Physical Testing and Control of Tidal Turbines

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To explore through physical testing the interactions of tidal devices with:
- their energy fluxes
- each other
- the electricity network

to understand:
- cyclic and extreme forces acting on the turbine
- structural loadings
Programme objective

REAL WORLD
Capturing Representative Conditions

TEC MODEL
Machine Operational Envelope

TEST TANK
Advancing Replication Abilities
Turbine design

- 1:15 scale, rotor diameter: 1.2 m
- Similar radial variation of rotor thrust coefficient to full-scale generic turbine
- Instrumented, controllable
- Max continuous torque: 37 Nm
Turbine design

- shaft seal
- brushless motor
- root bending moment sensor
- signal conditioning electronics
- bearings
- shaft
- slipring
- torque and thrust transducer
Snippets of tests – in current

- TSR sweeps - different flow speeds
- TEC control - different control parameters
- Flow measurements – instream flow, wake, near field z-profiles
- Array of two and three turbines
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Snippets of tests – with waves

- Regular wave repeats to study loading
- Irregular waves - extended set and angles
- NewWave focussed wave groups
- Real-time control
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Summary and opportunities

Data of turbine loads and performance under a range of flow conditions, including in waves.

Detailed inflow and wake maps for single turbine, two-turbine and three-turbine arrays.

Three turbines and associated hardware available – possibility for use within other projects.

Real-time controller allows the exploration of other control schemes.