SuperGen 3 UK Centre for Marine Energy Research

Mission

SuperGen Marine Phase 3 is the

UK Centre for Marine Energy Research

whose core membership and management team will

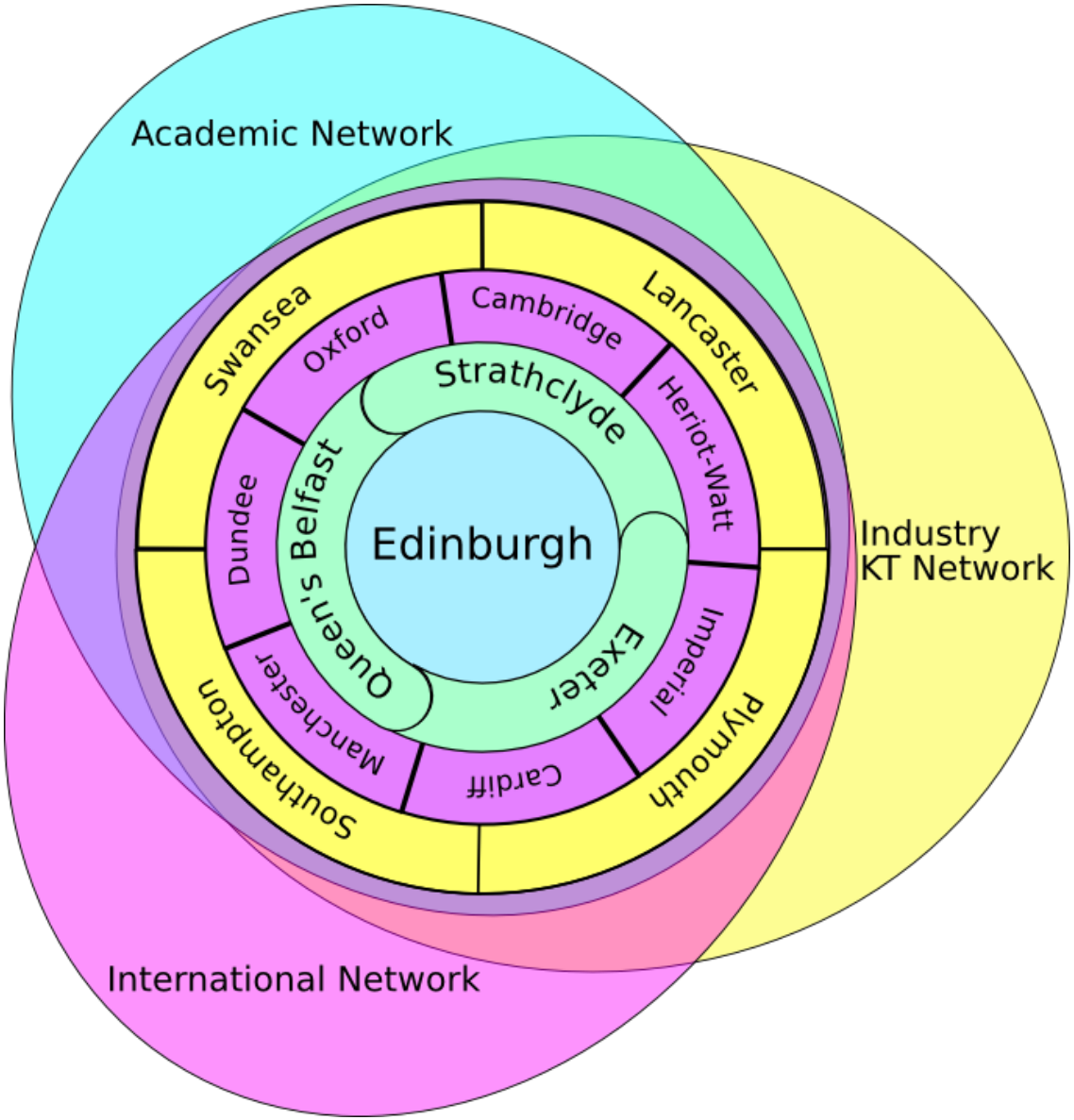
- ensure joined-up regional, disciplinary and thematic effort to meet the challenges in accelerating deployment towards and through 2020 targets

Rationale and Vision

Within this landscape UKCMER will

- *Conduct world-class **fundamental and applied research** that assists the marine energy sector to accelerate deployment and ensure growth in generating capacity through 2020 targets.*
- *Expand and operate an inclusive **marine network** of academic researchers, industry partners and international collaborators.*
- *Continue to provide the highest quality of **doctoral training and knowledge transfer** in partnership with industry to build intellectual and human capacity for the sector.*

Structure


Academic Network
Industry
KT Network
International Network
Edinburgh
Strathclyde
Queen's, Belfast
Exeter
Cambridge
Heriot-Watt
Imperial
Cardiff
Plymouth
Lancaster
Oxford
Swansea
Dundee
Manchester
Southampton

UK development infrastructure

This is world-leading research capacity in 15 universities, gathered by SuperGen Phase 3 and Grand Challenge.

