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Cost Reduction to Encourage Commercialisation of Marine in the UK

Anna Stegman

IDCORE Research Engineer

ETI10 TEN YEARS OF INNOVATION 2007 – 2017

Introduction

- 4 Year EngD course
- Offshore wind, wave and tidal covered
- Variety of engineering backgrounds
- Currently ~ 50 students

Year 1
- Edinburgh University

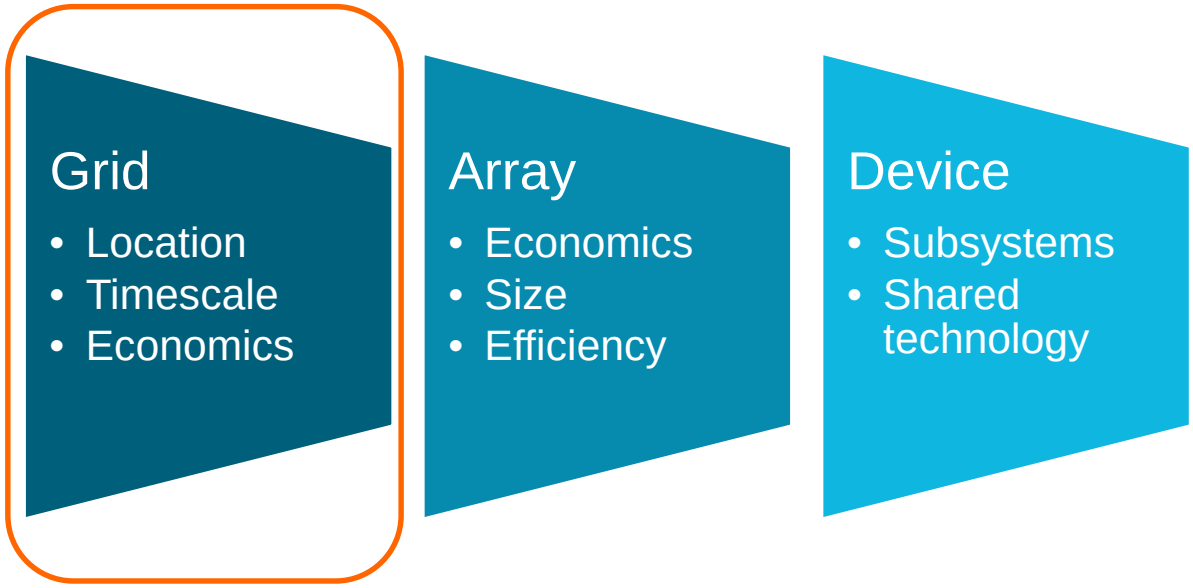
Year 2
- Begin research project
- Oban summer school

Year 3
- Continue research
- Falmouth summer school

Year 4
- Complete research!

My overall project…

Using a systems engineering approach to the development of wave energy technologies



Being realistic…

Current Policy

- EC Renewable Directive: 15% met from renewables by 2020, 27% by 2030
- 2008 Climate Change Act: reduce GHG emissions by 80% by 2050
- Scotland's green strategy: 50% of Scotland's heat, transport and electricity consumption 2030

Marine has to be able to compete with other technologies

What LCOE reduction is required for marine energy to be installed at grid scale?

