AQUAMARINE POWER

MAKING MARINE RENEWABLE ENERGY MAINSTREAM


Aquamarine Power is a technology company that has developed a product called Oyster which produces electricity from ocean wave energy.

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WHO IS AQUAMARINE POWER?

- Marine energy company
- Established 2005
- Head office in Edinburgh
- Resources in Belfast and Orkney
- 55+ staff
- Technology developer and site developer
- Oyster hydro-electric wave energy converter

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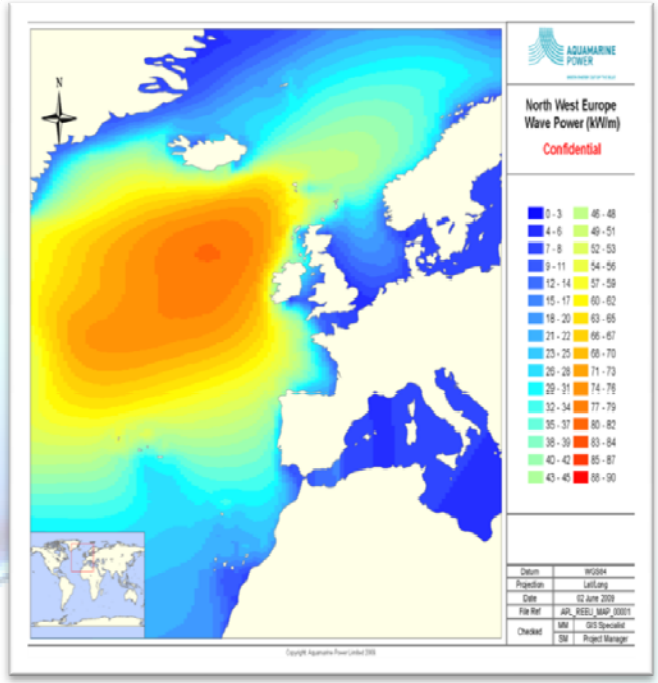
WHY MARINE ENERGY?

- Vast resource - wave power alone could produce up to 80,000TWh/year (five times global electricity consumption)
- Less intermittent, more predictable than wind
- More widely available than tidal



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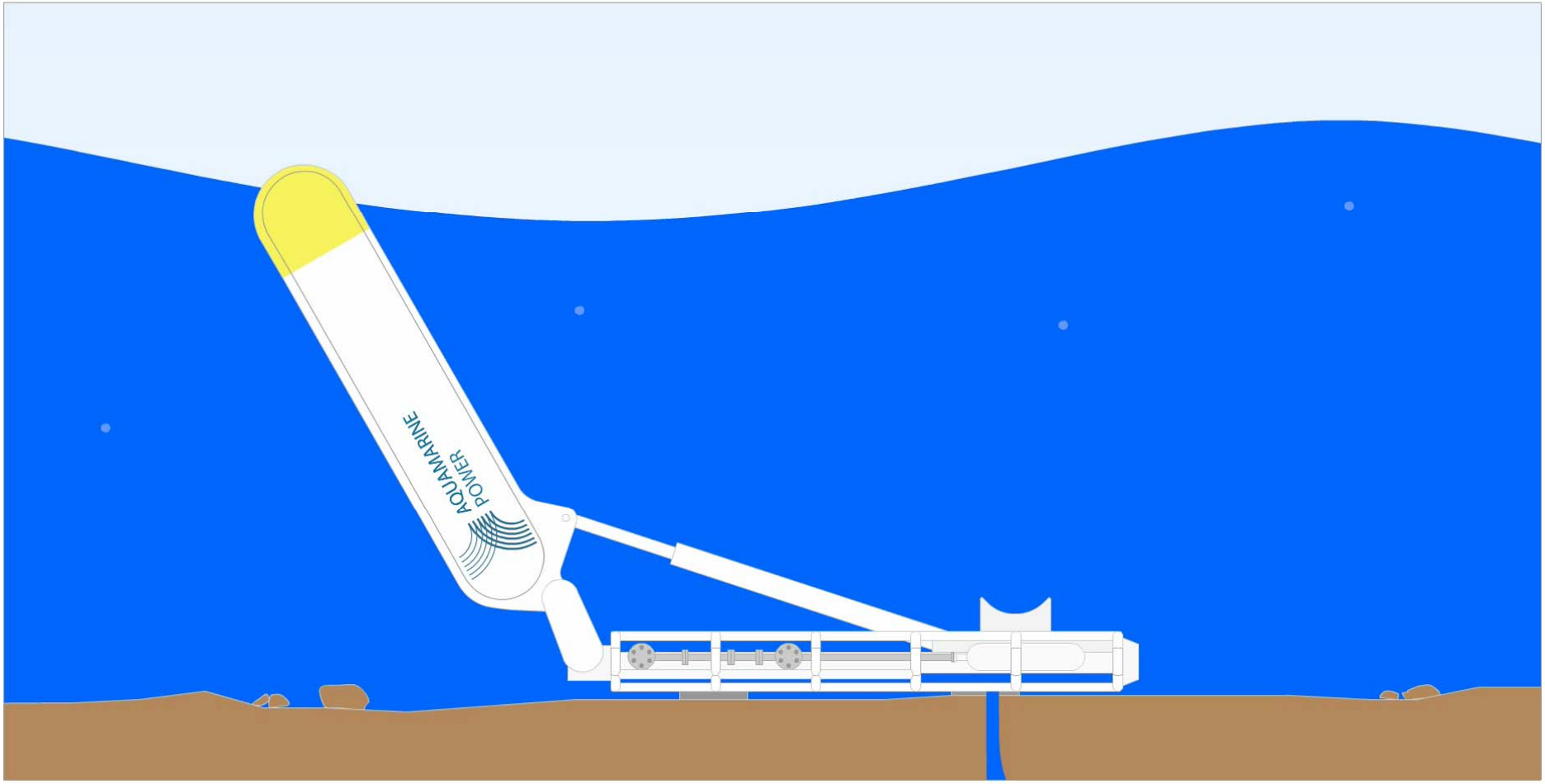
DESIGNED SIMPLICITY

