

Entretiens Jacques Cartier

Nelles Energies – Energie des Mers

Michel Couston - Erick Pelerin

20 – 21 Novembre 2012

**ALSTOM**

# Alstom Renewable Power



HYDRO



HYDRO



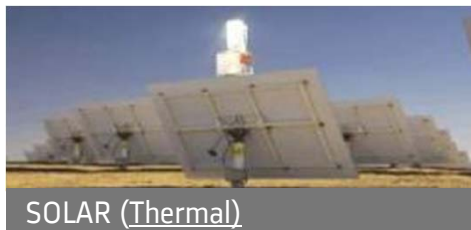
WIND OFFSHORE



WIND ONSHORE



WIND



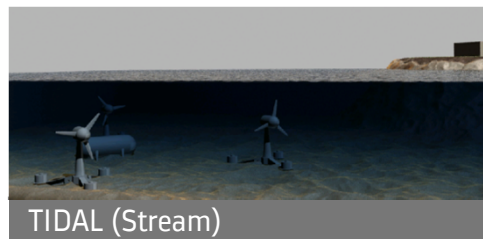
SOLAR (Thermal)



GEO THERMAL



BIOMASS



TIDAL (Stream)



WAVE



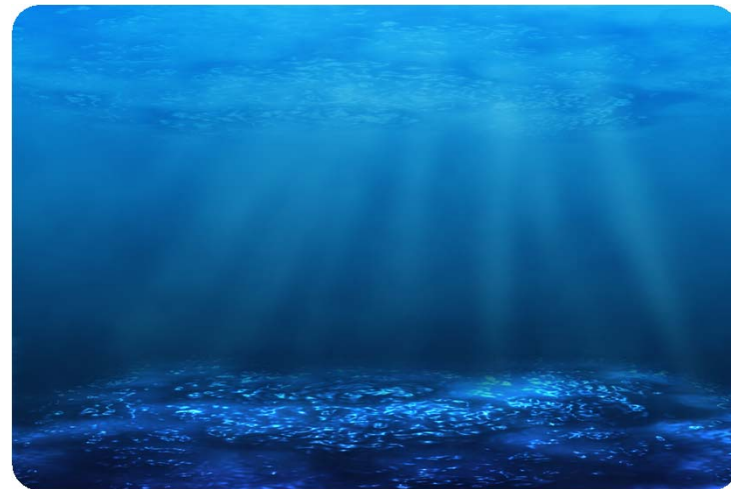
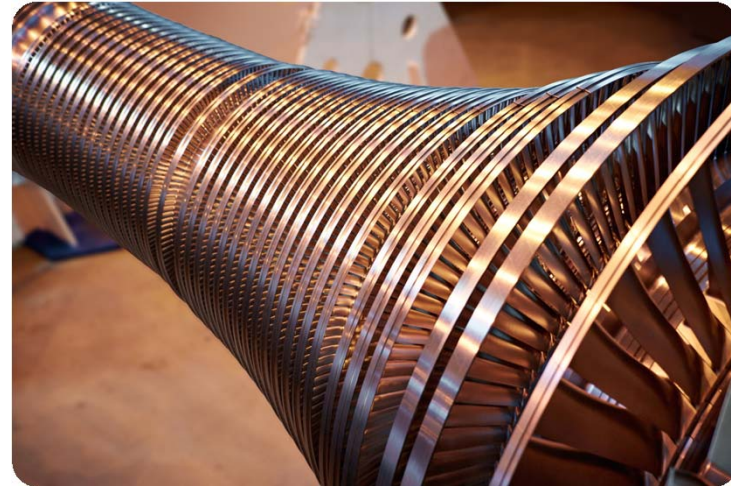
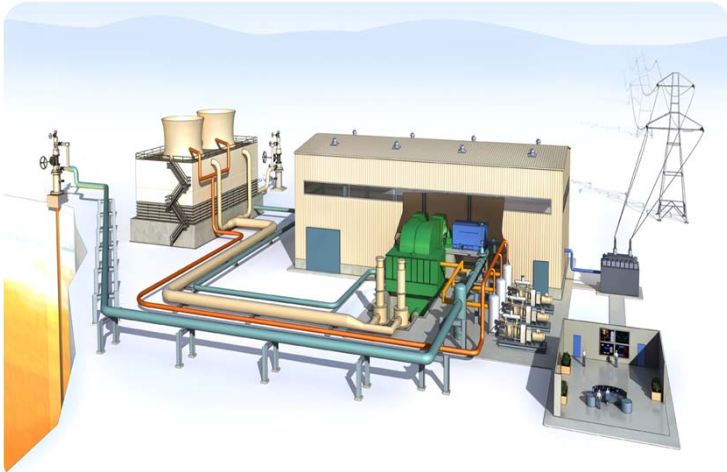
NEW ENERGIES

