

MRIA, February 2013

ESB Ocean Energy Projects

Opportunities in an All-Islands Market

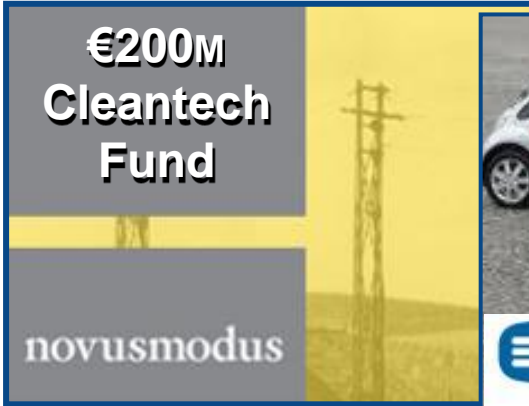


John Fitzgerald
ESB Ocean Energy



Developing new lines of business for ESB and Ireland

**€200M
Cleantech
Fund**



novusmodus



ESB ecars
Leading the charge

HALO
energy efficient living

YOUR CHANCE TO WIN!



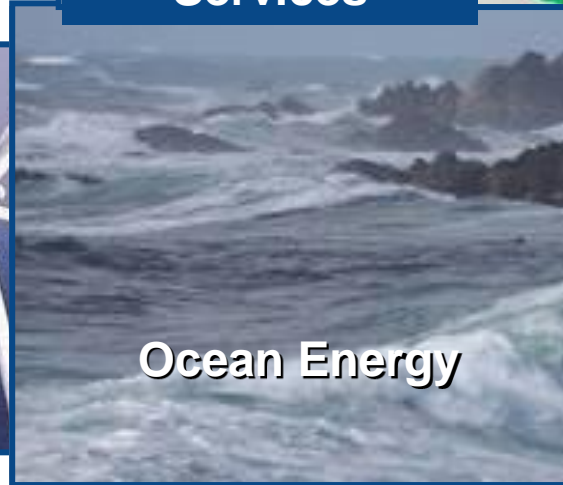
**Home Energy
Services**



Smart Metering



Wind Energy



Ocean Energy



Offshore Renewables in an All Islands Market



Current “Best New Entrant” Renewable:



Onshore Wind

- UK O/Wind Operational
2.6 GW Operational
~7GW planning / approved

Future Offshore Options:

- ▲ UK O/Wind Options to R3
~ 50 GW
- ▤ Wave Resource Regions
- ▤ Tidal Resource Regions

=> Wave and Tidal options must be at least as commercially attractive as future offshore wind options



Offshore Wind Reference Costs

£130 (€160) per MWh by 2020

Renewable UK “Forecasts of Future Costs and Benefits”, 2011

<i>Capital Costs:</i>	
CAPEX:	£3.2m (~€4.0m) /MW
<i>Operational Assumptions:</i>	
OPEX:	~ 2.5% of CAPEX / year
Capacity Factors	40%



