



Marine Renewable Energy

A Global Opportunity

Safe, Secure, Sustainable

Duncan Ayling

Head of Offshore, BWEA

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BWEA

Delivering the UK's wind, wave and tidal energy



UK's leading renewable energy trade association
390+ Company members

Champion the UK Wind, Wave & Tidal energy sectors

Co-ordinate industry and liaise with stakeholders
Guide Government towards industry requirements
Conduct studies to help develop industry
Raise Profile and increase confidence

www.bwea.com

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Delivering the UK's wind, wave and tidal energy



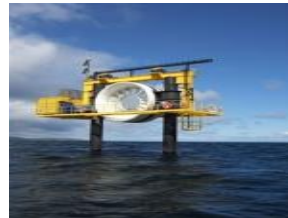
- 1. The increasing global scale of marine renewable energy**
- 2. The UK advantage**
- 3. The commercial opportunity**

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1. The increasing global scale of marine renewable energy





**Global sustainable energy investment was
\$70.9 billion in 2006,
an increase of 43% over 2005.**

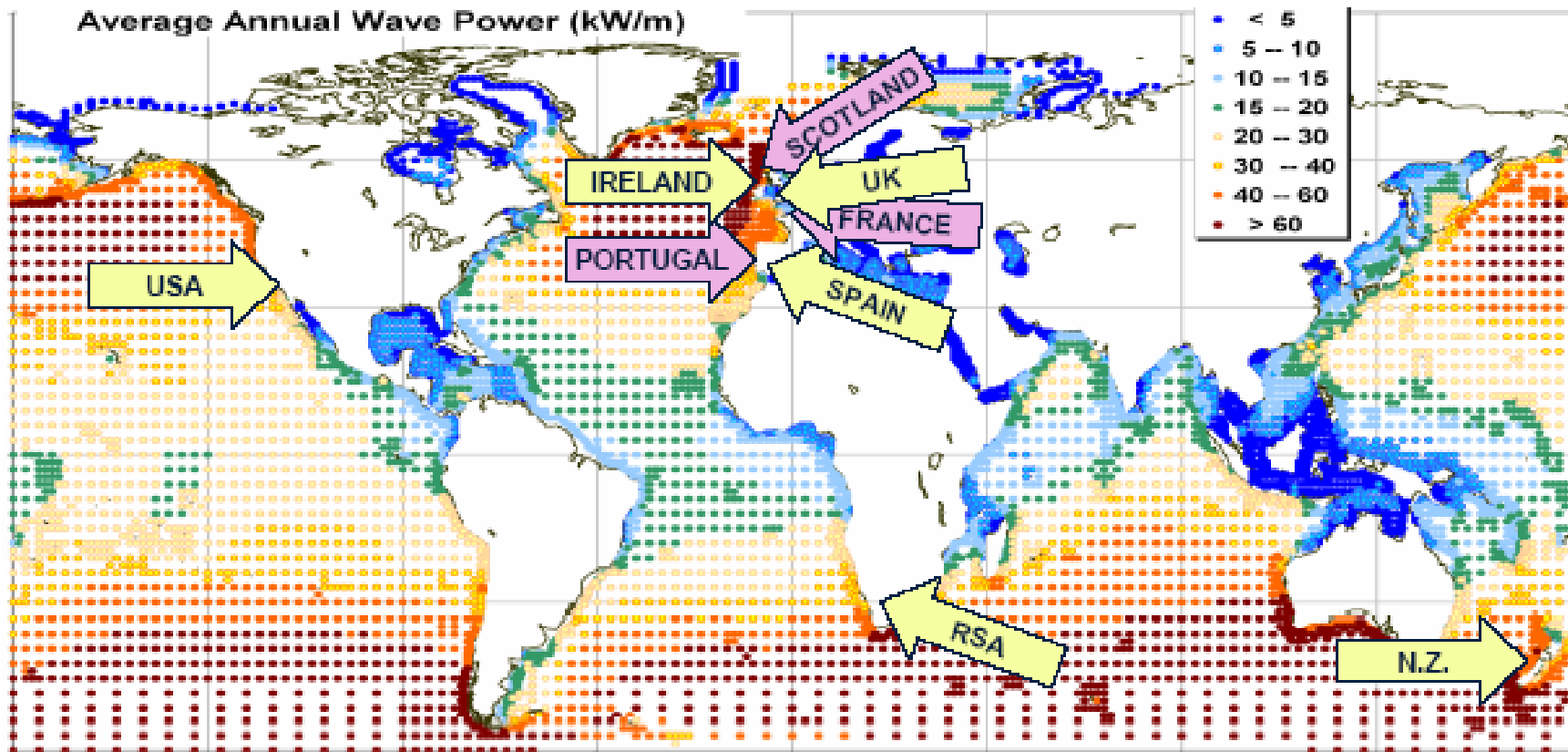
**The upward trend continued in 2007,
with \$85 billion forecast for the year**