FOR NEW PLANTS AND INSTALLED BASE

© ALSTOM 2012. All rights reserved. Information contained in this document is indicative only. No representation or warranty is given or should be relied on that it is complete or correct or will apply to any particular project. This will depend on the technical and commercial circumstances. It is provided without liability and is subject to change without notice. Reproduction, use or disclosure to third parties, without express written authority, is strictly prohibited.

**ALSTOM**

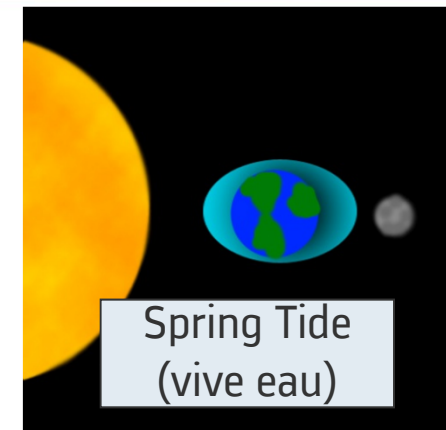
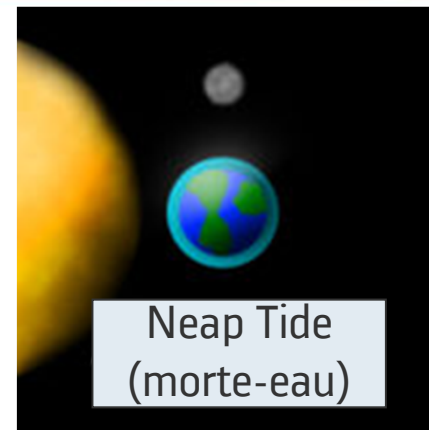
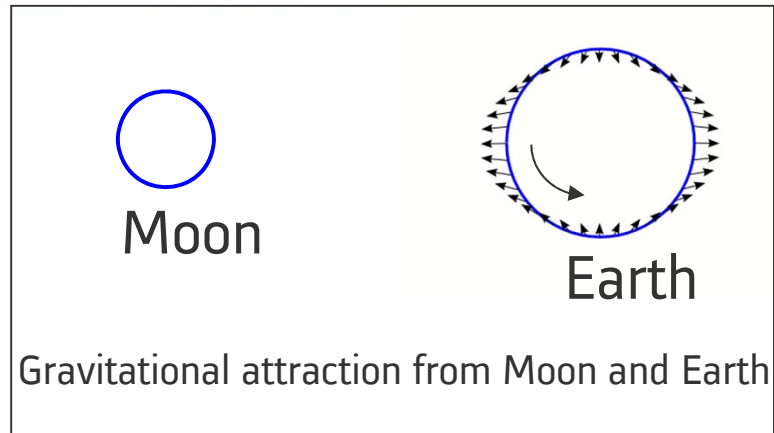
# New Energies



