



Renewables

Challenges and opportunities
for
innovation and commercialisation

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SE commercialisation support

KEY PROGRAMMES

- **Proof of Concept Programme (PoCP)** - From the university lab to the global marketplace- creating new sustainable technology businesses in Scotland or licensing the technology to Scottish companies.
- **Enterprise Fellowships** help researchers, post-graduates or recently graduated students spin-out their business ideas.
- **Procured Research & Development** – the former Intermediary Technology Institutes generated a range of R&D assets which we are now looking to exploit to create growth in the economy.

SUPPORT

- **Entrepreneurial Support** provides intensive support to pre-start companies to create a fully-funded new company. During this process, we help the team create a viable and fundable business proposition, ready to be finalised and presented to investors.

Marine renewables

➤ **Offshore wind**

➤ **Tidal**

➤ **Wave**

Offshore wind – market size

Potential market size	Installed capacity 2010 (MW)	Forecast of installed capacity by 2020 (MW) (a)	Forecast capital spend on projects by 2020 (£M) (b)	Forecast annual O&M spend on projects by 2020 (£M) (c)	Approximate no. of installations by 2020 (d)
All Scottish sites (e)	190	9,580	28,740	766	1916
Non Scottish sites	1,151	17,800	53,400	1,424	3560
UK total	1,341	27,380	82,140	2,190	5476
Rest of Europe	1,623	28,200	84,600	2,256	11,280
Rest of World	102	8,100	24,300	648	3,240
Non UK total	1,725	36,300	108,900	2,904	14,520
Global total	3,066	63,680	191,040	5,094	19,996

a) after Scenario A - 2020 numbers - Vision for Offshore wind

(b) assumes £3.0M/MW

(c) assumes £0.08M/MW/pa

(d) assumes 5MW turbines

(e) leasing capacity less Bell Rock, Kintyre sites

Source: Scottish Enterprise (4)

Offshore Wind - Costs per MW

Current Offshore Wind Capital Cost

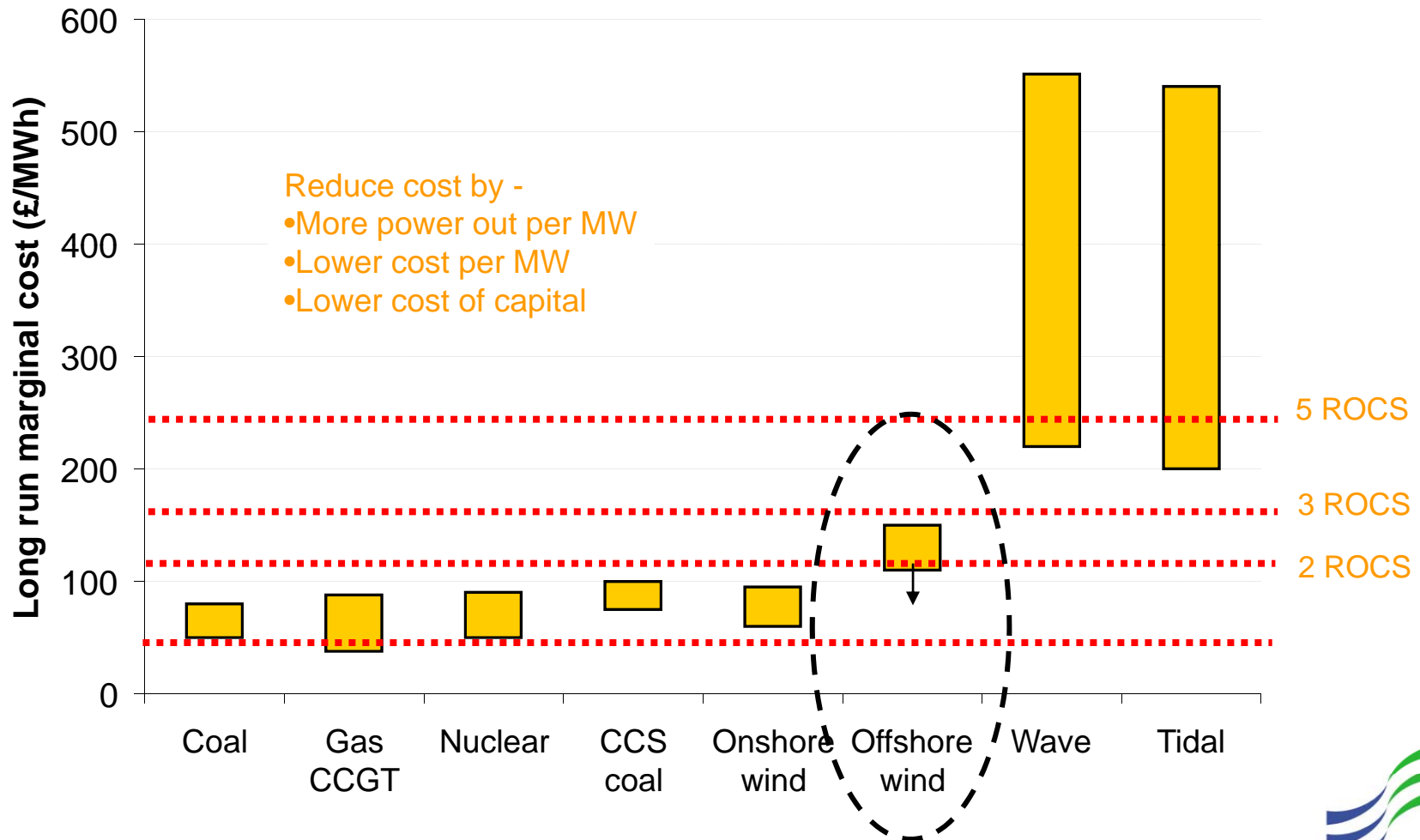
Component	% of Cost	£m/MW
Wind Turbine	44%	1.3
Foundations	16%	0.5
Electrical Infrastructure	17%	0.5
Installation	13%	0.4
Planning & Development	10%	0.3
	100%	3.0

