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## Programme Area: Marine

### Project: ReDAPT

**Title:** ReDAPT Project Dissemination Workshop OEE Conference - Dublin - Oct 15

### Context:

One of the key developments of the marine energy industry in the UK is the demonstration of near commercial scale devices in real sea conditions and the collection of performance and environmental data to inform permitting and licensing processes. The ETI's ReDAPT (Reliable Data Acquisition Platform for Tidal) project saw an innovative 1MW buoyant tidal generator installed at the European Marine Energy Centre (EMEC) in Orkney in January 2013. With an ETI investment of £12.6m, the project involved Alstom, E.ON, EDF, DNV GL, Plymouth Marine Laboratory (PML), EMEC and the University of Edinburgh. The project demonstrated the performance of the tidal generator in different operational conditions, aiming to increase public and industry confidence in tidal turbine technologies by providing a wide range of environmental impact and performance information, as well as demonstrating a new, reliable turbine design.

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# ReDAPT – Reliable Data Acquisition Platform for Tidal



## ReDAPT Project Dissemination Workshop OEE Conference - Dublin - Oct 15



Jon Rhymes – Engineering Director

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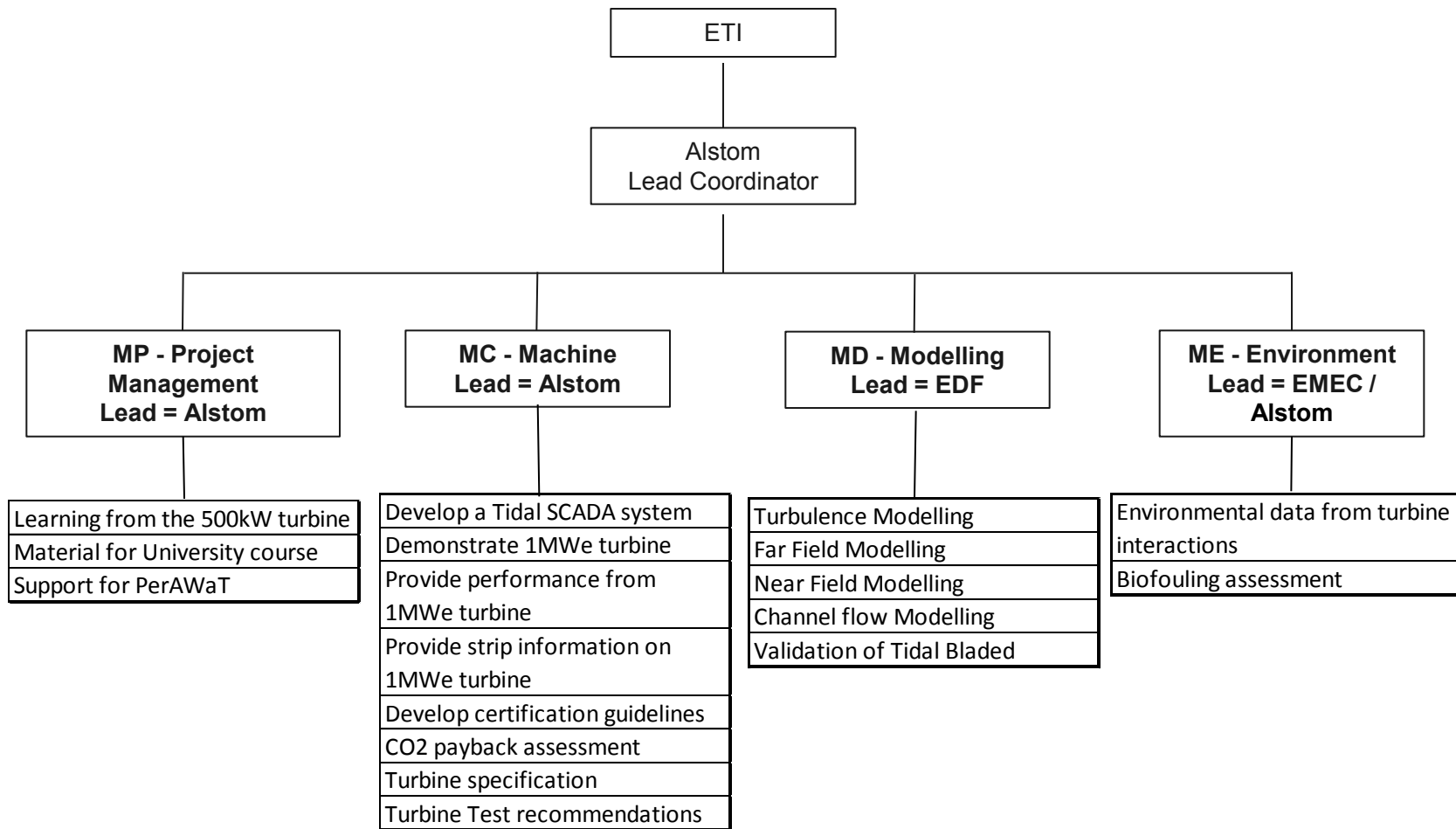
# ReDAPT Workshop - Agenda

