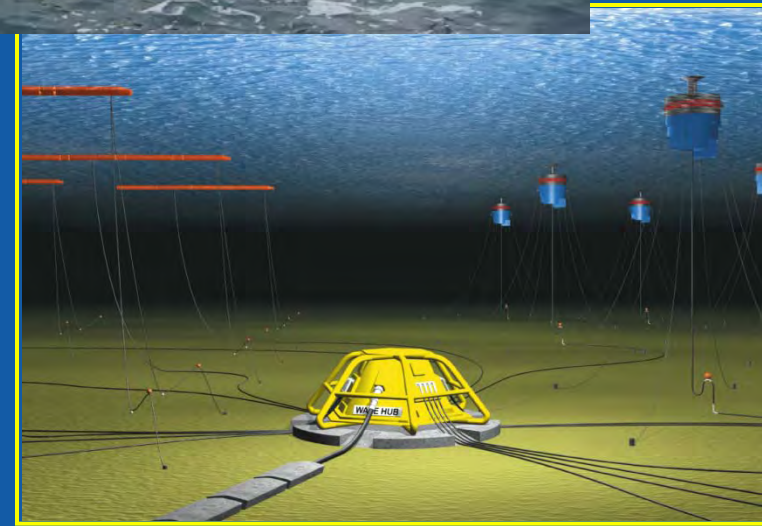


The Ocean Energy Program at Vattenfall

Galway

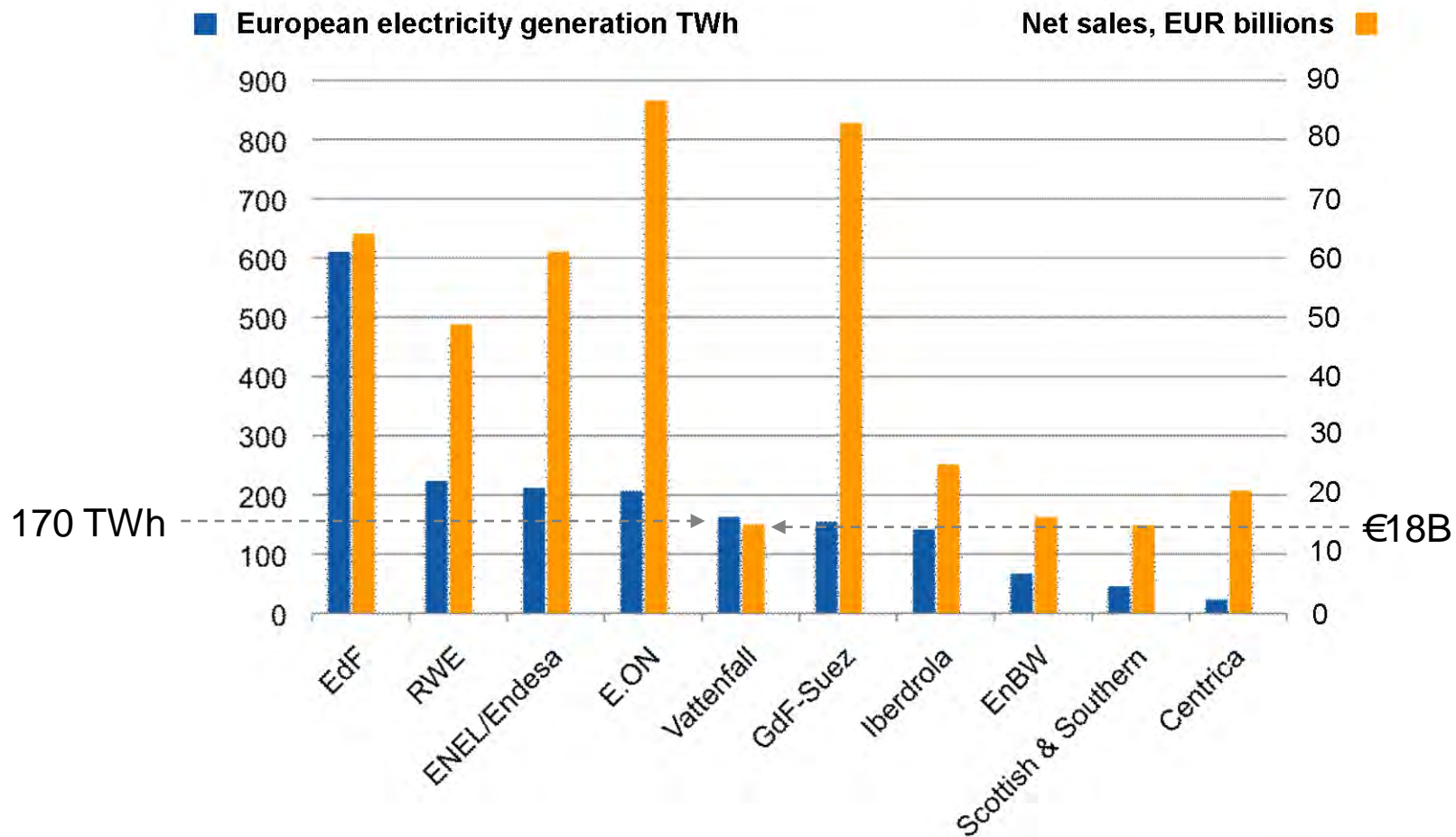
March, 2010

Ulf Tisell

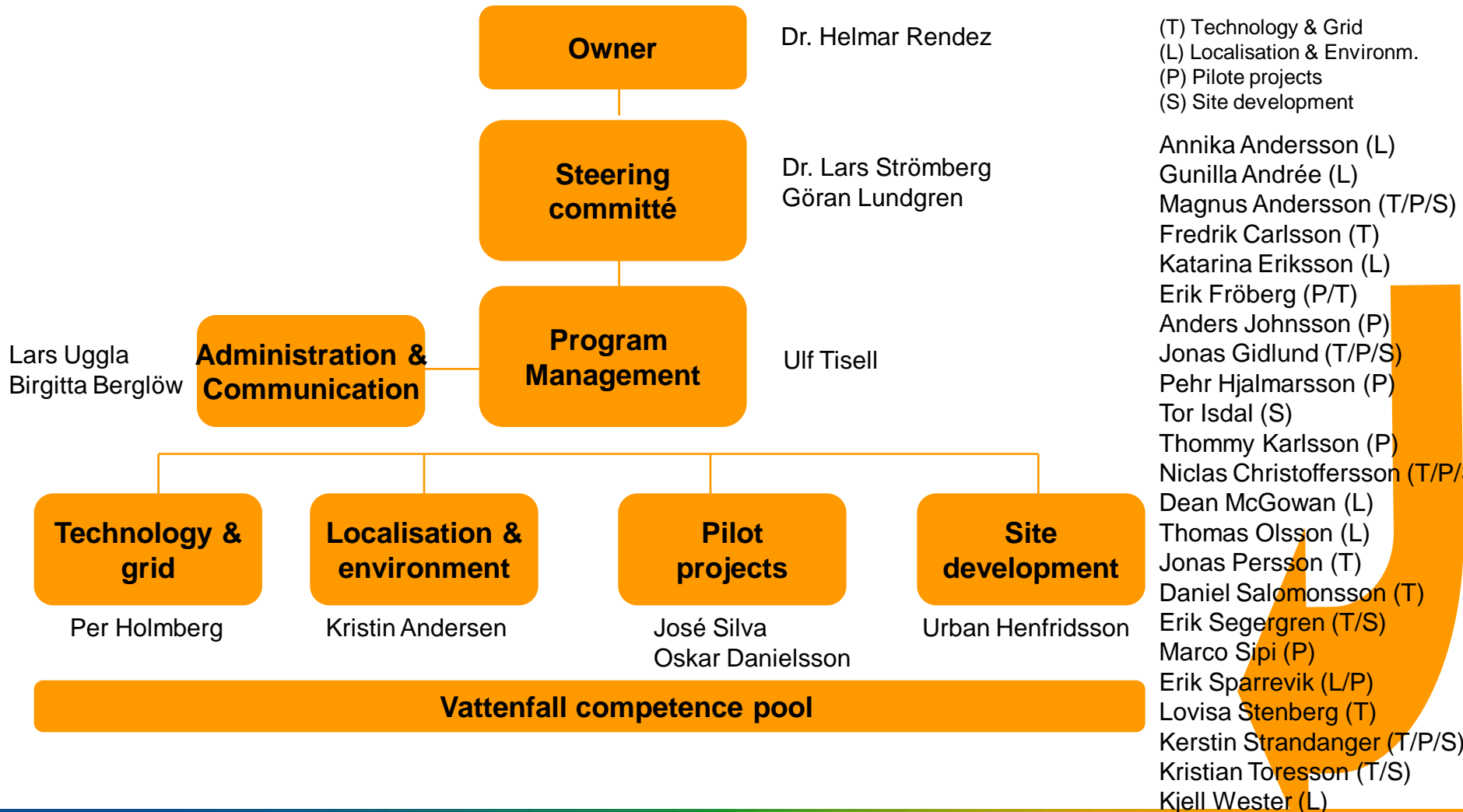