O&M Annual Cost

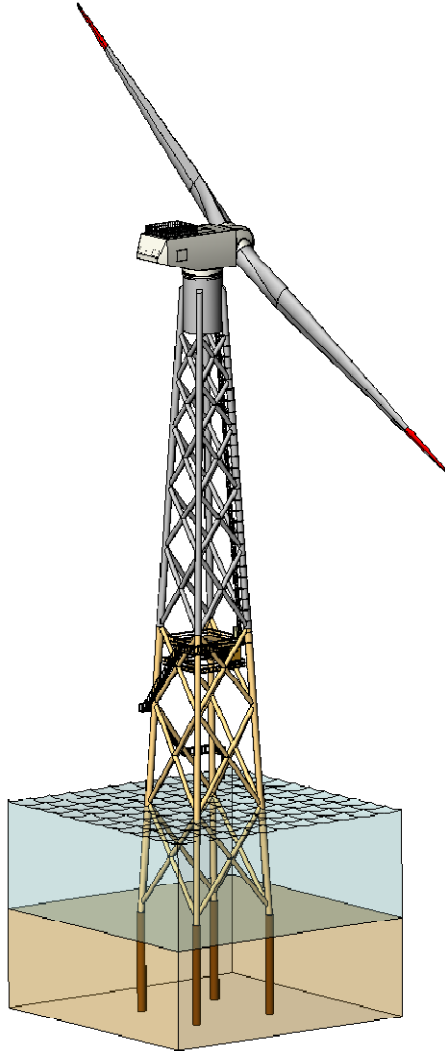
Component	% of Cost	£m/MW/ pa
Equipment	53%	0.042
Grid Maintenance Lease/Insurance	24%	0.019
Personnel Access	9%	0.007
Labour	8%	0.006
Installation/Repair Vessels	6%	0.004
	100%	0.078

Source: Douglas-Westwood Ltd

Costs & revenues of different technologies



Top ten recommended innovation areas



- Next generation turbine designs
- Support structures
- Operating and maintenance strategies
- Novel drive train technology
- Deepwater installation vessels
- Next generation blade technology
- Personnel access (for challenging offshore sites)
- Remote monitoring and control (including condition based monitoring)
- Wind farm array management
- Innovative turbine maintenance methods

Wave & Tidal – market size

The estimated mix of wave/tidal in Scotland by 2020 is roughly equal at:

188MW for tidal and 212MW for wave (baseline market estimate)

For commercially-viable devices operating in 2020, we would expect that their costs to be in the order of:

Wave: £4.9m/MW and £237/MWh* from £9.5m/MW now

Tidal: £3.4m/MW and £164/MWh* from £8m/MW now

* Assuming a 30% availability, a 25 year operating life and using a 12% discount rate

Wave Devices

Key elements

- **Collector element**
- **Reaction source**
- **Power take-off**
- **Foundations and moorings**
- **Electrical connections**
- **Installation vessels**

Tidal Current devices

Key elements

- Turbine blades, and when used flow augmenters
- Transmissions and gearboxes
- Electrical generators
- Support Structures and Foundations
- Electrical connections
- Installation vessels

Present limitations

For both wave and tidal current, the main limitations are reliability and cost.

The corresponding hurdles are to...

1/get devices into the water and keep them there for an extended period;

2/ reduce the capital and operating costs and enhance power output.

Wave & Tidal – market size

Professors Mueller and Wallace (University of Edinburgh) outlined a road map for delivering a successful marine industry and listed 7 key areas of focus:

- power output predictability,
 - manufacturability,
 - installability,
 - operability,
 - survivability,
 - reliability
- and*
- affordability.

Shortlist of opportunities – from foresighting work

- **Facilitated research and development knowledge sharing**
- **Leveraging SE spend off other public funding**
- **Core component marinisation**
- **Novel device concepts**
- **Novel power take off concepts**
- **New materials**
- **Improved hydrodynamic subsystems**
- **Tidal device foundation improvements**
- **Supply chain development initiatives**
- **Core component marinisation testing facility**
- **Support for device fabricators**