



James Fisher and Sons plc

Introduction

2015



www.james-fisher.com

Offshore wind: **Cost-reduction through innovation**



Innovation defined

To be called an innovation, an idea must be replicable at an **economical** cost and must satisfy a **specific need**. Innovation involves deliberate application of information, imagination and initiative in deriving greater or different values from resources, and includes all processes by which new ideas are generated and converted into useful products.

In business, innovation often results when ideas are applied by the company in order to further satisfy the needs and expectations of the customers.

Innovation is **not** invention.



Offshore wind: **Cost-reduction through innovation**



Innovation

- Built on experience
- Built on contracting strategy – vertical integration
- Built on technical application
- Built on sharing best practice
- Built to align a common vision
- Offshore wind cost reduction pathways study



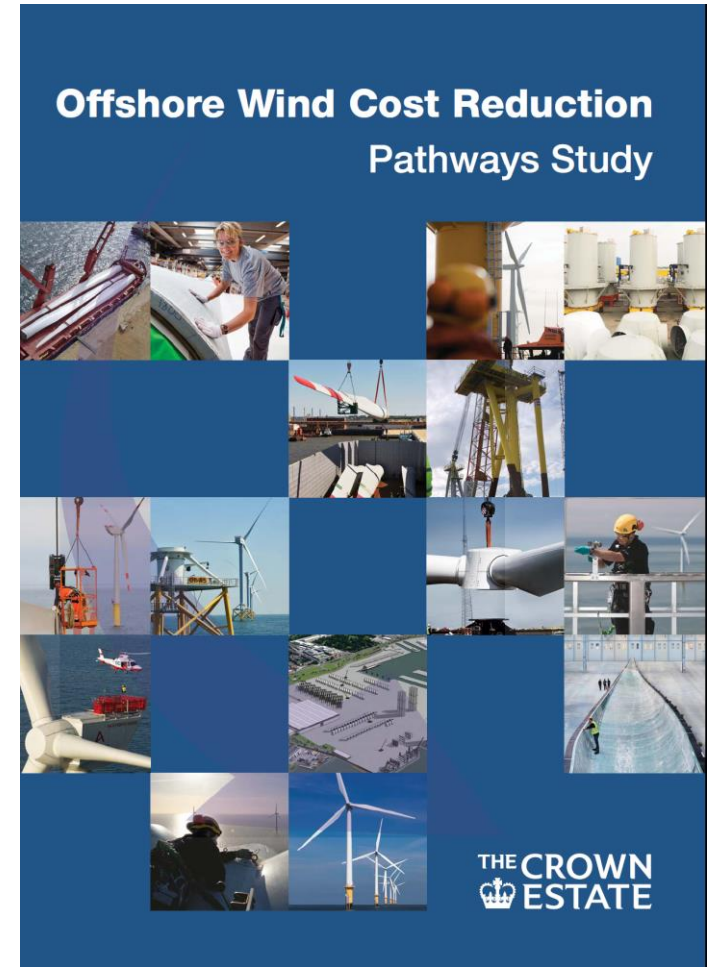
Offshore wind: **Cost-reduction through innovation**



Best practice

Take into consideration the cost reductions pathways (Crown Estates), which advocates **learning from others**.

- Oil and gas sector
- Marine industry



Offshore wind: **Cost-reduction through innovation**



Categories of potential savings – applying innovation

Applying innovation is key to delivering cost reductions, but defining the areas of potential need underpin its success.

1. Contracting strategy
 - a) Vertical integration
 - b) Improving safety
 - c) UK manufacturing and support
 - d) Economies of scale
 - e) Technologies innovation (examples below)
2. Intelligent Fender System (IFS)TM
3. Offshore Wind Management System (OWMS)TM
4. Offshore Wind Turbine Installation ship (OWTIS)TM