Pelamis

Europe's main electricity companies



The Ocean Energy Program - organization



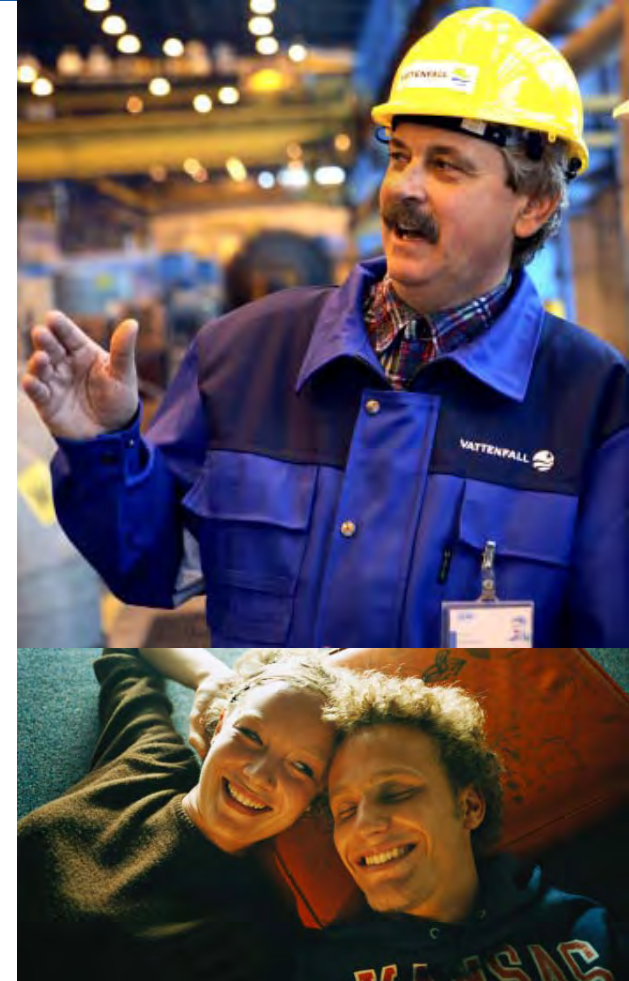
Let's take a look around the corner!

