING EXPERTISE

Since 2012, the group have invested in building business alliances with suppliers of turbines such as Tocardo and Schottel, contractors such as Strukton, research institutes like Deltares and Erasmus University Rotterdam and government agencies.

With a distinctly Dutch background in the field of civil engineering and fighting against the water, they now know how to make use of the water to generate energy from it. The solution is simply to combine expertise in the engineering of dikes and bridges, fish behaviour, hydrology, permits and business case development with the manufacturing of turbines by their partners.

ENERGY PRODUCTION, TESTING AND DEMONSTRATION

Examples of tidal energy projects that the group are involved in include…

- The development of a 2MW power plant at the sluices in Kornwerderzand at the Afsluitdijk, a 33km wide closure dam in the north of the Netherlands. The excess water from the IJsselmeer lake is discharged into the Wadden Sea, creating a strong water flow. This flow will be used to generate clean electricity installing 18 Tocardo turbines (with Tocardo BV)
- The engineering of the Tidal Technology Center, a test and demonstration facility at the Grevelingendam (commissioned by BT Projects)
- The engineering of the Palmerah Tidal Bridge, crossing the Larantuka Strait in Indonesia (to be developed by Strukton International and DEC). A floating bridge to which free flow turbines are mounted, with an installed capacity of 18MW to 23MW, providing energy for more than 100,000 people

JOINT BUSINESS OPPORTUNITIES

Looking at these examples, Dr. Wim Kloezen, Business Developer at Antea Group in the Netherlands, commented: *"We have learned that it takes much more than the best-suited turbines to successfully develop a tidal power plant, a testing technology centre or a demonstration site. We would be delighted to bring our integrated expertise to new business partners and work with them on new tidal projects worldwide."*

Antea Group BV

CUTTING EDGE ENERGY TECHNOLOGY

Bluerise has developed cutting edge energy technology to harness the ocean's power for sustainable electricity and cooling where it's needed most: in the tropics

In this part of the world more than a billion people live close to the coast and more than half of the expensive and unsustainable electricity is used for air-conditioning.

The ocean covers 70% of the planet. It's our biggest natural solar collector. The surface collects and stores vast amounts of heat from the sun, but at the same time, the deep ocean is very cold. This temperature difference in the ocean is a giant source of sustainable energy, sort of like a big battery.

EFFICIENT AND SUSTAINABLE

The company uses this resource to provide very efficient sustainable cooling for buildings in the tropics by pumping ice-cold water from a 1,000 metre depth. These so called deep seawater district cooling systems are 10 times more efficient than regular air-conditioning and it saves 90% of the energy used for cooling. This translates into cost savings that can go up to 60% or even more. Typical applications are cooling of houses, hotels, data centres, airports, but also greenhouses.

GENERATING ELECTRICITY

Moreover, Bluerise generates electricity using the temperature difference between the surface and the deep water in tropical oceans. This energy technology, known as Ocean Thermal Energy Conversion (OTEC), is an important addition to the energy mix, since it's available year-round, day and night. OTEC provides lower costs of energy compared to oil based generation in small island and isolated grids and attracts new industries and research to diversify and enhance an island's economy.

Together with their partners, Bluerise is currently developing projects in Curaçao, Jamaica, Colombia and Sri Lanka. These projects will open up many new opportunities for commercial rollout to the wider market.

WHEN IS THE FIRST SYSTEM OPERATIONAL?

Design, build and testing of the OTEC demonstration system started in 2012 together with Delft University of Technology. The first project in the Caribbean is expected to break ground in 2018.

NEW OPPORTUNITIES

Berend Jan Kleute, CTO Bluerise BV concluded: *"Together with our partners, Bluerise is currently developing projects in Curaçao, Jamaica, Colombia and Sri Lanka. These projects will open up many new opportunities for commercial rollout to the wider market."*

Bluerise BV

OTEC demonstration plant

CONNECTING WATER AND ENERGY SECTORS TO REALISE JOINT IMPACT

The Dutch Marine Energy Centre (DMEC) is a not-for-profit network and consulting organisation building partnerships in the offshore, deltatech and marine energy sector

Research and Development

Testing and Demonstration

In DMEC's vision, marine energy plays a significant role in realising a 100% renewable energy supply globally. Their goal is to accelerate technology development and innovation, thereby shortening the time to market for marine energy devices.

STRONG SECTOR POSITION

The Netherlands has a strong position in the global marine energy sector, with a national ecosystem of high potential technology developers, renowned academic institutes and test facilities where new technologies are demonstrated. They build strategic collaborations within this network to realise joint international projects and business cases.

