



# Supergen



Offshore  
Renewable  
Energy

## Panel session 3: The Global- Local Industry

How do we best share best ORE practice through international collaboration? How do we ensure all communities and regions can benefit from ORE growth?

[www.supergen-ore.net](http://www.supergen-ore.net) | [#SupergenORE23](https://twitter.com/SupergenORE23)

UK  
RI

Engineering and  
Physical Sciences  
Research Council

# Keynote speaker: Hayley Hinchon

Principal Consultant, Howell Marine & ECOWIND  
Champion



# ECOWind

## Supergen



Offshore  
Renewable  
Energy

Annual Assembly, July 12<sup>th</sup> 2023



# ECOWind Champions



Dickon Howell



Henk van Rein



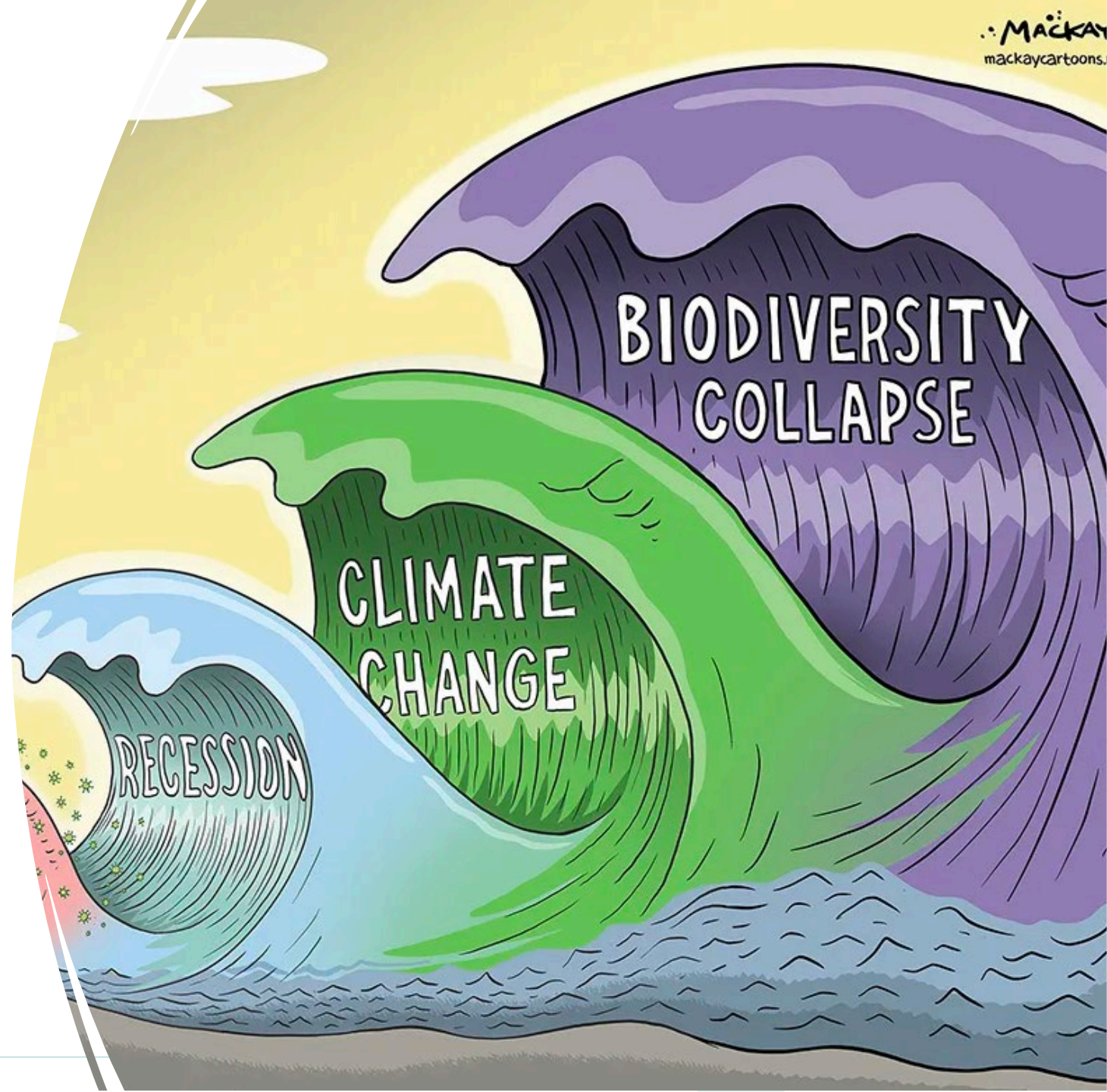
Hayley Hinchin



Kimberley Lloyd



**Why ECOWind...?**



# The Ecological Consequences of Offshore Wind

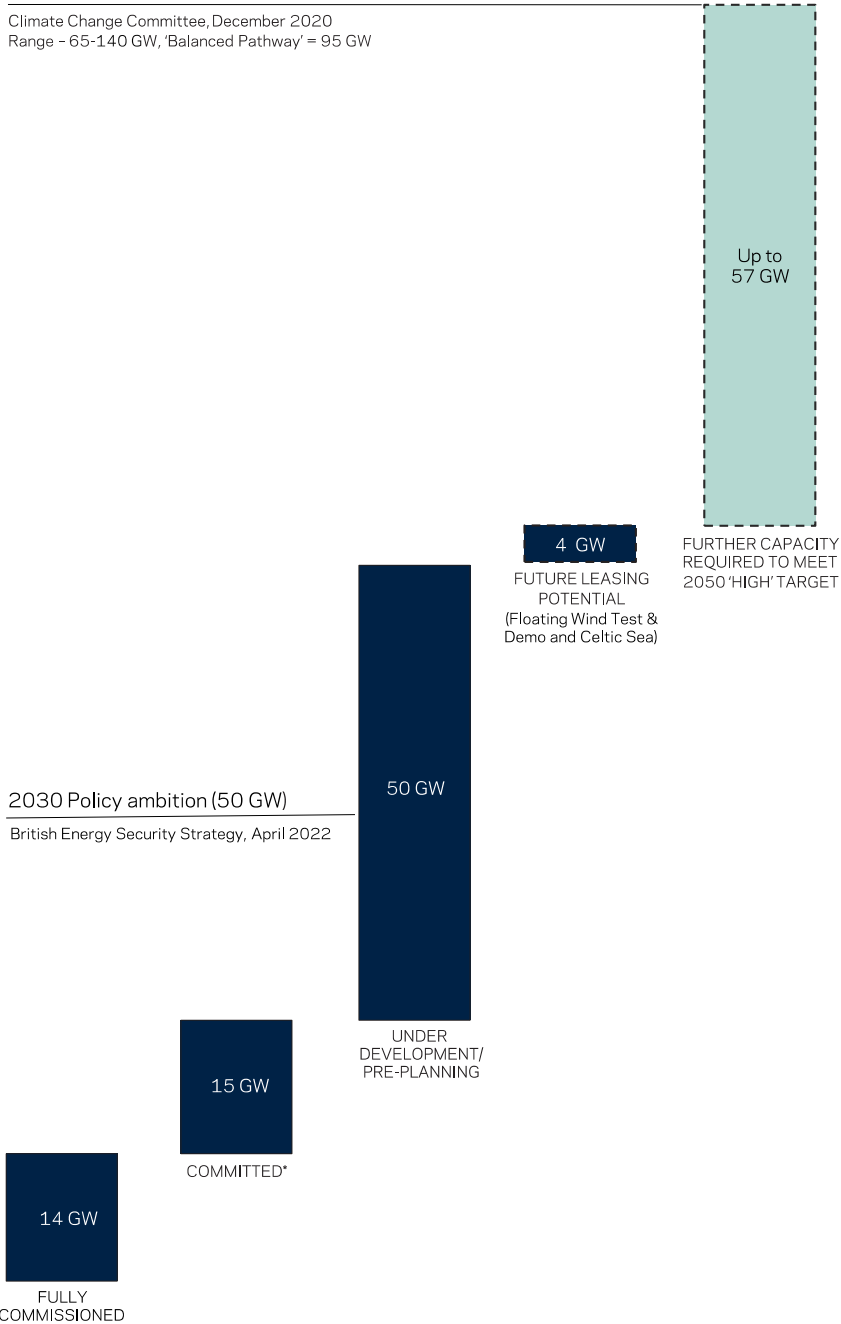
ECOWind's research aims to understand how OWFs affect ecosystems, and the species and habitats that make them...

and by better understanding this to influence the development of policies to better manage our marine environment...

