

# Leading the way in wave and tidal power.

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## Wavegen launches Spanish wave power project

The ocean's waves potentially hold the largest source of renewable energy, and as such have had inventors filing a succession of patents for more than 200 years in a bid to try and capture that power.

Inverness-based Wavegen has gone further than most and can rightly claim to be at the leading edge of wave technology. It is the company behind Limpet, the world's first grid connected power station on the island of Islay.

The 500kW system was commissioned in November 2000 supplying power to the national grid. It also enables Wavegen to validate results from wave tank tests and serves as a test bed for the development of new turbines.

Having cut its teeth with Limpet, Wavegen is using the technology in joint collaboration with Voith Siemens Hydro Generation S.L, a sister company based in the Basque Country in Spain, which will service as a blueprint for wave power stations both in Spain and other parts of the world.



Wavegen continuing to lead the way in wave power technology

The Spanish power station is based on the oscillating water column technology Wavegen developed and which is already being used successfully on Islay.

What makes the Spanish venture different is the way the technology is being applied.

For this project the chambers and 16 turbines are being incorporated into a new breakwater which is currently being built.

continued...

# Beatrice powers up



The second off-shore wind turbine leaves Nigg



The first turbine, already in position at the Beatrice oil field off the east coast of Caithness

The Beatrice wind farm demonstrator project reached a major milestone in May when its first power was demonstrated. The £35m project is a joint venture between Talisman (UK) Ltd and Scottish and Southern Energy (SSE) and is a key part of DOWNViND (distant offshore wind farms no visual impact in deepwater)

Announcing the news, Talisman Energy Inc. President and Chief Executive Officer Dr Jim Buckee said: "We are making history with the first electricity being generated by this offshore deepwater turbine. This achievement is a huge milestone in the DOWNViND project."

At 85 metres, the two 5MW turbines are the largest in the world. The first was sailed into position 25 kilometres east of Helmsdale on the Caithness coast in August 2006. The second left Nigg in July, just as this newsletter went to print.

Once in place, the two turbines will provide an estimated 30 per cent of the Talisman Beatrice oil platform's 14MW daily electricity requirements.

The project is hailed as an inspiring example of the powerful collaboration between the oil and gas sector and the renewable energy industry.

Over the next five years, Talisman and SSE will collect data from Beatrice to establish the technical performance and economic viability of this large scale development.

Funding for the project came from a number of sources including £6m from the European Community, £3m from the Scottish Executive, a further £3m from the DTI with the remainder coming from SSE and Talisman augmented by contributions in kind from many of the participants.

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The project will enable the breakwater to generate 'green' electricity which will be supplied to the local grid.

Harnessing power from the world's oceans offers a huge resource for meeting the planet's energy needs. The World Energy Council estimates the energy that can be harvested from oceans is equal to twice the amount of electricity we currently produce.

Yet wave power is still a relatively young technology and a key challenge is making that technology work at a cost of power which the consumer is willing to pay.

Wavegen is characteristically upbeat about the future and with good reason.

"There is worldwide demand for energy, which will double by 2050, and since

approximately 60 per cent of the world's population live within 60km of the coast there is an enormous potential for wave power," says general manger David Gibb.

"It's undoubtedly taken a long time to develop wave energy because it's a tough environment and requires a lot of money. Wave energy converters have us working at the knowledge base for hydrodynamics, but we've learnt extremely valuable lessons from the oil and gas industries and we're already seeing progress speeding up.

"The IEA estimates we could eventually generate more than 10 per cent of the world's electricity requirements from wave energy and here at Wavegen we certainly see that as a real possibility."



# EMEC takes centre stage in growth of marine technology

Situated within some of the UK's smallest islands, the European Marine Energy Centre (EMEC) is playing a global role in the evolution of marine technology.

EMEC is the first centre of its kind anywhere in the world and it is attracting groundbreaking projects in sea-based renewables.

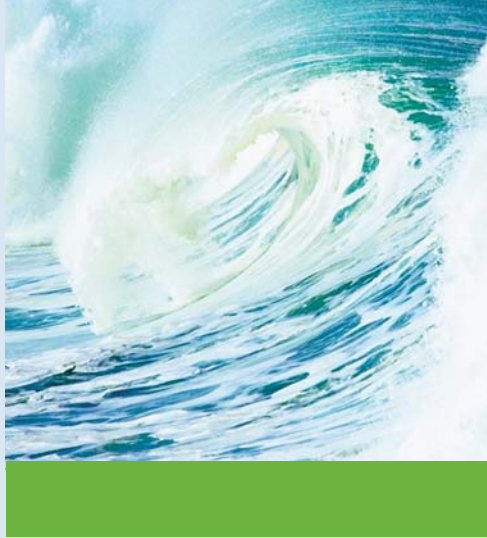
Early this year it was announced that nine companies developing tidal and wave projects will use the European Marine Energy Centre to test their technologies after winning substantial support from the Scottish Executive in a £13.5m funding package.

