EPSRC NHP-WEC Research Project
3rd Advisory Board Meeting

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Project Team & WP Structure

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- P-I - Professor George AGGIDIS
- Co-I - Dr Xiandong MA
- Co-I - Professor C. James TAYLOR
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- PDRA2 – RA – Dr Yueqi WU

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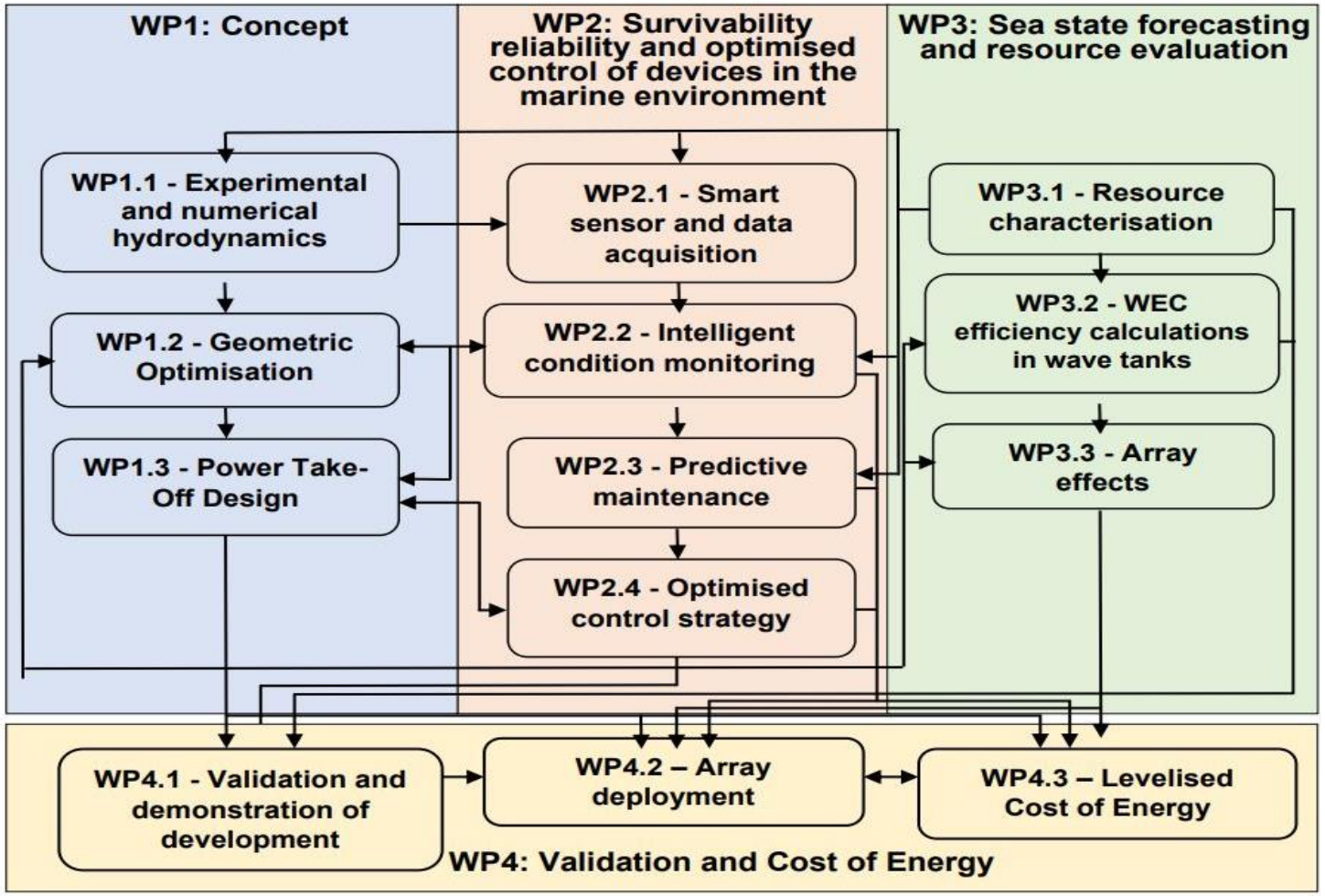
- Co-I - Dr Robert DORRELL
- Co-I - Professor Daniel PARSONS
- PDRA3–SRA – Dr Igor RIZAEV