...while also tackling climate change

2050 Net Zero scenarios (up to 140 GW)

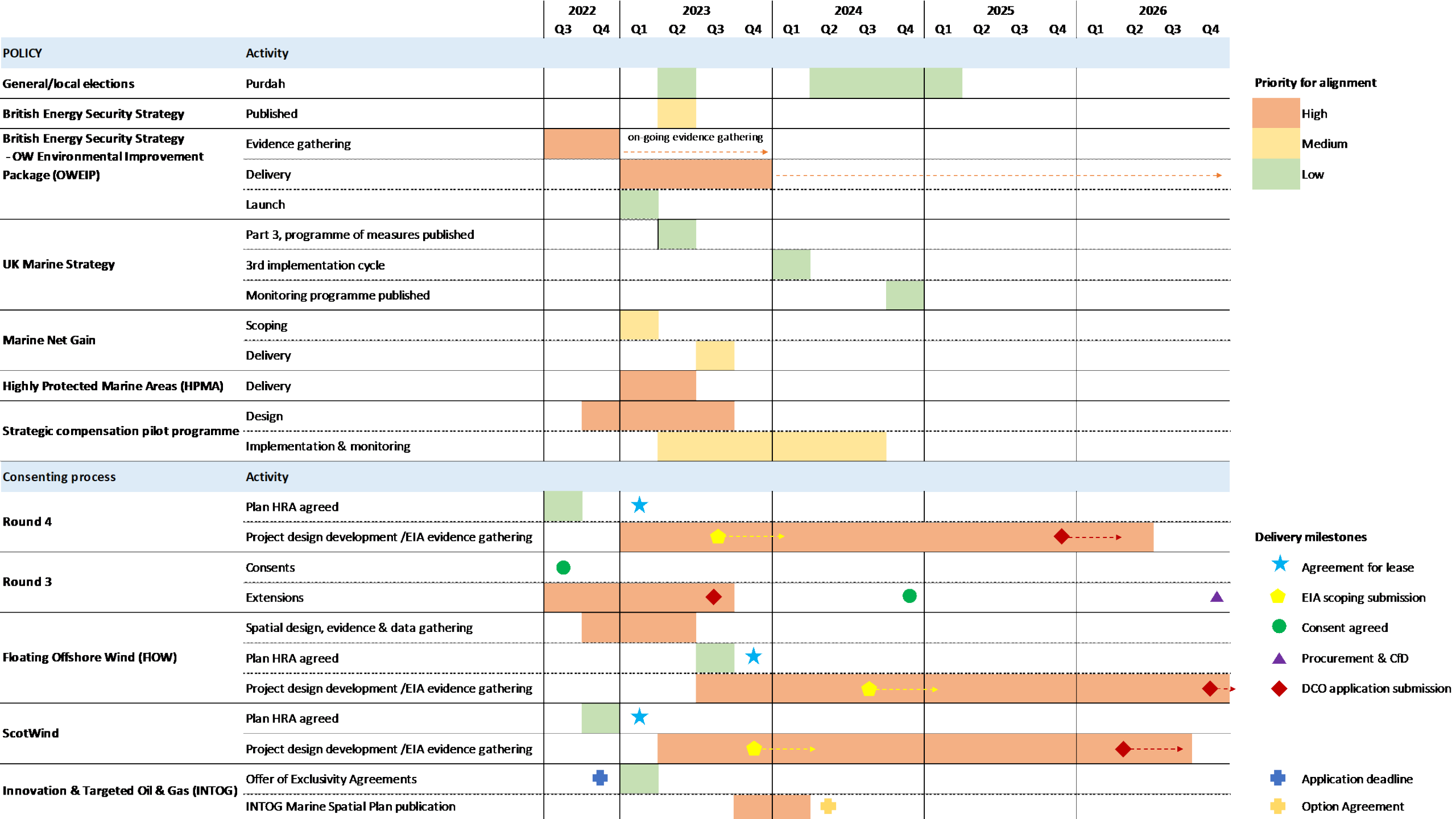
Climate Change Committee, December 2020  
 Range - 65-140 GW, 'Balanced Pathway' = 95 GW



- 2030
  - Good Environmental Status achieved (currently 4/15 indicators)
  - 30% of UK waters designated and well managed
- 2025
  - Marine Net Gain launched in England
- 2024
  - Marine Recovery Fund Launched
- 2023
  - Highly Protected Marine Areas designated
  - Strategic Compensation Mechanism agreed

\* Projects under construction or that have government support on offer e.g. Contract for Difference OR taken FID





# ECOWind Programme

To understand how fixed offshore wind expansion, combined with other anthropogenic pressures, affects species interactions and marine ecosystems to enable robust approaches to marine environmental restoration and net environmental gain

## ECOWINGS

Ecosystem change,  
offshore wind, marine  
net gain & seabirds

Francis Daunt, UK Centre  
for Ecology & Hydrology

## ACCELERATE

Ecological implications of  
accelerated seabed  
mobility around  
windfarms

Katrien Van Landeghem,  
Bangor University

## PELAgIO

Physics to ecosystem  
level assessment of  
impacts of offshore  
windfarms

Beth Scott, University of  
Aberdeen

## BOWIE

Sustainable expansion of  
offshore wind while  
protecting benthic  
biodiversity & functional  
value

Martin Solan,  
Southampton University



# What is impact?

## UKRI

Academic impact is the demonstrable contribution that excellent research makes to scientific advances, across and within disciplines, including significant advances in understanding, method, theory and application.

Economic and societal impact is the demonstrable contribution that excellent research makes to society and the economy, of benefit to individuals, organisations and nations.