Dublin-based OpenHydro has already installed the first tidal turbine at EMEC's new test site.

Ten years in development, this is the UK's first grid-connected tidal turbine. The company's Open-Centre Turbine generates electricity from tidal currents and will be connected to a seabed cable at the Fall of Warness, off the island of Eday.

"We are currently putting the turbine through a detailed test programme and are looking forward to producing the first tidally-generated power for Britain's homes and businesses," said OpenHydro's chief executive, James Ives.

OpenHydro called in assistance from a number of Orkney businesses to provide maritime skills, diving teams, environmental, health and safety and fabrication expertise and a range of other services.



OpenHydro tidal turbine at Orkney

Earlier this year the first offshore wave energy device to generate electricity for the National Grid returned to Orkney for a new test programme at EMEC.

Developed by Edinburgh-based Ocean Power Delivery, Pelamis can meet the energy needs of more than 500 homes and is feeding electricity into the grid again during the trials.

It is also the prototype for four new machines that are due to be deployed in a single array at EMEC next year by CRE Energy Ltd, a subsidiary of ScottishPower.

Funding from the Scottish Executive worth £4.1 million will support the development of the world's biggest wave power project.

OPD managing director, Richard Yemm said: "The grant package, along with

extensive upgrades of the EMEC infrastructure, provides the basis for a world leading Scottish project, using world leading Scottish technology."

The wave energy converter currently under test, nicknamed the Sea Snake, has been fitted with a new mooring system during an extensive refit and upgrade carried out at the company's base in Leith.

This is designed to speed up the installation process when the technology is deployed offshore and allow the use of relatively small, readily available vessels.

A lengthy test programme is planned at EMEC, with extensive sea trials and time alongside the pier at Lyness for checks and maintenance work.

## Highland company unveils ambitious plans for tourist venue

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A Highland renewable energy company has announced ambitious plans for one of the region's most popular tourist destinations.

Invisible Heating Systems (IHS) of Ullapool has bought the Hydroponicum at Achiltibuie. Attracting more than 10,000 visitors each year, the Hydroponicum is an important demonstration centre in the UK for growing a range of tropical and exotic plants without soil.

Plans for the site include a high quality community centre with seminar, workshop and exhibition facilities.

Energy efficiency will play a major part of the new development and many of IHS's own systems such as heat pumps, solar panels, seawater and grey water heating will be incorporated into the design.

IHS's purchase of the business follows months of public meetings and

negotiations and the local community will retain an active involvement in the centre.

IHS Director Liz Stewart says: "We are genuinely delighted to be involved in the Hydroponicum. We are hugely committed to the local community here and this is a way for us to demonstrate this.

"With our experience, we feel our contribution can make the Hydroponicum both a commercial and community success."

# Glendoe project progressing well

Hydro electric power is Scotland's oldest form of green, clean energy. The first scheme was built in the 1890s and when the North of Scotland Hydro-electric Board was set up in 1943 a succession of other projects followed.

It's been half a century since any large scale conventional hydro project has been built on Scottish soil. But then along came Glendoe. Situated in the hills above Loch Ness, Glendoe is the biggest hydro facility since the 75MW Erochty station in Perthshire opened in 1957. Once complete, Scottish and Southern Energy's £140m scheme will generate 100MW of hydro-electric power.

Not only will it have the greatest drop of any UK hydro station, but it will also be the most efficient. Yet for all the impressive statistics, Glendoe will, for the most part, be largely hidden from view. The only part of the scheme to be seen from any public road will be a water outlet on the shore of Loch Ness and even this is being built to blend in with the natural landscape. It is deep inside the Monadhliath Mountains where the real action happens.



Glendoe's power cavern under construction

In less than a year since work began, the Glendoe project is already well ahead of schedule in preparation for generating its first power in March 2009. Already 90 per cent of the rock volume to be excavated has been removed in what will eventually be the Power Cavern housing the massive generator and turbine.

Meanwhile Eliza Jane continues to power her way through the Headrace Tunnel,

having completed more than half of the 8km length. She has already drilled through 1050m of the 7,500m of Aquaduct Tunnel. And in recent weeks lead contractor Hochtief has started work on what will be the visible part of the dam with rockfill being placed to form the embankment. The dam, which is made of rock with a concrete coating on its reservoir side, will measure 35m at its highest point.

## Waste not in the outer hebrides

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It is often in the more remote corners of the British Isles that some of the most exciting environmental projects can be found.

Take the Outer Hebrides for example. Here the main waste treatment plant for the islands has become the first in the UK to incorporate a commercial-scale anaerobic digester for source-separated organic household waste.

The digester – capable of processing more than 700 tones of waste every year – is part of a visionary waste management strategy being implemented by the local authority, Comhairle nan Eilean Siar.

Kenny John Macleod, the council's head of community services, believes regions such as the Outer Hebrides are well placed for ground-breaking projects such as this.