Vattenfall wants to grow and intends to be climate neutral in 2050, making electricity clean

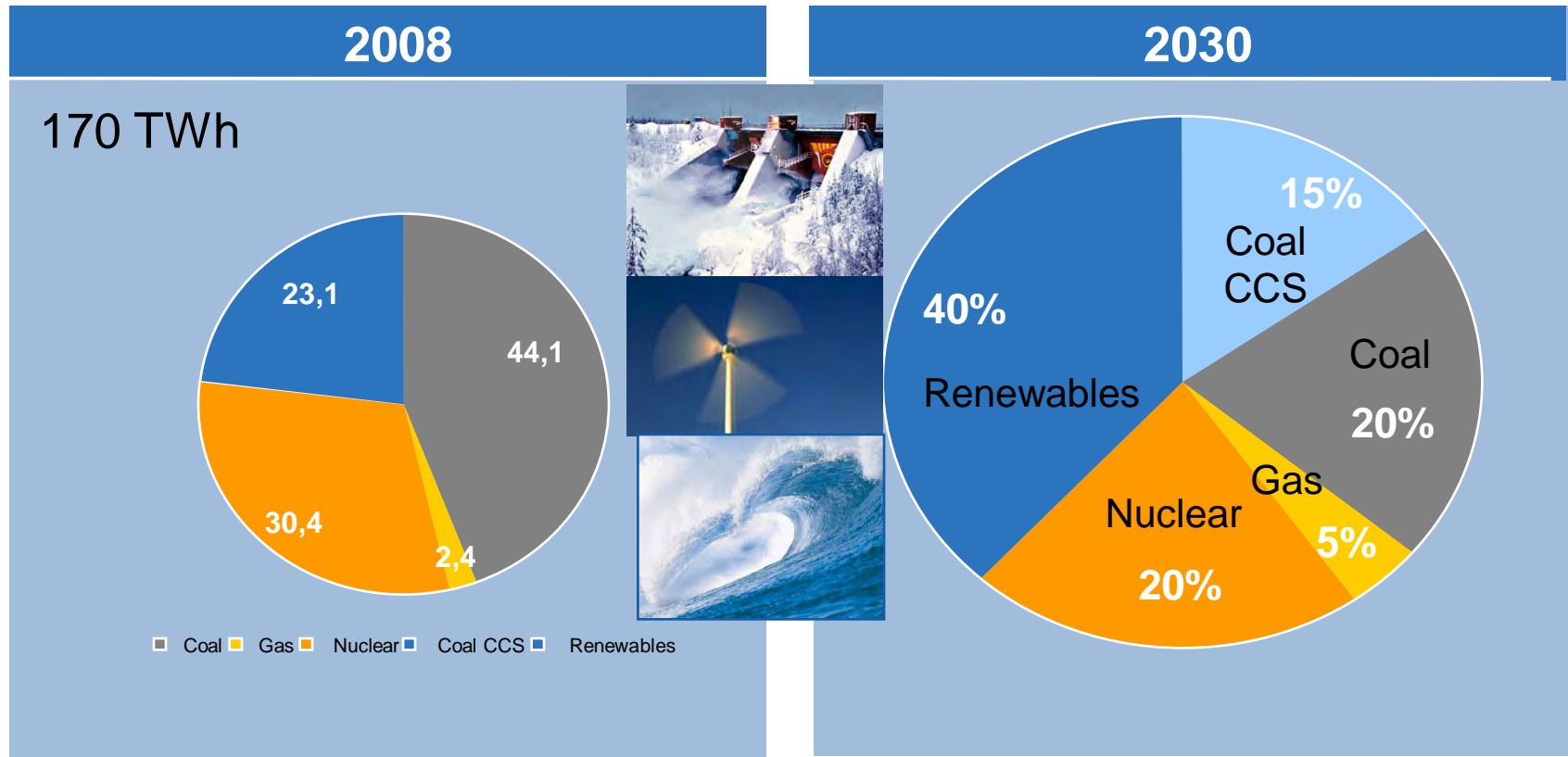
Renewables like Wind Power and Ocean Energy are attractive ingredients as well as CCS-technology

Important ingredients are also

- Nuclear power where it is accepted
- Efficient and smart energy consumption
- Smart grids that can handle renewable generation



Vattenfall Ocean Energy program: Focus on expanding renewables



What is Ocean Energy to Vattenfall ?

