




Developments in Wave and Tidal Power

Neil Kermode
Managing Director

© www.emec.org.uk

1



World leading test facilities

- £36m public funding
- Not-for-profit organisation
- Independent test laboratory




Vision: A globally successful marine energy industry as part of a clean energy system

Mission: Reduce the **time, cost, and risk** to progress innovative sustainable technologies to market.

Technology Focus Areas



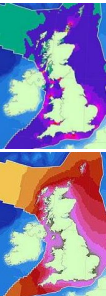


2



The UK resource


- 50% of Europe's tidal energy
- 35% of Europe's wave energy
- 20% of UK's current electricity demand from our coastline

Opportunity
Industrial innovation
Security of supply
Reduce carbon emissions

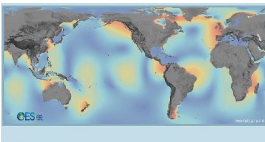
© www.emec.org.uk

3

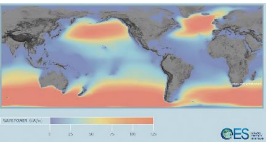


Global market


Tidal resource



Wave resource




- International Energy Agency, 2015
 - 337GW worldwide by 2050
 - \$1.87 trillion worldwide by 2050
- £4 billion to UK GDP by 2050



© www.emec.org.uk

4





Marine Energy- Is it worth it?

Perfect fit with UK's Industrial Strategy


- Clean growth
- World lead
- Across the country
- Inward investment

• Fits too with Scottish Energy Strategy





© www.emec.org.uk

5



Why Orkney?

- Big waves & strong tides
- Close access to sheltered waters
- Most northerly point on national grid
- People/expertise:
 - Energy
 - Marine
 - Environmental

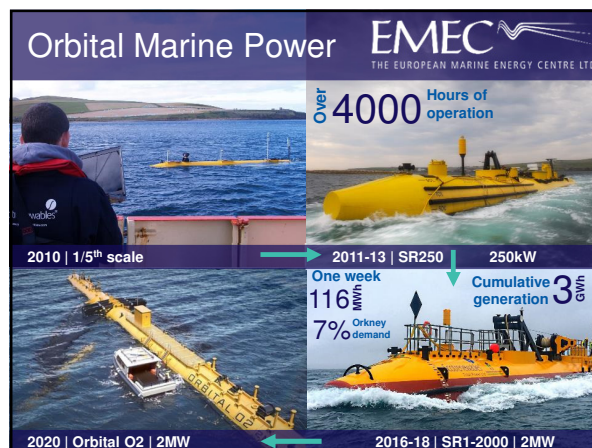





© www.emec.org.uk

6



13



14



15



16



17



18

Reality: It is hard out there

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

© www.emec.org.uk

19

Failures

1. TSB cable
Corrosion
2. Shackle component
Failed after 2-3 weeks
3. Brake caliper bolt
Sheared 24 hours after torques
4. Fibre optic cable
Detached from nacelle's cable connector
5. Waverider buoy spring
Sheared

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

© www.emec.org.uk

20

16 years' experience: Ocean energy projects

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

© www.emec.org.uk

21

Tide to hydrogen

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

16MWh of diesel a day

Electrolyse & store

Value of hydrogen at ports of use by application area (€/kg)

FC cars	FC buses	FC ferries	FC boats	H ₂ ICE	H ₂ ICE with methanol	H ₂ ICE with Backhills generators	Backhills Agriculture	Heating	Ammonia production	Hydrogen recovery	Other
6.5	5.7	5.5	4.4	3.4	3.4	3.4	2.9	1.7	1.2	1.1	0.8
1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

CO₂ saved (blue bars), CO₂ emitted (red bars)

© www.emec.org.uk

22

H₂ SURF 'N' TURF

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

© www.emec.org.uk

23

Energy Systems

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

© www.emec.org.uk

24

Energy Systems

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

The ReFLEX Project

- Demonstration of a first-of-its-kind Integrated Energy System (IES) for local power, transport, and heat networks
- Smart, real time, digital interlinking of energy sources and demands to optimise overall system efficiency
- £28.5M UK Research and Innovation funded Smart Local Energy Systems project
- Use pre-financed and self-financed customer/user infrastructure delivered through democratised business models

© www.emec.org.uk

25

Energy Systems

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

FlexiWENT
VPP Technology
Heat Pumps
Green Hydrogen
Domestic Thermal Storage

INTEGRATED ENERGY SYSTEM
500 Smart Charging Stations
500 Electric Buses & Bikes
500W electrolyser
500kW Commercial Energy Storage Devices

FlexiGRID
Up to 1000 Domestic Energy Storage Devices
Up to 100 Commercial Energy Storage Devices

FlexiTRANS
FULLY CHARGED
500W electrolyser

© www.emec.org.uk

26

Economic benefits
£284.7 million GVA

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

Jobs

Supply chain – transferrable skills

Study – cosmopolitan Stromness

Infrastructure

© www.emec.org.uk

27

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

Follow us: [Twitter](#) [LinkedIn](#) [Facebook](#) [YouTube](#)

© www.emec.org.uk

28