

PARIS AGREEMENT

1.5°C

“All ships designed and built today must operate in a net zero emissions world at the end of their service life”



Challenges Facing Shipping

A large iceberg floats in a calm sea under a sunset sky. The visible tip of the iceberg is small and jagged, while the vast, submerged portion is much larger and smoother, illustrating the concept of hidden challenges.

Regulation & Compliance Costs (SOx, EEDI, SEEMP etc.)

Future Regulatory Framework? (GHG, NOx, Noise)

Regional Legislation (EU, US)

Volatility in Fuel Prices & Energy Security

Split Incentives for Efficiency Investments

Next Generation Fuels ?

Technology Selection

Over Capacity

Future Trade Patterns & Prediction

Crewing & Training

And so on.....

A large iceberg floats in a calm sea under a sunset sky. The visible tip of the iceberg is small and jagged, while the submerged portion is much larger and smoother. The text 'Uncertainty', 'Transition', and 'Volatility' is overlaid on the image, with 'Uncertainty' positioned above the water line and the other two below it.

Uncertainty

Transition

Volatility

Wind Propulsion Systems can.....

- ...be retrofitted to existing vessels or incorporated into new build design.
- ...reduce dependency on fossil fuels and deliver increased energy security.
- ...deliver 10-30% fuel savings as retrofit and around 50% for new builds.
- ...help make vessels compliant with existing regulation and prepare for future scenarios.
- ...increasingly be viewed as a credible, viable and cost-effective alternative.

Wind Propulsion Technology Options?



Technology Toolbox



Stage of Development?

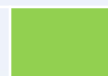
Technology	Ship Size	2008	2014	2016	2018
Rotors	<10,000t	Concept	Test & Trial	Commercial	Commercial
	>10,000t	Test & Trial	Commercial	Commercial	Commercial
Hard Sail	<10,000t	Test & Trial	Commercial	Commercial	Commercial
	>10,000t	Concept	Concept	Test & Trial	Commercial
Soft Sail	<10,000t	Commercial	Commercial	Commercial	Commercial
	>10,000t	Concept	Concept	Test & Trial	Commercial
Kite	<10,000t	Commercial	Commercial	Commercial	Commercial
	>10,000t	Commercial	Commercial	Commercial	Commercial
Suction Wing	<10,000t	Test & Trial	Test & Trial	Test & Trial	Commercial
	>10,000t	Concept	Concept	Concept	Test & Trial
Turbine		Concept	Concept	Test & Trial	Test & Trial
Hull Form		Concept	Concept	Concept	Test & Trial