- Introduction to the ReDAPT Project – **Jon Rhymes**
- **Alstom**
  - MC6 & 7 – Turbine Deployments and Achievements in Operation – **Jon Rhymes**
- **University of Edinburgh**
  - MD3.8 – Characterisation of Tidal Flow & Turbulence in the FoW – **Brian Sellar**
- **E.ON**
  - MD5.2 – 3D Modelling of Channel Flow in the Fall of Warness (FoW) – **Kester Gunn**
- **EDF & UoM**
  - MD1.4- 3D CFD Model Development – RANS to LES – **Tim Stallard**
- **DNVGL (GH)**
  - MD6.5 – Validation of Tidal Bladed for Turbine Design – **Steven Parkinson**
- **DNVGL**
  - MC8 - Update of Certification Guidelines for Tidal Turbines – **Claudio Bittencourt**
- **Plymouth Marine Laboratory**
  - ME8.5 – Biofouling and Corrosion in Tidal Environments – **Tim Fileman**
- **Energy Technologies Institute (ETI)**
  - ReDAPT Summary and Value of the Project - **Paul Trinick**

# ReDAPT Project Overview

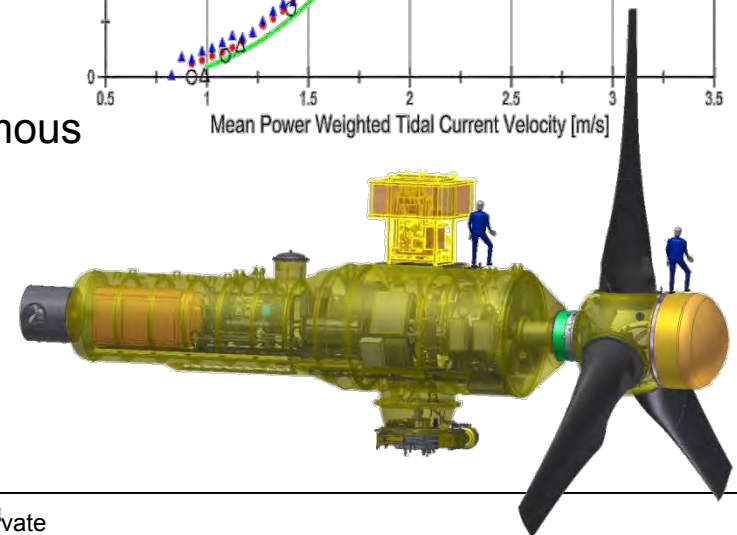
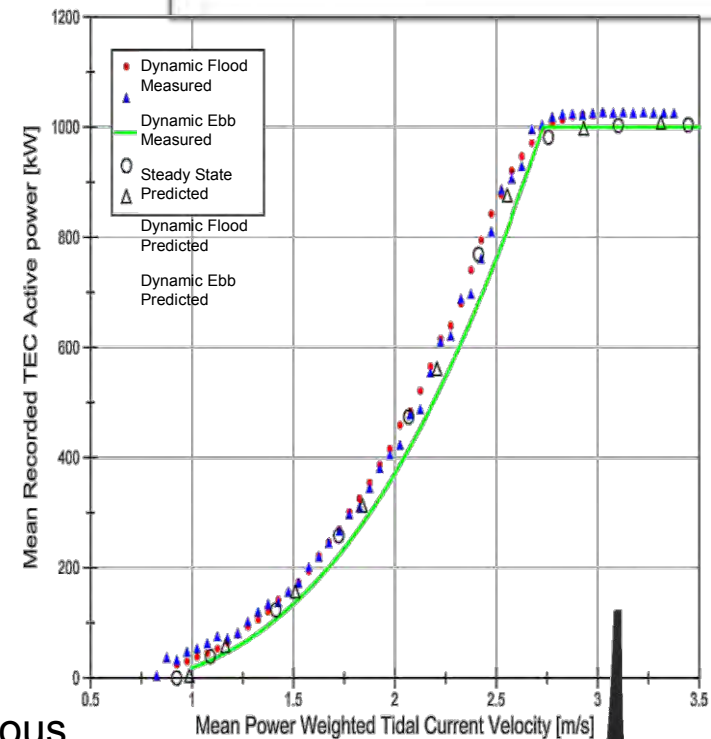
- The ReDAPT project was commissioned and co-funded by the Energy Technologies Institute (ETI).
- £12.6m programme intended to provide information to the Tidal Industry to facilitate rapid growth and help achieve the ETI's objectives.
  - Accelerate development of tidal energy industry
  - Install and test a commercial scale, horizontal flow, tidal turbine
  - Develop analytical and environmental assessments
  - Progress certification guidelines
  - Increase confidence in tidal turbine technologies
- Various industry leaders are involved in the project:
  - EDF
  - E.ON
  - DNVGL / Garrad Hassan
  - Plymouth Marine Laboratory
  - Alstom / Tidal Generation Ltd
  - University of Edinburgh