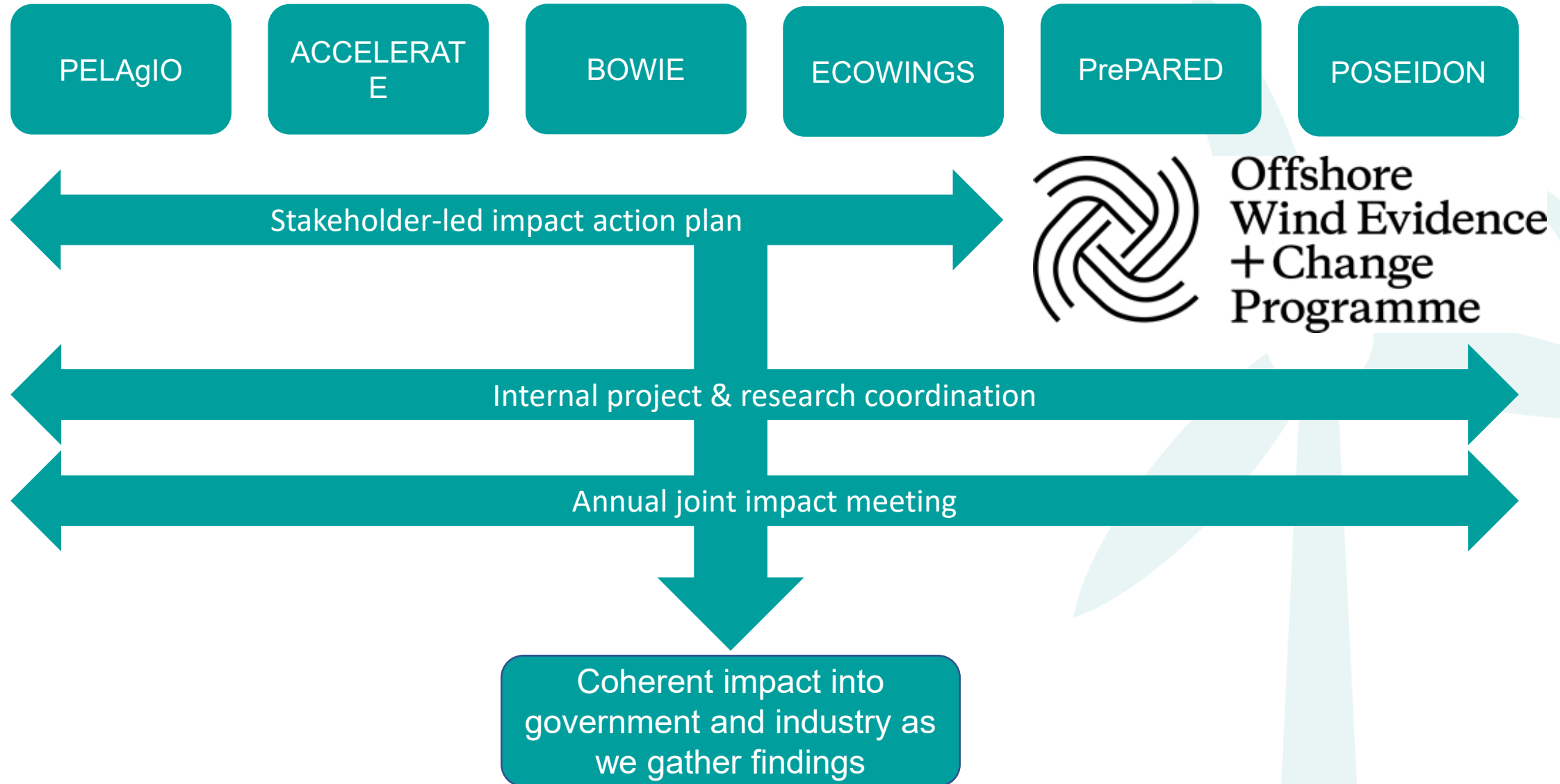
## Government

Impact is shown by research that can contribute to decision making and enable the development and delivery of government policy outcomes

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# Delivering a coherent programme



**ECOWind can understand  
ecological impacts &  
trade-offs...**

**But can we engineer  
differently to  
avoid compensating?**





# ECOWind

[www.ECOWind.uk](http://www.ECOWind.uk) | [Champions@ECOWind.uk](mailto:Champions@ECOWind.uk)



# Panel session 3: The Global-Local Industry

How do we best share best ORE practice through international collaboration? How do we ensure all communities and regions can benefit from ORE growth?

# SICE

# Renewable Theme

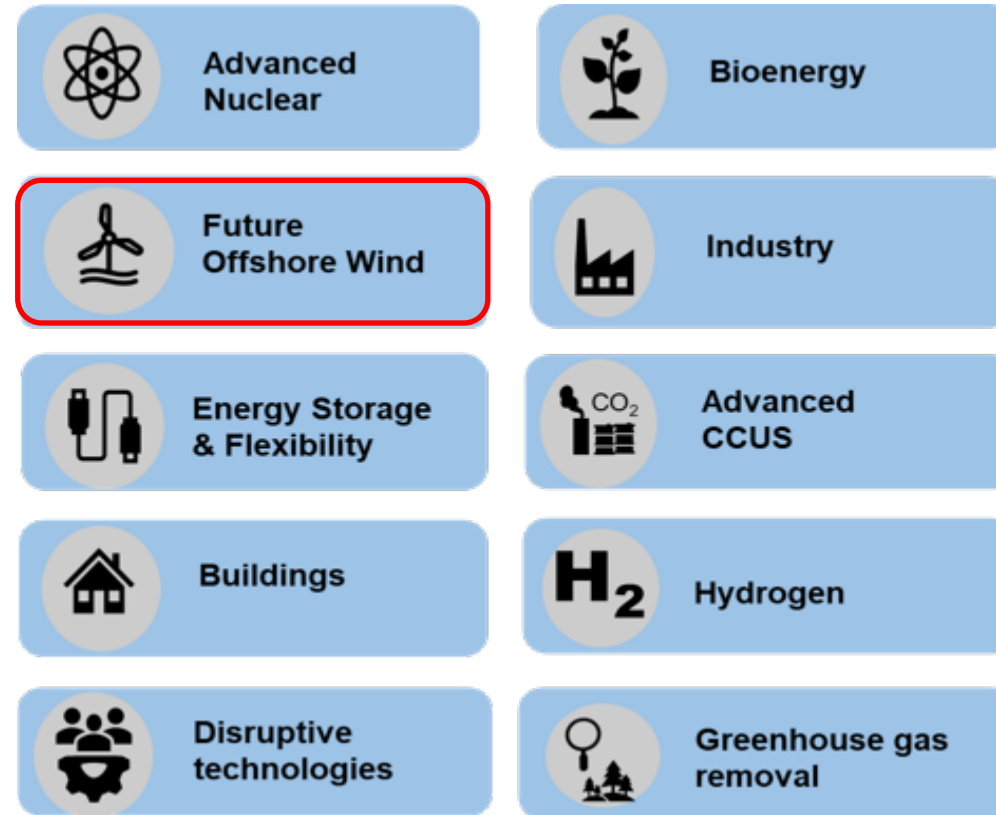


Department for  
Energy Security  
& Net Zero


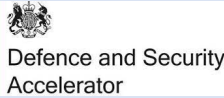





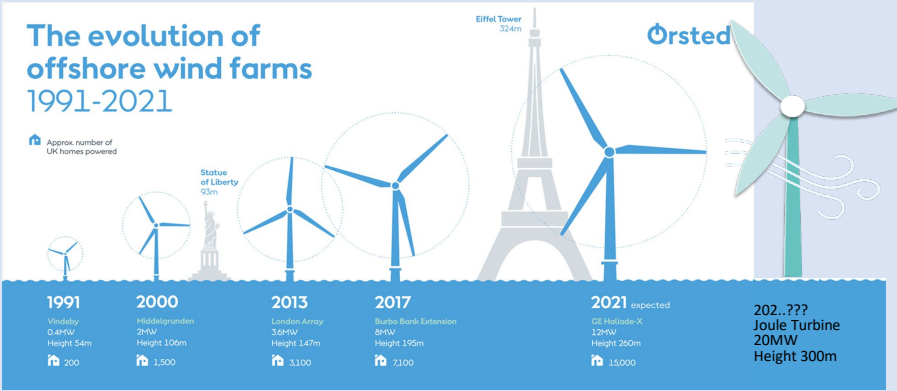
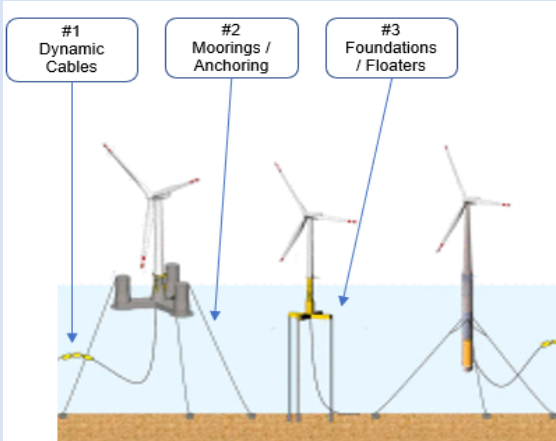
YANNIS DRAGOTIS  
HEAD OF RENEWABLE ENERGY  
INNOVATION DELIVERY  
  