Wave



Tidal



Osmos



POTENTIAL

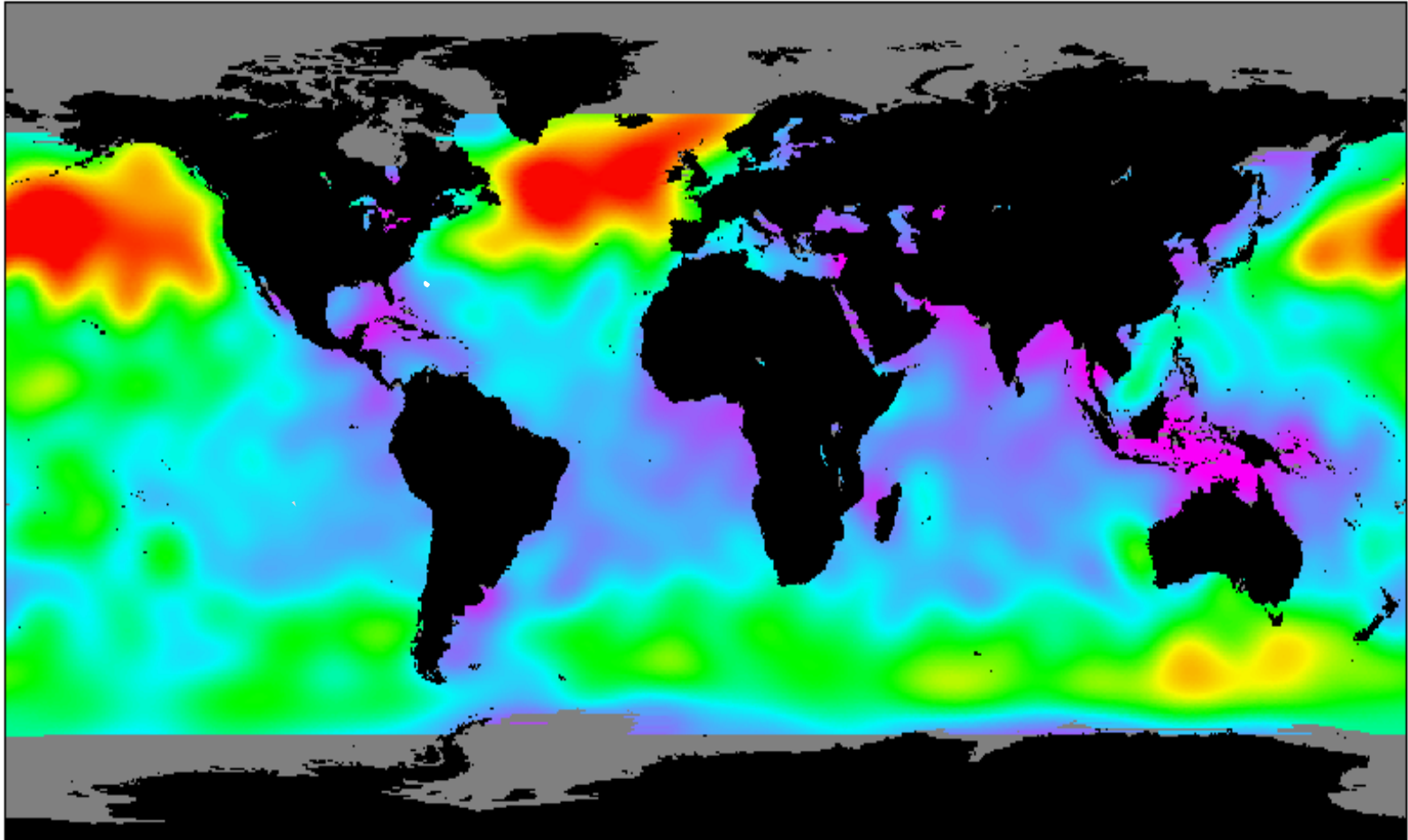
Total
~ 6 000 –15 000 TWh/y
Europa ~ 2 000 TWh/y

Total ~1 000 TWh/y
Europa ~ 100 TWh/y

Total ~ 1 600 TWh/y
Europa ~ 200 TWh/y

Sources: World Energy Council, Statkraft

Wave Intensity in January



The Ocean Energy Output

Output = Survive (no/yes) * Efficiency (wave to grid) * Reliability

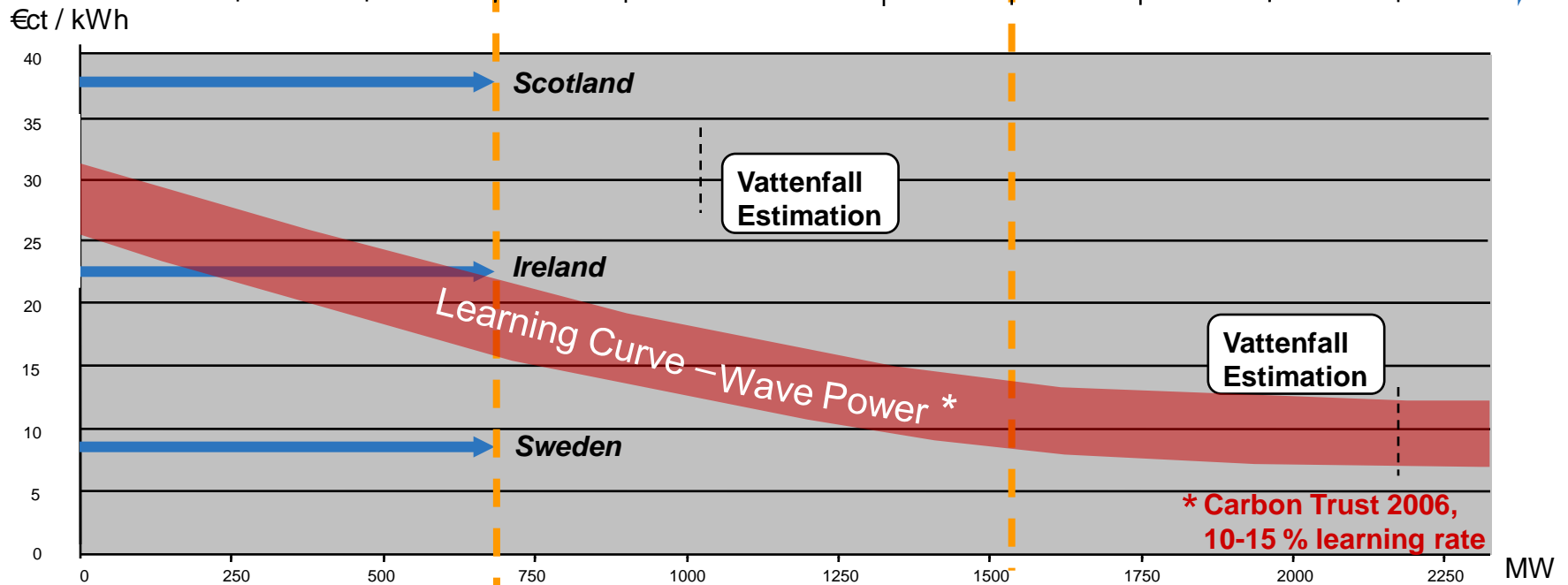
The Ocean Energy markets / Attraction

Markets	Energy intensity kW/m wave	Incentives €/kWh	"Attractiveness"
UK (Scotland)	50	0,4	20
Ireland	70	0,2	14
Norway	40	0,05 – 0,1	4
Denmark	15	0,1	2
Germany	10	0,1	1
Netherlands	10	0,1	1
Sweden (Bohus)	5	0,1	1