Oyster®



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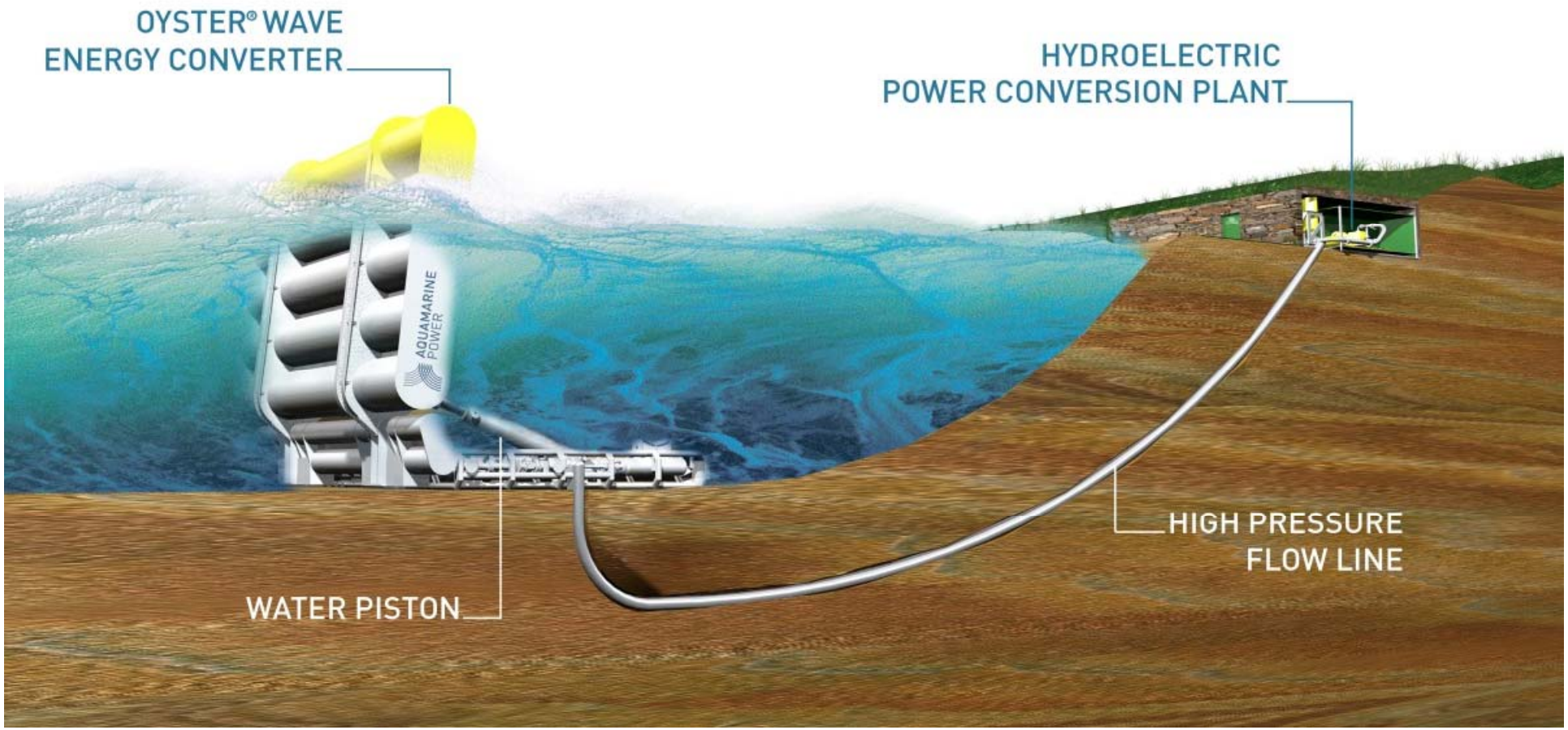
OYSTER TECHNOLOGY