SCIENCE AND INNOVATION FOR  
CLIMATE AND ENERGY

# NZIP – Net Zero Innovation Portfolio

- £1B of funding.
- Aims to accelerate the commercialisation of innovative low-carbon technologies, systems and business models in power, buildings and industry, and decrease the costs of decarbonisation.
- Builds on previous £505M Energy Innovation Programme, which included £180M Nuclear Innovation Programme.
- Potential to unlock 300,000 jobs by 2030 in exports and domestic industry; enables savings across low carbon sectors; will have a strong regional impact.
- Leverages £1B industry matched funding.



# NZIP Renewable Theme

<p><b>Programme</b></p>	<p><b>Radar Mitigation Ph3 (Jul'23-Mar'25)</b></p>	<p><b>Composites Ph2B (Jul'23-Jan'25)</b></p>	<p><b>Floating Offshore Wind (FOW) (Jan'22-Mar'25)</b></p>																												
<p><b>Aim</b></p>	<p>To develop technologies enabling the coexistence of future offshore windfarms alongside UK air defence radar</p>	<p>To incorporate radically new composite-based components such as a composite tower in the next-generation of offshore wind turbines, and demonstrate how they can be manufactured and delivered in the UK context.</p>	<p>To demonstrate FOW technologies to encourage market confidence, investment and further development to bring down the Levelised Cost of Energy (LCOE).</p>																												
<p><b>Partners</b></p>	 	 	 																												
		 <table border="1"> <caption>The evolution of offshore wind farms 1991-2021</caption> <thead> <tr> <th>Year</th> <th>Project</th> <th>Height</th> <th>Approx. number of UK homes powered</th> </tr> </thead> <tbody> <tr> <td>1991</td> <td>Vindaby Oland</td> <td>5.4m</td> <td>200</td> </tr> <tr> <td>2000</td> <td>Hiddigegrund</td> <td>1.06m</td> <td>1,500</td> </tr> <tr> <td>2013</td> <td>London Array</td> <td>1.47m</td> <td>3,100</td> </tr> <tr> <td>2017</td> <td>Burbo Bank Extension</td> <td>1.95m</td> <td>7,100</td> </tr> <tr> <td>2021 expected</td> <td>Ørsted Høllade-X</td> <td>2.00m</td> <td>10,000</td> </tr> <tr> <td>202..???</td> <td>Joule Turbine</td> <td>300m</td> <td>-</td> </tr> </tbody> </table>	Year	Project	Height	Approx. number of UK homes powered	1991	Vindaby Oland	5.4m	200	2000	Hiddigegrund	1.06m	1,500	2013	London Array	1.47m	3,100	2017	Burbo Bank Extension	1.95m	7,100	2021 expected	Ørsted Høllade-X	2.00m	10,000	202..???	Joule Turbine	300m	-	
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## “The DISCO-BUOY”



**UK Project Value:**

£331,155

**BEIS Contribution:**

£264,924

**Start Date:**

Nov 2021

**Completion Date:**

March 2023

**Start TRL: 5 / End TRL: 6**

**Challenge:**  
Moorings/Anchors

[www.londonmarine.co.uk](http://www.londonmarine.co.uk)

## Articulated Wind Column (AWC)



**UK Project Value:**

£1,170,575

**BEIS Contribution:**

£760,874

**Start Date:**

November 2021

**Completion Date:**

March 2023

AWC Technology are leading the project in collaboration with ODE appointed as the Design Contractor

<http://www.awctechnology.com>

## UKCS Floating Wind Accelerator



**UK Project Value:**

£1,376,154

**BEIS Contribution:**

£825,692

**Start Date:**

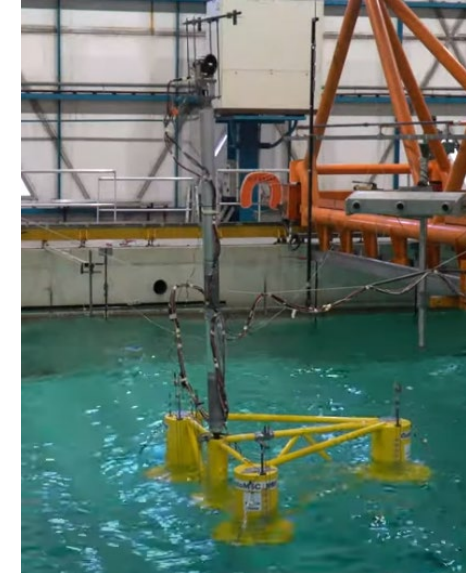
Oct 2021

**Completion Date:**

Dec 2022

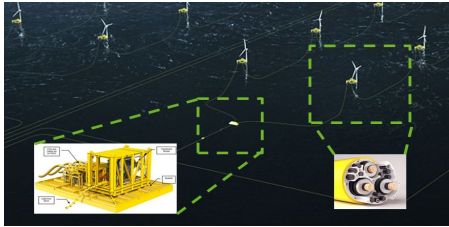
**Start TRL: 3 / End TRL: 4**

**Challenge:**  
Floater/Foundation  
Dynamic Cables  
Moorings/Anchors



**FINISHED**

**AkerSolutions**



**MARINE POWER SYSTEMS**



**SENSEwind**



**PelaStar TLP floating foundation**  
 Less steel vs equivalent semi-sub/spar  
 The smallest seabed footprint and no bottom scouring  
 Minimizes wave loads and no angular motions at nacelle

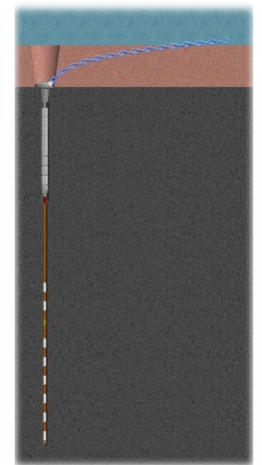
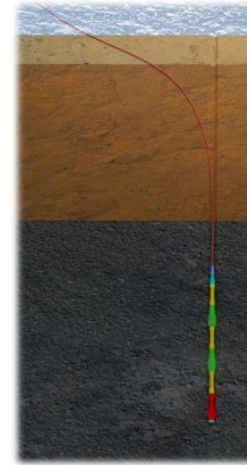


**SENSE turbine installation and service system**  
 Easier and faster installation of turbine in port  
 Allows construction at UK ports without major infrastructure change  
 Major service in situ – no need to float back to port



**Subsea Micropiles seabed anchors**  
 Easily scaled to match loading  
 Adaptable to a wide range of soil conditions  
 Low acoustic and seabed impact