ETIs modelling tool

ESME
Energy System Modelling Environment

2050 Demand Scenarios

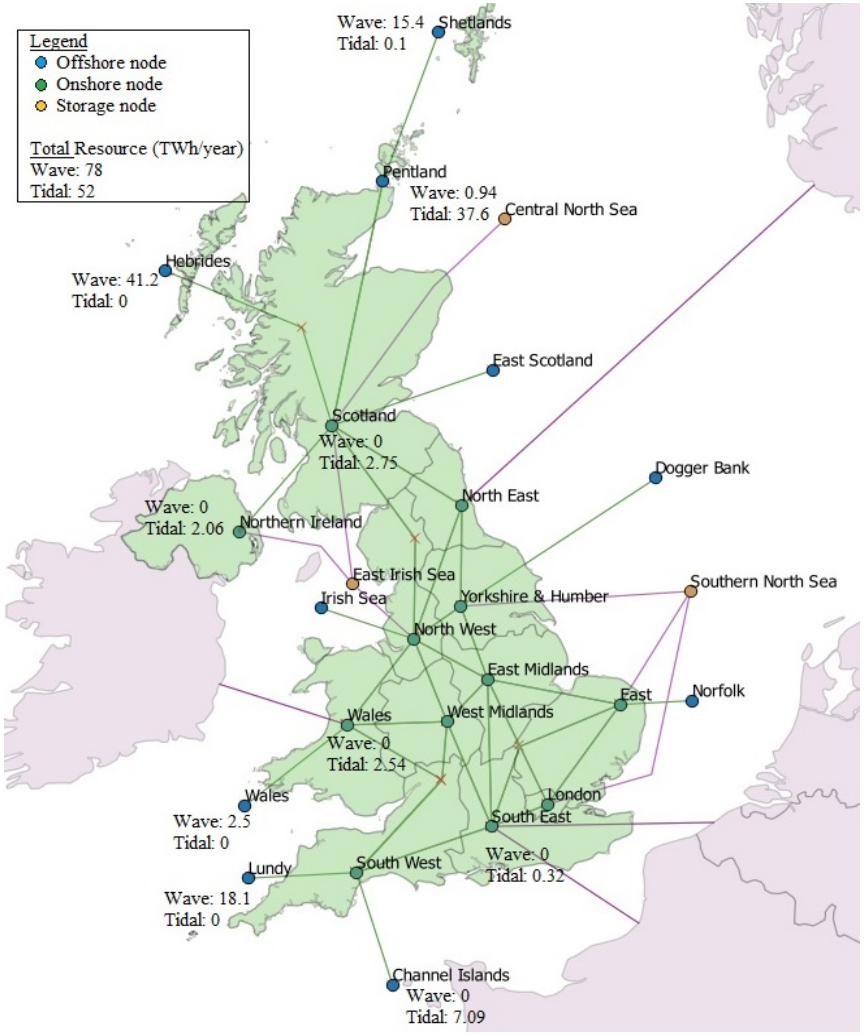
Technology Roadmaps

Energy Resources

ESME
- Power
- Heat
- Transport
- Infrastructure

Global Parameters

Energy System Blueprints



Inputs - ESME

Energy System Modelling Environment

