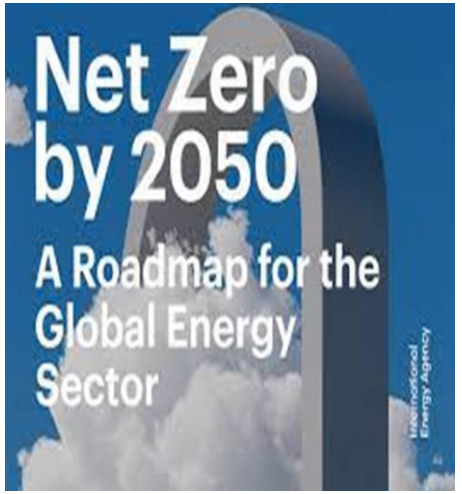
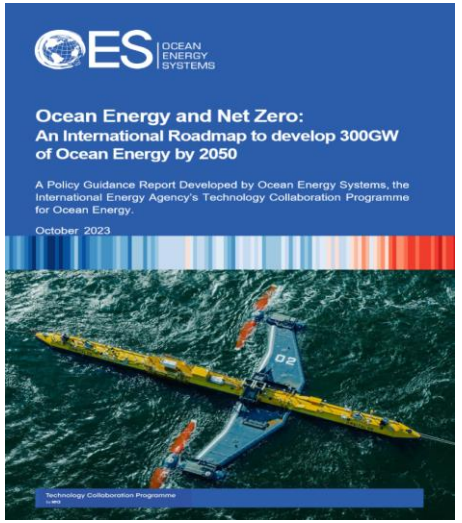
OCEAN ENERGY:
A Net Zero Roadmap for 2050 - A Preview



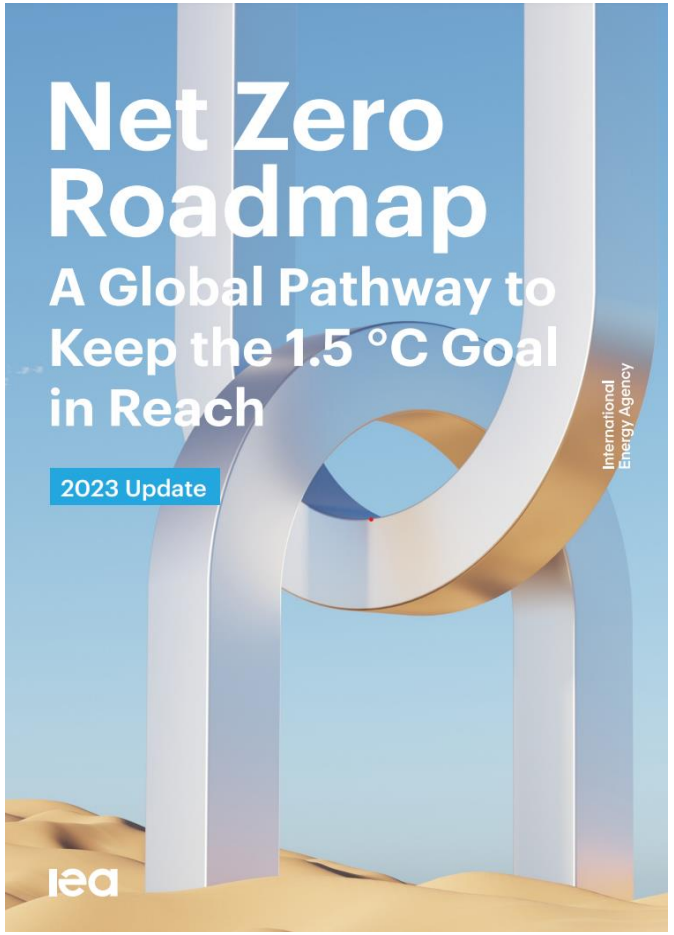


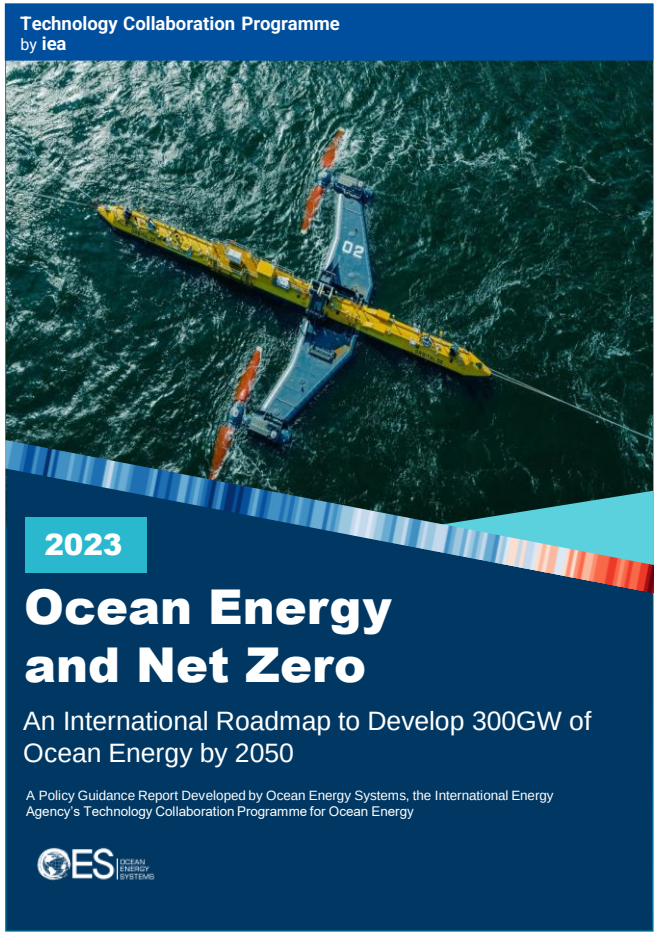
Wave Energy Scotland
Edinburgh 2023

Ocean Energy at an International Level

- **The IEA net zero roadmap update published in September 2023**

- **The IEA-OES Roadmap is intended to present a pathway through with ocean energy technology can contribute to achieving Net Zero**





