

Policy and Innovation Group

## Marine Renewable Energy

## Benefits and Importance of Continued and Consistent Support

The Policy Makers Tool Box

Henry Jeffrey Annual Assembly July 2023





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# **Analysis and Reports**



#### Deployment **Economic Benefit** Systems Benefit Value of Innovation Areas of Innovation Modelling (GVA) Supergen 🛞 🕬 Supergen 🛞 Officience Supergen 🛞 🚎 Supergen (R) Offshore Ocean Energy and Net Zero: **Research and Innovation** Delivering Net Zero: Policy Support for the for Wave and Tidal Stream Achieving the Deployment of What is the value of innovative What are the UK power system Cost Effective Delivery of 12GW of Wave and Tidal Stream offshore renewable energy in the UK and EU benefits from deployments of wave in UK Waters by 2050 deployment to the UK economy? 12GW Wave and Tidal Stream by 2050 and tidal stream generation? A 2023 Summary A Supergen Offshore Renewable Energy Hub Policy Paper prepared by the Policy and innovation Group at the University of Edinburgh. A Supergen Offshore Renewable Energy Hub Policy Paper prepared by the Policy and Innovation Group at the University of Edinburgh A Supergen Offshore Renewable Energy Hub Policy Paper prepared by the Policy and Innovation Group at the University of Edinburgh. A Supergen Offshore Renewable Energy Hub Policy Paper prepared by the Policy and Innovation Group at the University of Edinburgh. A Supergen Offstore Renewable Energy Hub Policy Paper prepared by the **Policy and Incovation Group** June 2023 niemativ of Edinburgh June 2023 School of Engineering THE UNITART / TONK INC. School of Engineering EERA School of Engineering **(** Engineering and Physical Ectences Research Council Policy and Innovation Grou Policy and innevation Group Engineering and Physical Sciences Research Council Buginessing and Parallel Balancies Balancerth Coursel CEONSET Keytneering and Physical Sciences Research Council Policy and Innovation Group Policy and Innovation Group Policy and Innovation Group



### **Deployment Modelling**



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### How much wave and tidal could be installed by 2050?





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Engineering and Physical Eclanova Research Council

### **Economic Benefit (GVA)**



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#### **GVA Benefits:**

- £4.9B £8.9B from UK deployments
- £6.4B £32.1B from International deployments

Great Just Transition argument !





What is the value of innovative offshore renewable energy deployment to the UK economy?

Supergen Offstore Renewable Energy Hub skoy Paper prepared by the Policy and Issovation Group the University of Edinburgh









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### **System Benefit**



benefits from deployments of wave

Engineering and Physical Sciences Research Council

and tidal stream generation?

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System benefits in 2050:

- £1.03B annual reduction in cost of dispatch ٠
- **300 GWh reduction in fossil fuel dispatch** ۲

An enabler of offshore wind ! ۲





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# **Five reports**



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### **Existing Underpinning**





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### **Market Pull and Tech Push Policy Analysis**



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Ocean Energy and Net Zero: Policy Support for the Cost Effective Delivery of 12GW Wave and Tidal Stream by 2050

A Supergen Offshore Renewable Energy Hub Policy Paper prepared by the Policy and innovation Group at the University of Edinburgh.

#### June 2023





What is the least cost option to deliver 6GW of wave + 6GW of tidal stream by 2050?

- Technology Push Funding Analysis
- Market Pull Funding Analysis



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## **Existing Polices – Technology Push (Wave & Tidal Stream)**



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### Between 2017-2022

### Total funding in UK: **£315 Million**

- Total Funding from EU: **£241 Million** 
  - Total Funding from UK: **£74 Million**





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**Existing Polices – Technology Push (Wave & Tidal Stream)** 

# Supergen in Contraction Supergen

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### Between 2017-2022

Total Domestic Funding: **£74M** 

- Total Funding from Scottish Govt.: **£44M** 
  - Total Funding for H.E. Guarantee: **£4.8M** 
    - Total Funding from UK Govt.: **£25.2M** 
      - EPSRC: **£18.4M**
      - Innovate UK: £3.6M
      - Energy Entrepreneurs Fund: £2M
      - Others: £1M





### **Future Scenario Analysis – Market Pull**



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### CfD mechanism

• Tidal Stream

From 2022 (CfD4 - Strike Price £178.54/MWh)



- Wave (Assumption)
  - From 2027 (CfD9 Strike Price £178.54/MWh)





### Market Pull – Future Scenario Analysis (Tidal Stream)

Politav and Innovation Group

Offshore Renewable

Enerav

Supergen

Total Market Pull Investment

- LR 10% Suboptimal £18.6Bn
- LR 15% Preferable £ 3.3Bn
- LR 20% Ambitious £ 1.9Bn



# Technology Push investment greatly reduces total Market Pull investment



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### Market Pull – Future Scenario Analysis (Wave)