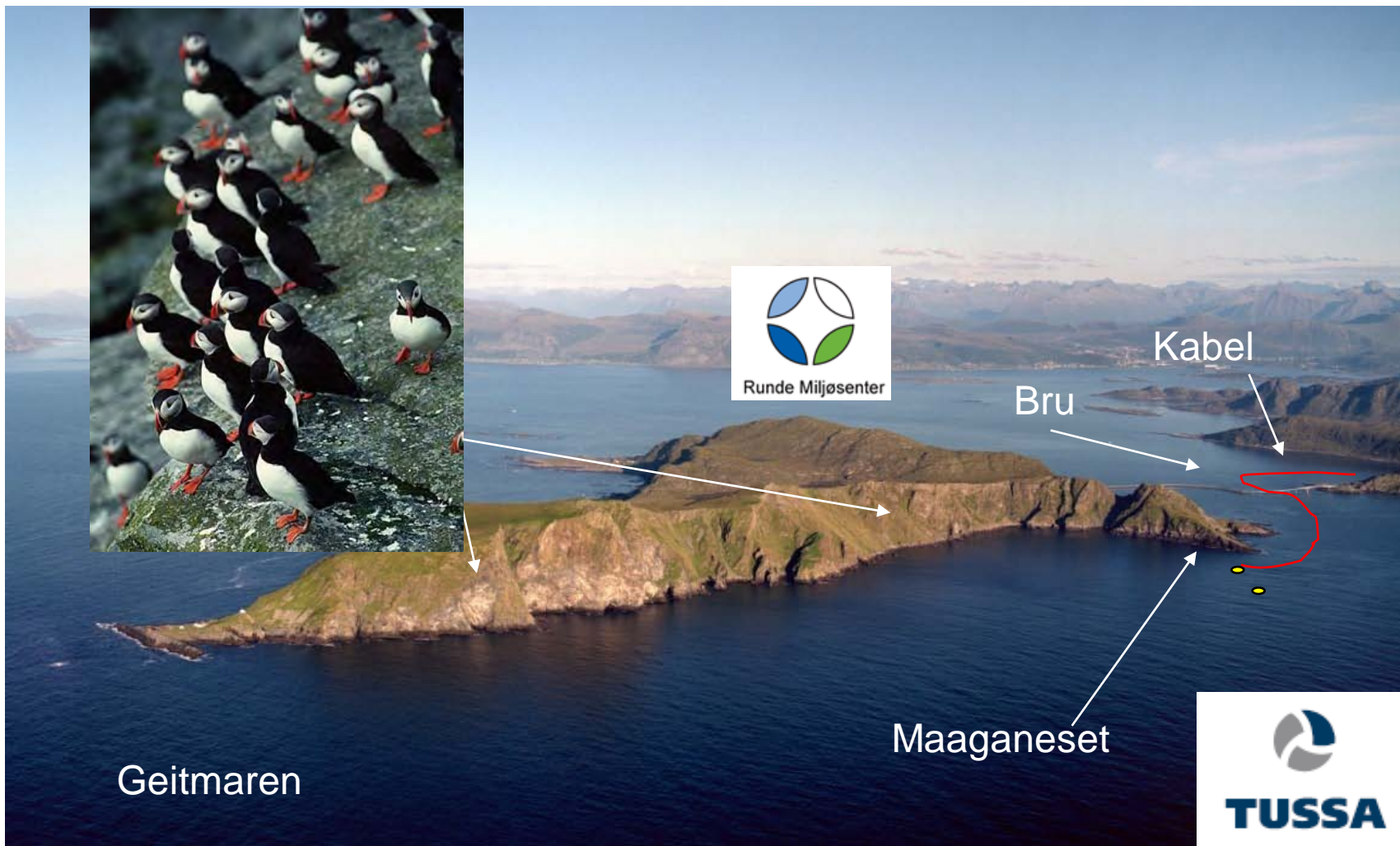
OEP - North Atlantic Ocean



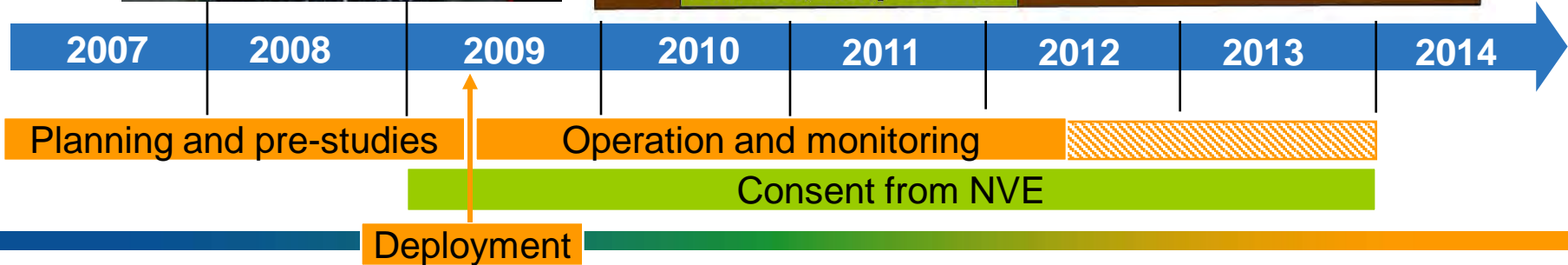
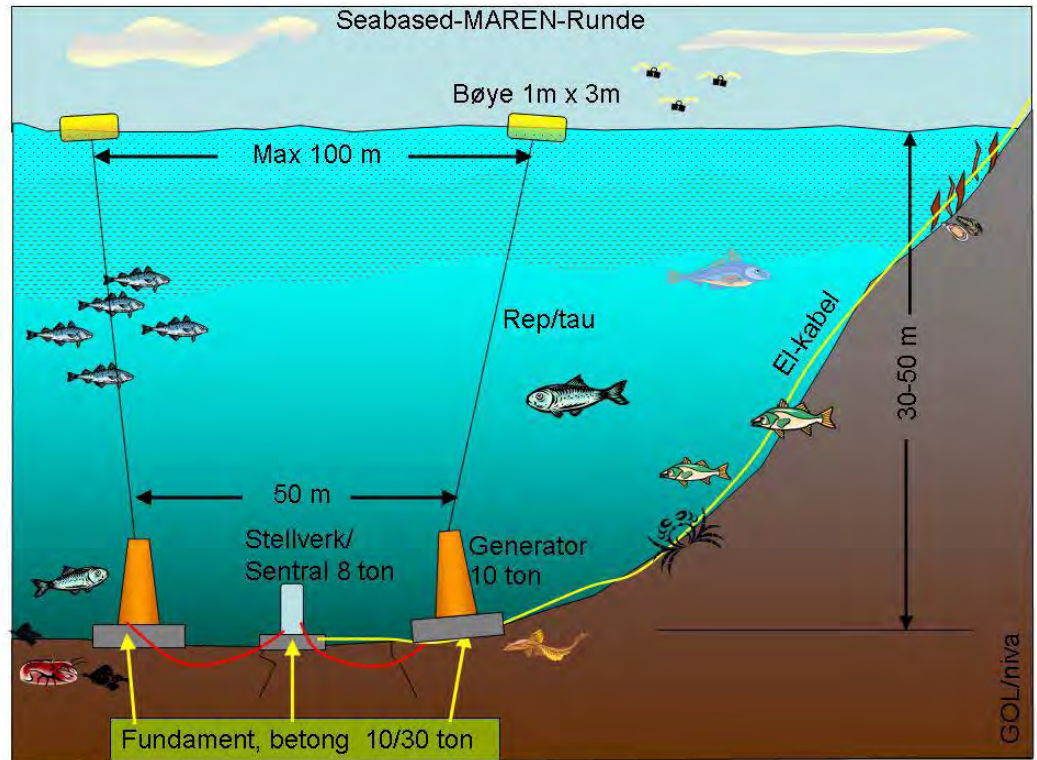
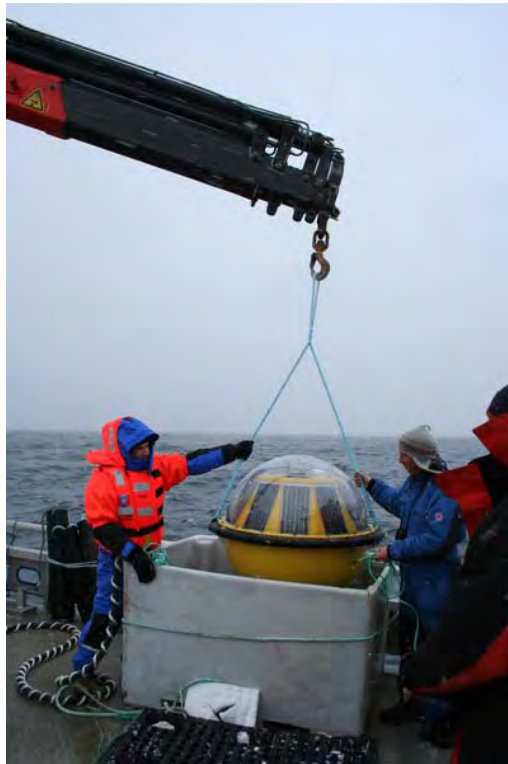
Learning Curve