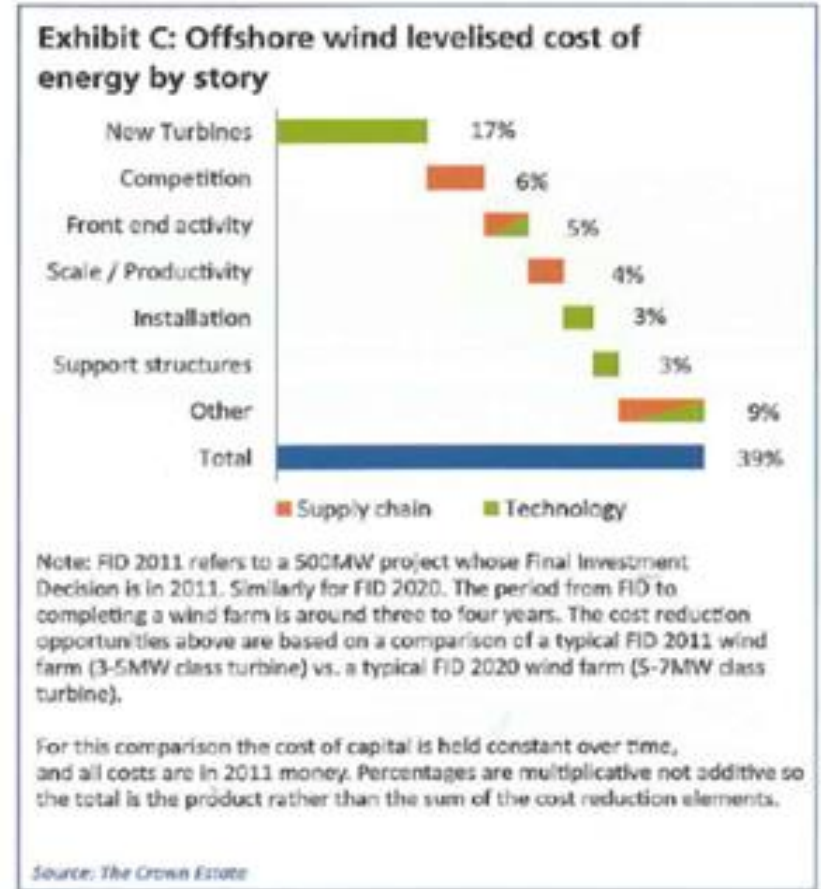
Offshore wind cost reduction pathways study

Vertical collaboration across different tiers in the supply chain:

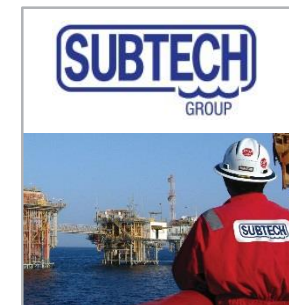
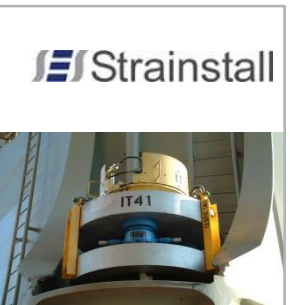
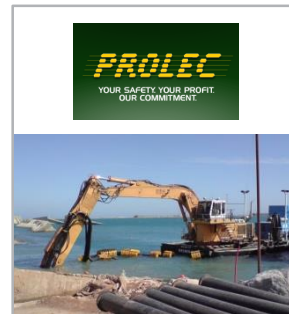
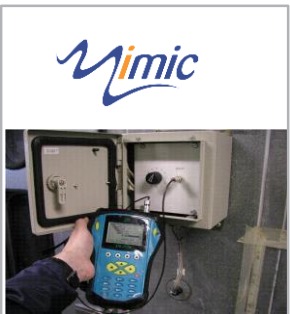
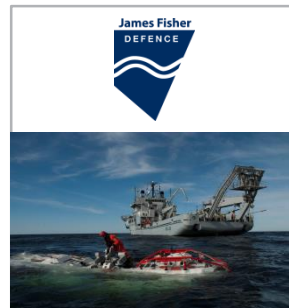
Currently contracts are mainly awarded on a project by project basis with most developers typically letting 5-8 major contracts.

This can lead to a silo approach without adequate recognition and management of the interdependencies between contracts.

This often leaves the developer bearing much of the **interface risk**.



