

# Welcome & Introduction to NHP-WEC

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ENERGY AND  
ENVIRONMENT INSTITUTE



Engineering and  
Physical Sciences  
Research Council

Engineering

Lancaster  
University



# Who is involved



- P-I - Professor **George AGGIDIS**
- Co-I - Dr **Xiandong MA**
- Co-I - Professor C. **James TAYLOR**
- PDRA1 - SRA - Dr **Wanan SHENG**
- PDRA2 – RA - **TBC**
  
- Co-I - Dr **Robert DORRELL**
- Co-I - Professor **Daniel PARSONS**
- PDRA3–SRA–Co-I - Dr **Evdokia TAPOGLOU**



# Advisory Board

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1. European Marine Energy Centre (EMEC)
2. Offshore Renewable Energy Catapult (OREC)
3. DNV
4. AURA
5. Advanced Manufacturing Research Centre (AMRC)
6. The Deep



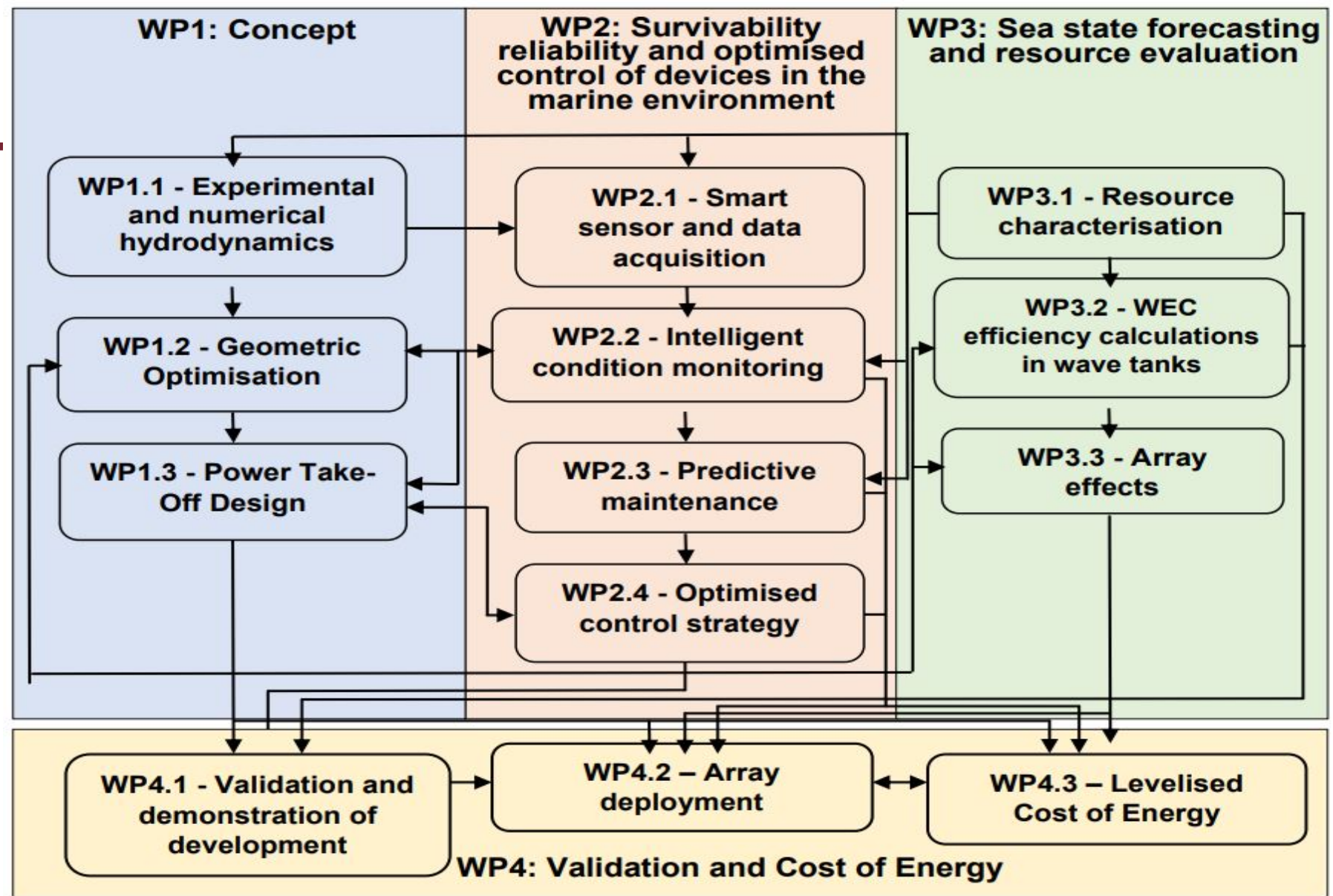
# Project Aim & Objectives



- **The project aim:** *Advance WEC technology by developing essential device control and monitoring systems that are integrated with high-fidelity sea state forecasting.*
- **Objectives:**
  1. **Concept optimisation** – *Parameterize hydrodynamic behaviour due to the WEC geometry and PTO design to refine, optimise and maximise performance.*
  2. **Operational systems** – *Investigate and implement sensors and actuators required to develop a condition monitoring system that will improve reliability and survivability, and control methods for the multi-axis PTO system advancing overall conversion efficiency.*
  3. **Resource forecasting** – *Develop machine-learning based forecasting tools to provide both short-term accurate predictions for the operational systems and long-term energy yield predictions for the device across various deployment sites.*
  4. **Device deployment potential** – *Develop a wave-to-wire model to determine the Levelised Cost of Energy (LCOE) at given sites, for both standalone devices and arrays, quantifying the TRL financial baseline performance essential to stimulate commercialisation.*
  5. **Marine wave energy development** – *Develop industrial input and research impact objective, including dissemination and showcasing of all the outputs, to ensure that not only one technology develops but that the solutions proposed will benefit the wider energy community.*