$$LCOE = \frac{CAPEX + Annual\ OPEX}{Annual\ Energy\ Production}$$

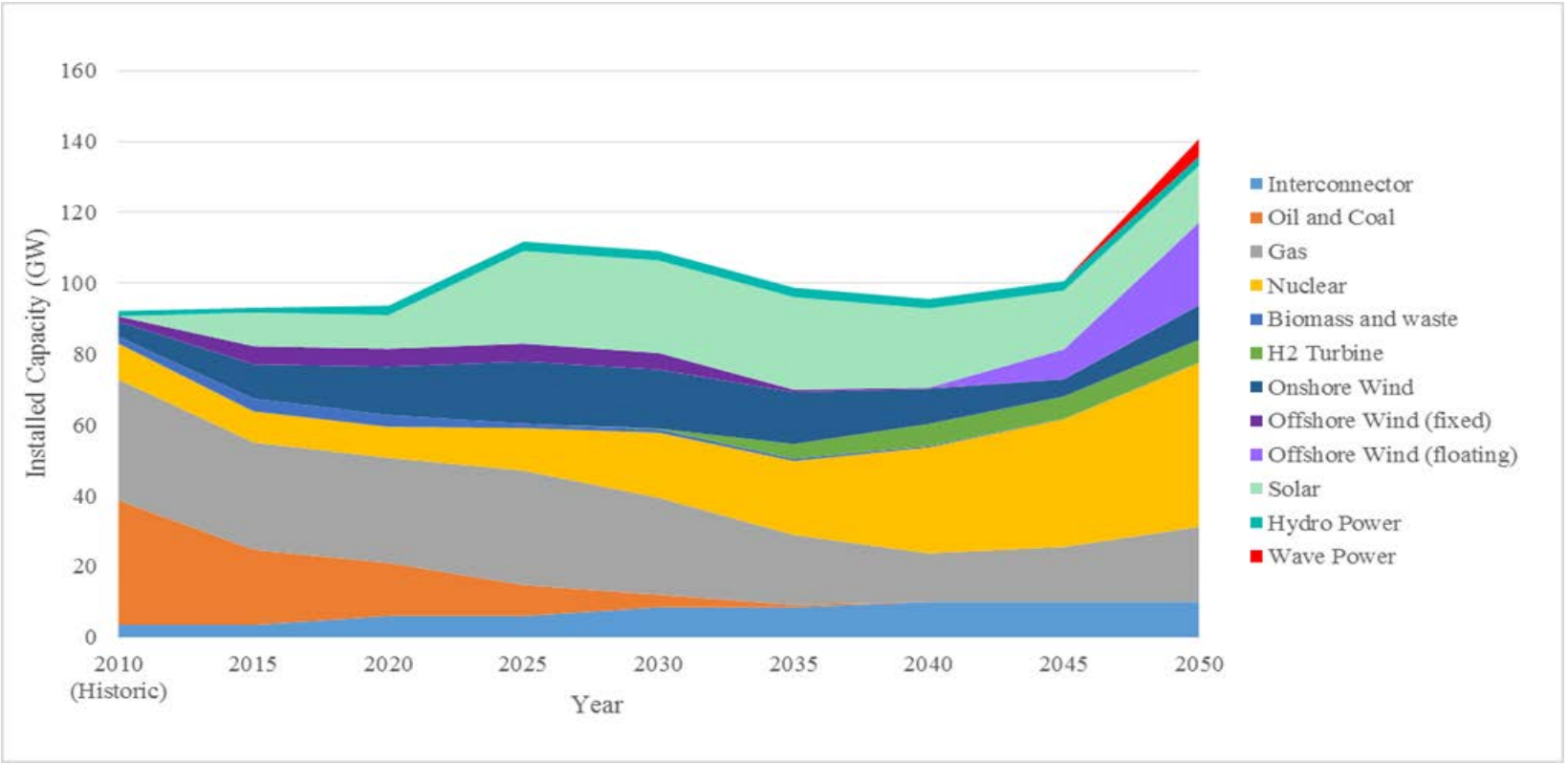
	Wave	Tidal	Description
2015 CAPEX[1] (£/kW)	3250	2700	Developer predictions
2050 CAPEX (£/kW)	500 - 3000	500 - 2500	2050 Targets
Capacity Factor	15-40%	15-40%	2050 Targets