"In a rural and island context, innovative waste management technologies make sense not only for the contribution to protecting and improving our local and global environment but it also enables us to seize opportunities to develop new

renewable energy options," he says. "The electricity generated from the biogas fuelled gas engine will meet all the electrical and heat energy requirement of the plant, initially generating up to 1 million kWh of electrical power each year with surplus electricity available for export to the local network."

The solid digestate will be matured and will eventually be used as high quality compost for local use.

The digester went through rigorous three-month commissioning trials starting in August 2006. At the same time, the council started a systematic collection of segregated household waste which was rolled out across the whole of the Outer Hebrides by January this year.

The anaerobic digester uses a system known as Linde dry technology and was the choice of Earthtech, the main contractor on the project.

Kenny John Macleod says: "There was a high level of confidence in Earthtech's choice of Linde for the design and supply

of the anaerobic digestion and associated system as they had a proven track record in this form of waste technology on the continent."

The plant has been a major investment for Comhairle nan Eilean Siar but they were successful in winning significant funding from the Scottish Executive's Waste Fund (SWF) towards the capital costs.

Further investment for the Western Isles has come from the Scottish Renewable Hydrogen and Fuel Cell Support Scheme. A grant of £55,000 will see the installation of an electrolyser at Lews Castle College.

The electrolyser splits water into oxygen and hydrogen and the college intends using the renewable hydrogen to supply energy for its teaching laboratory.

A second electrolyser is being installed at the Creed Waste Management facility to produce hydrogen from biogas with the aim of providing power for both the site and several hydrogen cars.

HI-energy will be charting the progress on Lewis with this technology in a future issue.

# Highlands and Islands on course to become world centre for wave and tidal power

Heriot-Watt University and UHI Millennium Institute have been awarded a £1m funding package by the Scottish Funding Council (SFC) to help secure the development of a world-leading centre of excellence in marine renewables.

The Strategic Research Development Grant (SRDG), aimed at advancing marine renewable energy research in Scotland by providing a unique regional focus for research and technical expertise, was announced at the All Energy conference in Aberdeen.

The SRDG will play a crucial role in the future growth of the marine renewables industry by improving knowledge, research capacity, and capabilities for understanding wave and tidal devices and predicting environmental impacts.

Four new research appointments will be created, two at Heriot-Watt University's Orkney Campus in Stromness and two at UHI's Environmental Research Institute in Thurso.

The grant will also help bring together existing expertise to build a critical research capacity linked to the European Marine Energy Centre's (EMEC) unique facilities.

The funding and associated developments will be a vital feature of the multi-disciplinary, strategic research programme in marine renewable energy being undertaken by Marine Renewable Energy Developments Scotland (MREdS).

MREdS links government bodies, public and private stakeholder interests, and the renewable and petroleum industry sectors.

Professor Jon Side, who is heading up the Heriot-Watt University partnership in MREdS, stressed that all involved anticipated the funding package would enable them to fulfil a number of key objectives.

"The funding of four new key research posts will make a big difference to our work," he said. "It will also allow us to bring together existing areas of academic and industrial expertise and resources, and use that critical mass as a platform for future marine renewables research projects and activities.

"There is no doubt that Scotland, largely through the entrepreneurial drive of a number of small and medium-sized enterprises, has led the technological development of wave and tidal energy conversion technologies. We believe that, just as in the 1970s when Scotland became a major player in world-wide oil and gas technologies and petroleum industry-related research and development, we can similarly lead the way in the emerging marine renewables sector.

ERI director Dr Stuart Gibb, who is leading UHI's contribution to the partnership, said: "The Scottish Executive has said that it wants 40 per cent of Scotland's electricity to be generated from renewable resources by 2020. "It is widely acknowledged that marine energy may hold the key to achieving these targets and the dynamic conditions of the Pentland Firth presents unrivalled opportunities for research and development.

"This programme contributes to the aspiration of establishing Scotland at the



Professor Jon Side, who is heading up the Heriot-Watt University partnership in MREdS and Dr Rob Harris who joins the team

forefront of research, development and certification of marine energy devices. It secures a unique trans-Pentland Firth partnership between Heriot-Watt University, EMEC and the UHI and will provide a focal point for the development of research capacity and expertise in marine renewable energy for Scotland."

Elaine Hanton, head of renewables at Highlands and Islands Enterprise, said: "We are delighted Heriot-Watt University and UHI Millennium Institute have successfully secured this significant funding.

"The breadth of research expertise and technological skill in renewables technology currently building up in the Highlands and Islands is being increasingly matched by significant funding.

"It's a combination that's making this region one of the most exciting places in the world to be working in this vital sector and we will continue to provide strategic support for its development."

[www.hi-energy.org.uk](http://www.hi-energy.org.uk)

If you require further information, please contact the renewable energy team at Highlands and Islands Enterprise  
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HIGHLANDS AND ISLANDS OF SCOTLAND  
HARNESSING NATURE'S POWER