# ReDAPT - 4 Major Workstreams



# Alstom 1MWe turbine at the heart of the ReDAPT Project

- Demonstrating commercial scale device in real sea-state conditions.
- To provide the industry with a wide range of environmental impact, performance and reliability information.
- 1st deployment in January 2013 at the EMEC (European Marine Energy Centre – Orkney, Scotland). Final recovery mid Feb 2015.
- Testing programme :
  - Power curve demonstrated
  - Over 1.2 GWh produced & 3500 hours autonomous operation
  - 3 months continuous autonomous running
  - Validation of in house design tools
  - Proved the buoyant nacelle + detachable winch installation
  - Free ascent retrieval processes



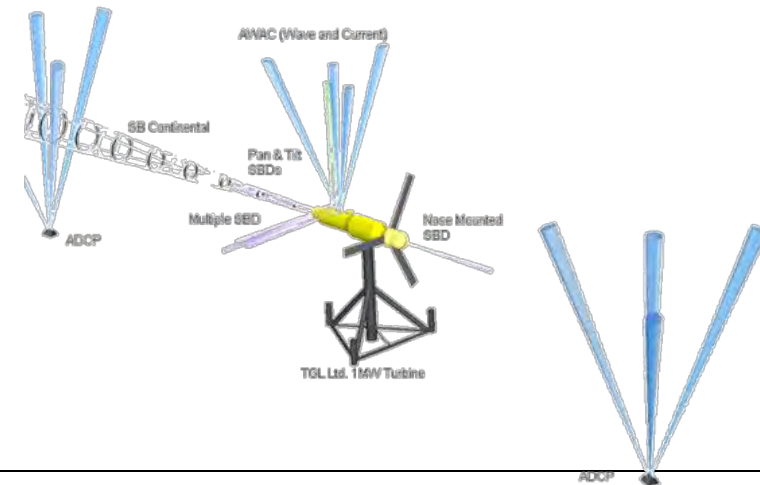
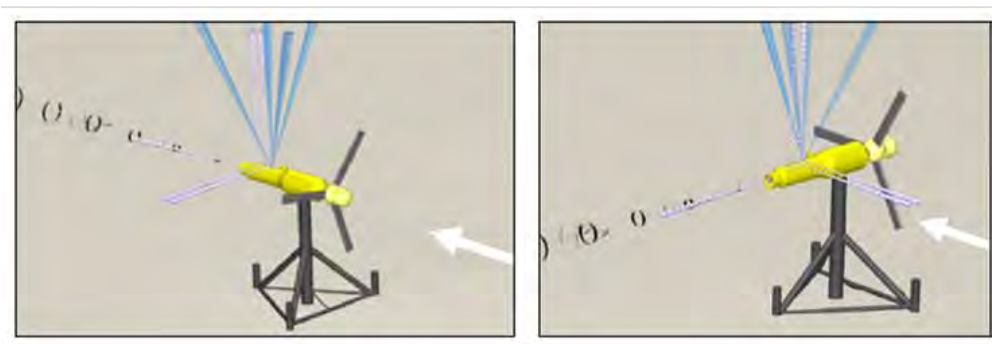
# Modelling Sub Project – Data collection



