FlanSea | Flanders Electricity from the Sea

About FlanSea

In September 2010, the Flemish Agency for Innovation by Science and Technology (IWT in short) voted to provide EUR 2.4 million in financial support to the FlanSea research project. The FlanSea project aims at developing a wave energy converter for use in moderate wave climates such as they are common along the Belgian coast.

During the 3rd and final year of the research project, a wave energy converter is to be installed at approximately 1 km outside of the port of Ostend. Its reactions to prevailing conditions will be monitored intensively.

The diversity of the combined professional expertise and experience of the seven partners in the project will ensure that this project is brought to a successful conclusion.

Blue or Green?

In order to meet the European objectives for renewable electricity production by 2020, Belgium will drastically shift its goals for electrical energy generation from conventional towards renewable energy technologies. Traditionally, renewable energy conjures up notions of solar, biomass, and wind energy. Although these technologies are undoubtedly making notable inroads in the field of energy generation, with no end in sight for their progress, they nonetheless face restrictions in their individual applications.

Belgium and Flanders in turn need to diversify their renewable energy portfolios. Wave energy refers to the energy that can be tapped from the waves in the seas and oceans. This so-called 'blue' energy technology forms the object of the FlanSea project.

Over the past few years, wave energy has known a spectacular rise. In countries that can take advantage of very large and natural wave capacity (the United Kingdom, Portugal, Ireland, Japan, Australia, the USA), a number of different wave converters are already in or past the development stages. In Europe, a number of testing centres have been created: EMEC (UK), Wavehub (England), BIMEP (Spain),... This year – and no doubt likewise in the coming years – a great number of demonstration projects are on the planning boards. At the same time, the first commercial projects have been launched.

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The objective

The basic objective is to generate renewable energy and produce electricity at current (competitive) market prices. The first objective is to bring the cost price down to the same level as charged for other forms of offshore energy, e.g. offshore wind generated energy. Hence, the devices developed for the purpose need to be able to "catch" the energy generated by waves with the same efficiency and effectiveness and subsequently convert it into electrical power.

In the development of the wave energy converters, the designers and developers have generally concentrated their efforts on marine areas distinguished by outsized wave actions, meaning zones that produce excessive wave energy. Such marine zones are, however, also breeding grounds for major violent storms. These storm waves bring large pressures to bear on the wave energy converters, thus placing high demands on the structural strength of these devices. Their resistance to such extreme conditions, called their 'survivability', is therefore as crucial as their efficiency.

The development, construction, and the secure anchorage of a device that can sustain the barrage of major storms without suffering damage not only affect the cost price, it also has to prove technically feasible!

Experiences with a string of failures of large converters under violent storm conditions call for a cautious approach. The FlanSea converters therefore are meant for use in marine areas in more moderate wave climate zones, such as, for example, the southern part of the North Sea.

The team's ultimate objective is the development and production of robust and efficient wave energy converters suited for use in a moderate wave climate and cost-effective in mass production with other renewable energy sources, such as offshore wind generated energy.

The partners

The University of Ghent, as coordinator of the European-financed project SEEWEC, has gained a great deal of expertise and knowledge in the process. Various professors in diverse disciplines have collaborated in this project, while a number of doctoral dissertations have taken wave energy as their subject.

At the initiative of the University of Ghent, a cooperative partnership has been formed with a number of Flemish enterprises (DEME Blue Energy, Electrawinds, Haven Oostende, Cloostermans-Huwaert, Spiromatic and Contec).

On 31 March 2010, this cooperative partnership submitted, via DEME Blue Energy, a project application for a subsidy to the IWT (Flemish Agency for Innovation by Science and Technology). This ambitious project is scheduled to run for 3 years.

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At its Board of Directors meeting of 16 September 2010, the IWT decided to provide financial support to the project application titled 'FlanSea' (Flanders Electricity from the Sea) for the amount of EUR 2.4 million. The project applicants are obviously delighted with, and welcome, this positive decision by the IWT.

Point absorber technology

The FlanSea wave energy converter is based on the so-called "*point absorber*" technology. These *point absorbers* are complex buoys that keep track of and react in synch with wave motions, whereby their movements vis-à-vis the seafloor as a fixed point of reference promote the production of electrical power.

With the FlanSea buoy, the generator will be mounted on/inside the buoy itself. Moreover, inside the buoy there is a special winch with a cable coiled around it. The other, far end, of the cable is fixed into the seafloor. The buoy will use the rising and falling motions of the waves to wind or unwind the cable on the winch, thus producing electrical power (see illustration).

During the first two years of the project, the expertise within the team will be directed towards conducting a thorough study (hydraulic, mechanical, electrical) of developing and building a wave energy converter, and conducting tests in laboratory conditions. During the 3rd and final year of the project, a wave energy converter will be positioned at approximately 1 km outside the port of Ostend. This wave energy converter will feature all sorts of different measurement and registration devices meant to provide scientists with insights into production capabilities (efficiency) and the loads and the strength and resistance (survivability) of the system. During this phase, the converter will not be connected to the electrical distribution grid.

Chances of success?

The project team has high expectations and makes every conceivable effort to make these trials positive experiences, giving impetus to the idea that, in the future, one may seriously consider the idea of the production and installation of several wave energy converters in marine parks.

Likewise, a possible consideration is the placement of wave energy devices in offshore wind farms – amongst the wind turbines – thus to make optimal use of the limited space available at sea and to increase the electricity production capacity offshore. As such, profitable synergies would emerge among the wind turbines between both kinds of renewable energy, while optimal use would be made of the electrical infrastructure.

As such, this project offers a splendid opportunity to develop Flemish technology and, in time, produce and exploit it in Flanders' own waters as well as in foreign waters, accompanied by the added bonus of increased Flemish employment in the growing sector of renewable energy.

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