# WP structure



# Timeline

Tasks	Quarter	1	2	3	4	5	6	7	8	9	10	11	12
WP1: Concept optimisation													
Experimental and numerical hydrodynamic analysis		█	█	█	█	█				█	█		
Geometric Optimisation				█	█	█							
Power Take-Off Design						█	█	█	█				
WP2: Survivability, Reliability and Optimised Control of Devices in the Marine Environment													
Smart sensor and data acquisition system					█	█	█						
Intelligent condition monitoring							█	█	█				
Predictive maintenance									█	█	█		
Optimised control strategy											█	█	█
WP3: Sea state forecasting and resource evaluation													
Resource characterisation					█	█	█						
WEC efficiency calculations in wave tanks								█	█	█			
Array effects											█	█	█
WP4 – Validation and Cost of Energy													
Validation and demonstration of development										█	█		
Array deployment												█	█
Levelised Cost of Energy												█	█

# Deliverables / Milestones

Tasks	1	2	3	4	5	6	7	8	9	10	11	12
Determined hydrodynamic characteristics			Blue									
Validation of numerical model/s			Blue									
Advanced optimisation of geometry				Blue								
Manufacturing of final model					Blue							
PTO design incorporation and model								Blue				
Established data acquisition framework						Orange						
Established condition monitoring method							Orange					
Predictive maintenance methods								Orange				
Optimised control method										Orange		
Machine learning model for wave evaluation from satellite images					Green							
Model for the calculation of the efficiency of the device in tank tests									Green			
Determination of array effects from tank tests												Green
Numerical data to validate development										Blue		
Experimental data to validate development										Blue		
Levelised cost of energy and potential												Orange
Array deployment potential												Green

# Management

Project Management	1	2	3	4	5	6	7	8	9	10	11	12
Progress Meetings	Twice monthly											
Group face-to-face meetings	Quarterly											
Advisory Board meetings												
Workshops												