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Offshore Renewable

Energy

Supergen

#### Total Market Pull Investment

- LR 10% Suboptimal £20.5Bn
- LR 15% Preferable £ 3.0Bn
- LR 20% Ambitious £ 1.3Bn



### **Technology Push investment greatly reduces total Market Pull investment**



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### **Market Pull – Future Scenario Analysis**



#### Summary

- Total Market Pull investment is greatly affected by the rate of cost reduction
- Rate of cost reduction is greatly affected by
  - **Technology Push Investment**

#### **Remember High TRL UK - £3.6 million**



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Engineering and Psychial Diversion Research Course

### **Research and Innovation Analysis**



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Research and Innovation for Wave and Tidal Stream in the UK and EU

#### A 2023 Summary

A Supergen Offshore Renewable Energy Hub Policy Paper prepared by the Policy and Innovation Group at the University of Edinburgh

July 2023



#### How should UK strategise future R&I funding?





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### **Demonstration & Innovation Analysis**

SRIA Recommendation (Baseline)	
Period	2021-2025
Recommended Budget	664 €m*
Suggested Number of Projects	148*

#### **<u>6 Challenge Areas</u>**

- Design and validation of ocean energy devices
- Foundations, Connections and Mooring
- Logistics and Marine Operations
- □ Integration in the Energy System
- Data Collection & Analysis and Modelling Tools
- **Cross-cutting Challenges**



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TOTAL

## **Research & Innovation Analysis**

### **<u>6 Challenge Areas - 17 Priority Topics</u>**

### For each priority topic, the SRIA defines:

- Scope
- Applicability (wave, tidal, others)
- Expected impact
- TRL (entry/exit)
- Budget Required (number and size of projects)

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hallenge Areas	Priority Topics	Number and Size of actions <sup>8</sup>	Budget Require	ed (million €)
Design and Validation of Ocean Energy Devices	Demonstration of ocean energy devices to increase experience in real sea conditions	Around 10 large and 10 medium	150	700
	Demonstration of ocean energy technology at array scale	7 Projects at array scale	350	
	Improvement and demonstration of PTO and control systems	Around 10 medium and 5 small	60	
	Application of innovative materials from other sectors	A few medium and around 5 small	25	
	Development of novel wave energy devices	Around 10 small and 5 medium	45	
	Improvement of tidal blades and rotor	Around 5 medium and a few large	55	
	Development of other ocean energy technologies	A few medium	15	
Foundations, Connections and Mooring	Advanced mooring and connection systems for floating ocean energy devices	Around 10 medium	50	85
	Improvement and demonstration of foundations and connection systems for bottom-fixed ocean energy devices	Around 5 medium and around 5 small	35	
Logistics and Marine Operations	Optimisation of maritime logistics and operations	Around 5 medium and a few large	55	80
	Instrumentation for condition monitoring and predictive maintenance	A few medium and around 5 small	25	
Integration in the Energy System	Developing and demonstrating near- commercial application of ocean energy in niche markets	Several medium and a few large	80	86
	Quantifying and demonstrating grid- scale benefits of ocean energy	A few small	6	
Data Collection & Analysis and Modelling Tools	Marine observation modelling and forecasting to optimise design and operation of ocean energy devices	A few medium and around 5 small	25	35
	Open-data repository for ocean energy	Around 5 small	10	
Cross-cutting Challenges	Improvement of the environmental and socioeconomic impacts of ocean energy	Around 5 small	10	20
	Standardisation and certification	Around 5 small	10	





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\*Boundary: only includes projects/activities in wave and tidal stream we are aware of that are active within 2022-2025

### <u>Current Status – Budget</u>







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### SRIA Analysis – Challenge Area 1, Priority Topic 1



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- **1.** Design and Validation of Ocean Energy Device
- 1.1 Demonstration of ocean energy devices to increase experience in real sea conditions





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### **1** Design and Validation of Ocean Energy Device

1.1 Demonstration of ocean energy devices to increase experience in real sea conditions

<u>Nº Projects</u> <u>Budget</u> Millions € 120 €100M € 100 10 Large Medium 10 10 € 80 20 100 €m € 60 €51M 2 Large € 40 3 10 Medium Medium 7 € 20 2 7 Medium 12 51 €m 3 Small € -SRIA Ask Delivered Medium Small Large **Funding Amount** €2M €8M



SRIA Ask

Large

Total

**Delivered** 

Small

Large

Total

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### **1** Design and Validation of Ocean Energy Device

1.1 Demonstration of ocean energy devices to increase experience in real sea conditions

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Offshore

Renewable Enerav

Supergen





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### **1** Design and Validation of Ocean Energy Device

1.1 Demonstration of ocean energy devices to increase experience in real sea conditions

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#### **Main Funders**



EC - European Commission Ec - European countries



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## Summary: the policy makers tool box





- 6GW Wave + 6GW Tidal Stream Net Zero
- Socioeconomic benefit Just Transition
- System Benefit Enabler of offshore wind
- Consistent Demonstration and Innovation is essential





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