Techno-economic assessment of wave energy converter -the case study of TALOS

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1. Summary of wave energy converter

- (1) Classification
- (2) Characteristics

Classification	Location	Structure	Device example	Characteristics
Oscillating water column (OWC)	Nearshore	Floating	Mighty whale BBDB power	low installation and maintenance costs; securing the coastline
	shoreline	Fixed	Limpet	
Oscillating bodies(OB)	Offshore	Floating	AquaBuoy TALOS II multi-DOF WEC Pelamis	high wave energy extraction efficiency; the more complex structure, costly devices, high repair cost
		submerged	AWS	
Overtopping WECs（OW）	Shoreline	Floating	Wave Dragon	simple and portable OW devices，low cost of installation and maintenance; the costly structure, impacting on sea environment in the degree
		Breakwater	U-OWC devices	
		Fixed	Sea-wave Slot-cone Generator (SSG)	

2.Techno-economic appraisal model

(1) Basic LCOE model

$$\mathrm{LCOE} = \frac{\sum_{t=1}^{n} \frac{TC_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{AEP_t}{(1+r)^t}}$$

(2) Model variation

$$\mathrm{LCOE} = \frac{\sum_{t=1}^{n} \frac{PC_t + CAPEX_t + OPEX_t + DC_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{AEP_t}{(1+r)^t}}$$

$$\mathrm{LCOE} = \frac{\sum_{t=1}^{n} \frac{CAPEX + OPEX_t + DC_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{AEP_t}{(1+r)^t}}$$

3.Component in the models

- (1) CAPEX structure and its estimation method

Sub-cost	Measure method	Prescription
Pre-installment	proportion method	Percentage of CAPEX
Structure	Mass cost method	Mass of materials*commercial price
PTO	proportion method	Percentage of CAPEX
Connection	Flexible cost method	Unit value *consumption quantity
Foundations	Mass cost method	Mass of materials*commercial price
Moorings	Flexible cost method	Unit value *consumption quantity
Installation	Flexible cost method	Unit value *consumption quantity
Electrical systems cost	Flexible cost method	Unit value *consumption quantity
……	……	……

4.Component in the models

- (2) OPEX structure and its estimation method

Sub-cost	Measure method	Prescription
Replacement	proportion method/ Fixed cost method	Percentage OPEX/ Expenditure at every year
Overhaul	proportion method/ Fixed cost method	Percentage OPEX/ Expenditure at every year
Annual O&M	proportion method	Percentage OPEX
Repair	Fixed cost method	Expenditure at every year
Management	proportion method/ Flexible cost method	Percentage OPEX/ Unit value *consumption quantity
Site lease and insurance	Fixed cost method	Expenditure at every year
Checking and adjustment of tension	proportion method	Percentage OPEX
Intangible cost	proportion method	Percentage OPEX
DC	proportion method	Percentage OPEX
……	……	……

3.Component in the models

- (3) Annual Energy Production
  - Special technological WEC
  - Simplified method
    - $\mathrm{AEP} = \mathrm{PCF} * \mathrm{DCF} * \mathrm{DAF} * 8766\ \mathrm{hour/year}$
- (4) Discount rate and life span
  - Discount rate
  - 5% -15%
  - 8% and 10%
  - life span
  - 30-50 years

4.Case study and discussions

- (1) Case study of TALOS
- Cost estimation and other variables
- Commercial scenes
- Calculation
- (2) Discussion of results

Tasks

1. A review of the levelized cost of wave energy based on techno-economic model (in the process of submission)
2. Techno-economic assessment of wave energy converter -the case study of TALOS (proceeding)
3. Optimization of key device's parts influencing on the levelized cost of wave energy-the case study of TALOS (to consider)

Thank You