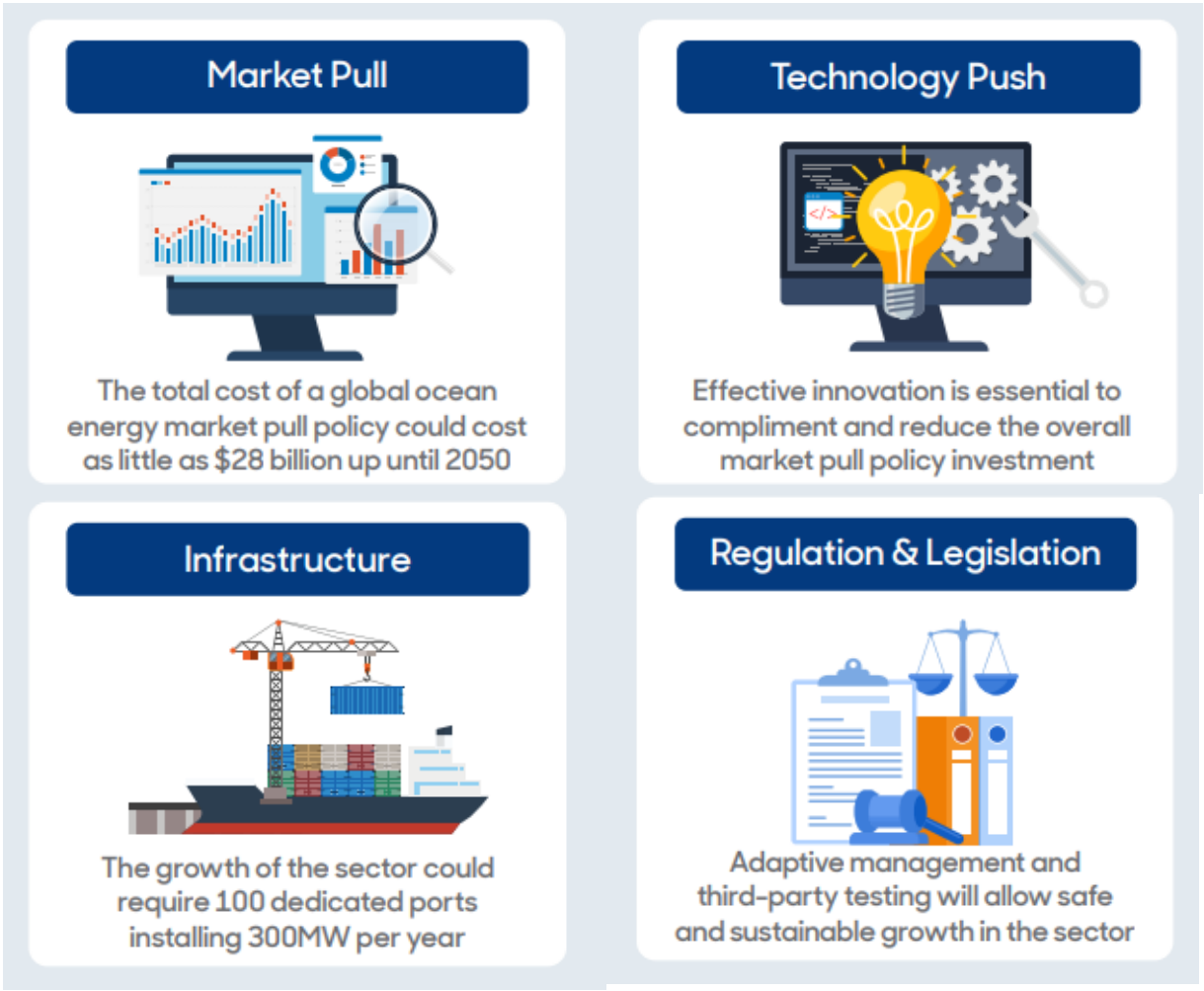
IEA-OES Roadmap Targets

Sector Targets

1. Installed Capacity (GW)
2. Direct Jobs
3. Investment in 2050 year/Gross Value Added (GVA US$)
4. Carbon Savings (Tonnes of CO2)

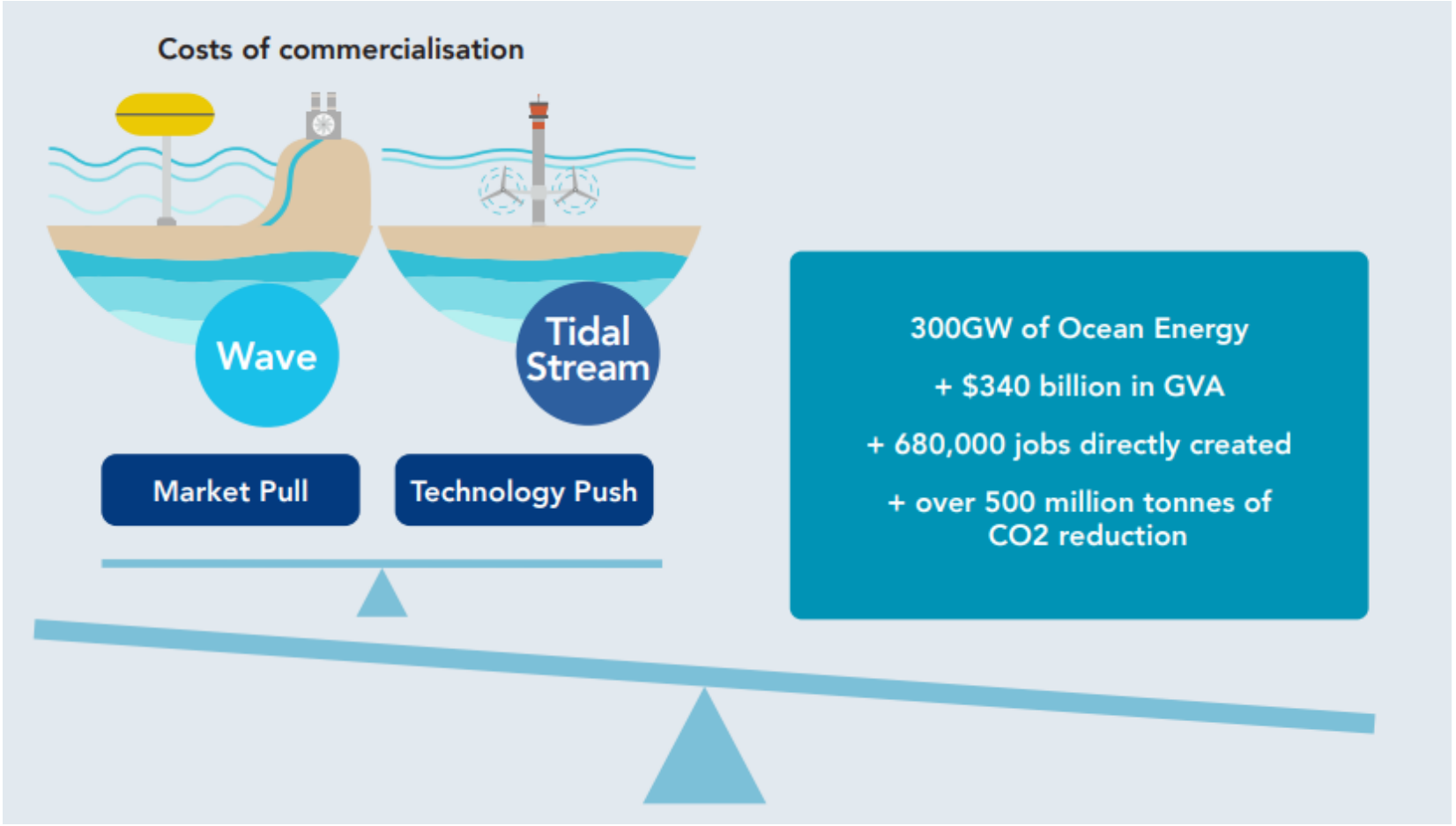
Policy Action Areas

- **Market pull mechanisms to fund deployment**
- **Technology innovation programmes**
- **Infrastructure – Ports and harbours**
- **Regulation and legislation**