**reflexmarine**



**LIVE**



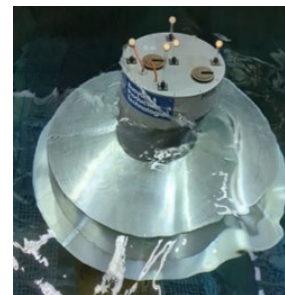
Figure 5: Nylon rope deployed on FOW project



**TRIVANE**

**COP** COPENHAGEN OFFSHORE PARTNERS

**Buoyant Production Technologies**







**CATAPULT**  
Offshore Renewable Energy

**Sharing best practice through international  
collaboration – An ORE Catapult  
perspective**

**Paul McKeever**

**July 2023**





# International Collaboration – Why?

- **ETIPWind** – Contains sector leading OEMs and Owners/Operators/Utilities; defines research and innovation (R&I) priorities
- **EERA JP Wind** – Provides strategic leadership for medium to long-term research for the European wind energy industry; brings together all public research organisations in Europe
- **WindEurope** – Leading trade association for our sector. Provides secretariat support for research/industry collaboration and lobbying platform for European Commission engagement.
- **IEA Wind** – Establishes global collaboration research platform. Coordinates task groups for key issues of the day (e.g. Task 25)
- **US** – Collaboration with US research community, e.g. NREL; the US has similar challenges and ambitions (10s GW of offshore wind)

**Provides excellent positioning and networking to inform the UK community of the technology and innovation opportunities within the sector.**



## DRIVING ECONOMIC GROWTH

- **Thought leadership**
  - In depth Analysis & Insight
  - Economic and Cost modelling
  - Market research
  - Policy influence
  - Energy transition
- **Identifying innovation priorities**
  - UK Government-funded Offshore Wind Innovation Hub, aligned with industry
  - Innovation challenges to supply chain to meet technology requirements
- **Industry Leadership**
  - Offshore Wind Industry Council and Sector Deal delivery
  - Scottish Offshore Wind Energy Council
  - Addressing devolved Government innovation and renewable energy priorities
- **Strong support to SME innovators**
  - Technology evaluation and validation
  - Helping secure investment
  - Growth programmes
    - Launch Academy, Fit for Offshore Renewables



# European Activity – ETIP Wind SRIA and EERA JPWind Research Programme

## The 5 R&I challenges



Challenge 1 – Wind energy system integration



Challenge 2 – Industrialisation, scale-up and competitiveness



Challenge 3 – Operation & Maintenance and Digitalisation



Challenge 4 – Sustainability and Circularity



Challenge 5 – Skills & Coexistence



etipwind.eu

## Consultation process for updating the SRIA



etipwind.eu

## Why a European Centre of Excellence (EUCoE)

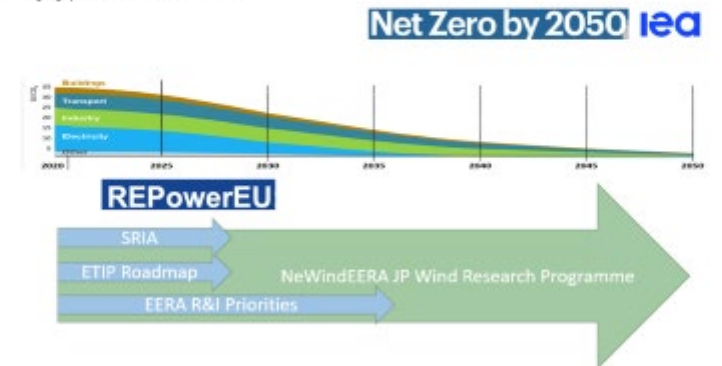
- We need more effective collaboration with more resources to speed up the research needed for wind energy to deliver the ambitious targets ahead.
- Address wind energy research priorities through collaborative projects in the context of a long term and stable research plan
- Research, innovation and international collaboration is essential for success.
- Offshore wind is a trillion € market, the challenges and risks ahead require significant new knowledge

*From projects to program*



## A Research Programme as the core for the EUCoE

- ▶ Focus on the medium to long term up to 2050
- ▶ Identify knowledge gaps related to deployment targets
- ▶ Turning knowledge gaps into research actions



## CONTACT US

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Visit us: [ore.catapult.org.uk](http://ore.catapult.org.uk)

Engage with us:



GLASGOW

BLYTH

LEVENMOUTH

GRIMSBY

ABERDEEN

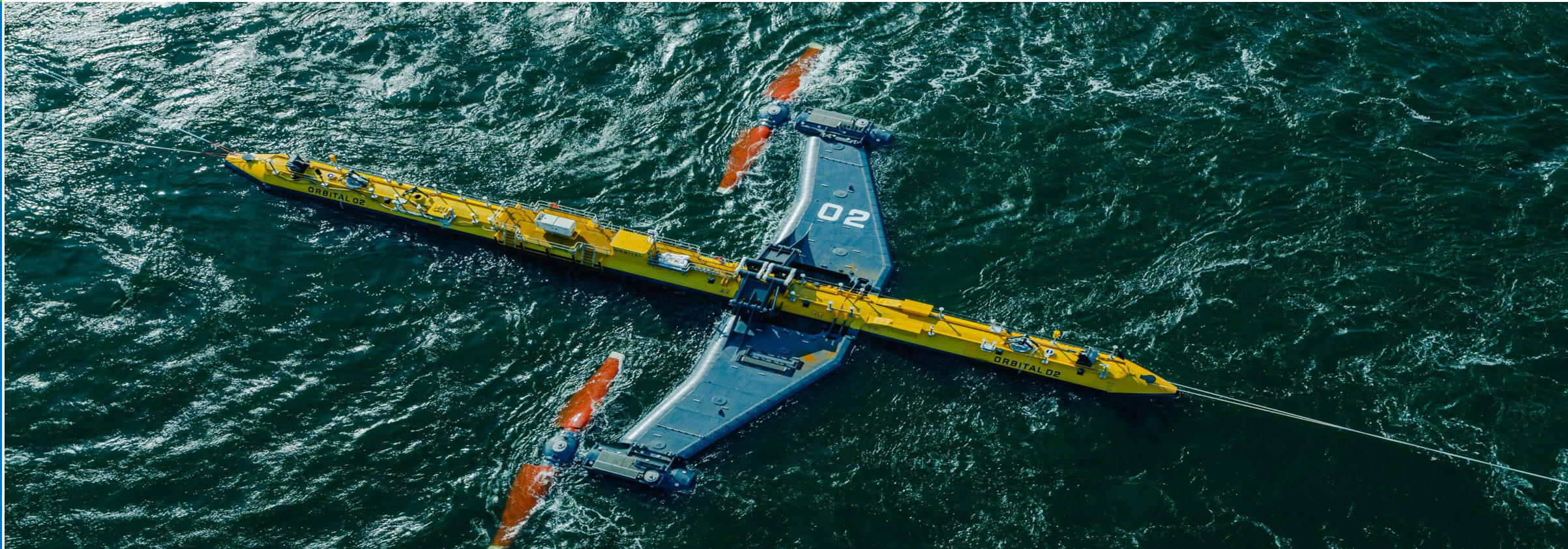
CHINA

LOWESTOFT

PEMBROKESHIRE

CORNWALL





## Ocean Energy: The next big thing in energy

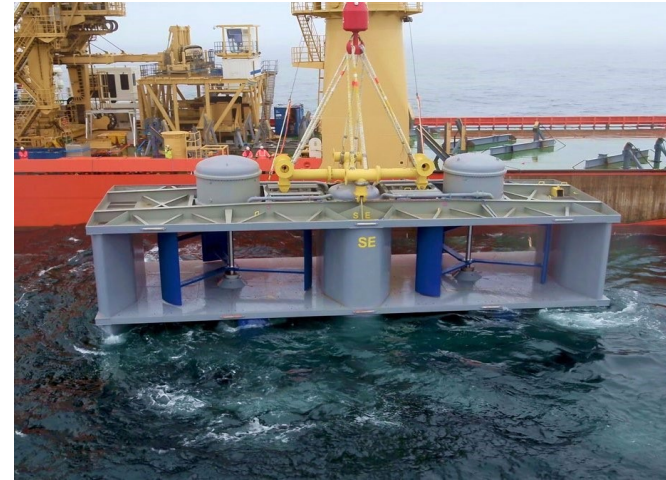
Valentin Dupont, Ocean Energy Europe



# Why Ocean Energy?



- **Strong potential:**
  - 100 GW in Europe
  - 10% of electricity
  - 94 Mio households
  - 337 GW globally
- **Security of electricity supply**
  - Indigenous resource
  - Manufactured in Europe
- **Stability of prices**
  - No fuel costs
- **Essential on a grid dominated by wind/solar**
  - Complement other variable renewables



# How ocean energy benefit communities and regions?

- **500 000 jobs for Maritimes industries and local communities**
- **High % of local content**
- **New opportunities for existing supply chains:**
  - Shipbuilding
  - Oil & Gas
  - Fisheries
- **No visual but economic impacts**





little/no visual impact



# From collaboration in innovation to market uptake



- **Collaboration is already happening:**
  - EuropeWave,
  - Horizon Europe
  - ETIP Ocean
  - TIGER
- **From knowledge sharing to commercial roll-out**
- **Long-term commitment and market visibility**
  - Deployment targets + revenue support



Thank you!



@euoea

[www.oceanenergy-europe.eu](http://www.oceanenergy-europe.eu)



Ocean Energy  
Europe

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T +33 7 83 15 06 64



CARBON TRUST OFFSHORE WIND

# Collaboration in offshore wind

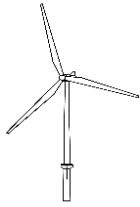
18 August 2023

# Carbon Trust are world-leading in establishing, growing and running collaborative programmes/accelerators/consortiums



## Market agnostic

Technology specific, global programmes



### The Offshore Wind Accelerator (OWA)

Carbon Trust's flagship collaborative RD&D programme for bottom-fixed offshore wind.

2008 - present



### The Floating Wind JIP (FLW JIP)

The Floating Wind JIP Overcomes challenges and advance opportunities for commercial scale floating wind

2016 - present



### The Offshore Renewables JIP (ORJIP)

Offshore Renewables JIP aims to reduce consenting and environmental risks for offshore projects.

2011 - present



### The Integrator

The Integrator is designed to examine the interplay between offshore wind, existing infrastructure, and other technologies to highlight opportunities for innovation investment.

2020 - present



### Sustainability JIP (SUSJIP)

The Sustainability joint industry programme aims to decarbonise offshore wind farm developments and support developers to achieve net zero targets.

2023 - present

## Market Specific

Addressing specific market challenges



### National Offshore Wind R&D Consortium (NOWRDC)

Prioritize, support, and promote research and development activities that reduce cost and risk of offshore wind development projects throughout the U.S.

2018 - present



### Philippines Joint Industry Programme

Developing offshore wind in the Philippines.

2021 - present



### State of Maine: Offshore Wind Research Consortium

Aims to create a common understanding of the local and regional impacts (negative and positive) of floating offshore wind in the Gulf of Maine

2023 - present



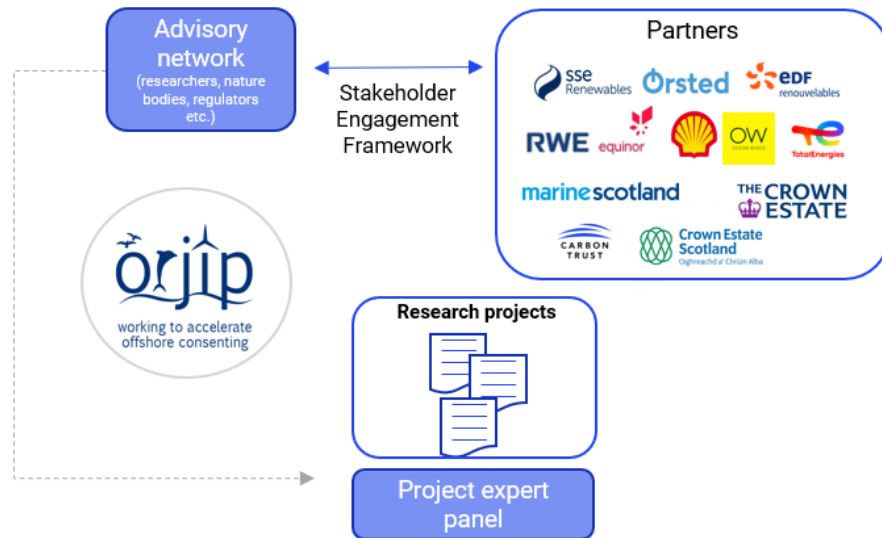
### Clean Hydrogen Innovation (CHIP)

Increase UK clean hydrogen deployment by identifying priority technologies in the supply chain for innovation.

2023 - present

# Examples of bringing diverse stakeholders to the table to work on environmental and wildlife projects

## Offshore Renewables Joint Industry Programme



- **Approach:** pools resources from the private sector and public sector bodies to fund projects that provide empirical data to support consenting authorities in evaluating the environmental risk of offshore wind.
- **Impact:** Running since 2012, outputs have included better understanding of the efficacy of acoustic deterrent devices, quantifying seabird avoidance behaviour with a 2-year campaign and improved safety of fishing activity near OSW cables.

## GOVERNOR'S Energy Office Maine Offshore Wind Research Consortium



- **Approach:** aims to create a common understanding of the local and regional impacts (negative and positive) of floating offshore wind in the Gulf of Maine. The consortium may prioritize, scope, commission, and/or find collaborative partners to implement scientific studies on the ecological, technological, economic and social impacts to achieve this goal
- **Impact:** Initiated in 2022, it has successfully brought together diverse stakeholders and prioritised research for the Consortium.



