



## Green Cat Wave Turbine SMART:Scotland Award

In January 2005, Green Cat Renewables received a SMART Scotland award to investigate the feasibility of the Green Cat Wave Turbine.

The turbine consists of a submerged neutrally buoyant cylinder positioned just below the sea surface located perpendicular to the oncoming waves. This cylinder rotates in tune with the circular orbits of sea water particles. Unlike a number of devices currently being investigated, this configuration enables maximum energy capture from both vertical and horizontal sea motions ('swell' and 'surge' respectively).



The Green Cat Wave Turbine differs from most other wave energy devices in that it employs an extremely novel yet simple mechanical coupling to drive a multi-pole Direct Drive generator. Recent advances in permanent magnet materials and power electronic converters have opened up this extremely straightforward conversion route. This device needs no hydraulic or pneumatic gearing to generate 50Hz electricity directly from low speed (~0.1Hz) mechanical rotations of the sea.

### *A Simple, Robust, Reliable Turbine for Capturing the Energy in Sea Waves*

Another key advance that has taken place in recent years is the widespread availability of computational fluid dynamics (CFD) software packages and exponential growth in computer power. Green Cat Renewables are using CFX software to model dynamic properties of the device and optimise the device design. This device is predicted to have one of the highest energy capture efficiencies of any device currently proposed

#### So what's new?

- The use of a 'direct drive generator' to convert the rotational kinetic energy of waves into electrical energy;
- A very simple robust turbine design;
- A simple robust structure for fixing the machine to the seabed;
- The ability to 'dive' under extreme sea conditions;
- An extremely novel control system that will use measured incoming wave characteristics to 'tune' the turbine to individual waves, thereby increasing energy capture.

**Development of the Green Cat Wave turbine will establish a modular device for large scale wave farm deployment and carbon positive electricity generation.**

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