FOCUS

Together with the Dutch offshore, maritime and deltatech sector, they develop unique concepts where marine energy technologies are integrated into sustainable multiple-business cases. They focus on 'energising' existing and new infrastructures like dams, dikes and bridges, thereby developing unique Dutch export products.

Environment and Planning

International Markets

SERVICES

To accelerate technology development, DMEC offers a suite of services covering the entire product development life cycle; from initial product design towards the realisation of national and international commercial projects.

TEST SITES & CERTIFICATION

To support developers in demonstrating their technologies, their test sites are part of a pan-European testing infrastructure via collaborative projects like FORESEA and MaRINET2. Additionally, they are working towards establishing internationally recognised certification schemes and standards for the sector in the MET-CERTIFIED project.

DMEC

FISH-FRIENDLY SOLUTION FOR LOW-DROP RIVERS

Doesburg, a mid-size town in the East of The Netherlands, is the first location to accommodate the Oryon Watermill, an innovative, unique and scalable hydroelectric power station, developed by Netherlands-based Deepwater Energy

The Dutch central government recently ensured the future of the project by financially supporting its implementation.

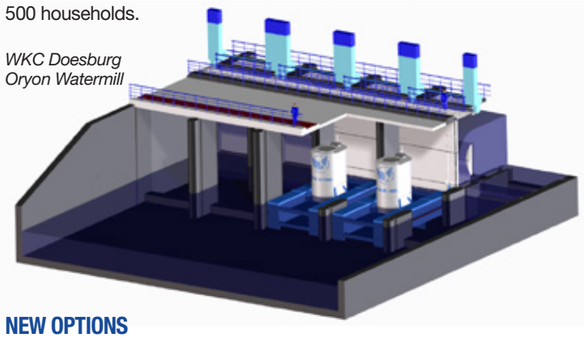
CHALLENGES AND OPPORTUNITIES

Up until now two important factors blocked the development and acceptance of ground-breaking hydroelectric power generating technology – costs and fish mortality.

As the number of installed projects rise, costs are expected to fall. The special design and technological features of the bidirectional Oryon Watermill also challenge the second objection. Older, conventional installations show fish mortality rates of sometimes up to 25%!

The Oryon Watermill however meets all demands put to a state-of-the-art hydroelectric power station and represents the new generation hydroelectric power turbines. The Doesburg project will generate renewable electricity for approximately 500 households.

WKC Doesburg Oryon Watermill



NEW OPTIONS

The efficiency with which water drives a turbine is largely defined by the differences in height along the riverbed. These determine the speed and power of the water flow. Most solutions for the generation of energy from water require a high head and much hydropower.

The customisable Oryon Watermill, with its three wings and special lamellas, however opens up new options for low head applications. Deepwater Energy's revolutionary watermill can be applied in 'head based' and in 'free flow' situations at very low flow rates and in shallow rivers.

SHORTER LEAD-TIMES – LOWER COSTS

Because of its smart design and modular construction, the Oryon Watermill can be implemented fast and efficiently, without making any concessions to the high requirements of the environment, stakeholders and authorities.

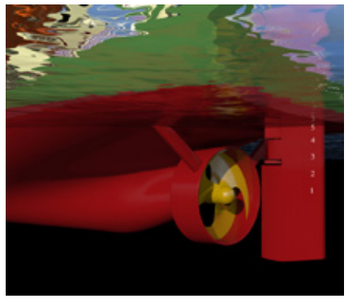
The result: shorter lead-times, lower costs!

Deepwater Energy

FREE-FLOW TIDAL TURBINE

In a small town in The Netherlands, FishFlow Innovations is developing a free-flow tidal turbine that makes it possible to generate hydro power at high efficiency

The patented design also makes the turbine fish friendly and silent. The innovative turbine impeller is bi-directional. It generates electrical energy during ebb and flow without need for the impeller blades to be flipped over when the flow direction changes. This makes the design robust, cheap to maintain and a lot less susceptible to malfunction.



SPECIFICATION

The specific shape of the impeller blades do not induce cavitation and the water leaving the impeller is released in an almost straight beam. Direct hits by hydro power turbine blades and the noise that turbines produce because of cavitation are hugely underestimated causes of harm to aquatic life. Regardless of the speed the FishFlow Innovations impeller is rotating, it will not harm any fish passing through the turbine and neither will it produce noise.

PLACEMENT LOCATION SITES

The glass fibre reinforced composite turbine can be placed either inshore or offshore. Inshore placement can for example be along the shoreline, attached to bridges and in fast flowing rivers. The advantages of inshore placement are the savings on expensive power cables, the turbines are not in ship routes and can be easily accessed for maintenance. Even though they are placed near shore they are no horizon pollution because they are completely submerged.