Source: Global Trends in Sustainable Energy Investment . © United Nations Environment Programme and New Energy Finance Ltd. 2007

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Global Wave Energy Development Activity



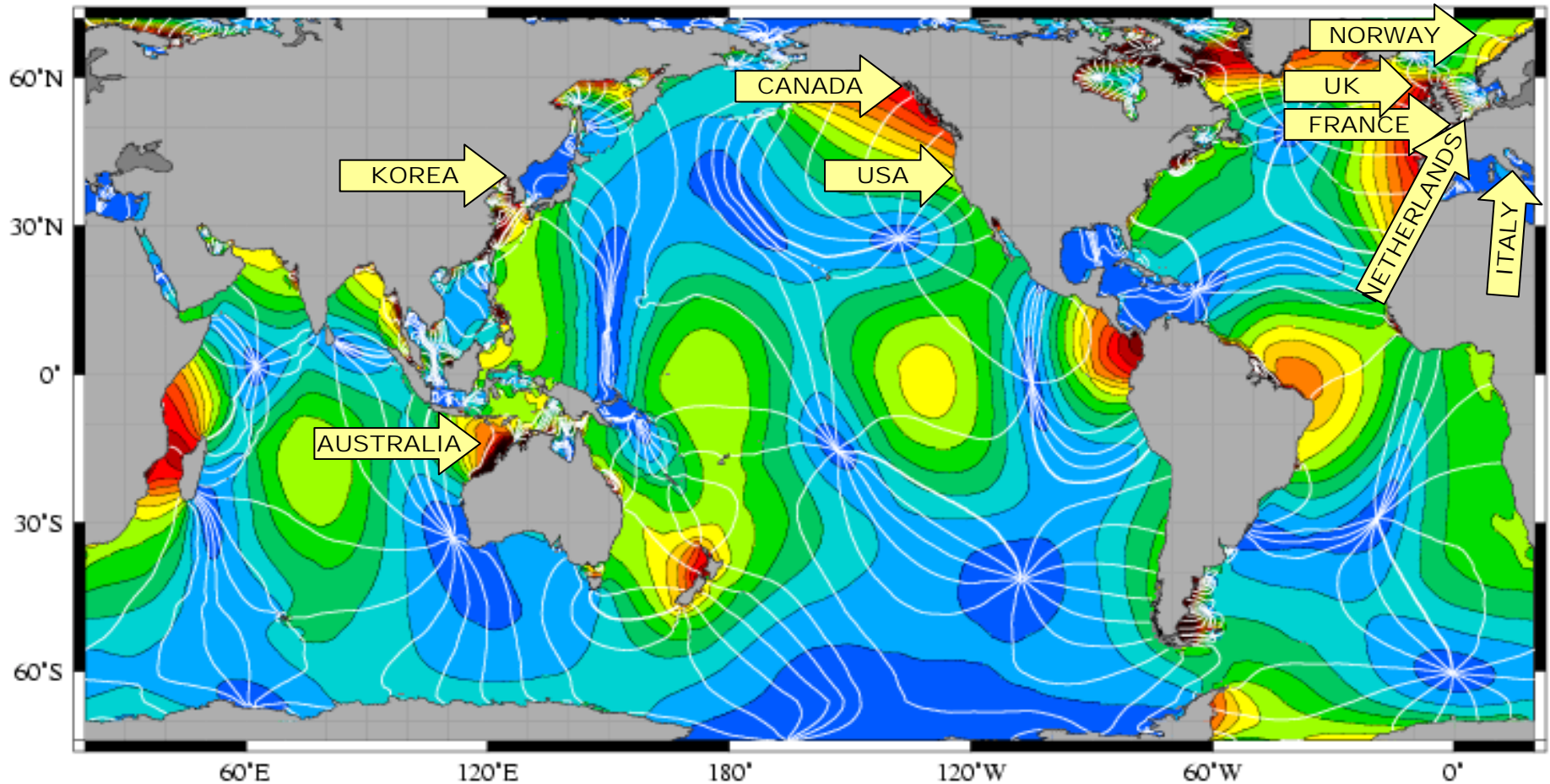
Data from the ECMWF (European Centre for Medium-Range Weather Forecasts) WAM model archive -calibrated and corrected by OCEANOR against a global buoy and Topex satellite altimeter database.



