



**2ND ANNUAL
GLOBAL MARINE RENEWABLE
ENERGY CONFERENCE**

Commercialization and the New Renewable Energy Economy

April 15-16, 2009 Washington, D.C.

Financing Commercial Projects
Matthew Seed
WaveGen



Generating Commercial Wave Energy Projects

Washington, DC

16 April 2009

Agenda

- 1. Voith Hydro & Voith Hydro Wavegen**
2. Mutriku Multiple Oscillating Water Column Project
3. Commercial Project Considerations

Voith – Sales and employees by division

Voith AG					
Group Divisions	Voith Paper	Voith Turbo	Voith Hydro	Voith Industrial Services	Group
Sales	1 984 mio. EUR	1 161 mio. EUR	800 mio. EUR	983 mio. EUR	4 934 mio. EUR
Employees	10 548	5 307	3 643	22 871	42 955

Fiscal year 2007/2008



Voith Hydro Wavegen



Inverness

- Headquarter
- Wave tank
- Turbine test rig

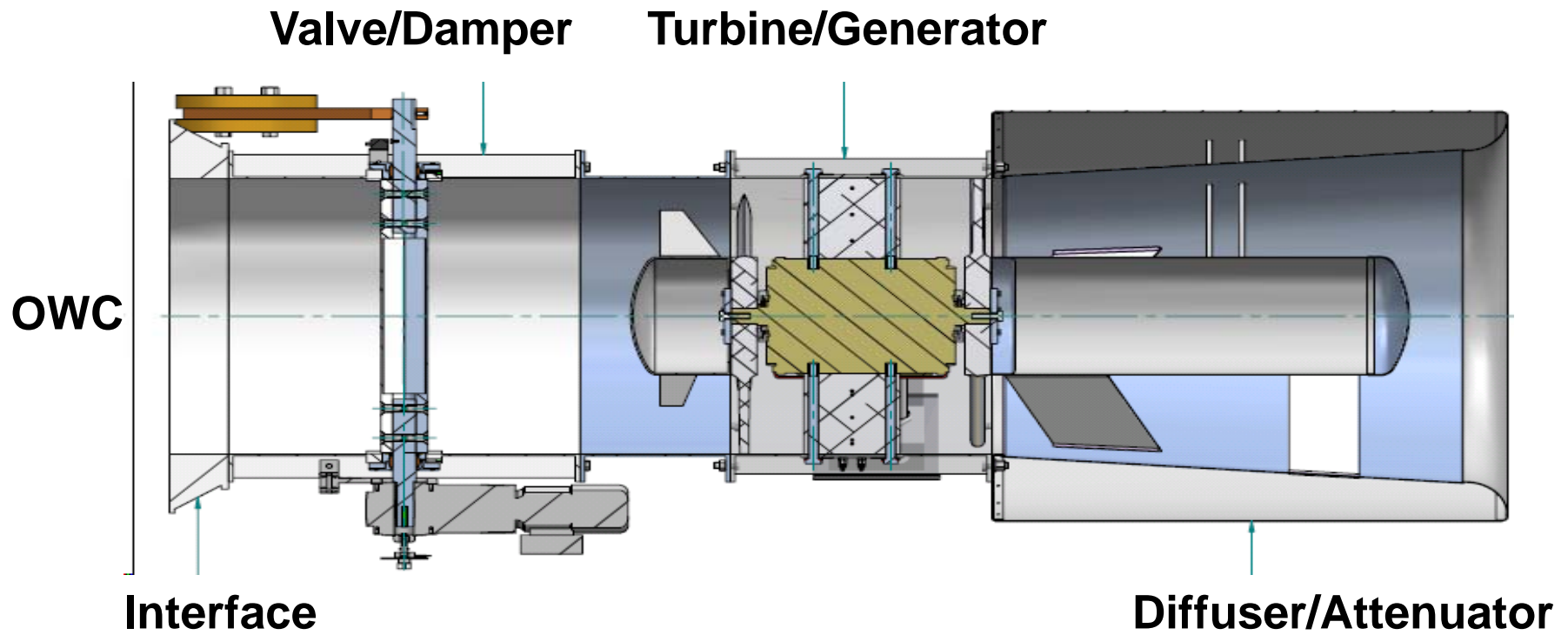


Islay

- Grid connected test facility
- Limpet
- In operation since year 2000



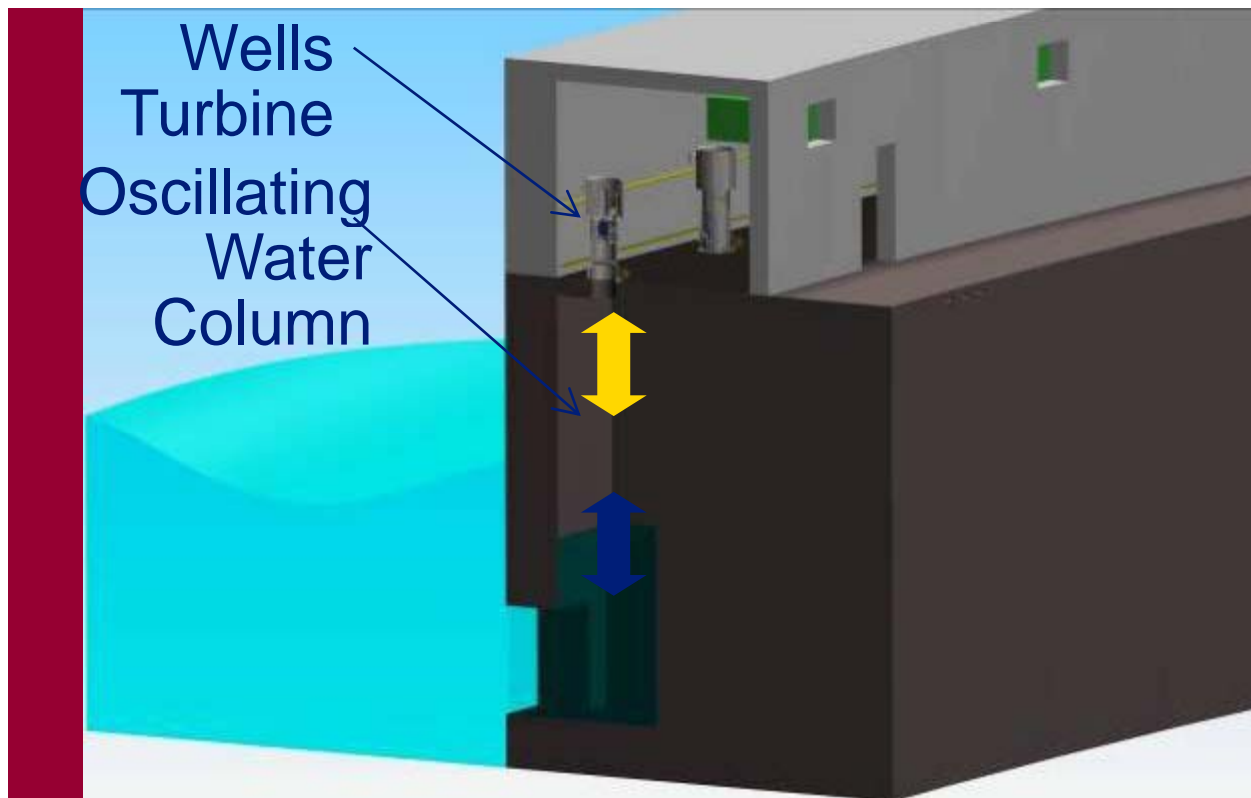
Wells Turbine



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Mutriku breakwater sectional view



Rise and fall of the wave column compresses and decompresses air.

Air drives the Wells turbine in both pressure and suction cycles to generate power.

Testing Turbines for Mutriku Project

18.5kW, 4 years operation, 22,500 generating hours (2009/03/31)