TESTING

FishFlow Innovations is also testing the turbine impeller design to be used as silent, cavitation free and fish friendly ship propellers and bow thrusters. Tests have proven they are more efficient than conventional ship propellers and thus saving on fuel costs and carbon dioxide emission.

FishFlow Innovations

INNOVATIVE AND PATENTED ENERGY SYSTEM

SeaQurrent was founded to accelerate the realisation of a 100% sustainable, affordable and reliable energy mix

To achieve this, the company developed an innovative and patented system, using a multi-wing underwater kite to make electricity generated from low velocity currents and shallow waters affordable.

HOW IT WORKS

The TidalKite Power Plant consists of several subsystems. It has a simple but robust design and is packed with smart electronics. The kite is tethered to a power take-off where the traction force of the kite is converted into green electricity.

The entire system is designed to be ecologically friendly and safe for marine life. It consists of several wings, enabling it to harvest a large amount of energy from the passing flow of water, in just one single movement.

ADVANTAGES

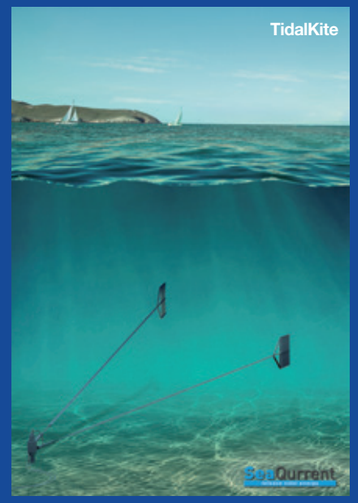
- Renewable energy production, 100% predictable and 24/7/365
- Large deployment potential, for both tidal and ocean currents
- Low CAPEX; through use of standard components, simple structure and low weight to kW ratio.
- Easy and cost effective installation and maintenance
- Simple and robust design; high availability

DEVELOPMENT

In 2017 SeaQurrent performed successful proof of concept tests at the leading research centre MARIN in Wageningen. The tests confirmed the theoretical performance, which was validated by The University of Groningen. In spring 2018, SeaQurrent will validate the performance of the TidalKite system during sea trial testing.

POTENTIAL

One TidalKite generates 500kW, enough to provide ‘green electricity’ to 700 households. Systems are deployed in kitefarms forming projects that deliver tens to hundreds of megawatts. Systems can be installed near shore (>10m depth) or combined with other offshore installations such as windfarms and gas platforms.



SeaQurrent

WHAT IS BLUE ENERGY?


Official opening of the Blue Energy Pilot-plant

Blue Energy is energy generated from difference in salinity between two solutions. Those solutions could be river water and sea water, for example at the point where rivers naturally empty into the sea, or sea water and brine, commonly found in industrial processes

The method can also be applied for energy reduction in desalination processes and in energy storage (in the salinity gradient).

REVERSE ELECTRODIALYSIS

Reverse Electrodialysis (RED) makes use of two types of membranes; one allows only positive ions to pass and the other allows only negative ions to pass. Electricity can be generated by arranging these two types of membranes in a RED stack. REDstack is the world leader in developing RED technology, with the mission of bringing industrial-scale RED to the market.

UNIQUE PILOT-PLANT

A worldwide unique pilot-plant is located on the Afsluitdijk, a closure dam connecting the provinces of North-Holland and Friesland, and uses water from the WaddenSea and IJssel-Lake with a total operating capacity of 50kW. This research plant was officially opened by the Dutch King Willem-Alexander. Blue Energy is under research, generated and supplied to the grid.

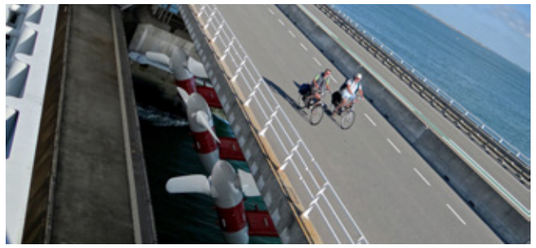
Because the pilot-plant is successful, the next step in the RED research programme is to upscale to a demonstration-pilot installation, in Katwijk, The Netherlands. This is conducted through the combined effort of the three project partners, Fujifilm Manufacturing Europe, Wetsus and REDstack

WHERE BLUE ENERGY CAN BE GENERATED

Blue Energy is a very promising export product for the Netherlands. Worldwide, a potential of 2.6TW, (20% of current energy consumption) is described by Post (2007).