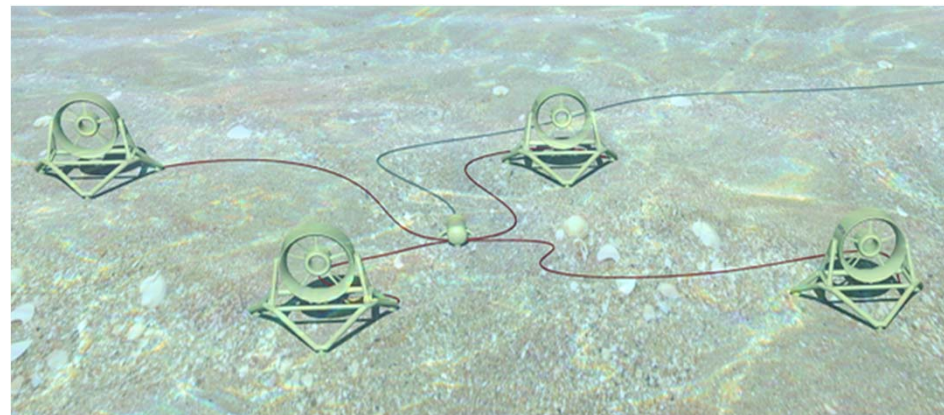
© ALSTOM 2012. All rights reserved. Information contained in this document is indicative only. No representation or warranty is given or should be relied on that it is complete or correct or will apply to any particular project. This will depend on the technical and commercial circumstances. It is provided without liability and is subject to change without notice. Reproduction, use or disclosure to third parties, without express written authority, is strictly prohibited.

**ALSTOM**

# Tidal Energy



Tidal barrage



Tidal In-Stream

100% Renewable - 100% Predictable

relied on that it is complete or correct or will apply to any particular project. This will depend on the technical and commercial circumstances. It is provided without liability and is subject to change without notice. Reproduction, use or disclosure to third parties, without express written authority, is strictly prohibited.

**ALSTOM**

# Tidal in Stream Energy market

## High Potential Locations



Source Danish Hydraulic Institute – Work commissioned for Atlantis



- Vast resource: 50 to 100GW
- Fully predictable
- Severe environment
- Need cost effective and reliable solutions

Alstom ambition: Top player in Ocean Energy

# Recent move in Tidal Agreement for the acquisition of TGL

## Technology

- Buoyant nacelle, allowing the turbine to be towed to and from the tidal site (ROV). No need of large offshore installation vessel Unique in the industry



- Rapid (patented) deployment and retrieval system
- Easily detachable from support structure for maintenance
- Ability to yaw to any heading
- Pitching composite blades
- Lightweight structure, attached to seabed with drilled piles



- Rated power: 1MW
- Rated velocity: 2.7m/s
- Rotor diameter: 18m
- Nacelle length: 21m

## Company

- Company created in 2005
- 100% owned by Rolls-Royce since 2009
- 29 employees based in Bristol, UK
- Development status:
  - September 2010: 500kW turbine deployed at European Marine Energy Centre's (EMEC), Orkney, Scotland, where it has generated 250MWh
  - End 2012: 1MW turbine to be deployed at EMEC for a two-year test period