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ReDAPT

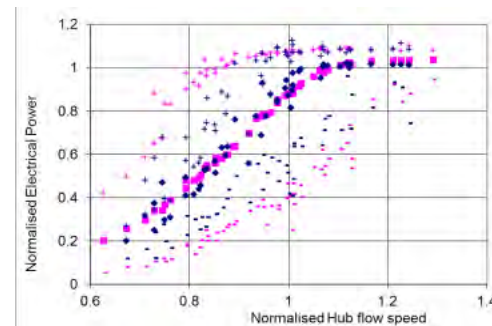
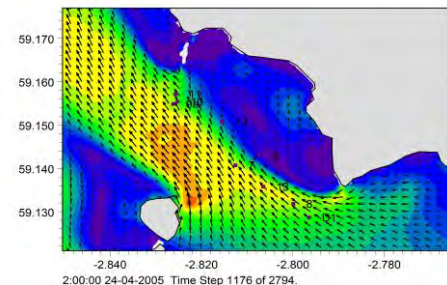
- The most comprehensive tidal device instrumentation array in the world to date
- Off-the-shelf & bespoke, seabed and turbine mounted equipment
- Acquiring data in representative in-flow conditions
- Multiple instrument configurations
- Real-time control of instrument arrays and live feedback





# Key ReDAPT achievements – non turbine

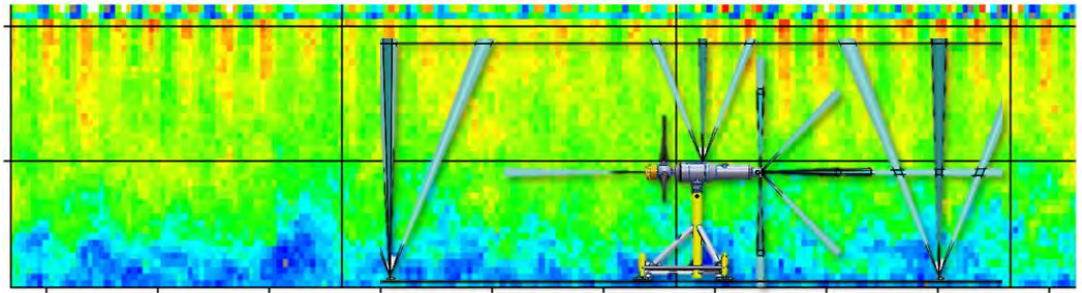
- Created and validated a macro level channel flow model of the Fall of Warness using field measurements
- Fully validated the industry standard design tool - Tidal Bladed
- Developed a suite of industry certification guidelines for Horizontal Axis Tidal Turbines (HATT)
- The performance of various biofouling coatings has been assessed and recommendations made



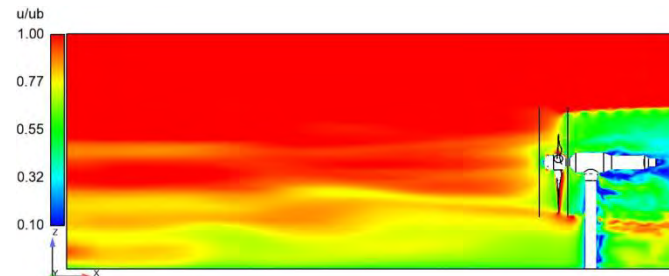


# Key ReDAPT achievements – non turbine

- Fully characterised the turbulent environment within the near field of the turbine
  - Inlet flow conditions and effect on turbine loads
  - Wake measurements



- Developed CFD methodologies on from plain flow models using averaged parameters (RANS) to specific turbulent inflow conditions and LES models



- Demonstrated minimal impact on surrounding marine life
  - Carried out acoustic tests to define any possible impact to wildlife from noise generation and monitored the turbine blades for impact

# The ReDAPT Legacy

## Confidence, Knowledge, 'Tool kit' and Data

### Industry

- ReDAPT has demonstrated the viability of HATT turbines in the tidal environment
  - The industry has moved on to the next level - pilot arrays.
  - Shown that turbines can be operated in a cost effective manner.
  - Improved confidence levels in Tidal Energy
  - Authorities have confidence and understand impact on marine life
- The knowledge base supporting the industry has been vastly improved by the Project and the ground breaking studies carried out.
  - A number of papers to be published this year based on ReDAPT work
- The industry has 'Tool kit' that facilitates the refinement of designs and ultimately drives down CoE
  - A firm set of certification guidelines
  - The industry has a fully validated design tools
  - Guidance on how to collect, characterise and analyse site data