Blue Energy is sustainable energy without producing CO2 and without smoke-stacks. Blue Energy is independent of the weather – rain or shine, with or without wind – meaning the potential of Blue Energy is predictable, requires no back-up capacity and plays a role in the sustainable energy-mix. Real sustainability in action!

REDstack



STATE-OF-THE-ART BUSINESS SOLUTIONS IN TIDAL ENERGY

Tocardo is driven to develop state-of-the-art business solutions that maximise the potential of the tidal energy production worldwide

The company believes that this type of energy stands at the beginning of its development and its full potential, just like wind turbines 10 years ago. Their engineers are determined to deliver the best tidal power solution at the lowest cost of energy. They have followed a thorough step-by-step product development process and have built, installed and tested as many as 15 tidal turbines up until now.

FOCUS

The company focuses on reliability and affordability, so they consider the awarding from the Independent certification body DNV GL for Tocardo's innovative bi-directional open rotor T2si tidal energy converter with a Statement of Feasibility as a major step.

The five T2 tidal turbines, have already been deployed in the Eastern Scheldt storm surge barrier, in The Netherlands and have shown performance as expected. The impressive results have led the company to announce that five T2s, 300kW rated turbines will be installed in the Minas Passage in Canada's Bay of Fundy and at EMEC in the UK.

ACCREDITATION

Ofgem (the Gas and Electricity Regulator in the UK) has granted Tocardo the accreditation under the Renewables Obligation (RO) scheme for their 1.4MW EMEC deployment. The company entered the UK tidal scene with the InToTidal project kick-off and successful installation of Tocardo's TFS (Temporary Foundation System) at EMEC. The successful deployment by Tocardo engineers is the start of the company's planned 20-year commercial demonstration project in Orkney.

THE NETHERLANDS

In The Netherlands their tidal power plant in the Dutch Eastern Scheldt surge barrier consisting of five tidal turbines has been performing as expected during the first year. The project marked a major step in the development of tidal energy.

CONTINUAL DEVELOPMENT

The development in tidal energy continues constantly. Tocardo engineers have already added a new device to our portfolio. The UFS (Universal Foundation System) for five 300kW-rated T2 bi-directional turbines is the perfect solution for offshore locations.

It's a semi-submersive floating 1.5MW tidal power platform. The company successfully tested the scaled version of the UFS at the MARIN Basin and Ifremer's offshore tank. The scale model passed the test with flying colours and behaved exactly like they expected and even better than that.

FUTURE CONFIDENCE

Tocardo is confident about the future of tidal energy. The Netherlands could be a leader in this green industry and with the support of EWA they should make every effort to achieve this.

Tocardo

EFFICIENT FISH FRIENDLY WATER TURBINES

A British and a Dutch company have joined forces in water power turbines and developed two products, Horizontal Axis Water Turbines, originally developed by Saunders Energy Ltd and the Vertical Axis Water Turbine of Dutch Water2Energy

30 – 50% MORE EFFICIENT

The Vertical Axis Water Turbine (VAWT) is 30–50% more efficient than the traditional Darrieus water turbines because of the innovation of variable pitch control. By continuously adjusting the angle of the blades the turbine is always taking full advantage of the force of the water and is rotating smoothly.

SETTING TECHNOLOGY APART

The improved level of power yielded by the innovative mechanism is further enhanced by the system for conversion to electricity through gearboxes and generators and then delivered to the grid through a smart system. The unique partnership between Water Power Turbines and Bakker Sliedrecht sets this technology apart from the competition.

Pro-tide fish friendliness test, Amerongen barrier on the river Rhine

ADVANTAGE

The advantage that Variable Pitch Control offers over conventional Darrieus turbines is demonstrated in the 2 diagrams below which show the differences in the driving force for the upstream quadrant of the blade rotation in a quasi-static situation (TSR – Tip Speed Ration = Zero). Left the Driving Force without Pitch Control. Right for controlled pitch.

At realistic Tip Speed Ratios, the pitch control is adapted for the rotational speed. The invention of Water2Energy uses a curve control which is less vulnerable than cam control.

SAFER FOR AQUATIC LIFE

The turbines are proven to be safe for aquatic life and eco systems. The open structure of the Darrieus turbine and a lower TSR allows fish to swim through easily and the VAWT has been proven to harm less than 1% of fish swimming through the turbine. This is significantly lower than the 20% damage to fish caused by traditional Kaplan water turbines.