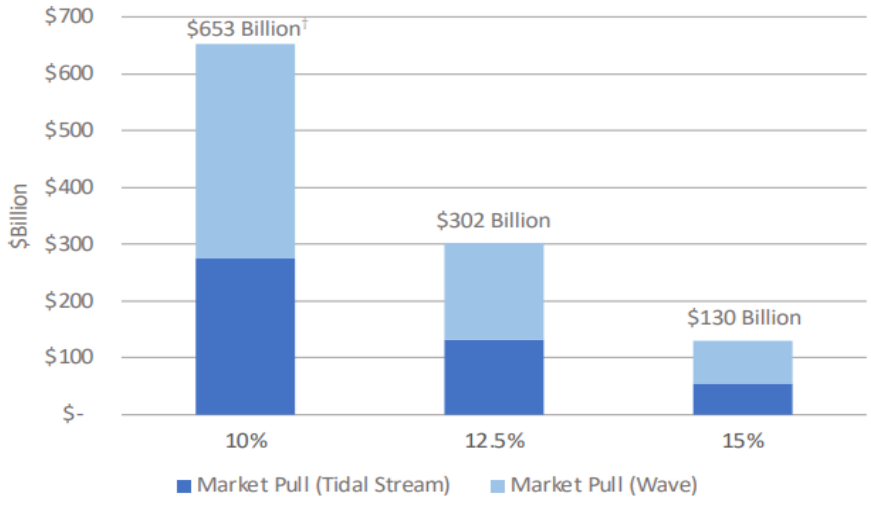
Market Pull & Technology Push &– Aims

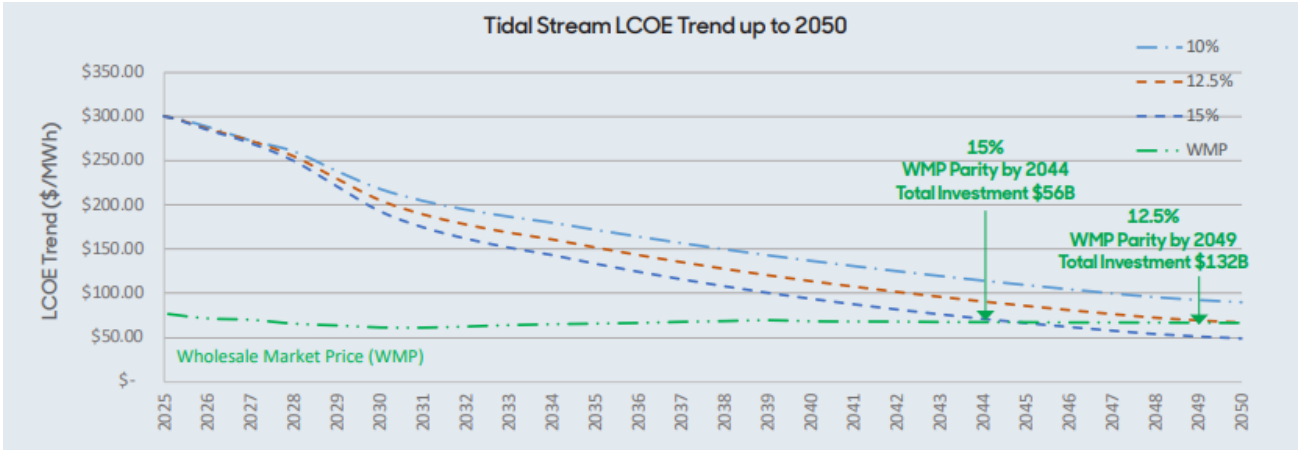
- How much will it cost to reach OES Roadmap targets by 2050?
- Finding the most cost-effective balance of Tech Push and Market Pull funding mechanisms



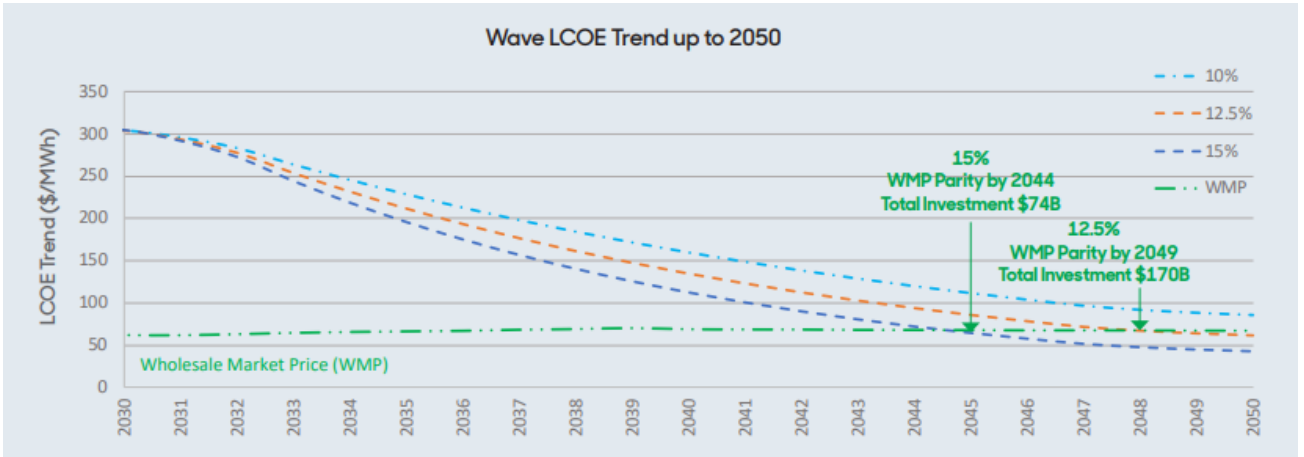
Market Pull Analysis – How much will it cost?

- **Providing appropriate technology push funding is key to maximising the potential of ocean energy.**
- **10% - $653B**
- **12.5 % - $302B**
- **15% - $130B**





Learning rate model for tidal stream market pull mechanism



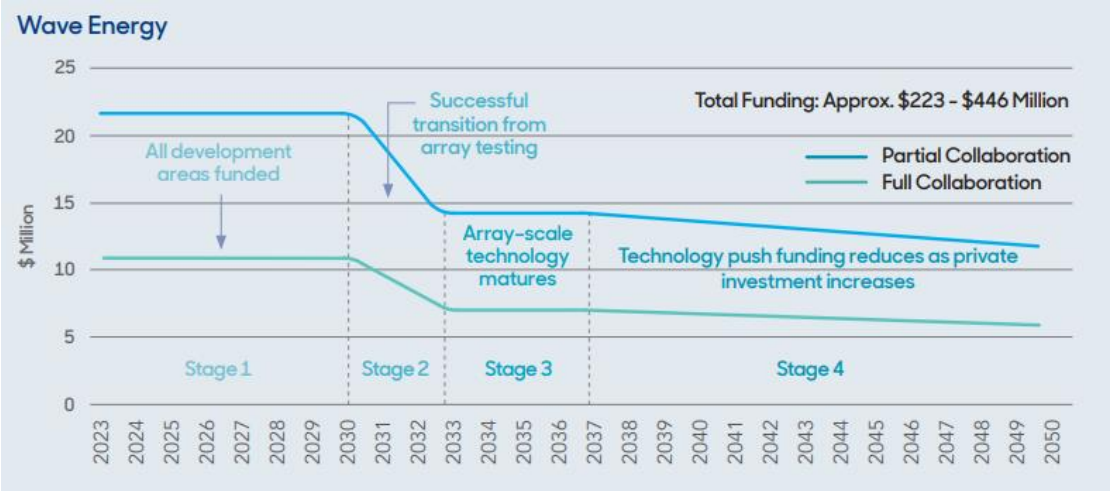
Learning rate model for wave energy market pull mechanism