Global Tidal Energy Development Activity

GOT99.2

NASA/GSFC



R Ray
Space Geodesy Branch





A practical ^[1] worldwide

**Wave energy resource of 2000 - 4000 TWh/year
and
Tidal energy resource of 800+ TWh/year**

Source: Building Options for UK Renewable Energy. Carbon trust. November 2005

**A quarter of the entire world electricity use in
2007**



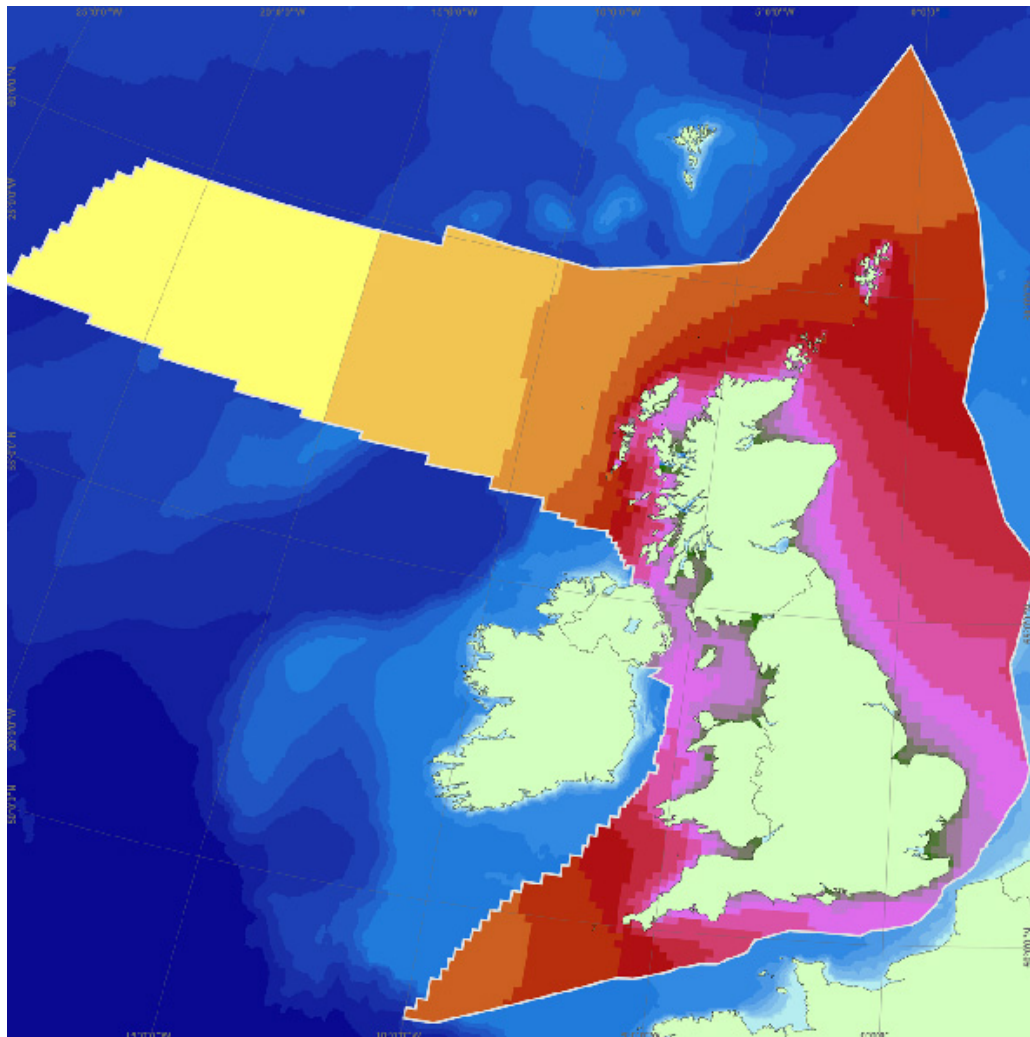
2.The UK advantage

2008: A Year of deployment

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Annual Mean Wave Height

Kilometres 0 50 100 200 300 400	
Projection	Transverse Mercator WGS 1984 UTM Zone 31 N
Scale	1:8,500,000 when printed A4