Who we are: Subsidiaries



James Fisher has also recently acquired the Mass Flow Excavation assets of X-Subsea and the WROV and survey assets of S3

Who we are: **Integrated approach**



Supplier/provider

Company A

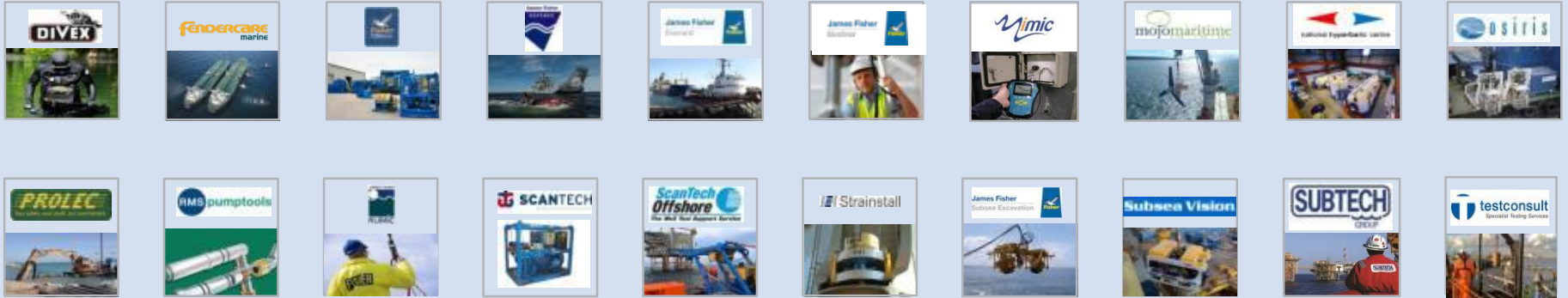
Company B

Is this you?

Is this you?

Niche service supplier

Niche equipment provider



Who we are: **QHSE**



Safety and efficiency

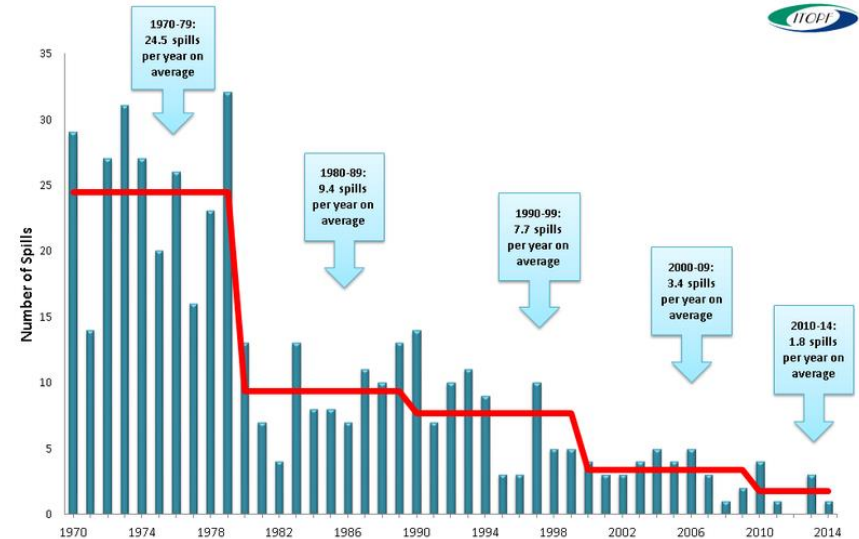
- Cost savings **cannot** be made at the expense of safety
- Improved safety performance – a driver for cost savings
- Safe operations lead to increased efficiency
- Efficient operations lead to reduced costs
- Accident/Incident free operations with reliable equipment/systems reduce opex costs (and optimise revenue)
- Serious incidents - can have a devastating impact on opex and profitability – and may even drive you out of business





Safety and efficiency

- Tanker safety improved dramatically in last 40 years
- Driven by industry initiatives and legislation
- Substantial investments in training, auditing, incident investigation and safety management
- JF proud to have played part in delivering improvements
- Control of costs – one reason why JF still in shipping/tanker business – while many other UK companies gone to wall or been swallowed up