Country led / Innovation is key

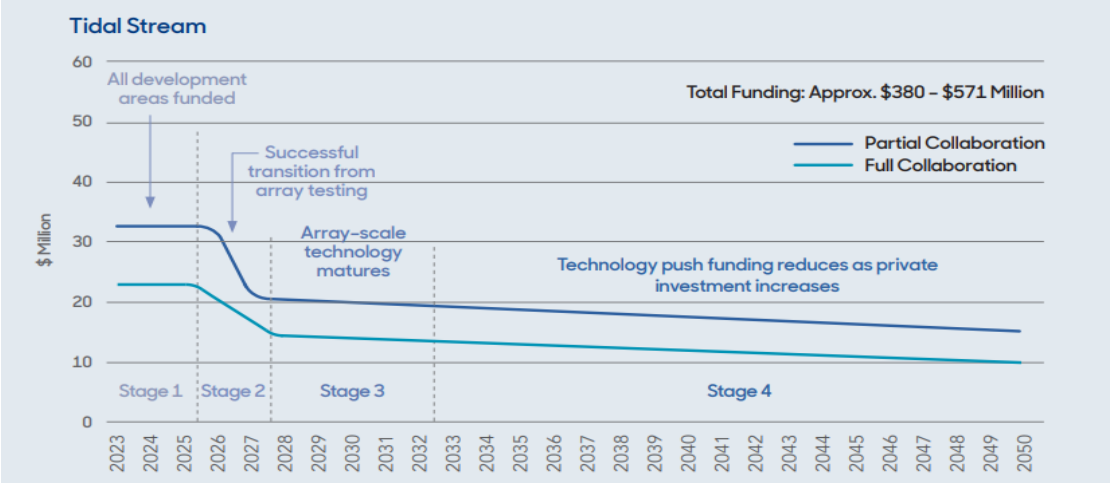
Innovation Funding Requirement Analysis

- Proposed funding from 2023 – 2050 **per country**
  - Wave investment **per country**
    - **Initial** **Approx. $21M/Yr**
    - **Technology Matures** **Approx. $14M/Yr**
  - Tidal Stream **per country**
    - **Initial** **Approx. $32M/Yr**
    - **Technology Matures** **Approx. $20M/Yr**

- **International collaboration is key**
- **Accelerates efficient cost reduction**



Proposed funding for wave energy per country 2023-2050



Proposed funding for Tidal Stream per country 2023-2050

Technology Push & Market Pull – Policy Action

"Market pull support is the foundation of a comprehensive policy plan"

- ***Led at a country-by-country level, the immediate application of a long-term and sustained market pull policy mechanism is key to strengthening and accelerating deployments in the ocean energy sector***

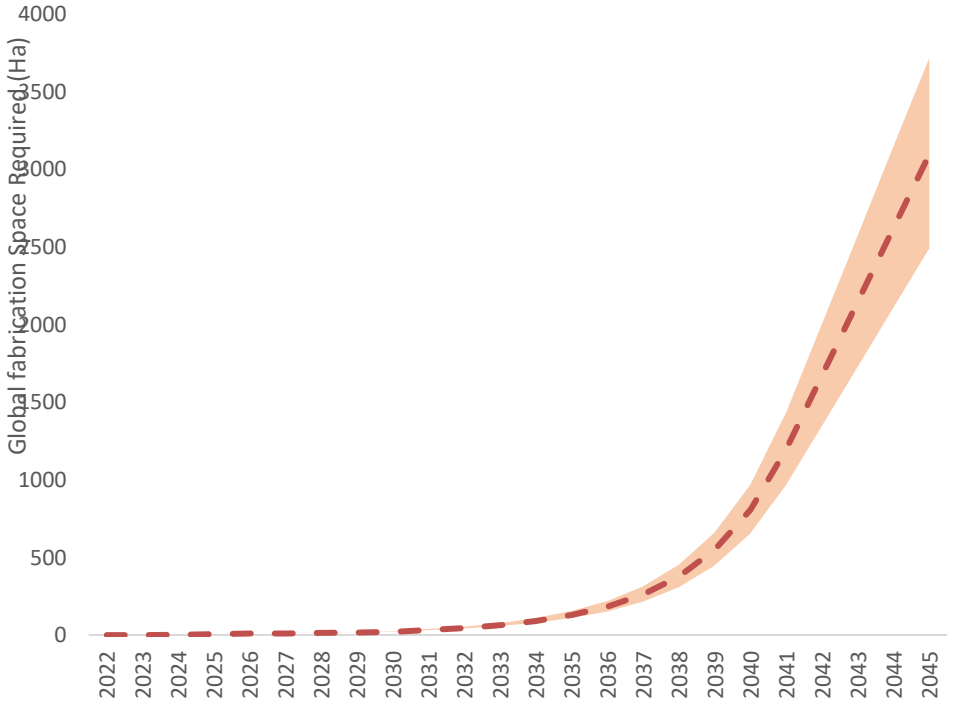
"Accelerated innovation is key to enabling long-term cost reductions"

- ***A well-funded and comprehensive technology push policy programme, actively pursuing international collaboration, is vital to ensuring that technological innovation occurs at a significant rate and helps to lower the overall investment required to provide a long-term market support mechanism***

Supply Chain Infrastructure

- Ports and Harbours
- Manufacturing Space
- Laydown space
- Number of global ports

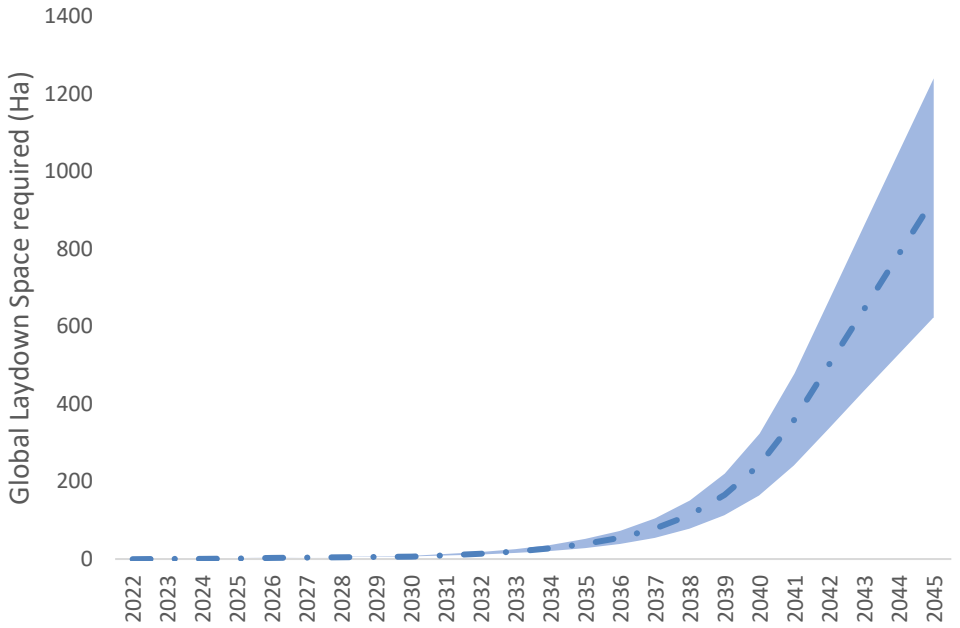
Manufacturing/Fabrication Space



- **For Devices, foundations, but also cover other sub-assemblies such as tidal blades and nacelles**