Stage 1 Offshore Renewables Atlas - January 2004

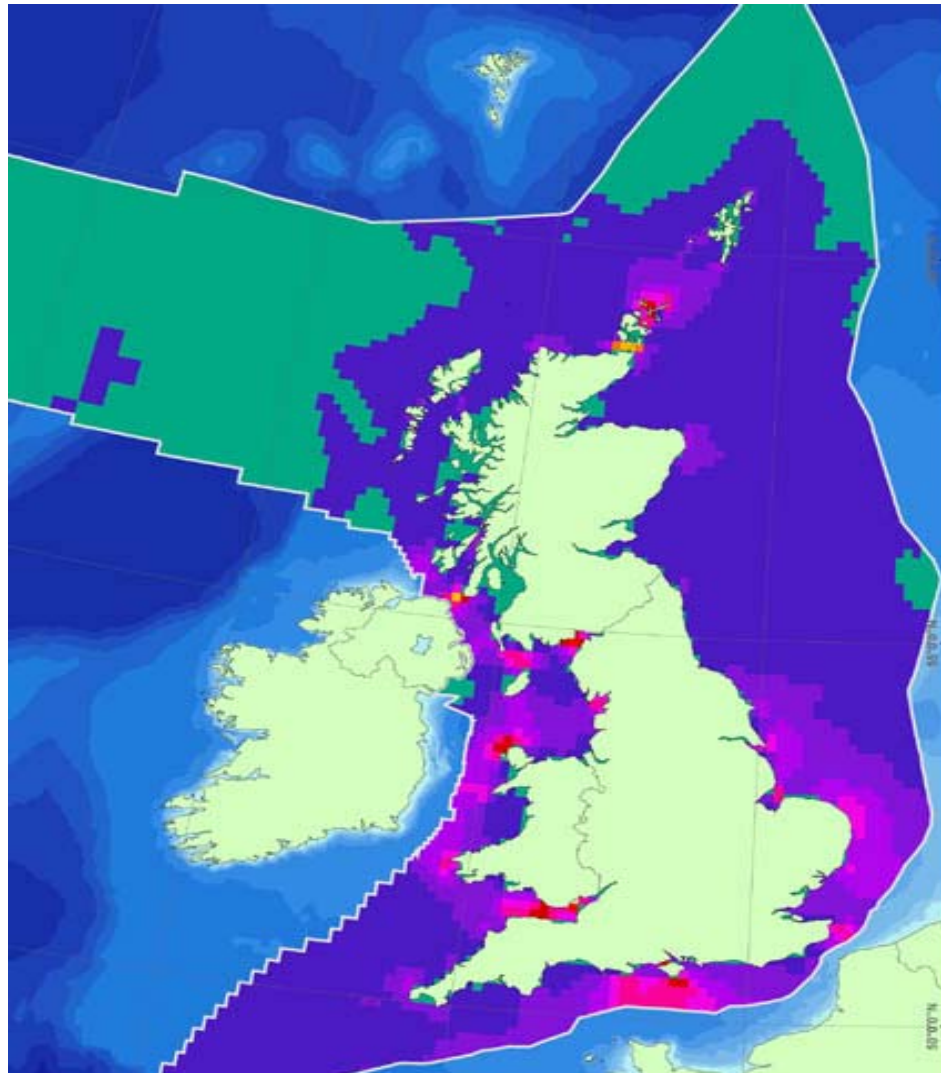
Notes

1. South of 63° N and East of 12° W model cell size approximately 12km. Model cell size approximately 80km in all other areas.
2. Data quality : Excellent.
3. Model accuracy is less robust in areas closer than 12km to land.
4. Wave model based on hourly predictions throughout three years.
5. © Crown copyright. All rights reserved. 2004.

Wave Height (m)

- 0.3 - 0.5
- 0.6 - 0.8
- 0.9 - 1.0
- 1.1 - 1.3
- 1.4 - 1.5
- 1.6 - 1.7
- 1.8 - 2.0
- 2.1 - 2.3
- 2.4 - 2.5
- 2.6 - 2.8
- 2.9 - 3.0
- 3.1 - 3.3
- 3.4 - 3.5
- 3.6 - 3.8
- 3.9 - 4.0

- Land
- UK Continental Shelf



Average Annual Tidal Power

		Stage 1 Offshore Renewables Atlas - January 2004 Notes 1. South of 63° N and East of 12° W, model cell size approximately 12km. Model cell size approximately 25km in all other areas. 2. Data quality - Excellent. 3. Model accuracy is less robust in areas closer than 12km to land. 4. Tidal model based on daily predictions throughout one year. 5. Tidal power is calculated per 1 square metre of vertical water column. 6. © Crown copyright. All rights reserved. 2004.
Projection Transverse Mercator WGS 1984 UTM Zone 31 N	Scale 1:8,500,000 when printed A4	