HyWave 750



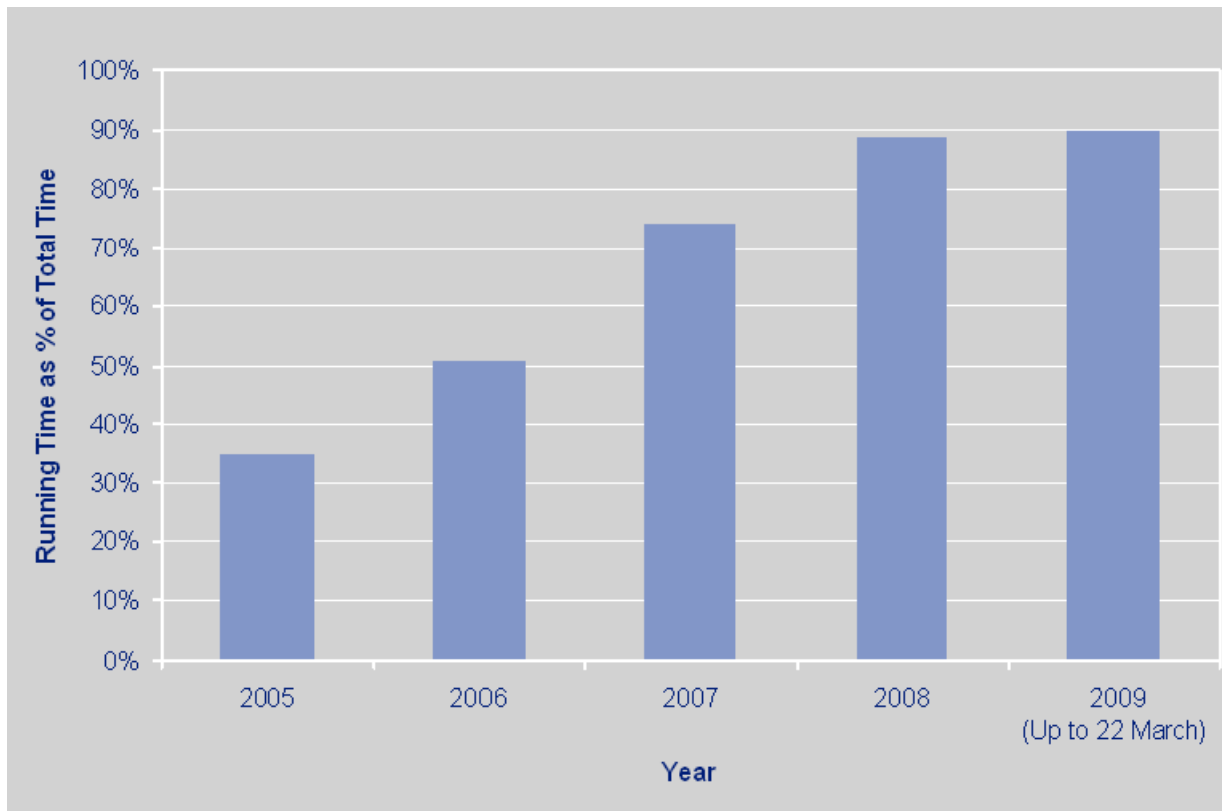
Turbine hall & acoustic attenuator



Voith Hydro Wavegen contractual commitments

- Deliver design and equipment to schedule – achieved.
- Performance Guarantee agreed with client – performance testing ongoing at Limpet plant.
- Availability Guarantee agreed with client – ongoing testing at Limpet plant will also show any maintenance and reliability issues 3-4 years ahead of Mutriku.
- Design requirement for low noise emissions – both machine and building attenuation tested at Limpet plant to demonstrate noise control.

Reliability improvements for test machines



Percentage of Actual Running Time. No allowance made for Research or other activities



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Siadar Project



Demonstrating next scale – purpose built ‘active’ breakwater



Isle of Lewis, NW Scotland

One of the most aggressive wave energy resources in Europe.

4MW, 200m long breakwater.

Planning consent granted by Scottish Government in January 2009 – also strong local support for project, and possible boat shelter.

Plant would qualify for Scottish Government’s multiple ROC scheme.



HyWave 1250 – Siadar Prototype



Commissioned July 2008.