	Ocean Energy
Fabrication Space (m^2/MW/Year)	800 - 1200

Laydown Space



- **Space contiguous with quayside to store components/ subassemblies before being assembled/transported to site.**

	Ocean Energy
Laydown Area Required (m^2/MW/Year)	200 – 400

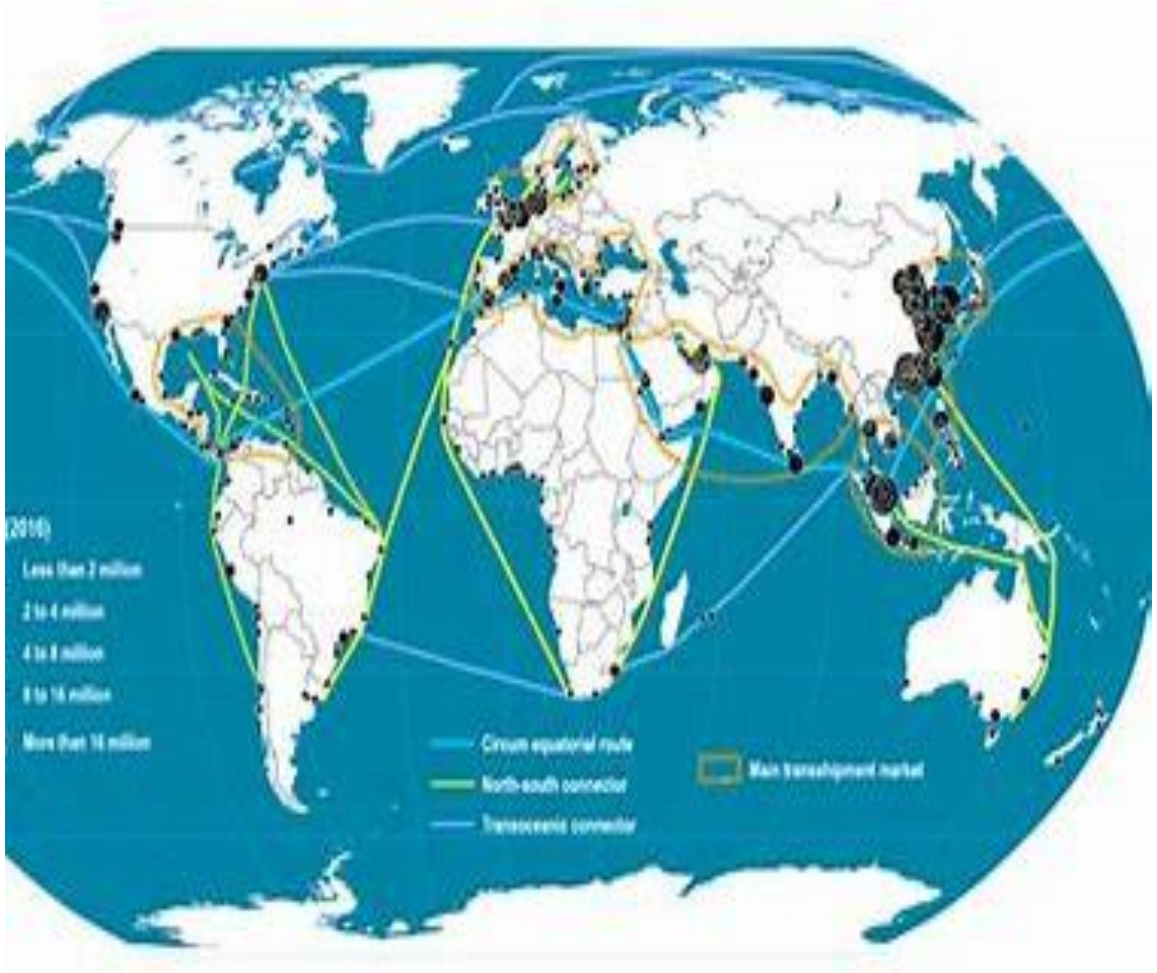
Infrastructure Policy Action

- **Case Study: 300MW/Year Future Port**

- **100 Ports Globally**

"A proactive approach to infrastructure development is required"

- ***While existing infrastructure is well-positioned to handle the short-term requirements of the sector, the rapid expected growth will require large-scale global infrastructure development projects to begin immediately***



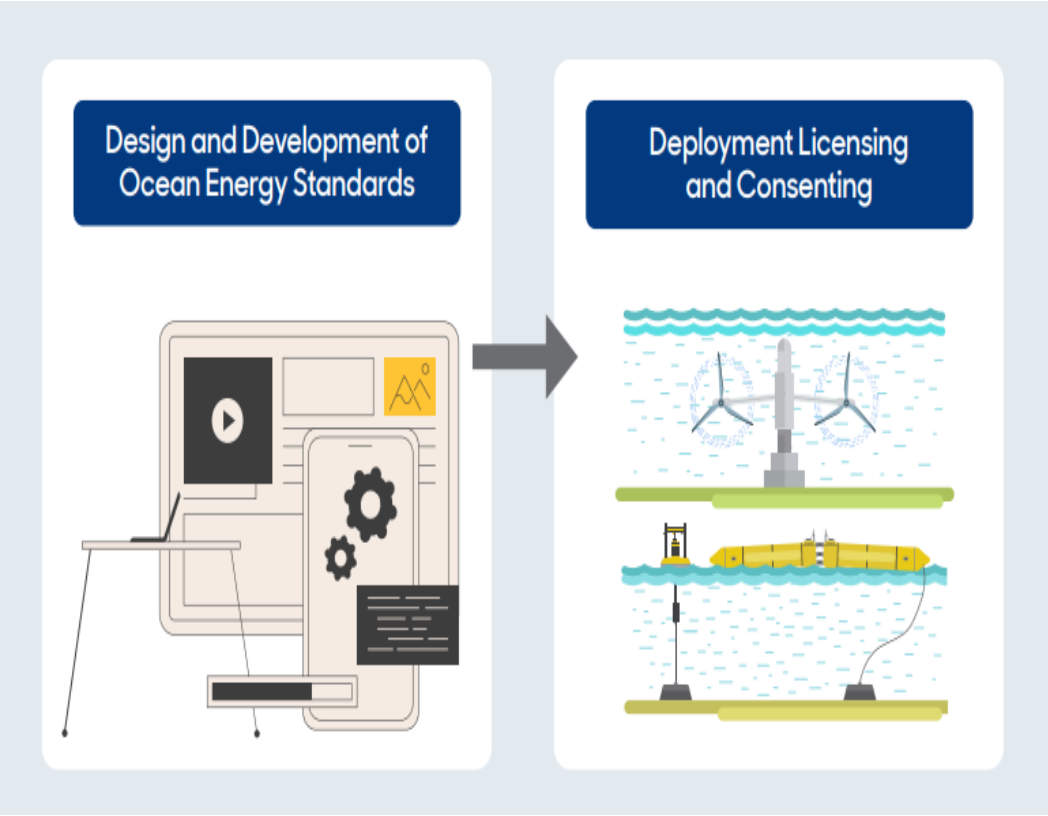
Regulation & Legislation and Consenting

- **Leverage test sites as key stepping stones for the ocean energy industry**
- **Incorporate a clear consenting scheme using a “one window committee”**
- **Ensure data transferability to address site-specific regulatory concerns**
- **Adaptive management strategies should be used to understand the interactions between technology and marine environment**