Average Tidal Power (kW / m² of vertical water column)

- < 0.01
- 0.01 - 0.04
- 0.05 - 0.12
- 0.13 - 0.25
- 0.26 - 0.41
- 0.42 - 0.59
- 0.60 - 0.82
- 1.20 - 1.63
- 1.64 - 2.17
- 2.18 - 2.50
- 2.51 - 2.90
- > 2.91
- Land
- UK Continental Shelf

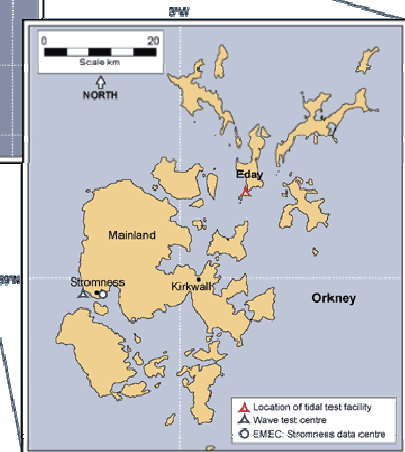
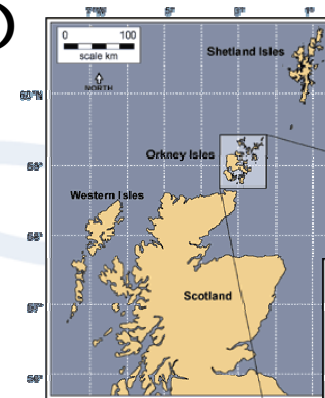
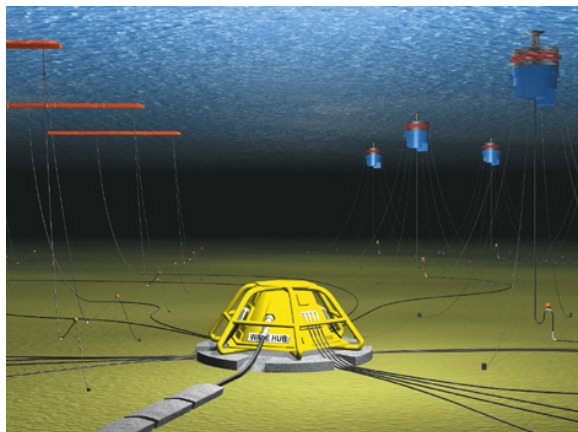
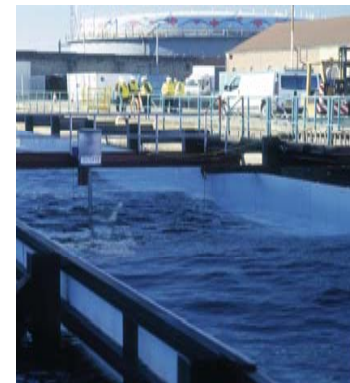


UK - Unique in the World

New and Renewable Energy Centre (NaREC)

European Marine Energy Centre (EMEC)

Wave Hub



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UK Wave and Tidal Stream in 2008 A Year of Deployment

UK Islay 500kW Limpet
(continued deployment)