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OYSTER
KEY BENEFITS

- **Accessible** – generation equipment is onshore – accessible 24/7
- **Reliable** – conventional hydro-electric power station – proven, reliable
- **Survivability** – no "survival mode", naturally ducks under extreme waves and keeps generating
- **High capture factor** – uniform wave direction, amplified surge forces
- **Economies of scale** – one generator, multiple flaps & low cost fabrication
- **Low weight to power ratio** - compared to alternatives, including offshore wind

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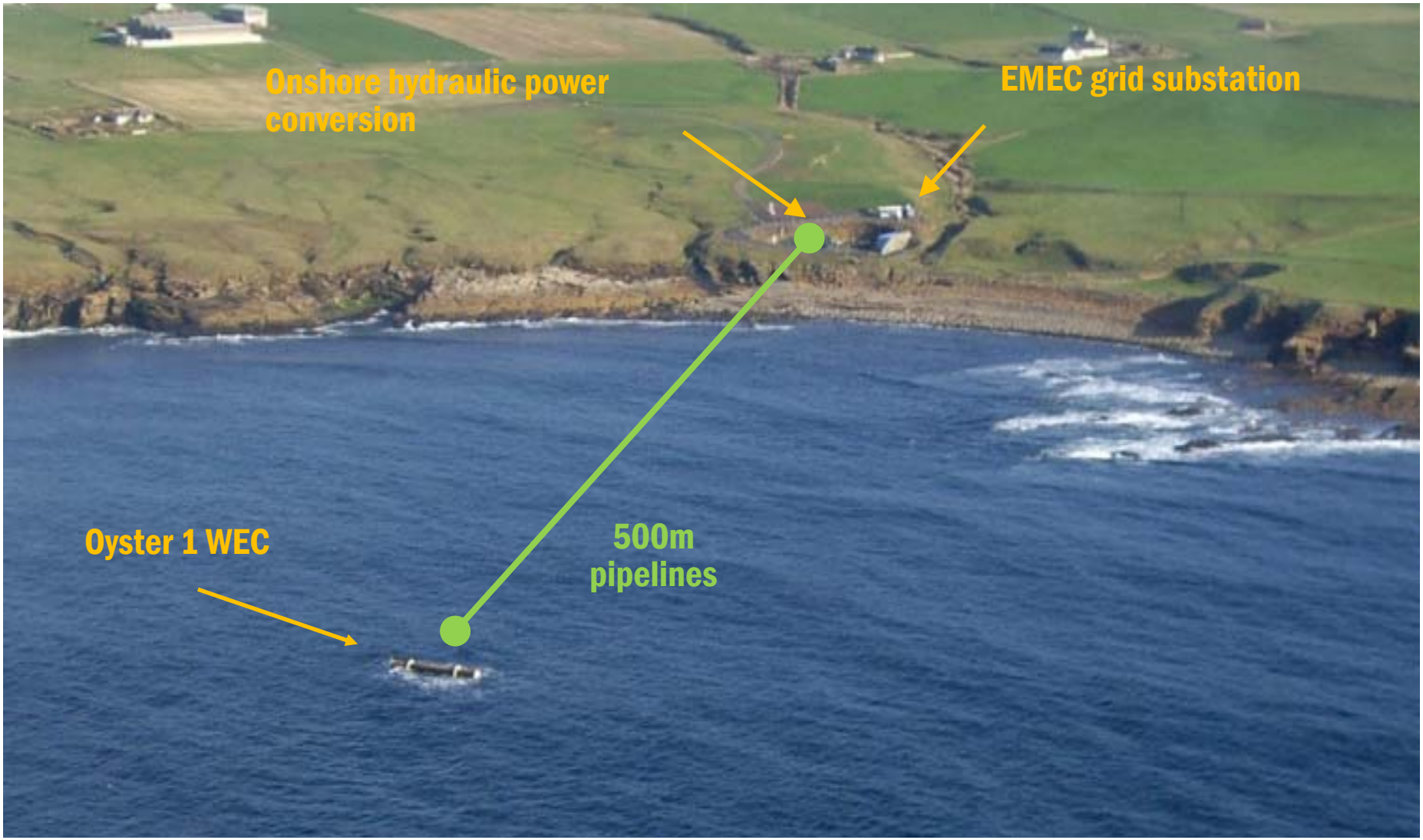
OYSTER 1 TEST BERTH AT EMEC