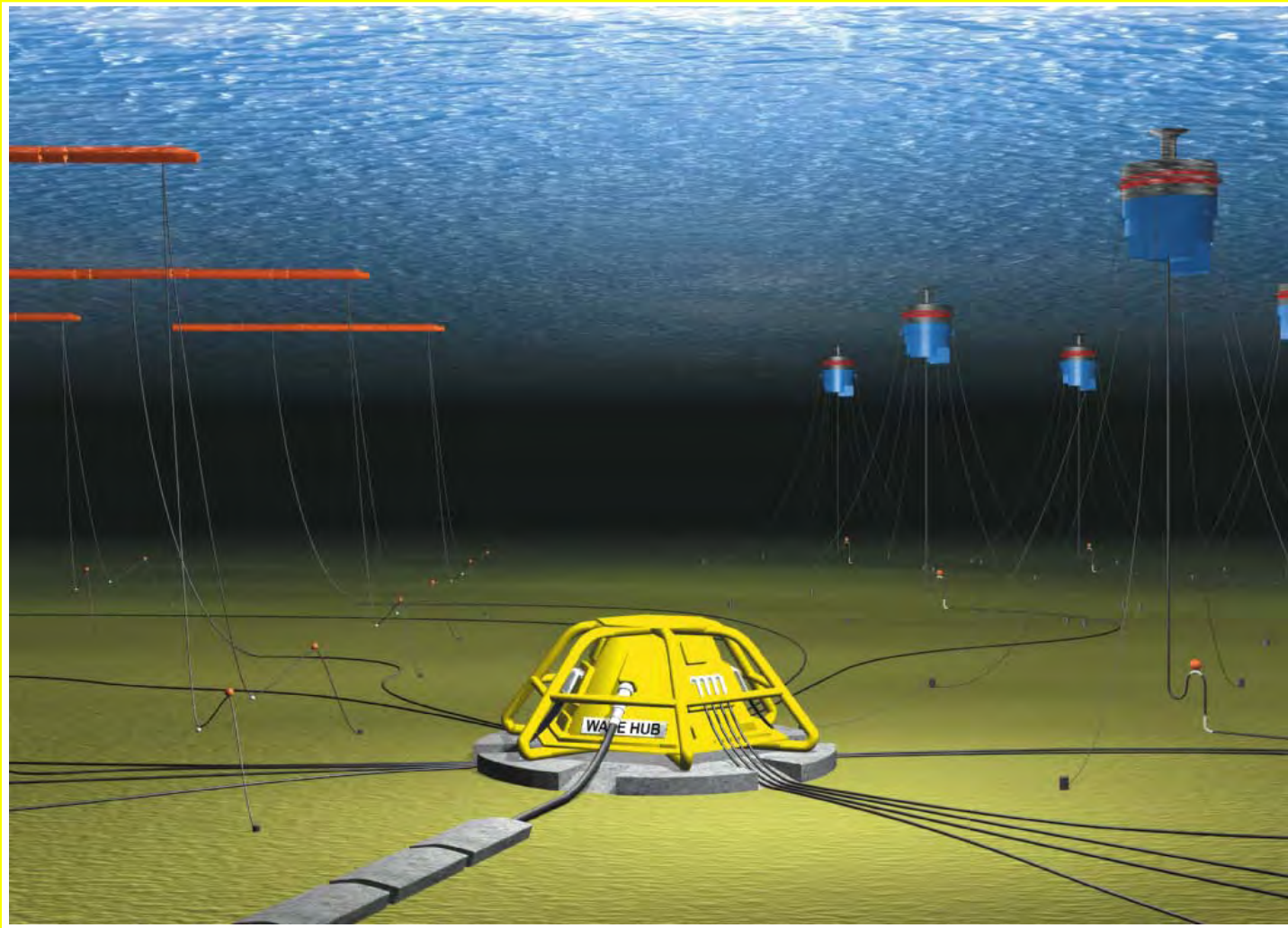
The location of the test site



The Maren project



Sub marine collective grid



Conflict of interests

- Fisheries
- Recreation
- Shipping
- Infrastructures (like cables)
- Military activities
- Protected environmental areas
- Public concern and opinion
- Seascape
- Archaeology and heritage



Environmental impacts

- The scenic view
- Oil
- Conditions on the bottom of the Sea
- The mooring and anchoring system
- Noise
- EMF



Do You Believe This ?

Imagine 2015.

Is the war against climate change ongoing, or won?