**UK Strangford 1.2MW
MCT SeaGen**

**UK EMEC 250kW
OpenHydro**

**UK EMEC 500kW
TGL**

**UK EMEC 300kW
Aquamarine Oyster**

**UK EMEC 150kW
OPT PowerBuoy**

**UK Humber 100kW
Pulse Tidal**

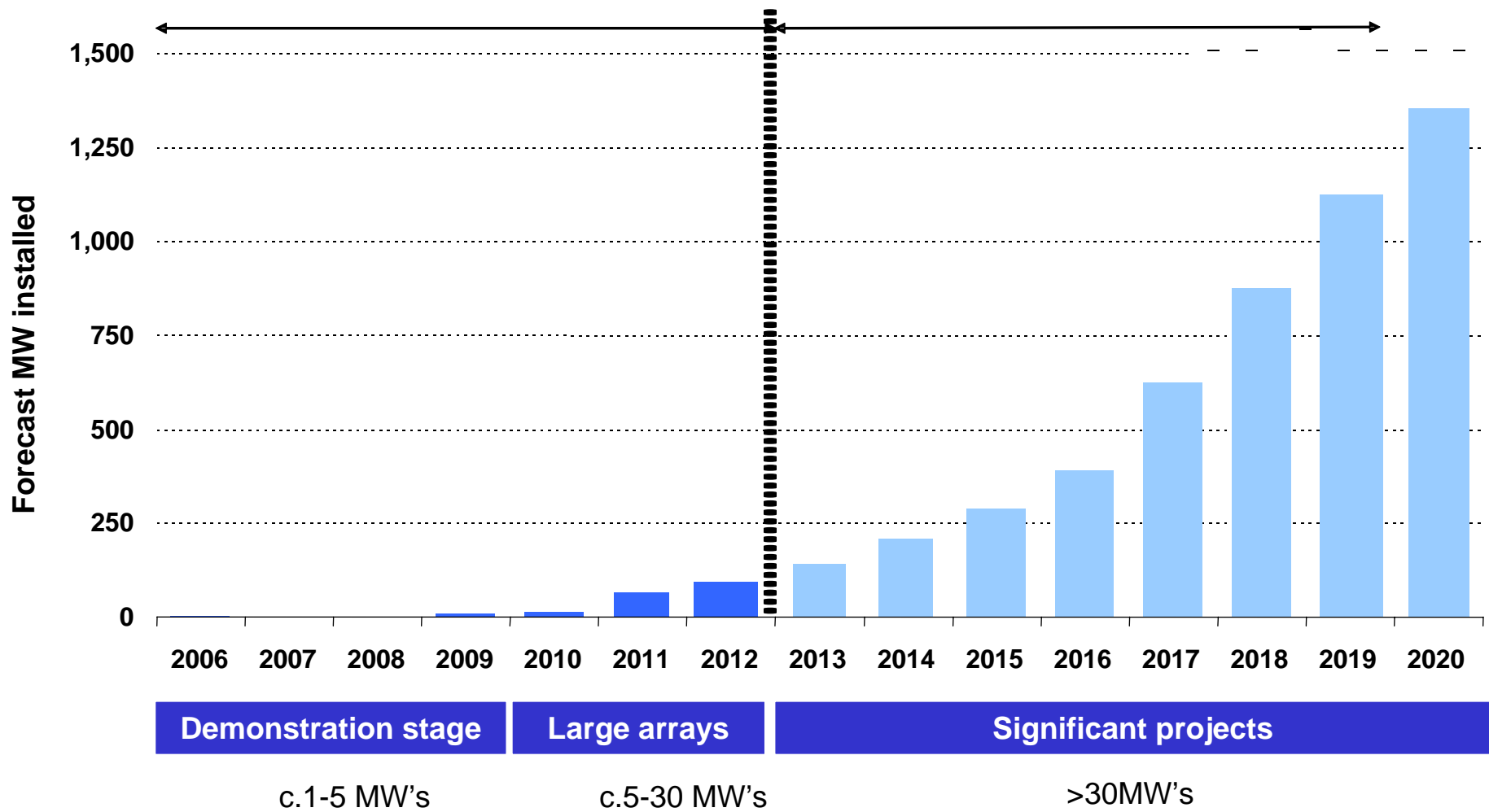
**Portugal 2.25MW
Energis Pelamis
(export)**