Regulation & Legislation : Policy Actions

"The regulatory and legislative framework should help, not hinder"

- *The ocean energy sector should be underpinned by a robust and efficient regulatory and legislative framework that provides the levels of support required to ensure that sector growth happens in line with forecasted timelines*



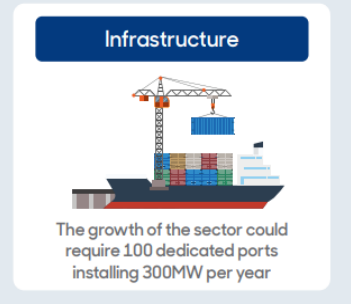
Summary: Policy Recommendations

Market pull support is the foundation of a comprehensive policy plan

- Led at a country-by-country level, the immediate application of a long-term and sustained market pull policy mechanism is key

Accelerated innovation is key to enabling long-term cost reductions

- A well-funded and comprehensive technology push policy programme, actively pursuing international collaboration



A proactive approach to infrastructure development is required

- Sector growth will require large-scale global infrastructure development projects to begin immediately

The regulatory and legislative framework should help, not hinder

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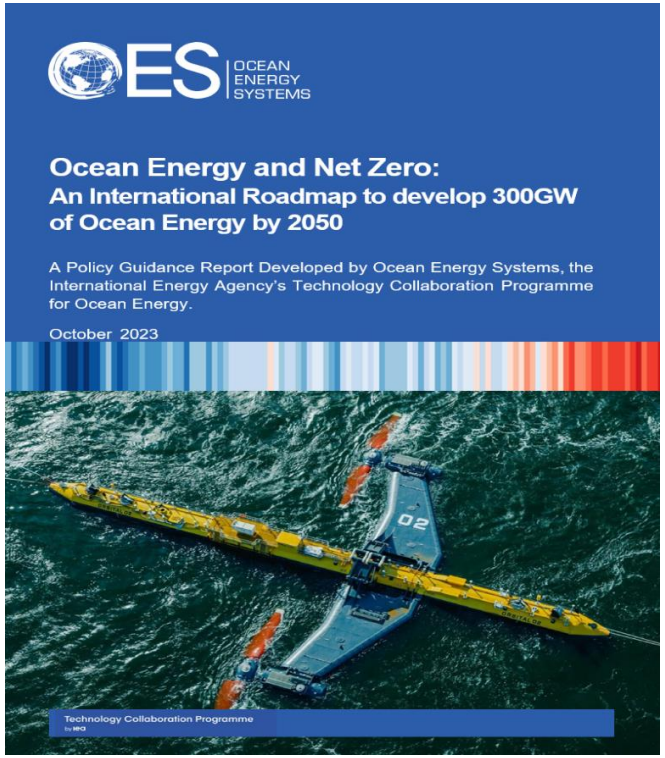
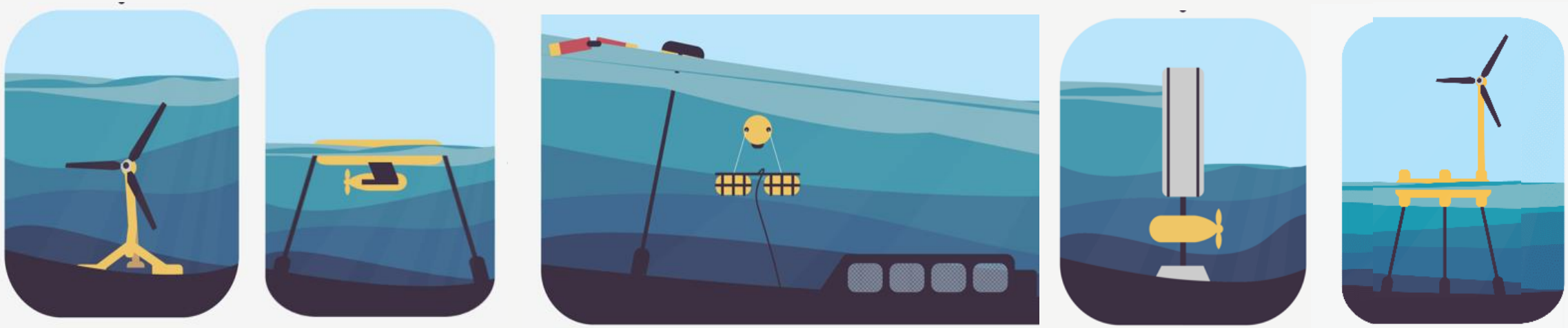
Launched alongside COP 28 UAE



Jay Sheppard - MEW Project Manager

Our Technologies



WHAT IS EMERGING OFFSHORE RENEWABLE ENERGY?

We can deploy all these technologies in Wales and provide an offshore renewable power station for the UK. Our strength is in the combination of technologies and skills.