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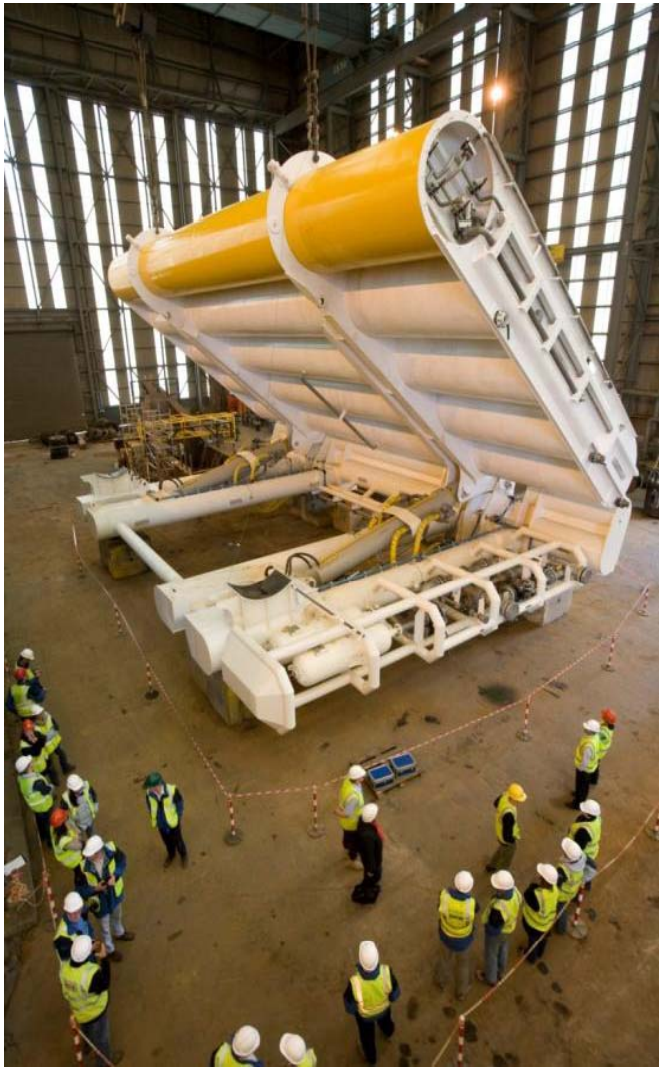
OYSTER: FABRICATION 2008



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MILESTONE DELIVERY 2005-10

- Grid connected Oyster 1
- Oyster 1 operated through Winter 09/10, 4000 Operating Hours
- £34m raised –grants and private funding
- 1 GW development agreement with SSE Renewables – UK and IRL
- First 200MW site secured from The Crown Estate in Orkney
- Aquamarine Power USA LLC incorporated Feb 2010
- Site Development Capacity