# Current status of Ocean Renewable Energy in China and the Research of Ocean University of China

## Prof. Hongda SHI

Ocean University of China  
Director, Shandong Provincial Key Laboratory of  
Ocean Engineering  
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Address: No. 238, Songling Road, Qingdao,  
Shandong, China



# CONTENT



## PART 01

Offshore Renewable Energy in China



## PART 02

The research at the Ocean University of China



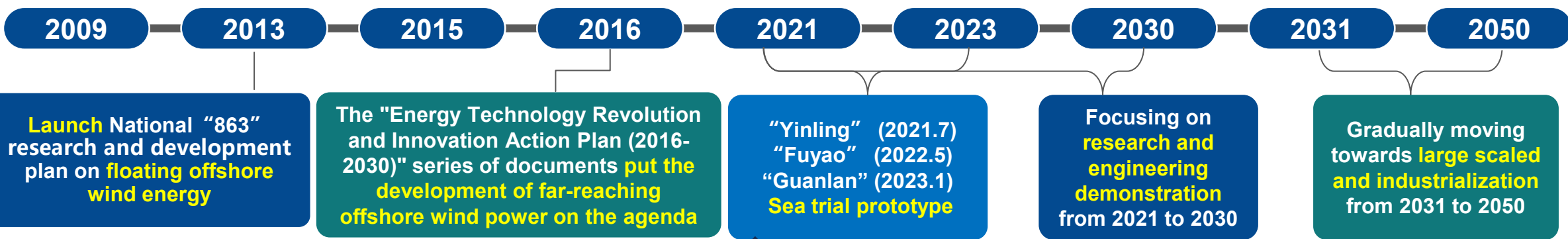
## PART 03

International cooperation of OUC & UoP under the Supergen ORE common goals

## Part 01: Offshore Renewable Energy in China

### ❖ Offshore wind energy

- ➔ As of the end of 2021, the total installed capacity of offshore wind power worldwide is 56GW, with China's installed capacity reaching **26.4GW**, ranking first in the world.
- ➔ In 28<sup>th</sup> June 2023, the lifting operation of the world's first **16MW** offshore wind turbine completed at coastal area of Fujian province.
- ➔ It is expected that by 2030, China's offshore wind power installation will account for **25%** of the global total, and the industry will develop rapidly
- ➔ For Wave power and Tidal power generation are relative more stable, **hybrid system and comprehensive utilization of ORE** is increasingly drawing attention.



Floating Wind Farm at Southeast of Wanning City

Loading Capacity (MW)	Average depth (m)	Site area (m <sup>2</sup> )	Offshore distance (Km)
100	90	160	33



## Part 01: Offshore Renewable Energy in China

### ❖ Offshore wave energy

➔ On 14 June 2023, China's self-developed **1 megawatt-class** floating wave power generation device "Nankun" was put into trial operation in Zhuhai, Guangdong Province.

### ❖ Offshore Tidal energy

➔ On 17 July 2019, a **600 KW** tidal power generator, was launched at Xiushan Island in Zhoushan, Zhejiang Province. The energy conversion efficiency is 37%, and the cut-in speed is 0.51m/s.

### ❖ Offshore photovoltaic

➔ On 6 April 2023, a **400 KW** semi-submersible multi-body floating photovoltaic array was launched at Yantai, Shandong Province. Serving for Offshore Floating Photovoltaic Testing and Inspection Center

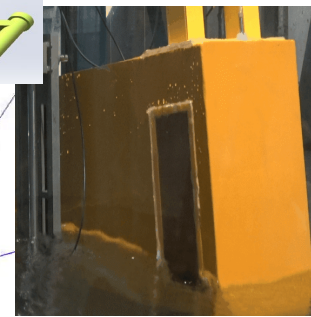
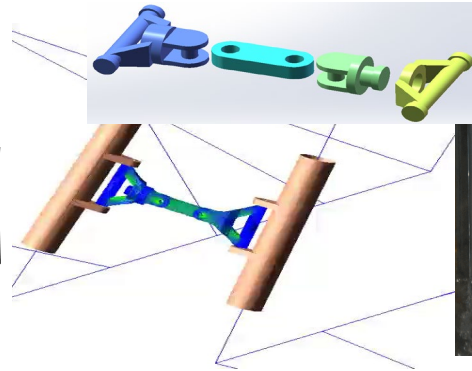
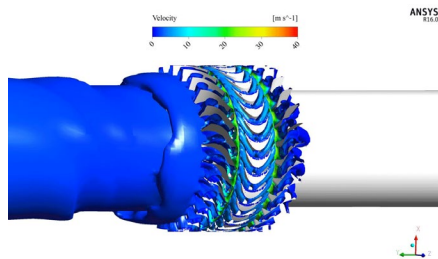
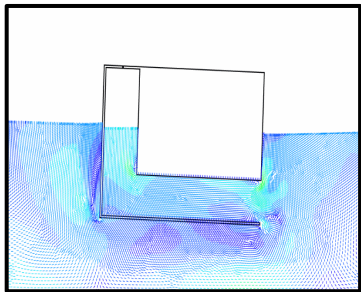




- Pro. Shengchang Wen from OUC began researching marine energy utilization technology as early as 1953, and it has a **history of 70 years** to date .
- In the past 20 years, under the leadership of Pro. Hongda Shi, the marine energy team at OUC has received a number of **research fundings** from China's first national key Research & Development program, 863 projects as well as the Natural Science Foundation project.
- OUC has the qualification to confer **doctoral degrees in marine energy utilization technology**.