### Academia

- A multi TeraByte database of Quality Controlled environmental data measurements and associated turbine parameters is in the public domain

# Further Information on ReDAPT

- ETI Website contains links to the Public Domain Reports

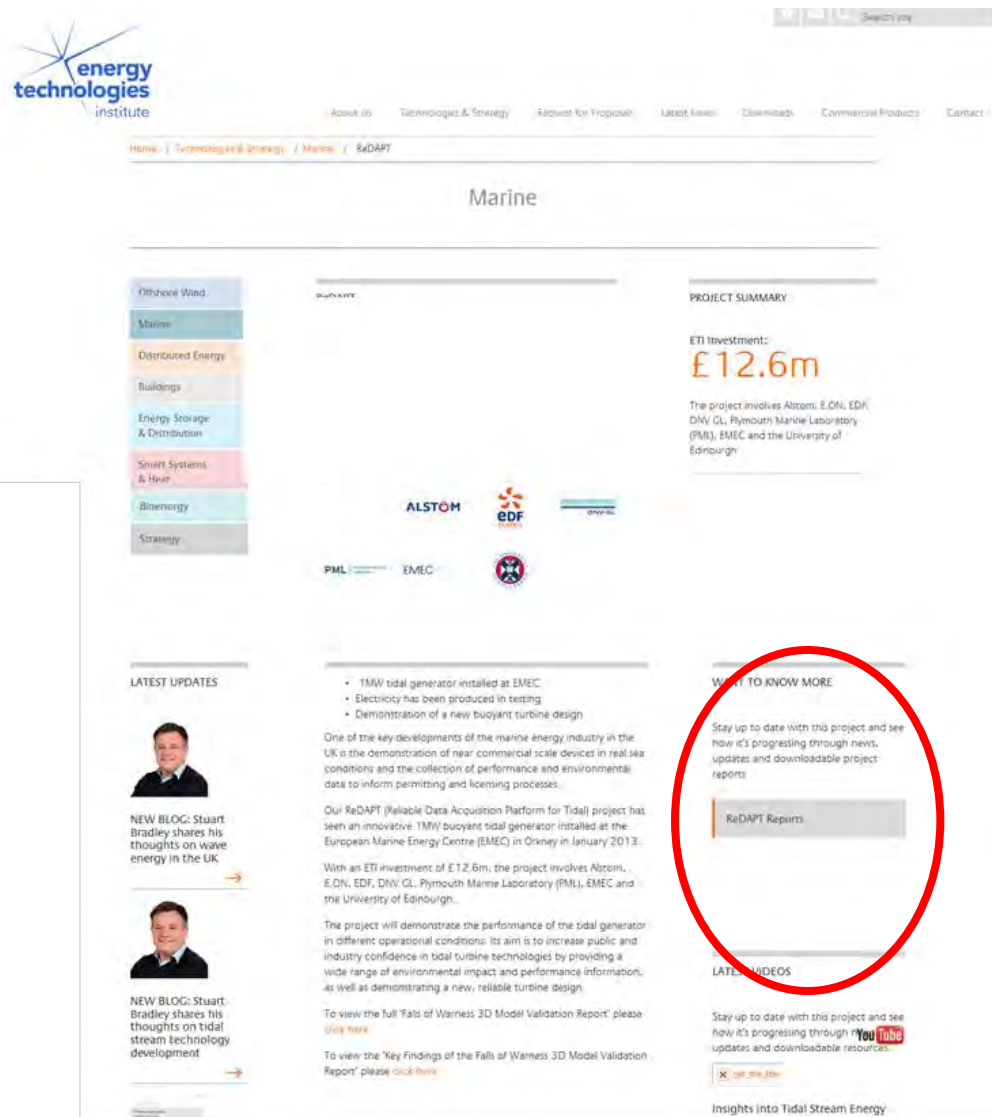
<http://www.eti.co.uk/project/redapt/>

- UKERC – Energy Data Centre (EDC) database for ADCP measured flow data

<http://data.ukedc.rl.ac.uk/browse/edc/renewables/marine>

- Alstom – Paul Chesman – ReDAPT Programme Manager

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