- estimated 70-90 academics and research staff
- 12 wave tanks, many wave flumes
- 16 towing or pumped tidal current tanks
- 6-10 other specialised, dedicated labs

Research Themes and Aims

Themes of Phase 3 emerged from consultation, foresighting and roadmapping. They form the basis of some core research, and student projects and are central to the Grand Challenge projects

Arrays and farms:

optimise design, hydrodynamic processes and nature of interactions between waves and current on the behaviour of devices and moorings

Turbulence:

reduce the need for over-design against fatigue, increase reliability, power quality and affordability

Extreme Loadings:

develop means to predict, economically design for and survive extreme loadings

Component and system reliability:

improve reliability and increase ability to predict wear and fatigue life of components & devices operating well away from design conditions.

Research Themes and Aims

Mooring and Foundations:

reduce installation and station-keeping costs

Power Take Off:

develop PTOs for the marine environment that accept the stochastic reciprocating input of wave power

Environmental impact:

understand and quantify the effects of energy extraction and modifications of flow on marine mammals, flora, fauna and sediment.

The Grand Challenge projects that follow and that feature today are internally and externally collaborative.

GC Research Projects

SUPERGEN UKCMER

1. *Optimal Design of Very Large Tidal Stream Farms for Shallow Estuarine Applications*:

Exeter, Edinburgh

UNIVERSITY OF EXETER

2. *Modelling Marine Renewable Energy Devices - Designing for Survivability*:

Imperial, Queens, Manchester Metropolitan

Imperial College London

3. *The Effects of Realistic Tidal Flows on the Performance and Structural Integrity of Tidal Stream Turbines*:

Cardiff, Liverpool, Swansea, Bangor, Cranfield

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

GC Research Projects

4. *Extreme Loading of Marine Energy Devices due to Waves, Currents, Flotsam and Mammal Impact*:
   Manchester, Edinburgh, Plymouth, SAMS

5. *Increasing the life of Marine Turbines by Design and Innovation*:
   Cambridge, Cranfield

6. *SuperGen Marine Technology Challenge*:
   Oxford, UCL, Bath

GC Research Projects

7. *Interactions of Flow, Tidal Stream Turbines and Local Sediment Bed under Combined Waves and Tidal Conditions*:
Dundee, Hull, Liverpool, Strathclyde

8. *Large-scale Interactive Coupled 3D Modelling for Wave and Tidal Energy Resource and Environmental Impact*:
Heriot-Watt, Edinburgh, Strathclyde

9. *Large scale interactive coupled modelling of environmental impacts of marine renewable energy farms*;
Queens, Imperial, CEFAS

Capacity Building

Continuing demand for trained marine energy researchers to supply both the industrial and research sectors.

UKCMER doctoral training courses continue *but to include industrial, CPD, participants*.

PhD students allocated in year 1 to core and associate universities against the evolving research landscape.

Student experience extended by working alongside industry led IDCORE EngD projects directly addressing industrial challenges.

Academic Network

HMRC Cork - Ireland, TU Delft-Netherlands, Ecole Centrale Nautique Nantes-France.
Dalhousie University-Canada,
Oregon State University, Florida Atlantic University, UMass – USA.
Universities of Osaka City and Hokkaido–Japan.
Harbin Engineering University and Dalian University of Technology–China.
National Taiwan University, National Taiwan Ocean University, National Chen Kung University-Taiwan

Industry Network

Aquamarine; Pelamis Wave Power; MCT; TGL; ScotRenewables; Nautricity;

Rolls Royce; Tidal Energy Ltd: GreenTide Turbines Ltd.

WaveHub; EMEC; NaREC

EdF; Converteam; SKF; Edinburgh Designs; DHI; Mabey Bridge Ltd;

Arup; TATA; Bosch Rexroth; EWF energy Ltd; Power Units M&E Engineering Ltd;

NGenTec

KE & Articulated Programmes

- **NERC Marine Programme**
- **SOWFIA**
- **SI-Ocean**
- **EERA**
- EU Marinet, MARINA, TROPOS, HydraLab IV
- Wavetrain
- IEA:OES
- TSB ORE-Catapult
- TSB Marine Technology Programme
- DECC Marine Energy Programme

Y1 – Establishment and Progress

- Core universities (not fully-funded for research staff) have raised towards £9m of consequent funding. All research staff are in place.
- Grand challenge partners just joining UKCMER have won over £8m of new awards and are either staffed or recruiting.
- Core and GC projects are highly collaborative
- Core and associate universities have recruited 10/11 PhD students and several others to DTP.
- Industry advice through Renewables UK Advisory Board

Y1 – Establishment and Progress

- UKCMER leads EERA-Marine
- New infrastructure opening and proceeding to plan.
- 58 publications in journals and at conferences.

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