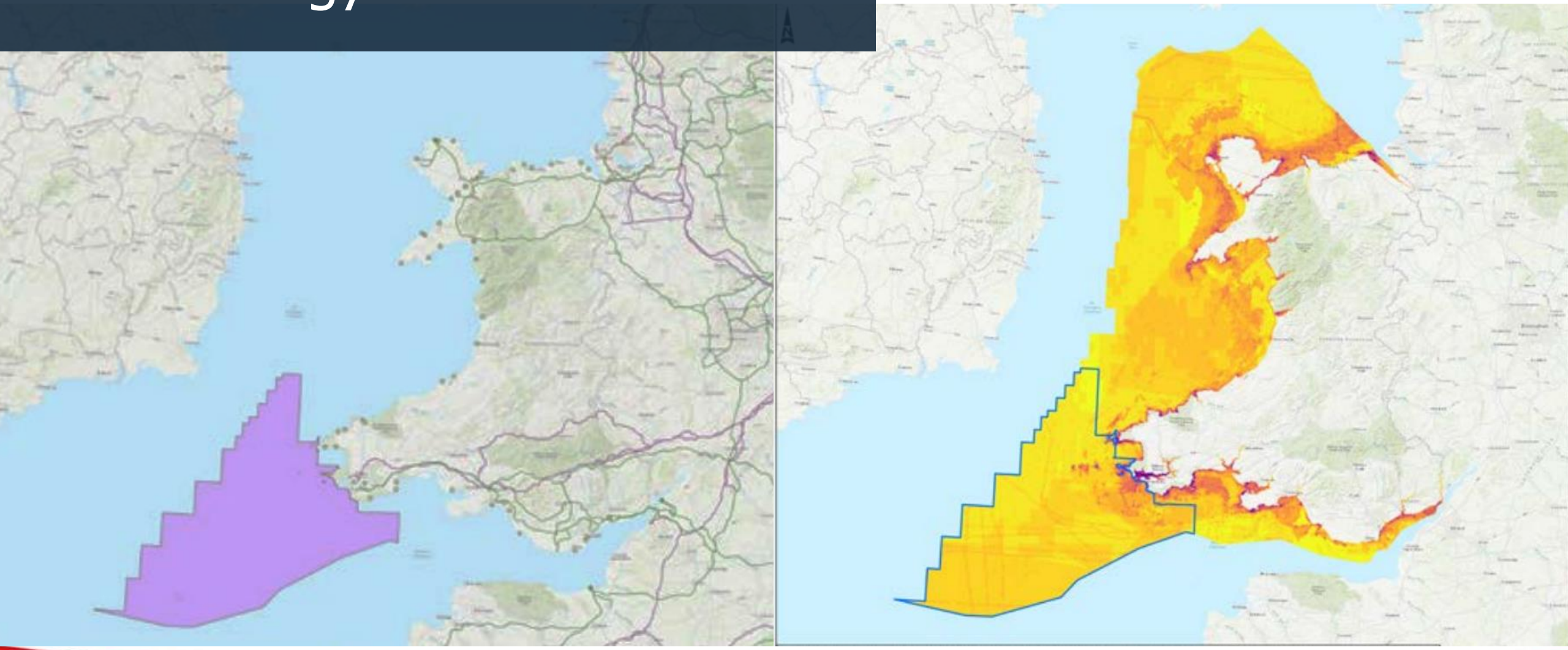
TIDAL STREAM ENERGY

WAVE ENERGY

TIDAL RANGE ENERGY

FLOATING OFFSHORE WIND

Wave Energy Potential in Wales



Welsh Government (2021). Sector Locational Guidance: Enabling Evidence for Sustainable Development, Wave Energy

Historical Development

UNDEB EWROPEAIDD
EUROPEAN UNION

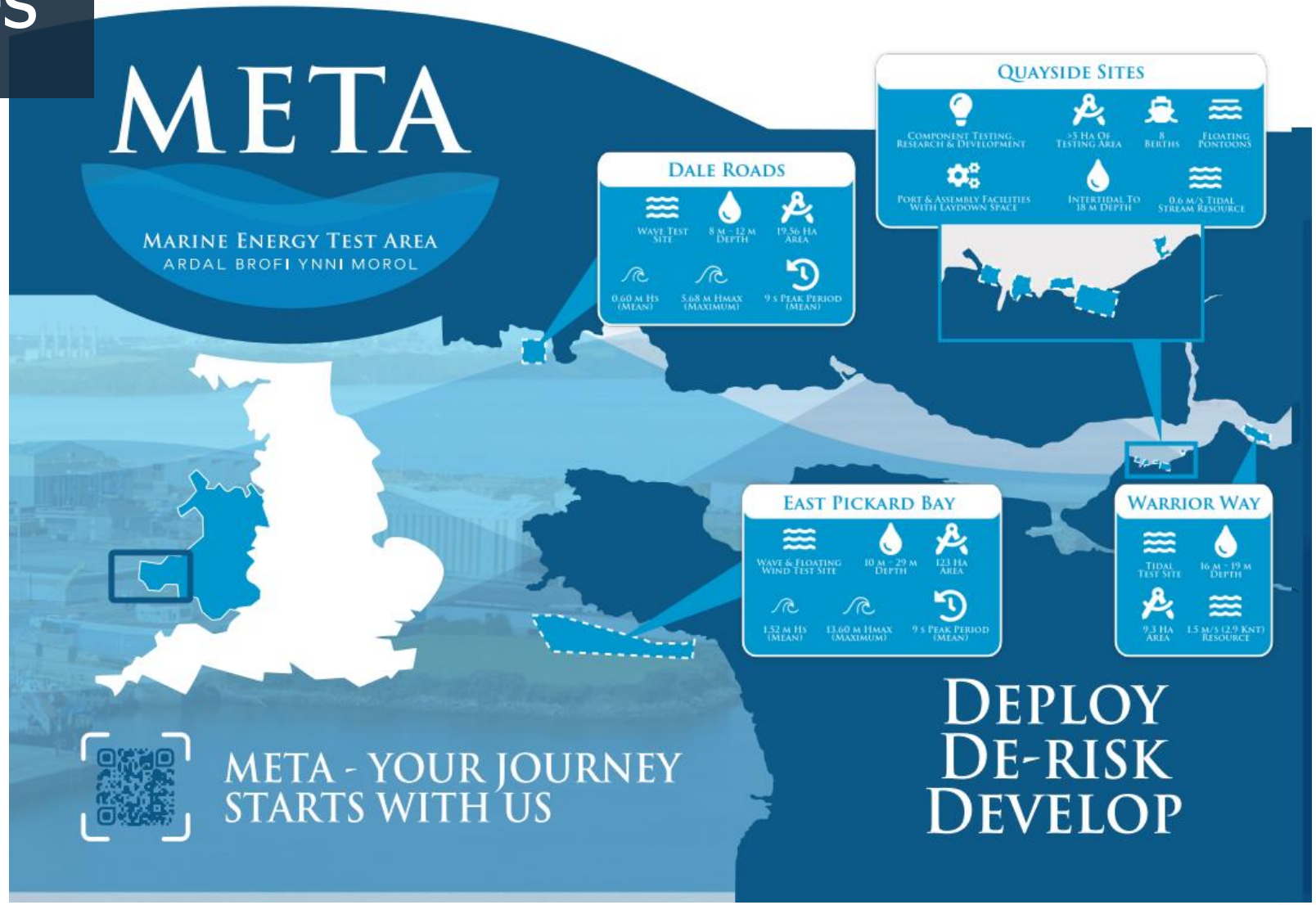
Llywodraeth Cymru
Welsh Government

Cronfa Datblygu Rhanbarthol Ewrop
European Regional Development Fund

- 2 wave energy developers anchored in Wales.
- £27.5m invested directly into Welsh economy to date.
- Well developed marine energy supply chain.
- Reliance on ERDF funding, spend concluding this year.
- Opportunities for testing and demonstration.

Current Opportunities

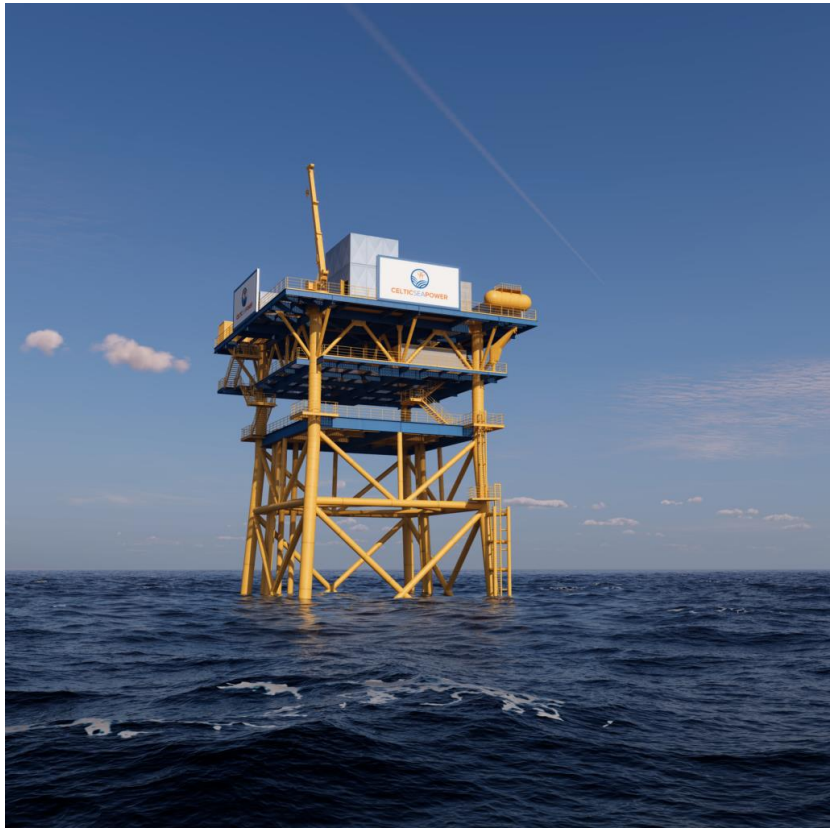
- Non-grid connected quayside and open water test sites.
- Stepping stone to larger projects.