### ❖ Numerical Simulation and properties evaluation

### ❖ Model Tests



### ❖ Engineering Demonstration



500 kW OWC station

Layered overtopping WEC

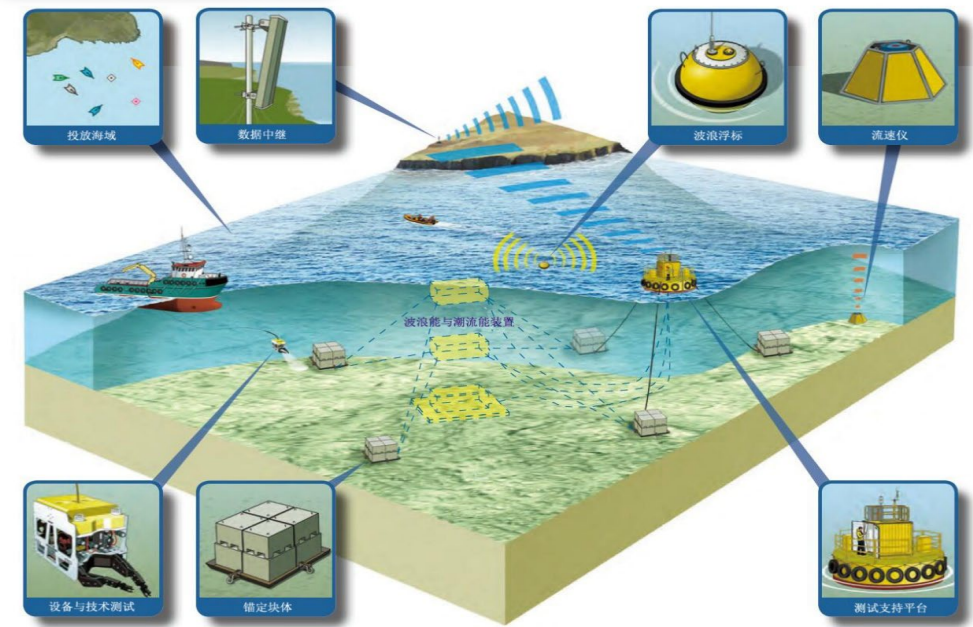
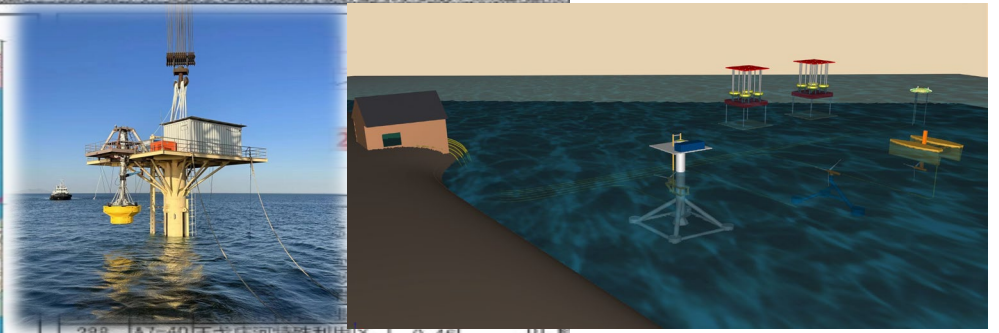
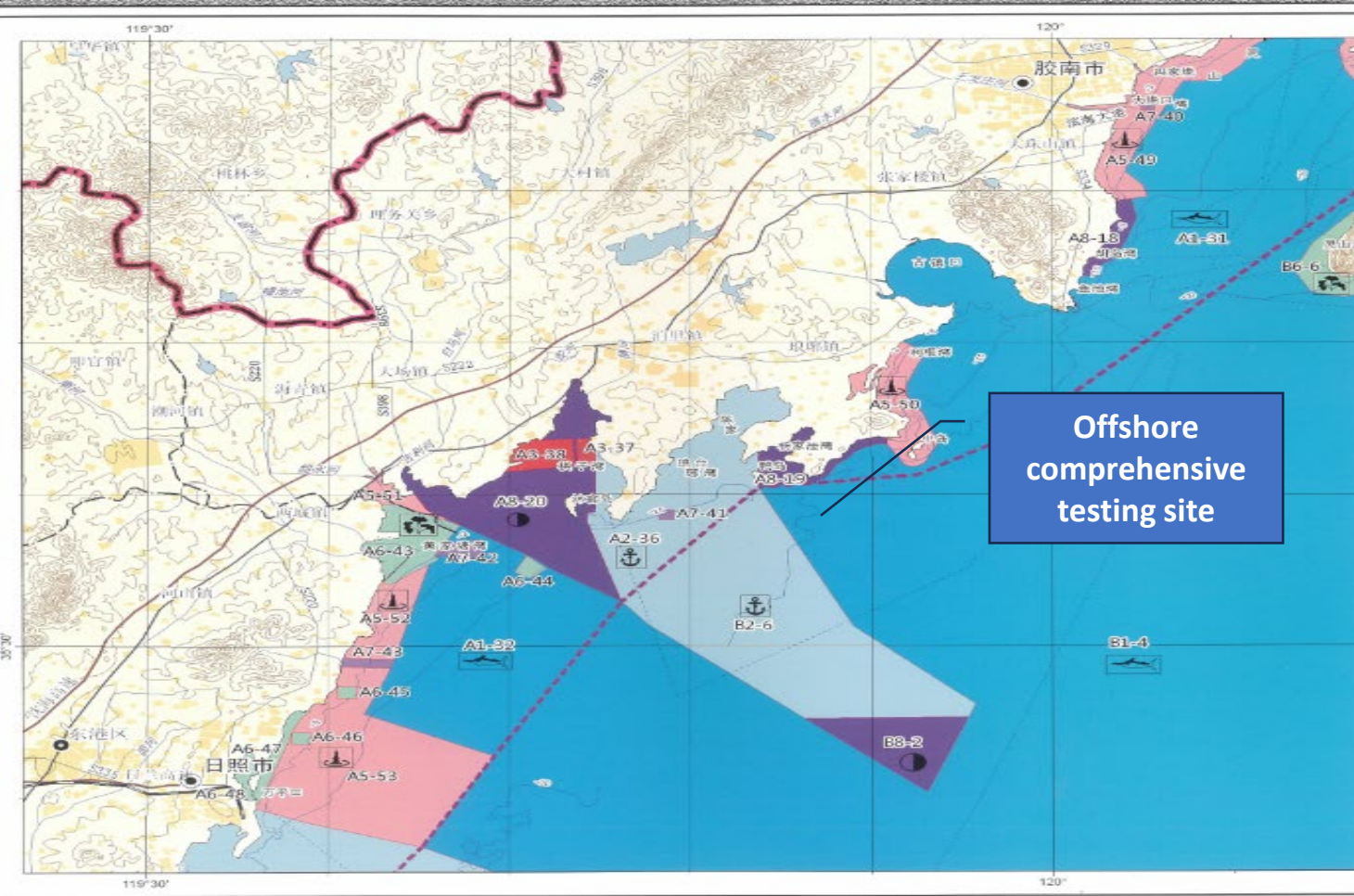
Breakwater-coupled OWC power station

Combined oscillating buoy WEC

Tidal WEC



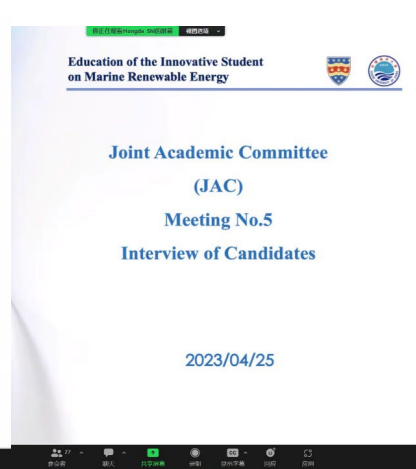
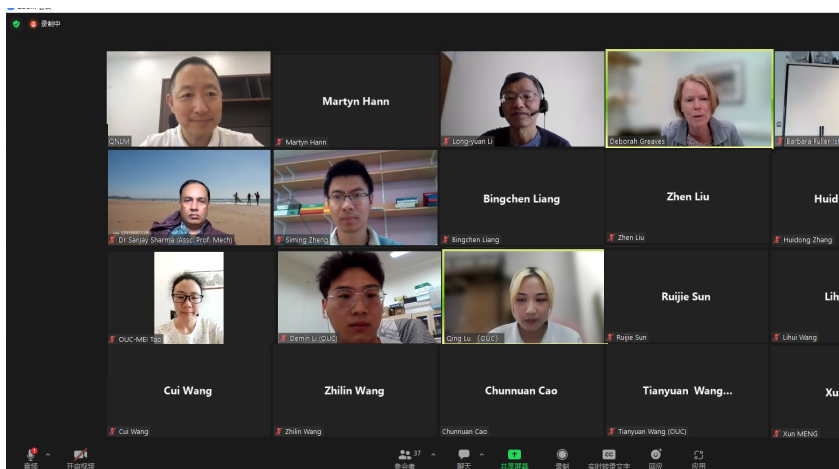
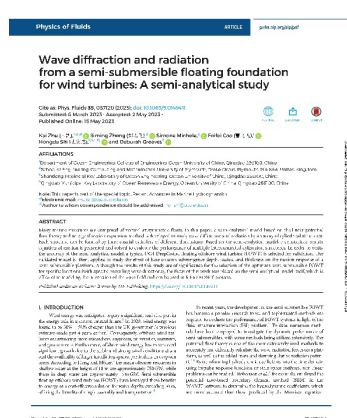
- The team is currently working on researching and testing **hybrid systems with wind turbines and wave energy converters**.
- OUC and the National Laboratory of Marine Science and Technology are jointly constructing an **Offshore Renewable Energy Test Site**.





## Part03: International cooperation of OUC & UoP under the Supergen ORE common goals

- ➔ On 6<sup>th</sup> November 2020, **the Agreement of Joint Education & Exchange between OUC and UoP** was signed.
- ➔ On 22 June 2022, OUC Held **the 4th Joint Academic Committee (JAC) for the co-education of innovative students on ORE.**
- ➔ On 25 April 2023, **OUC-UoP Dual PhD Program and Research Workshop** was held.
- ➔ 2 high level **research papers** were published by visiting PhD students with the cooperation of joint supervisors.





**Thank you!**

**Hongda SHI**

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# Panel session 3: The Global-Local Industry – Q&A

How do we best share best ORE practice through international collaboration? How do we ensure all communities and regions can benefit from ORE growth?