UNIQUE JOINING OF SKILLS AND TECHNOLOGIES

The water turbine and energy conversion set up are the design work of Water Power Turbines, Water2Energy and Bakker Sliedrecht. It's a unique joining of skills and technologies that ensures the most efficient conversion of streaming water into power and thence into electricity through a smart control system, combined with the benefit of being an eco and fish friendly product.

BENEFITS

- **High yielding**
- **Fish and Eco System friendly**
- **Powerful energy conversion**

Water Power Turbines combines many years of experience in tidal energy of both UK's Sanders Energy and the Dutch W2E as well as extensive knowhow in the Maritime and Offshore Industry. In cooperation with Pro-tide (an EU Interreg project by UK, France, Belgium and the Netherlands) they tested several of the VAWTs.

Water Power Turbines (WPT) & Water2Energy (W2E)

ADVANCING CERTIFICATION FOR MARINE ENERGY TECHNOLOGIES

Internationally recognised standards and certification schemes bring a wave of renewable growth opportunities as a new initiative sets out to accelerate the use of marine energy technology across the low carbon industry

The MET-CERTIFIED project initiated by the Dutch Marine Energy Centre (DMEC) is helping to progress the development of a global standardisation for marine energy devices destined for use by industry in the next two years.

AIMS

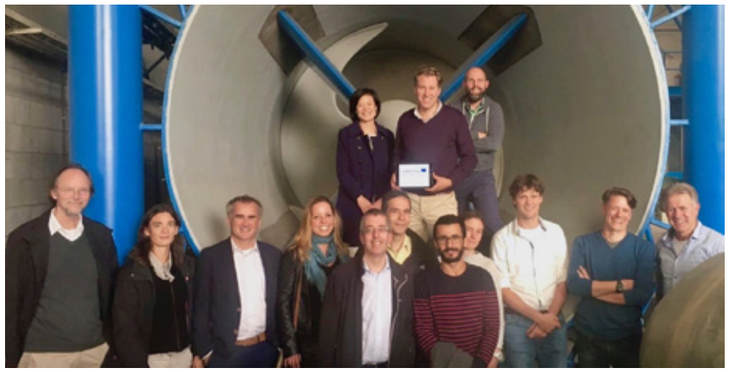
An initiative which aims to increase the adoption of insurable and bankable marine energy projects in the Interreg 2 SEAS region – a European Territorial Cooperation Programme covering South of England, North of France, the west-coasts of Netherlands and Belgium (Flanders) – is using the expertise from certification bureaus and test facilities in the development of internationally recognised standards and certification schemes for the sector.

Peter Scheijgrond, project manager for DMEC explained: *"Certification helps to reduce actual and perceived risks of new technologies used in marine energy power generation projects and can help to increase market confidence in how devices perform and their structural integrity, as well as helping this sector attract previously untapped finance schemes and making exporting marine energy technology across the world easier."*

ASSESSMENT

MET-CERTIFIED is assessing the entire process of certification, from concept to construction through to installation of a full-scale floating platform for tidal turbines with the support of the industry partners. The initiative is of huge importance for stakeholders wanting security and knowledge in how technology can be, and should be, certified – critical to groups such as banks and insurers through to consenting authorities, end-users, test facilities and certification bureaus.

PROJECT PARTNERS



The project partners (pictured above) are Dutch Marine Energy Centre (DMEC), Tocardo, NEC, Lloyd's Register, European Marine Energy Centre (EMEC), Perpetuus, DNV-GL, IFREMER, POM West-Flanders and Ghent University.

"Together with nine other partners from the 2 SEAS regions, we are working on standards and certification schemes for marine renewables both at the national and international level through International Electrotechnical Commission (IEC) and the IEC System for Certification to Standards Relating to Equipment (IECRE)," highlights Peter. *"We will provide feedback to the IEC committees by applying the standards and certification schemes in eight real-world demonstrations projects. Amongst others, we will apply the principles of certification in projects using the Tocardo turbines, the EEL Energy technology and the recently installed Plat-I platform developed by SME using Schottel turbines. To accurately reflect the needs of the marine renewable sector, MET-CERTIFIED also organises workshops for stakeholders."*

GLOBAL STANDARDISATION

Presently no universal marine energy certification scheme is available. However, the MET-CERTIFIED initiative is helping to progress the development of a global standardisation for marine energy devices destined for use by industry in the next two years. This in turn will increase the interest from investors seeking to invest with confidence in multiple or large scale marine energy projects.

Peter Scheijgrond
Project Manager at DMEC
for MET-CERTIFIED Project

SCAN/CLICK
ABOUT MET
ABOUT IEC
ABOUT IECRE