Do governments etc still have ambitions for ocean energy?

Then You Probably Have To Believe This.

Utilities like Vattenfall will develop wave farms of utility scale.

- Vattenfall, on its own, have ambitions for some 30 TWh for 2030+.
- Harvesting 30 TWh means an investment of some 15 to 20 b€, and an annually O&M cost of 0,5 b€.
- The 0,5 b€ will probably be split equal between
 - Boats / seamen
 - Workshop / mechanics
 - Workshop / electricians
- Probably half in Ireland
- HELP

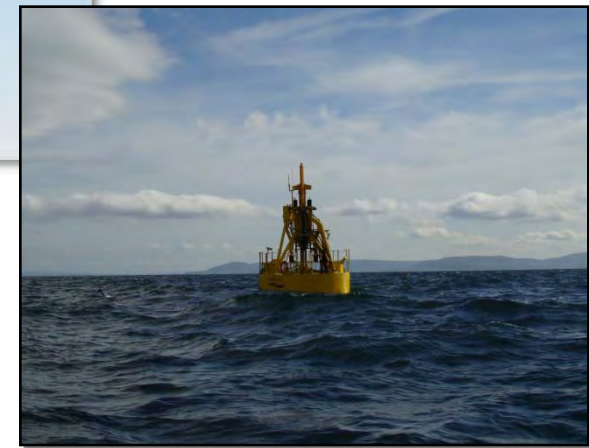
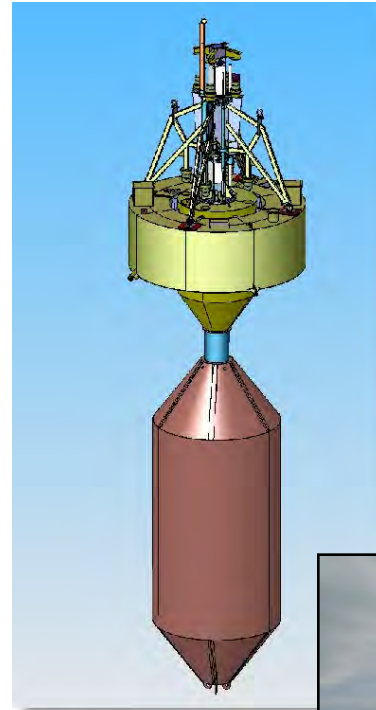
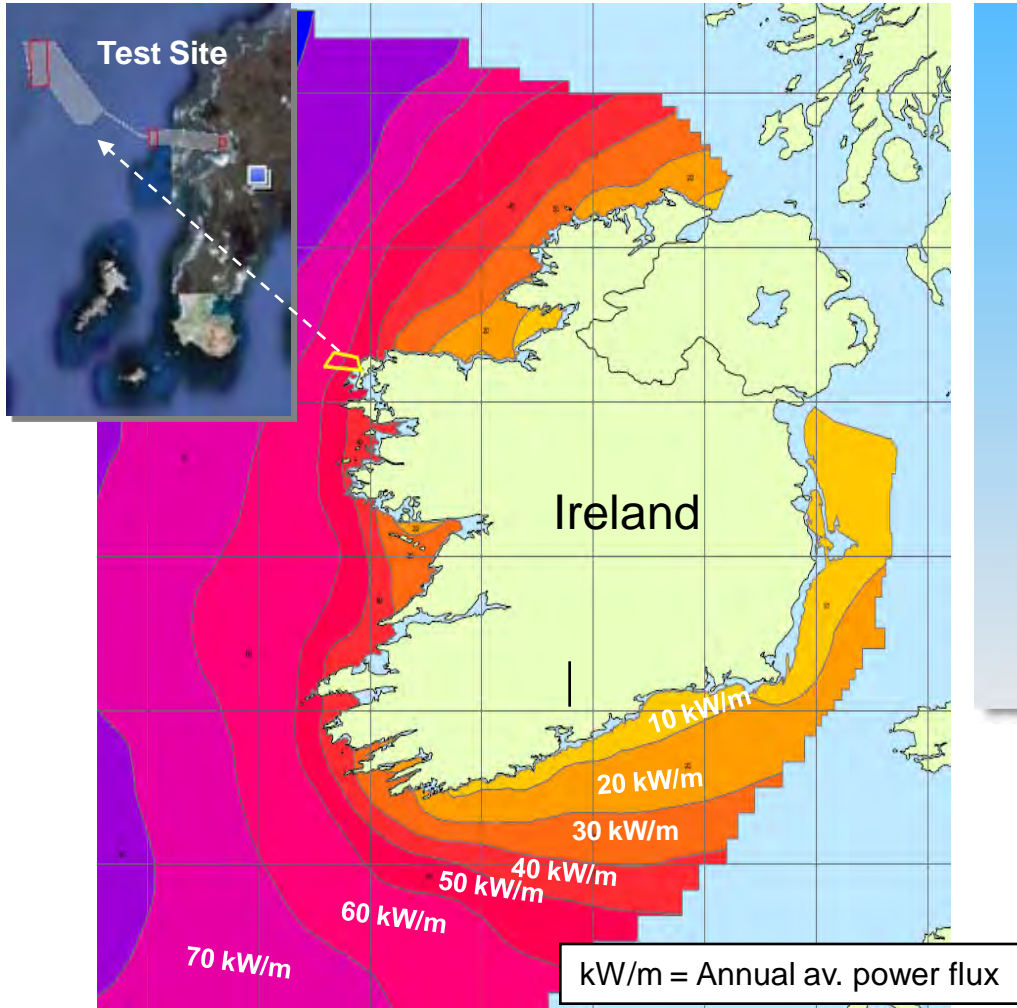
HELP!