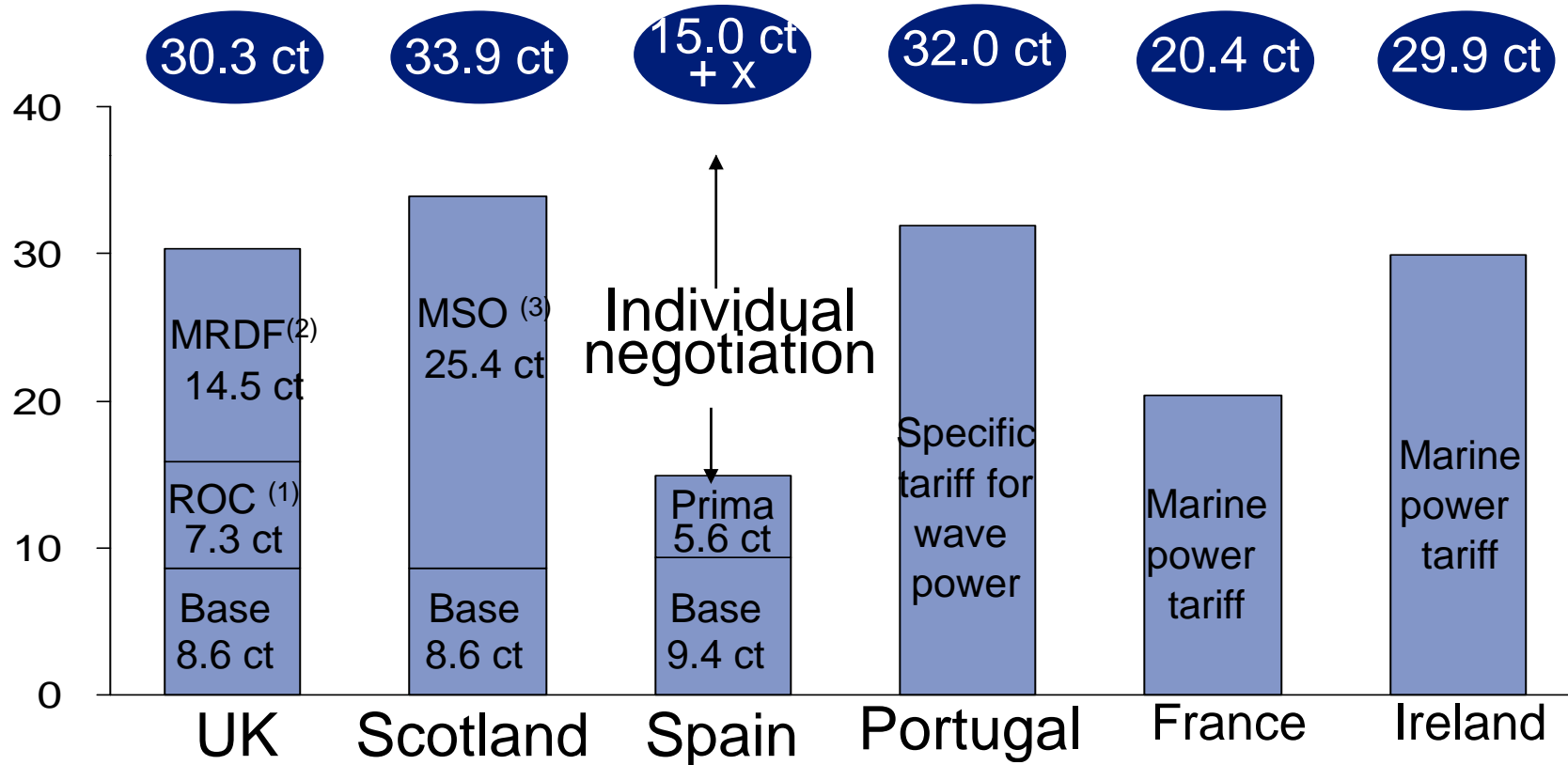
State of the art inverter controls.

Demonstrating high availability, and will give 3 years lead on maintenance issues.

Energy Output is other key project driver in Wavegen's influence.

Political support in Europe is providing some realistic support mechanisms

Support Mechanisms and Feed-in tariffs [USct/kWh] across Europe



(1) ROC: Renewable Obligation Certificate granted for each kWh produced

(2) MRDF: Marine Renewable Development Fund support for first commercial Ocean Power Plant

(3) MSO: Marine Supply Obligation



Commercial Project Considerations

Reliability	Performance	Economics
Survivability – tested in the environment	Siting – wave energy resource	Total price of electricity
Proven Availability - guarantee	Wave energy capture spectrum	Reduced capital cost – learning curve
Operational time and experience	Capacity Factor	Mass production and deployment
	Power quality	Minimal maintenance – experience based

Cost competitive production from wave energy converters






VOITH

Engineered reliability.