ESB Cost & Performance Envelopes

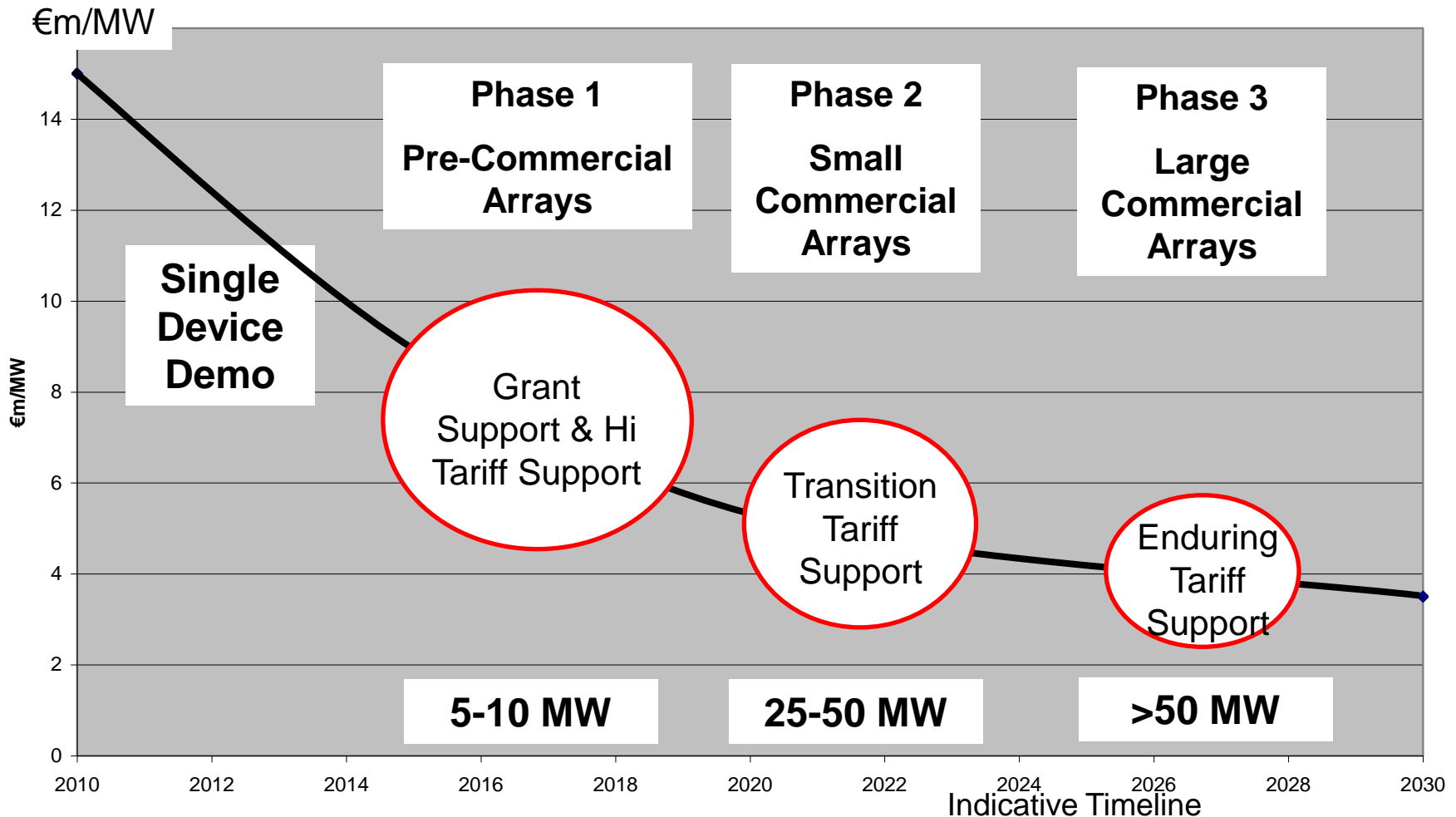
CAPEX €m /MW		Annual OPEX as % of CAPEX			
		1.0%	2.5%	4.0%	5.5%
Capacity Factor	10%	1.17	1.04	0.93	0.85
	20%	2.33	2.07	1.87	1.70
	30%	3.50	3.11	2.80	2.55
	40%	4.67	4.15	3.73	3.39
	50%	5.83	5.19	4.67	4.24
	60%	7.00	6.22	5.60	5.09
to yield 10% IRR for a 25 year project life where a €160.00 /MWh is payable					

Future Offshore Wind

=> Early Ocean Energy Projects will cost more.



Bridging the Gap (€/MW installed)