**Trident Energy
(confidential)**



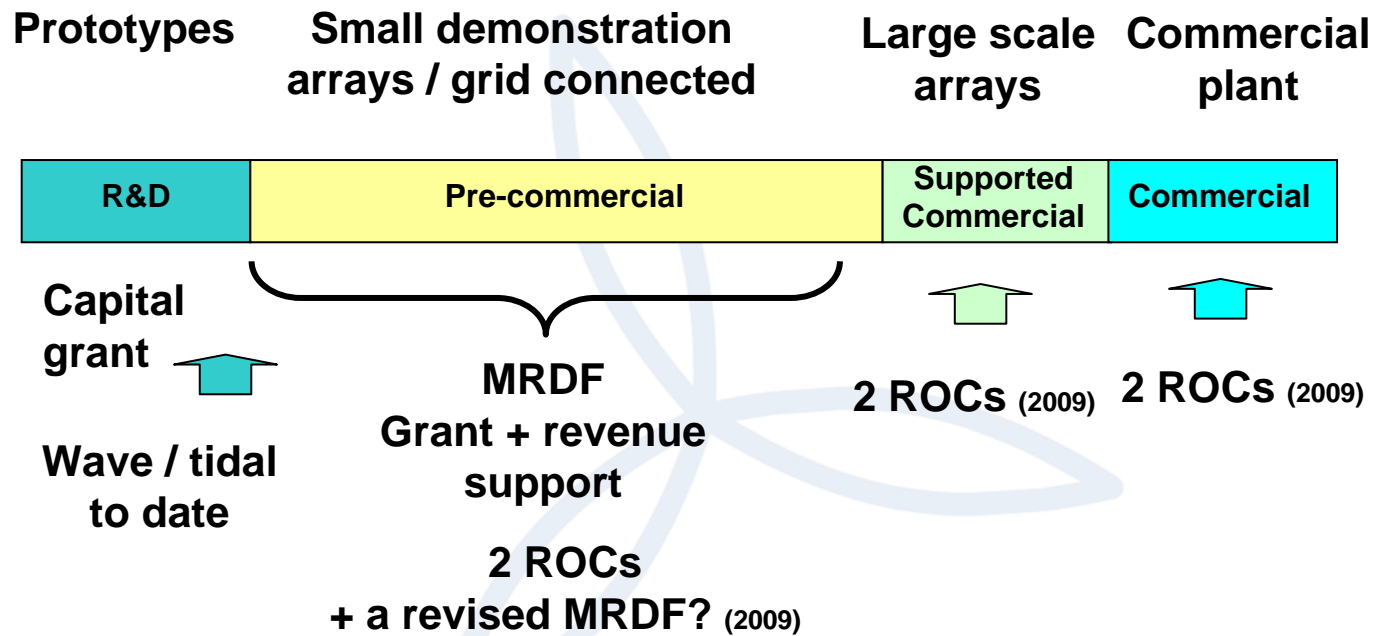


UK Market





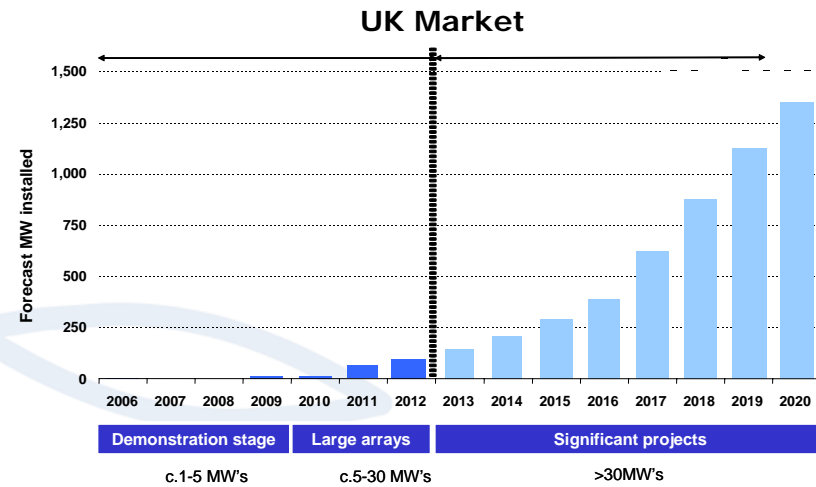
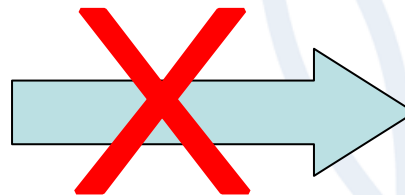
The existing funding system for marine renewables



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2 ROCs

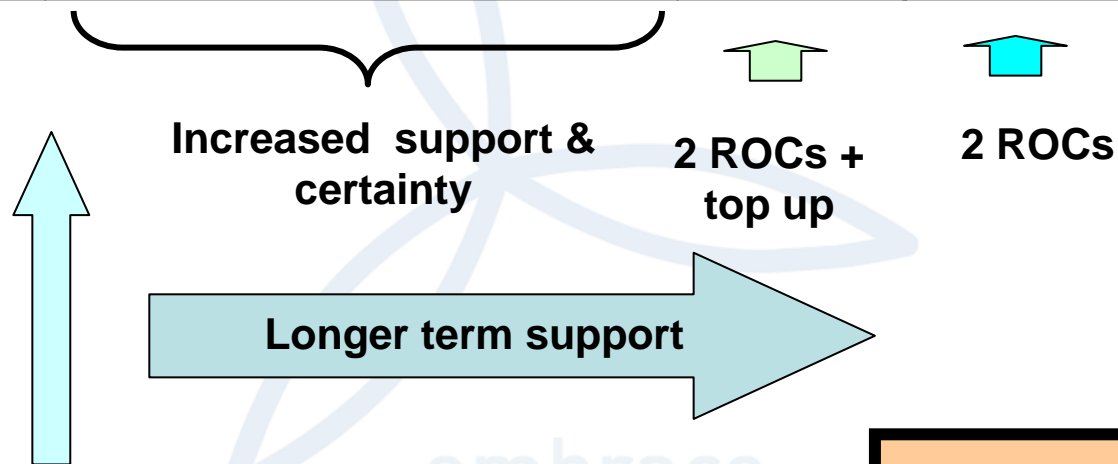
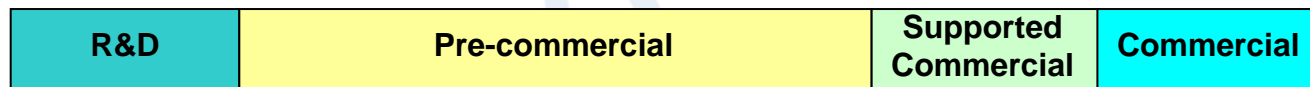