- Provide consistent & enduring rules
- Support the developers to become commercial.
- Investigate the environment
- Allocate wave farms to suitable areas
- Develop the electrical grid (even for export)

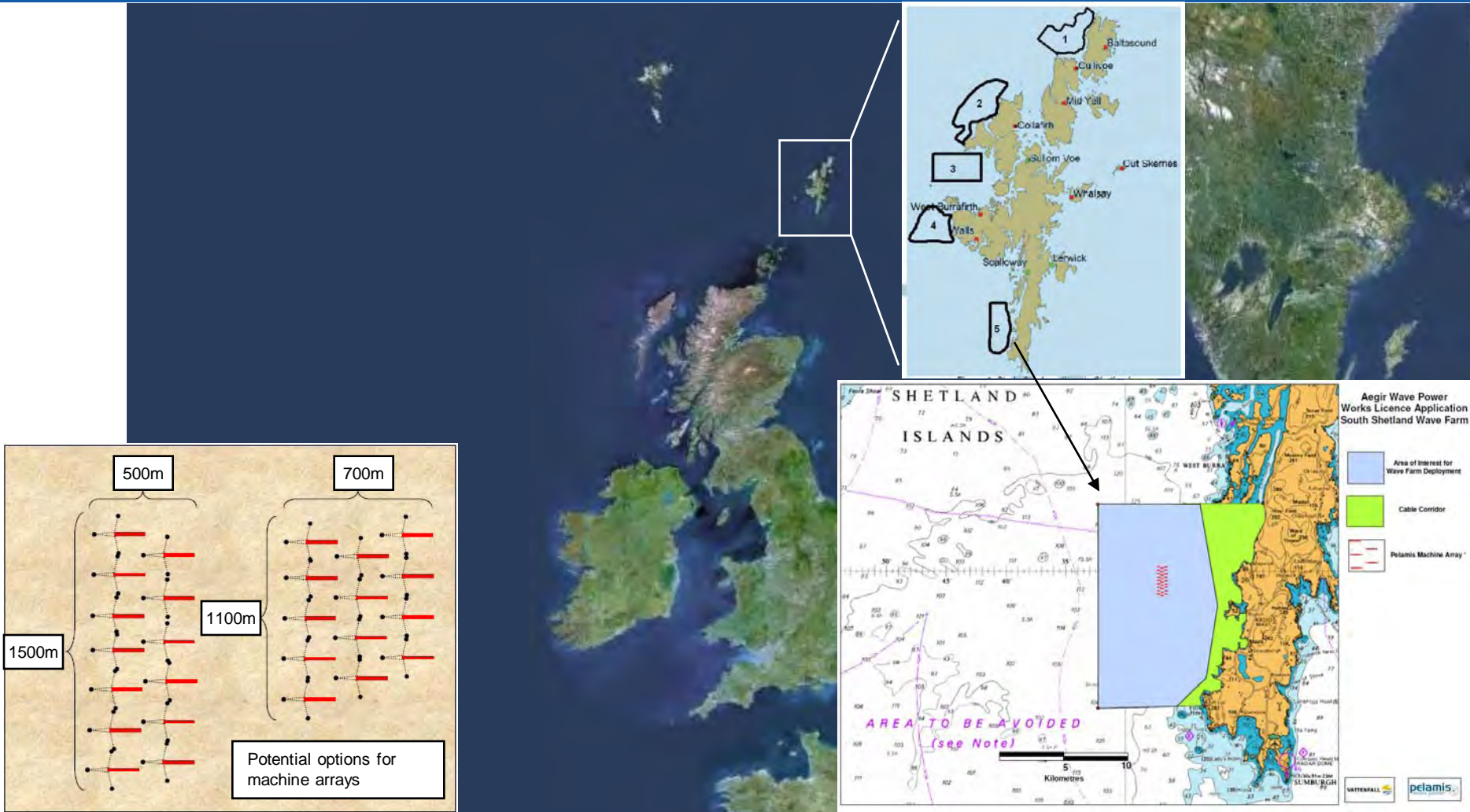
This is what we do

- Penetrate markets & contractors
- Co-operations with Authorities & Universities & Marine Institutes
- Co-operations with companies in Sweden, Ireland & Scotland
- Founded a company, Tonn, on Ireland with with the purpose to establish sites.
- Founded a company, Aegir, in Scotland to establish sites.
- Tonn & Aegir are mini-utilities

Tonn Energy



Aegir – 10,5 MW demonstration



Thanks for your attention !

Contact

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www.vattenfall.com