[1]OES, “International Levelised Cost Of Energy for Ocean Energy Technologies,”

Least Cost Optimisation - Wave

2050 LCOE: 4.37p/kWh

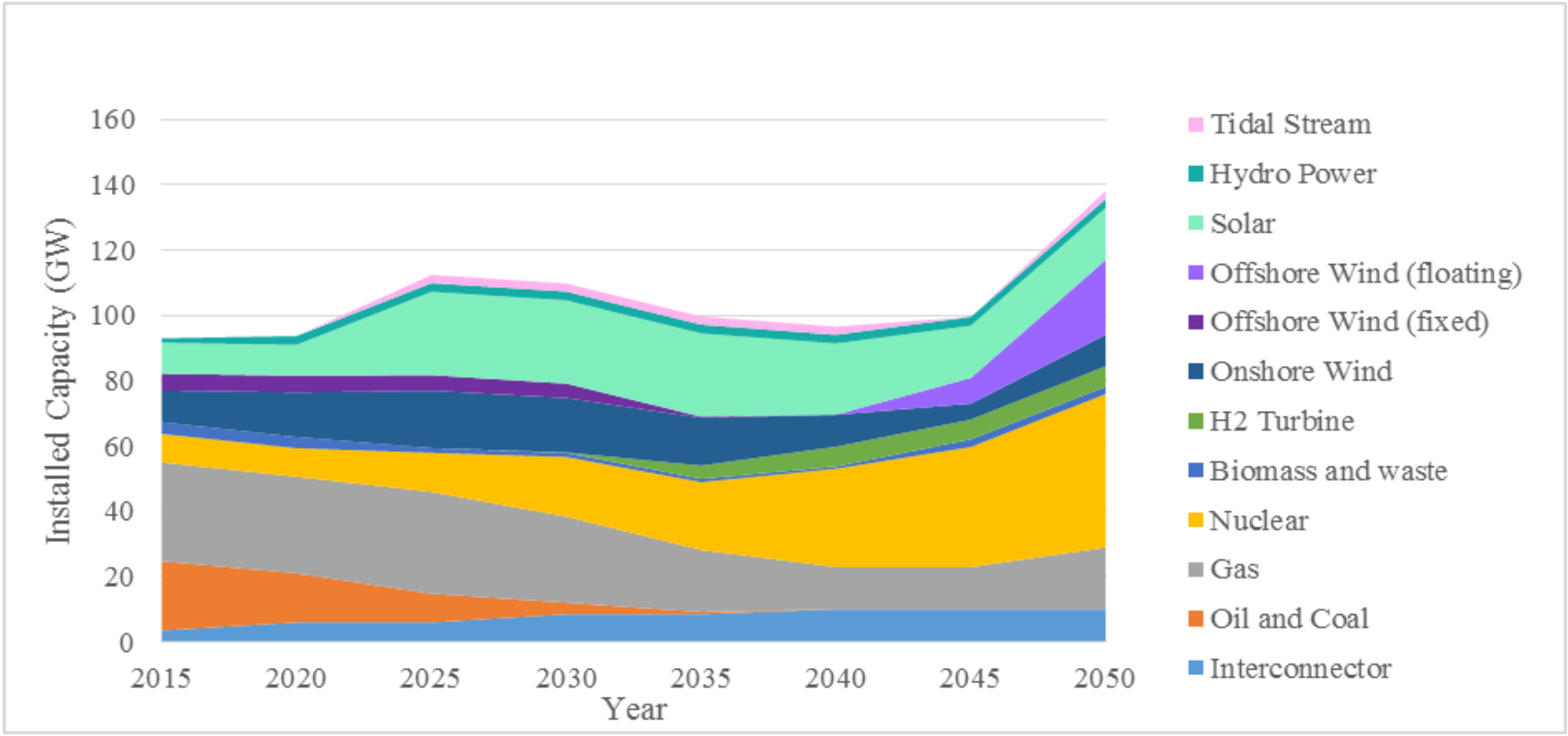
4.9 GW



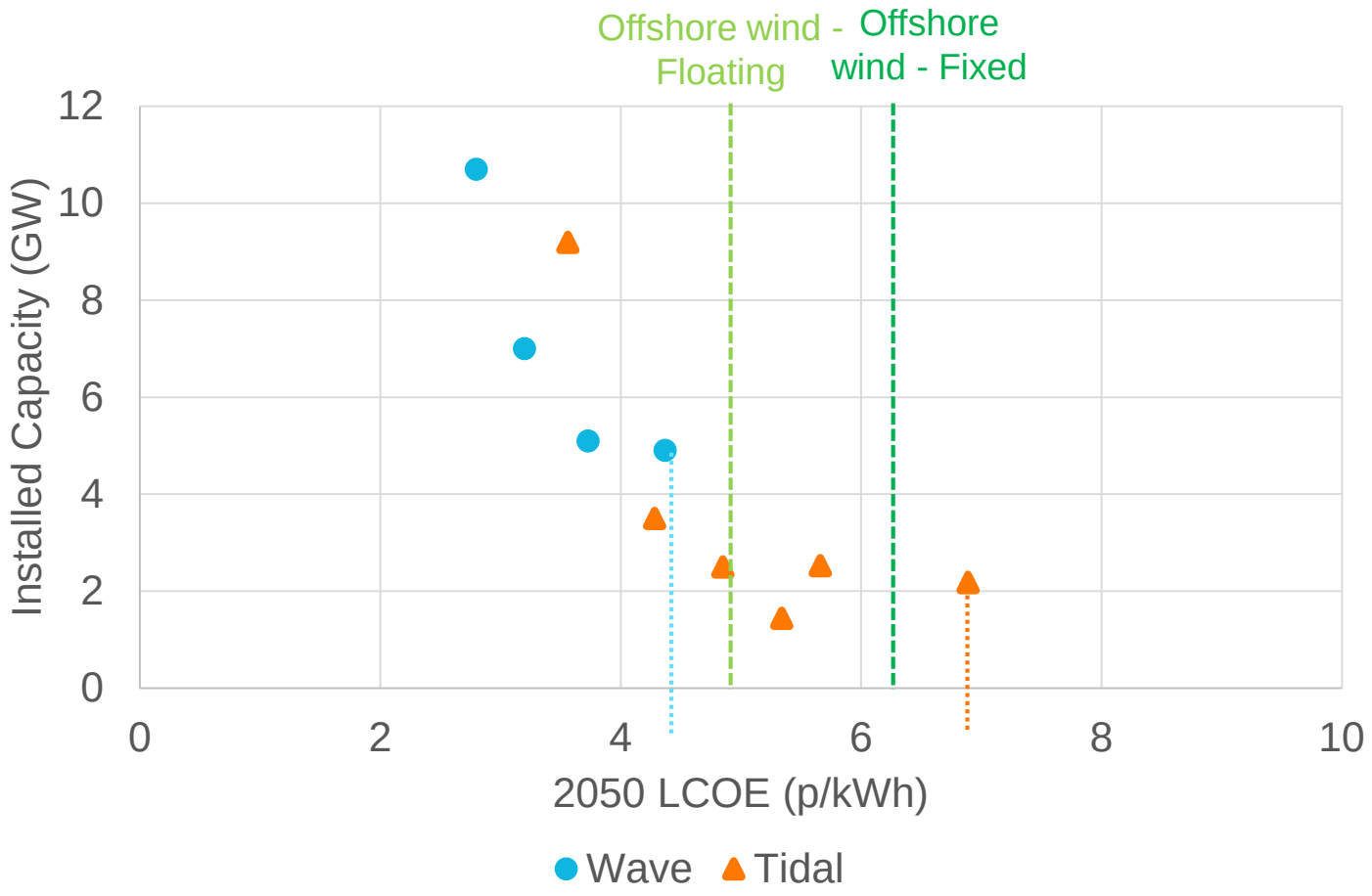
Least Cost Optimisation - Tidal

2050 LCOE: 4.9p/kWh

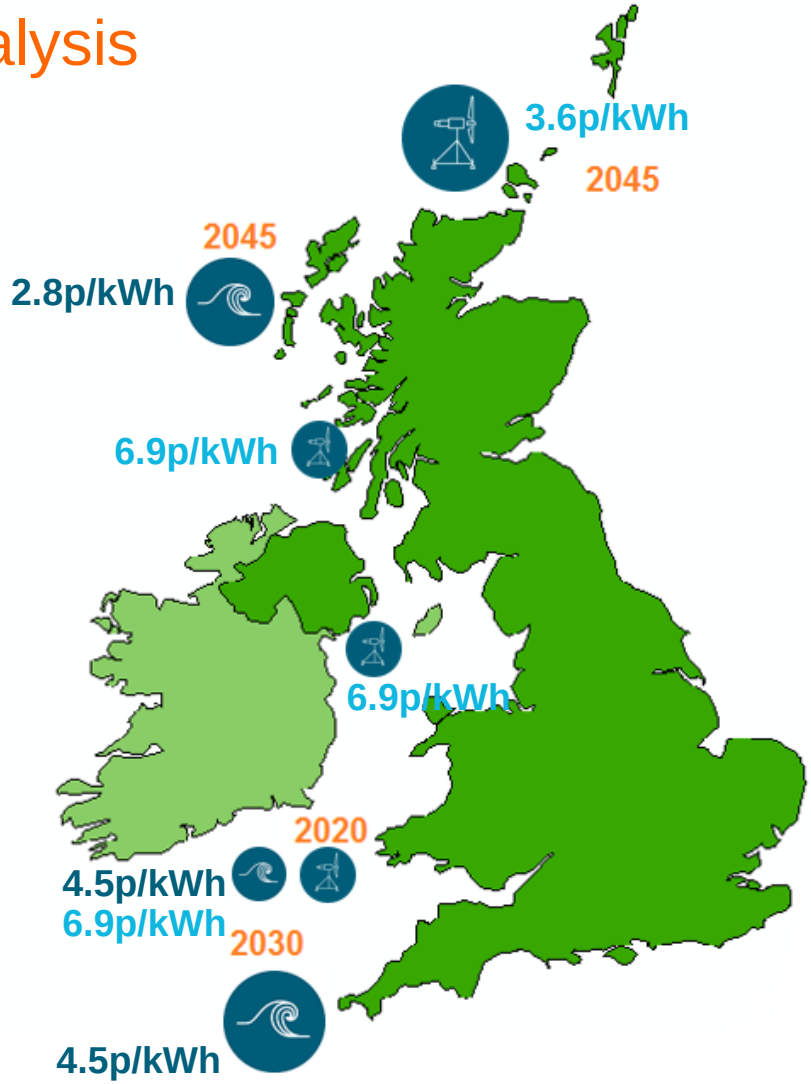
2.5 GW



Installed Capacity



Analysis



Additional competitive advantages

Complementary resource
- South West – high solar capacity
- Scotland – offshore wind

Public perceptions

Conclusions

Grid Scale by 2050:

	Wave	Tidal
LCOE (p/kWh)	< 4.5	< 7.0
CAPEX (£/kW)	< 1000	< 1500
Capacity Factor (%)	> 35	> 30
Earliest Deployment	2040-2045	2020-2025

In least cost optimisation: Significant reduction required

To be competitive needs additional advantages

Disclaimer
ESME timeline – to 2050
Focused on carbon targets

Thank you for listening

Any questions?

Stand F40
Anna.Stegman@eti.co.uk

Registered Office
Energy Technologies Institute
Holywell Building
Holywell Park
Loughborough
LE11 3UZ

For all general enquiries telephone the ETI on 01509 202020

For more information about the ETI visit www.eti.co.uk

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