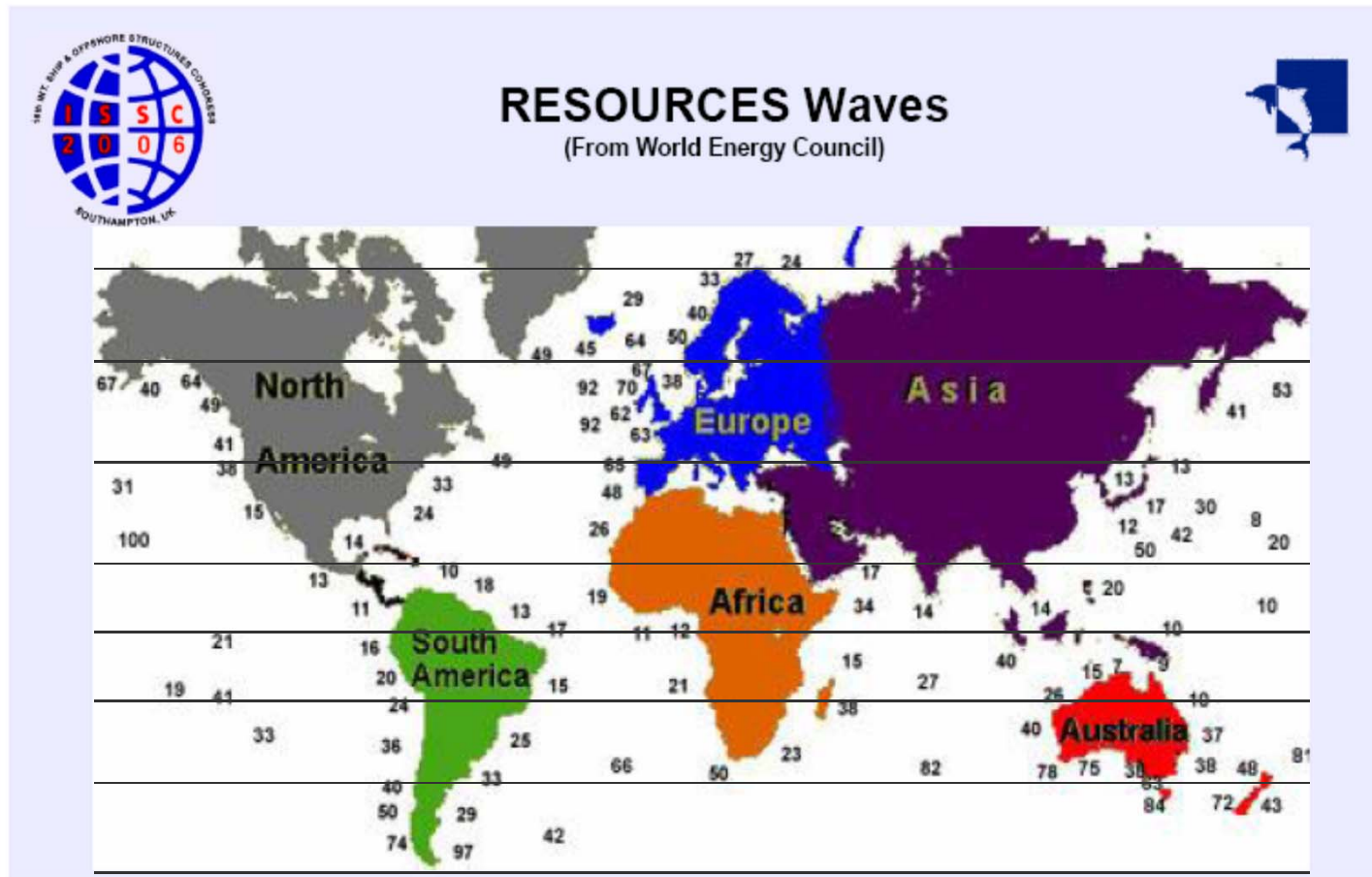
Enables Alstom to enlarge its offering and to speed up its development activities

# TGL turbine - Deployment and retrieval



Demonstrated at 500kW – 1MW by end of 2012 – Unique deployment concept

# Wave resources widely available



Worldwide resource : 200 to 300 GW

© ALSTOM 2012. All rights reserved. Information contained in this document is indicative only. No representation or warranty is given or should be relied on that it is complete or correct or will apply to any particular project. This will depend on the technical and commercial circumstances. It is provided without liability and is subject to change without notice. Reproduction, use or disclosure to third parties, without express written authority, is strictly prohibited.

**ALSTOM**

# Wave Energy

## Alstom – AWS and technology basic principles



- Alstom investment since June 2011
- Floating system
- Multiple identical absorbers cells on each WEC (*Wave Energy Converter*)
- Diaphragm converting wave power into pneumatic power
- Air turbine converting pneumatic power into electricity
- $P > 2 \text{ MW}$  /unit at scale 1:1



Robust engineering and product development

**ALSTOM**

# Wave Energy

## JV Alstom / SSER – Costa Head site, UK



- Pilot & commercial phase
- JV Alstom / SSER
- Site development ongoing  
- permitting, surveys
- Pilot farm:  
- 10MW – 4 WECs
- Commercial farm :  
- 200MW – 80 WECs

Largest on-going Wave Energy project



[www.alstom.com](http://www.alstom.com)

**ALSTOM**