Concept



R&D

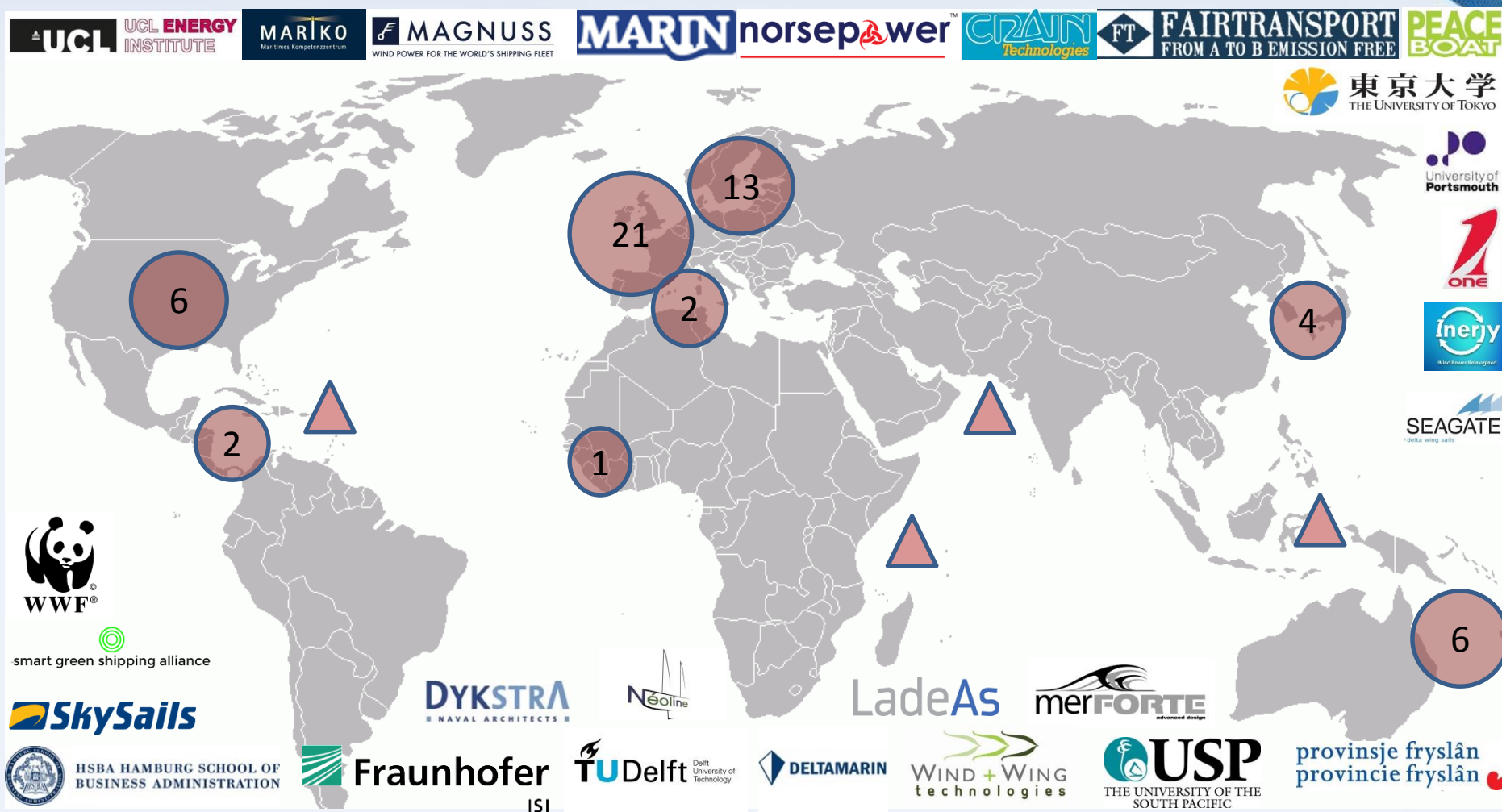


Test & Trial



Commercial

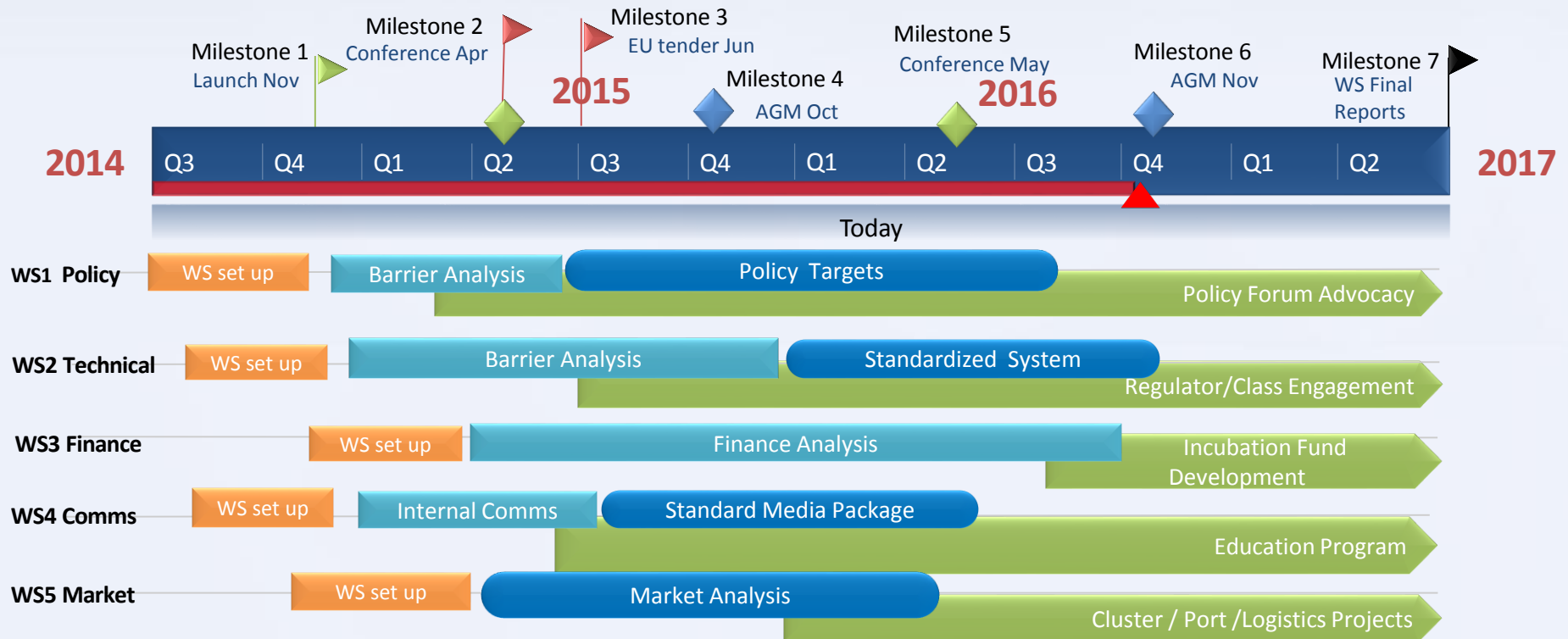
IWSA Membership & Windship Network



Blue Sky Over the Sea Conference 17-18 Nov

IWSA Work Stream Development

“Facilitate and promote wind propulsion for commercial shipping worldwide and bring together all parties in the development of a Windship sector.”



Blue Sky Over the Sea Conference 17-18 Nov

Barriers & Challenges

Industry structure – the split incentive, charter party clauses

Solution - new mechanisms e.g. SSI2040 Save as you Sail, Clean Shipping Index, CWR

Perception - a psychological barrier on a potential solution that is so visible.

Solution – increasing number of demonstration vessels, communication.

The promises – the need to ‘prove’ savings

Solution – more demo vessels, independent verification, pooling of information (IWSA)

Capital intensity for working demonstrators – cost for technology to reach market

Solution – increasing coop/pooling resources (IWSA), finance facility & build tech cluster.

Lack of technology transfer – from the offshore and yacht sectors.

Solution – increasing transfer is underway, incubation/innovation support (IWSA)

Operational & technical – route specific savings, compliance, cargo handling etc.

Solution – working with class, NA/engineers. Weather routing, automated systems, operations management etc.

Lloyds Register: Wind-powered shipping 2015

Case Study: Rotor Development



Deltamarin Award winning
'Delta Challenger' design



Norsepower fits twin
rotors on M/V Estraden



EU Funding
Large Rotor R&D

C-job Eco Freighter
Design Contract

2009

2014

2015

2016

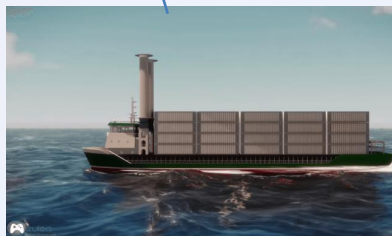
2017

2018

Enercon's E-ship 1
operational



Wind Hybrid Coaster
Design



Eco Flettner test
on MV Fehn Pollux



Magnuss
Commercial Test Rig