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MILESTONE DELIVERY 2010-15

- Oyster 1 –(315kW) demonstrator grid-connected at EMEC – >4000 Operating Hours to date
- Oyster 2 (800kW) –2.4MW demonstrator -on schedule for 2011-12
- Oyster 3 (1MW)–10MW development on track–commissioning 2013 -14…targeting USA, UK & IRL
- Oyster 4 (1MW)–Scaling up to first 20MW deployments from 2015
- Saltire Round – Just announced by the Scottish Government

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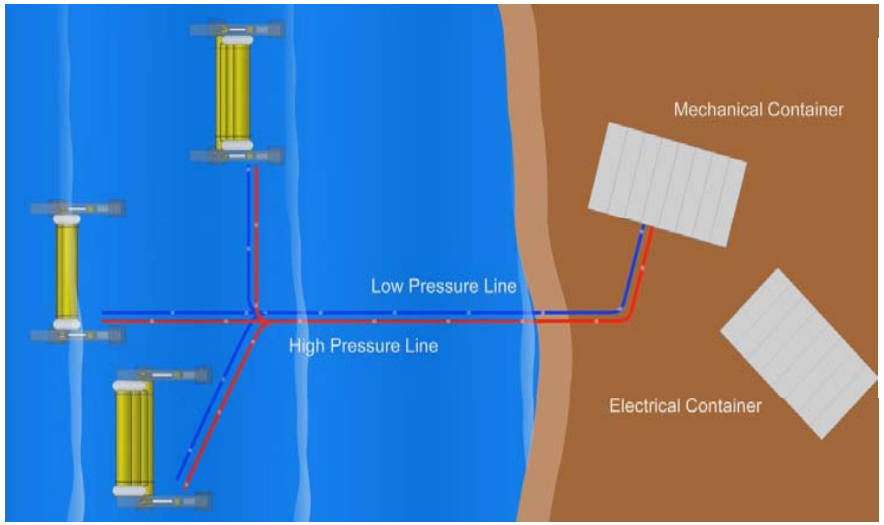
OYSTER EVOLUTION



Oyster 1
1 device
315kW
18m wide flap, 1m freeboard
1 set of pipelines to shore
Onshore site at EMEC

Oyster 2
3 inter-linked devices
2.4 MW
26m wide flap, 3m freeboard
1 set of pipelines to shore
New onshore site

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ENVIRONMENTAL CONSIDERATIONS

- **Coastal Processes** – Understand 1 device well, modelling work in progress to understand the impact of an array
- **Visual Impact** - Dependant on receptor
- **Recreational - Surfing Wave** – Aquamarine believe this to be minimal, however can only be understood through practical deployment of an array.
- **Birds** – Insignificant, too much regulation based on offshore wind farms.

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ENVIRONMENTAL CONSIDERATIONS

- **Marine Mammals** – Minimal Impact
- **Migratory Salmon** – No impact
- **Benthos** - Possible habitat creation, provision of shelter
- **Noise** – Operational low, comparatively low during construction
- **Socio-Economic Activity** – Direct beneficial impact to local communities from development. However potential interference with creel fisheries.

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CURRENT AND FUTURE CONSIDERATIONS

- **Consenting Regime** - consenting process needs to be clearly articulated and allow for product innovation – needs to keep up, its currently the No.1 risk to investment and long term future.
- **Understanding Env Impact** – Deploy and monitor essential but needs ability to scale up (not incremental) – can't go to 10MW even if 2.5 MW is demonstrated
- **Regulatory Clarity** – Too much focus on birds as a legacy of wind

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CURRENT AND FUTURE CONSIDERATIONS

- **Avoid Generic Regulatory approach** – all technologies are different with varying impacts and mitigation needs – different challenges in different markets.
- **Onus on Developers to Educate** – both regulators and stakeholders (just part of development costs)
- **Building an Industry**– Aquamarine Power Report on Lessons learned from Danish Wind Industry; available from www.aquamarinepower.com


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POWER
MAKING MARINE RENEWABLE ENERGY MAINSTREAM
inspire
Innovation
We value and reward innovation.
When people tell us it cannot be
done we ask why not!
INTEGRITY NURTURE SAFETY PARTNERSHIP INNOVATION RESPECT ENTHUSIASM

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SENIOR DEVELOPER

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