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What is required?

Prototypes **Small demonstration arrays / grid connected** **Large scale arrays** **Commercial plant**



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Plus Grid Availability



MSO equivalent

5 ROCs for wave

3 ROCs for tidal

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Post MRDF (after a technology has been supported by the MRDF).

A stepped gradual reduction of revenue support will be needed to provide a finite amount of public financial commitment.

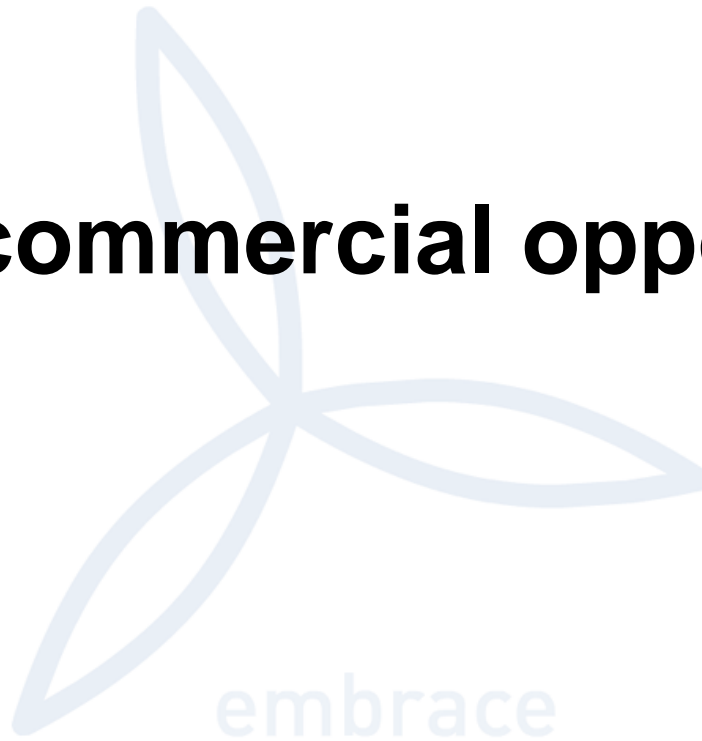
- 2 ROCs + £150/MWh until 20MW installed
- 2 ROCs + £100/MWh until 50MW installed
- 2 ROCs + £50/MWh until 100MW installed
- 2 ROCs + £25/MWh until 200MW installed

However further capital grant should not be ruled out at this stage.
could be to create strategic support directed vessels or environmental issues (e.g. birds, sea mammals).

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3. The commercial opportunity





Benefits for UK plc by 2020

$1360\text{MW} \times 1500 \text{ £/kW} \times 1000 = \text{approx. } \text{£}2\text{bn}$

$1360\text{MW} \times 3000 \text{ £/kW} \times 1000 = \text{approx. } \text{£}4\text{bn}$

How much of this can be won by UK companies?

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UK Jobs

Opportunities for People

Eg Grimsby Fish Docks

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UK Ports and Harbours

Opportunities for expansion and new business





MPI Resolution



Jack-up Barges



A2Sea
Sea
Jack



Smit
Lisa



Jack Up
BV
JB109/JB
110



Matador 3

Crane Barges



Taklift 4



Svanen



Rambiz



Marine Current
Turbines

Seagen Installation

Strangford loch
Northern Ireland





Other Vessels

Jack-ups barges
Floating barges
Guard boats
Diving vessels
Tug boats and pilots
Work boats



**Pelamis Wave Power
Sea Trials, Scotland**



- 1. The marine renewable energy industry is expanding globally**
- 2. The UK has the lead**
- 2. The commercial opportunity**

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Marine Renewable Energy

Thank You

Duncan Ayling

Head of Offshore, BWEA

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