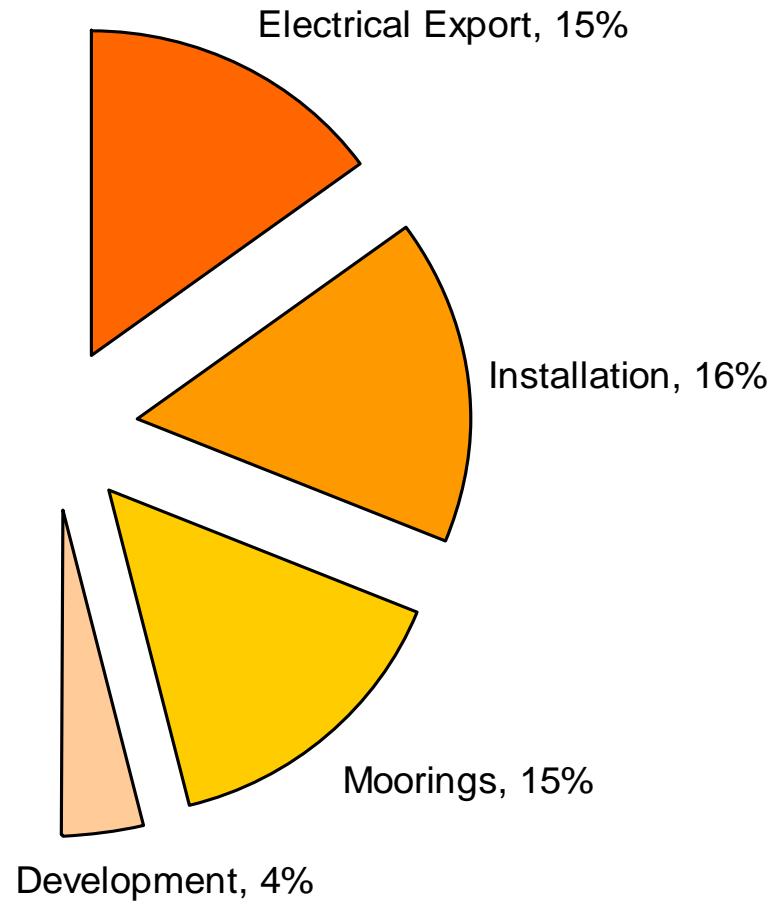


=> International Collaboration Required.



Wave Energy Project Cost Breakdown

Project Development and Balance of Plant Costs likely to track future offshore wind:



=> Can the converter be as cost effective also?



Can the cost gap be bridged?

Renewable Resource	Power Density (W / m ²)
Wind (input wind at 12m/s, the typical rated velocity of an offshore wind turbine)	1,100 W/m ²
Tidal (input water current at 2.4m/s, the typical rated velocity of a tidal turbine)	7,000 W/m ²
Wave (input seastate H _s =6m, T _z =8s, the typical rated sea state for wave energy converters)	9,400 W/m ² (average in upper 10m of sea)

Yes, marine renewables can compete, with:

- ⇒ the right conversion technology
- ⇒ Bankable reliability and performance (TRL9)
- ⇒ A bridging market to economies of scale

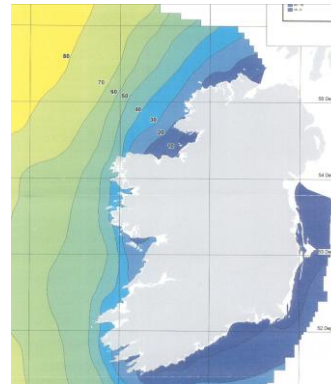


Ireland's Opportunity

1. **Long Term:** RES & Marine Services in an All Islands Market
2. **Medium Term:** Technology and Supply Chain Development

Ireland has advantages in the medium term:

- Grid Access for Pre-Commercial Phase 1&2 projects
- World-leading Ocean Energy Resource.
- Irish Supply Chain and R&D capabilities internationally recognised.
- Possibility to leverage significant EU R&D funding
- International collaboration / investment in services & technology.