Case Study: Wind Challenger



Cape Size Bulker	Panamax Bulker
296m	228m
177,000t	83,000t
9,000m ² (sail area)	4,000m ² (sail area)
18,660kW x 91rpm	9,965kW x 94rpm
15.0kt (service speed –design)	14.3kt (service speed –design)
25 crew	25 crew



Case Study: Smart Green Shipping Alliance

smart green shipping alliance

smart

Proven - Masts rotate to capture maximum wind. Push-button operation from the bridge ensures safety. Same crew number as conventional ship. No ropes or rigging on deck to obstruct cargo handling.

TRADEWIND automated routing system optimises wind propulsion.

Hull made from recycled steel



SAILING HYBRID SHIPS Potentially 100% renewable today

Commercially, technically and environmentally superior

green

At least 50% propulsion from wind

Biofuelled conventional engines ensure scheduling reliability. Biofuel bought on long term fuel supply contracts provide fuel cost certainty.

Creates new transformational business model, increases order book to reduce unit cost and further improve customer proposition.



TATA STEEL

HUMPHREYS
YACHT DESIGN

WOLFSON UNIT
FOR MARINE TECHNOLOGY & INDUSTRIAL AERODYNAMICS


CAMMELL LAIRD
SHIPREPAIRERS & SHIPBUILDERS LTD

 **Rolls-Royce**

 **Lloyd's Register**


Met Office

Regulation

Clear, stable framework for low carbon shipping development worldwide.
Modern shipping practices.

Finance

Efficiency gains shared by all players. Finance decisions based on long-term infrastructure investment horizons

Sustainable Shipping

Commercial

Profitability/Viability

Logistics chain – factory/farm gate to dinner plate.
Circular economy – cradle to cradle development.

Technical

Vision of Low Carbon Technology. Systematic development of R&D, demonstration & market introduction of low carbon technologies

Any Questions?



**International Windship
Association**

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