# Wave Power

Wavegen®

A Voith and Siemens Company

# The Company

**Wavegen is a wave energy company dedicated to the development of marine renewable energy technology. Wavegen was formed in 1990 and is based in Inverness in the highlands of Scotland. In 2000 Wavegen became the first company to connect a commercial scale wave energy plant to the grid.**

**Wavegen is part of**
**Voith Siemens Hydro Power Generation.**

Rising demand for energy and the finite nature of conventional fuels, are leading to increased prices. The problem of green house gas emissions continues. Harnessing the immense wave power in the world's oceans can be part of the solution to our energy needs. At Wavegen we are delivering the wave energy technology to help make that happen.


## Voith Siemens Hydro - Europe's large family-owned companies

Voith Siemens Hydro Power Generation is a Group Division of Voith and - with a workforce of around 2,600 employees and sales of more than €600 million per business year - Voith Siemens Hydro Power Generation belongs to the world-wide leading companies for hydro power equipment.

Voith is setting standards in the markets paper, energy, mobility and service. Founded on 1 January 1867, and nowadays with approximately 30,000 employees, a turnover of €3.5 billion and 200 locations world-wide, Voith is one of Europe's large family-owned companies.

## Voith Wants to be its Customers' Preferred Supplier and Business Partner

Quality, reliability and financial soundness are key concepts of our corporate identity. These are expressed in:

***Engineered reliability.***

# Applications

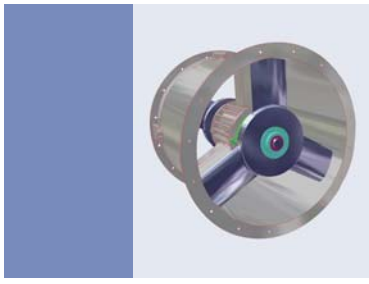
The OWC with Wells turbo-generator technology can be applied in a number of locations:

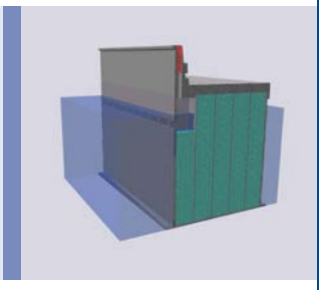
- Shoreline
- Breakwater, coastal defence, port
- Near-shore
- Offshore

Wavegen has developed small turbo-generators for incorporating into breakwaters, coastal defences, land reclamation, port walls and community power schemes. Installation or removal can be achieved using a small mobile crane. These turbines are the fifth generation and incorporate all the learning and cost reduction experience gained from previous designs and operation of the Limpet plant.

### Active Breakwaters

- Easy access and maintenance
- Simplified planning and consents
- Shared civil costs
- Simple/reliable plant
- Easy to access/maintain
- Close to grid connection
- Can help EIA for breakwater
- Reduced reflections





# Wave Power and Technology

Waves are caused by wind blowing over water, and winds are generated by the sun heating the earth. Water covers around three-quarters of the earth's surface. The World Energy Council estimates that the energy that can be harvested from the world's oceans is equal to twice the amount of electricity that the world produces now.

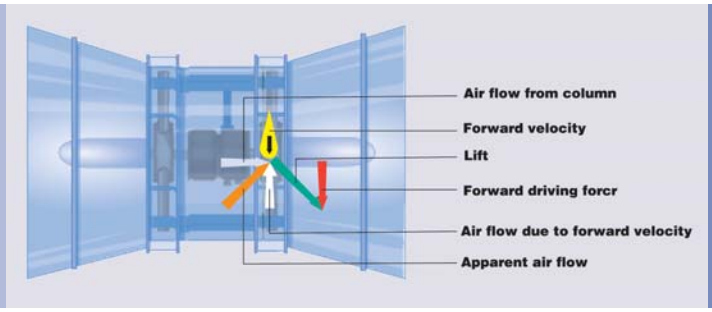
Wave energy technology is very young compared to generating electricity from hydro or wind turbines. Wavegen is at the leading edge of developing methods to harness wave energy and convert it into electricity using processes and technologies that do not damage the environment.

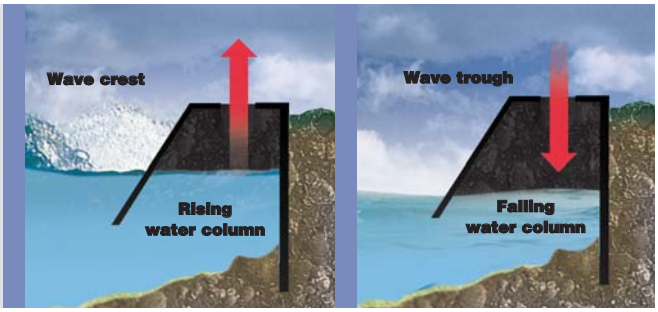
## Technology

Wavegen technology is based on the Oscillating Water Column (OWC) with Wells turbine power take-off.

## Advantages of Wells Turbines

- No gearbox
- No hydraulics
- Bi-directional
- Variable flow
- No pitching blades
- Works with air
- Simple
- Reliable



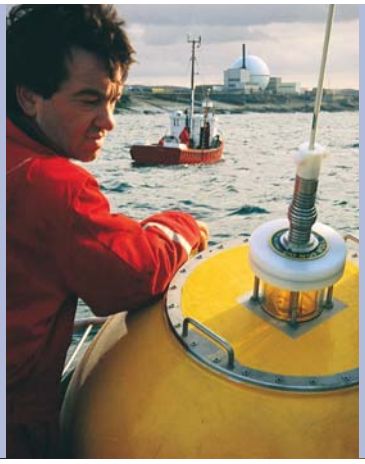



# Facilities

### Wave Tank Test Facilities

Wavegen owns and operates one of the most advanced marine renewable development test facilities available. This enables us to simulate a wide range of wave conditions at model scale, including site specific conditions measured with our own waverider buoy.

The paddles develop highly repeatable wave conditions under controlled experimental conditions, including regular, irregular and multi-directional waves for operational and survival sea states.



### The Limpet Plant

The Limpet plant on the island of Islay, off the west coast of Scotland, is the world's first grid connected commercial scale wave energy plant.
The plant was commissioned in November 2000.
It is a shoreline wave energy converter utilising an inclined oscillating water column (OWC) with Wells turbine power take-off.

This full scale plant has enabled Wavegen to validate results from wave tank tests and numerical models. The Limpet plant is also used as a full scale test bed for the development of new turbines.

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