NER 300

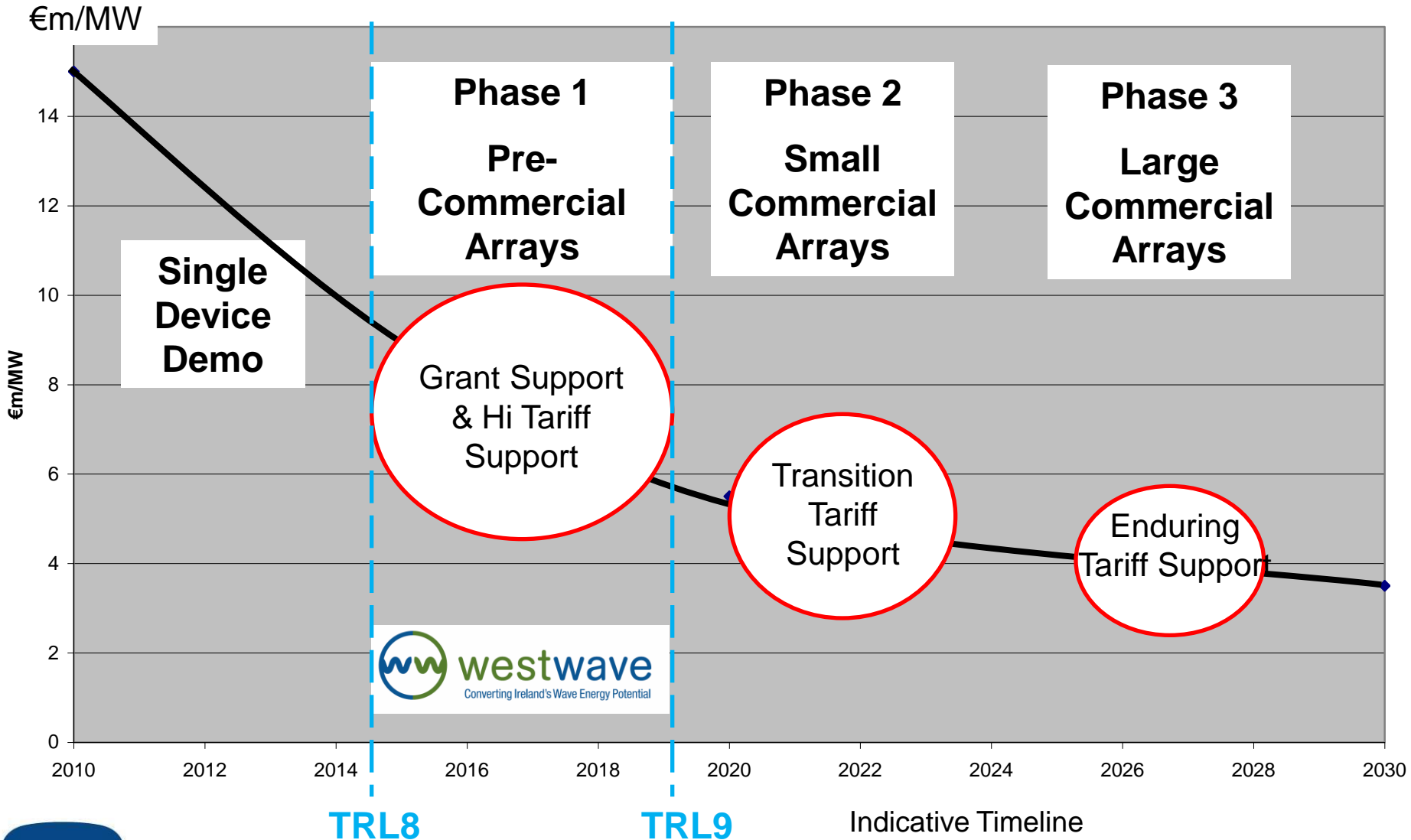
Irish Maritime and Energy Resource Cluster
imerc



SMARTOCEAN
IRELAND



WestWave Project – Phase 1



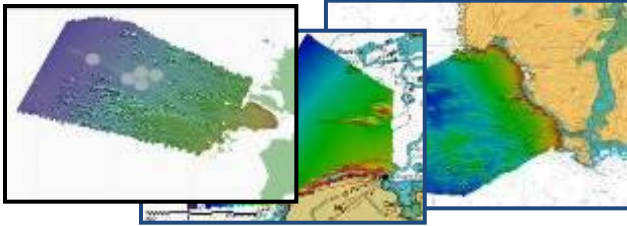
WestWave Project

- Opportunity for first wave energy project in Ireland: 5 MW
- Up to €19.8m Funding awarded under EU NER300 Wave category
- Project consortium includes four of the leading technologies
- Project supported by industry via a number of Associate Partners
- Opportunity to develop the Supply Chain for Ocean Energy in Ireland



www.WestWave.ie (images courtesy of Aquamarine Power, Wavebob, Ocean Energy, Pelamis Wave Power)

WestWave Progress



Seabed Surveys Complete



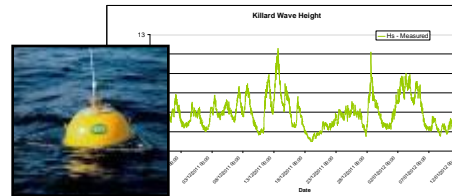
Technology Procurement
– early steps taken



Environmental Scoping Reports
Published



Grid Offers in
place



Wave Measurements
underway

Summary

- Ocean Energy is a credible future RES option for the All Islands Market but costs must be in line with Offshore Wind.
- A trajectory to acceptable cost and performance requires :
 - International Collaboration
 - A transition support regime
- Ireland can play a significant role in services and technology development for the sector and derive significant economic benefit.
- WestWave is now well positioned for Ireland to capitalise on these opportunities.