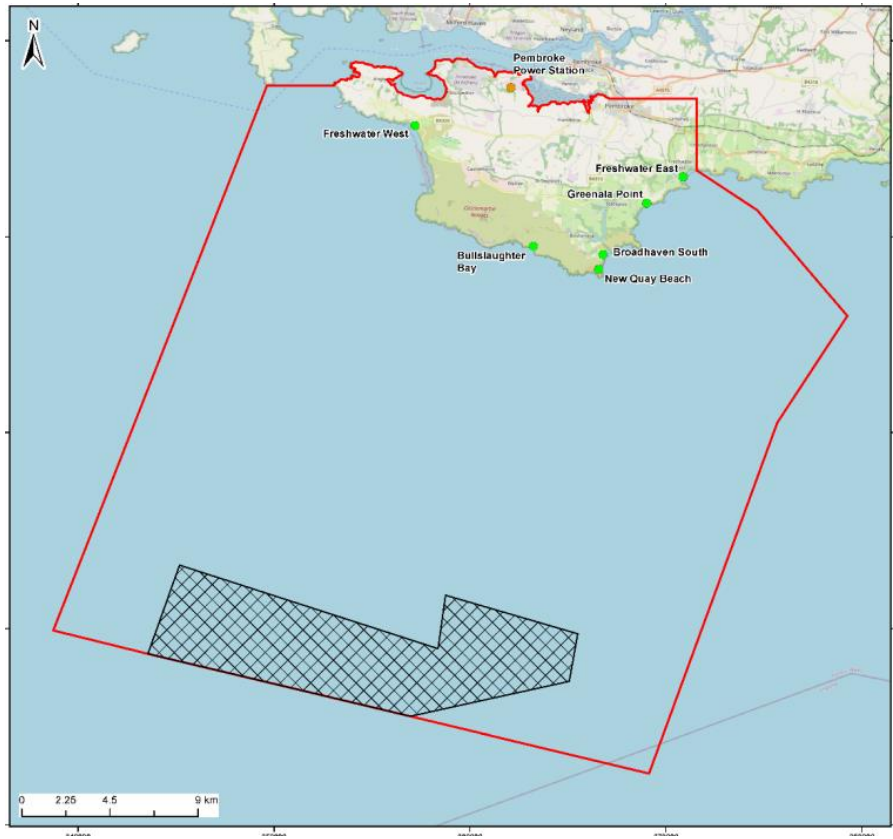


Future Opportunities

- Pembrokeshire Demonstration Zone operated by Celtic Sea Power

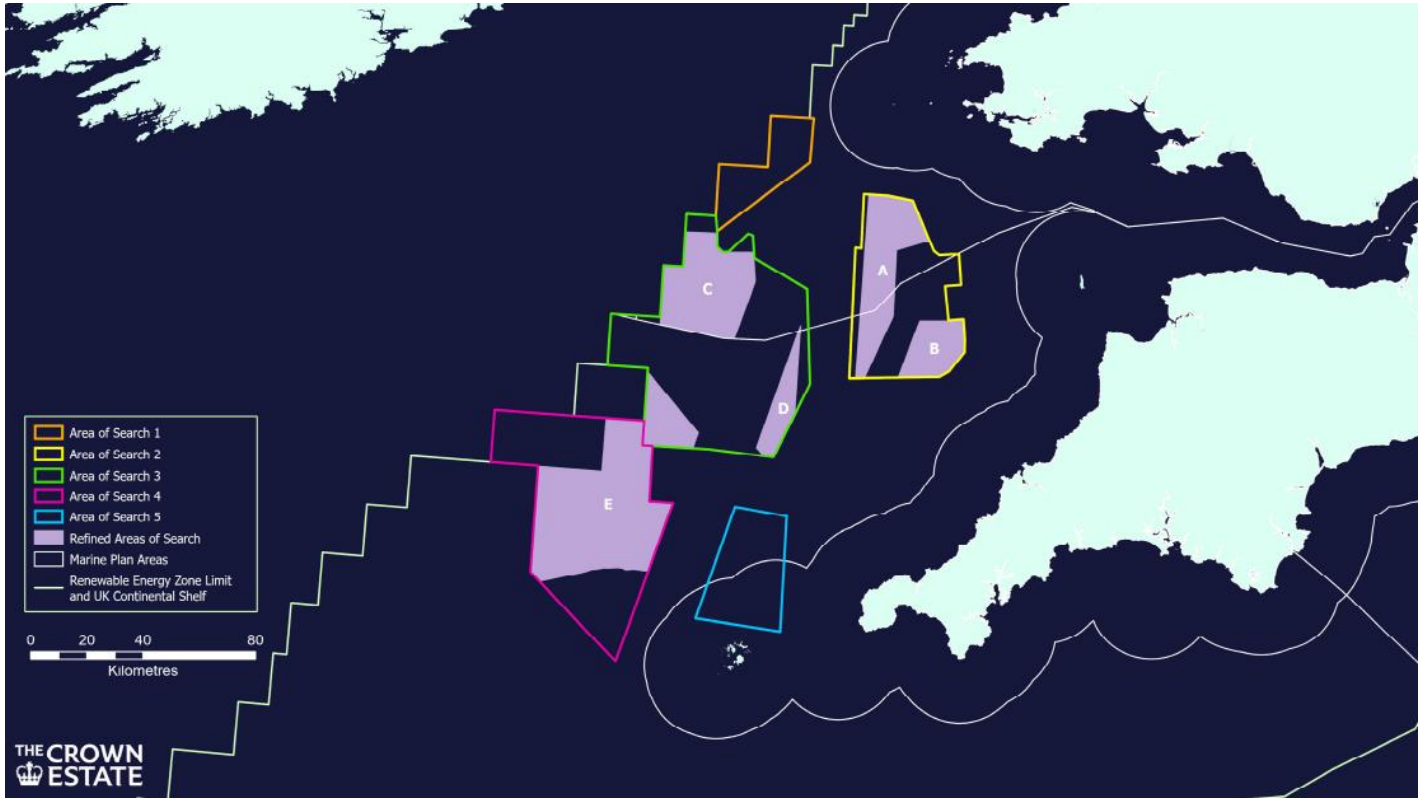
- 400 MW Multi-purpose offshore substation.





Future Opportunities

- Floating Offshore Wind in the Celtic Sea a big area of focus for The Crown Estate.
- 4.5 GW leasing round upcoming. A further 20 GW beyond.
- Co-location of wave is a possibility, a lot needing to be done to de-risk the proposition to stakeholders.



Challenges

Wave energy development in Wales has made steady progress over the years but has recently stalled

- Reliance on EU Funding.
- More innovation funding needed, not ready for CfD.
- Technology must be de-risked through enabling longer term deployment.
- Proving itself to floating wind sector.
- America taking lead, do we need a UK strategy?