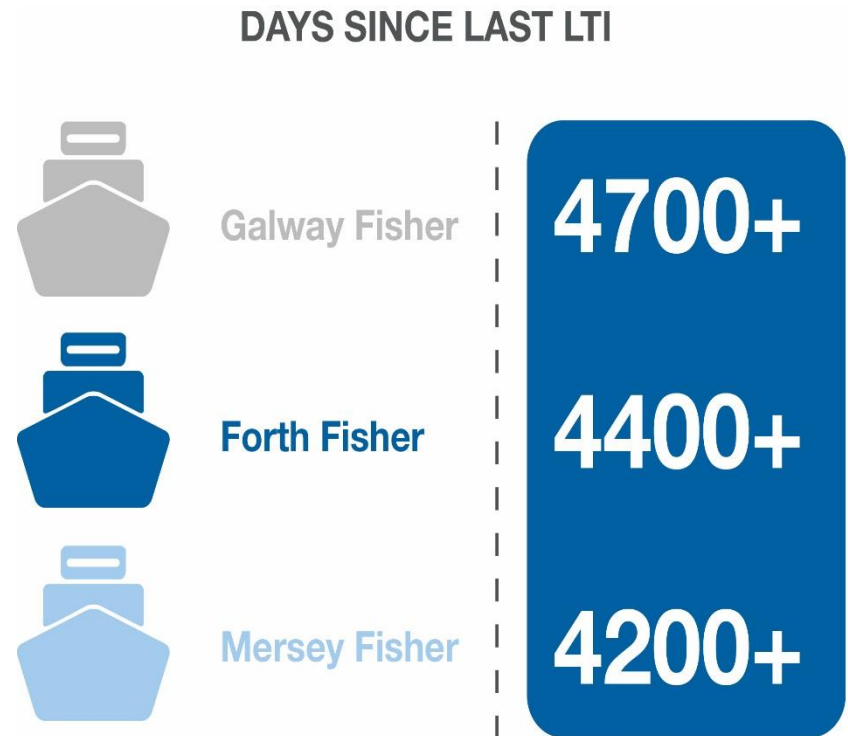
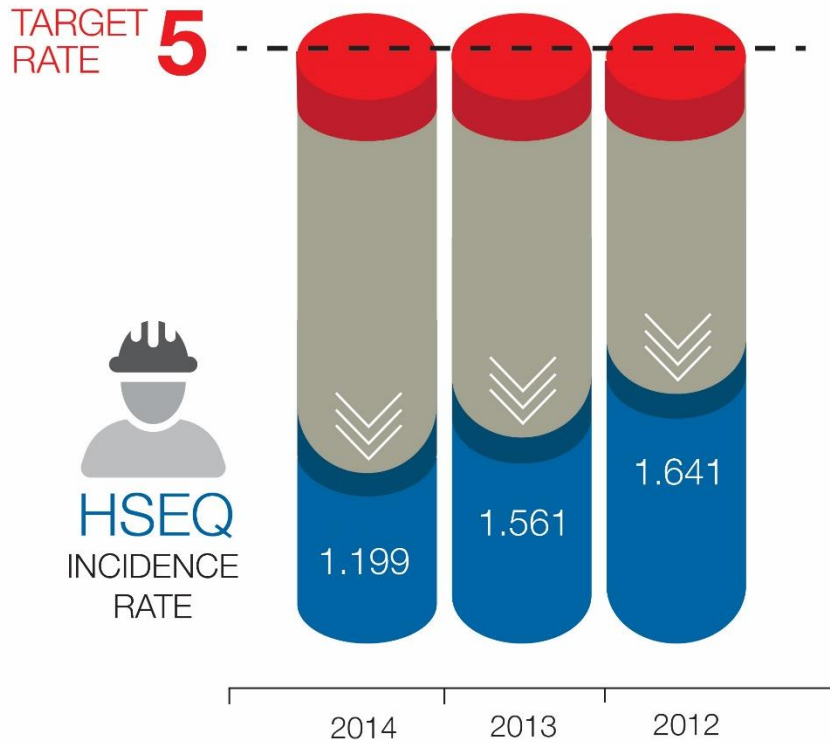


Who we are: QHSE



Since 2012, James Fisher has delivered year on year improvement of group wide incident rates

Outstanding fleet performance with three vessels reaching over 11 years without incident



Approach: **Tried and tested**

Henry Ford and the supply chain

Some supply chain challenges for offshore wind are similar to the car industry 100 years ago.

Similarities:

- Cost reduction (added value)
- Scheduling and timing of projects (model launches)
- Scarce resources
- Standardisation
- Economies of scale and scope

Solutions:

- Industrialisation
- Any colour in black
- Vertical integration
- Supply chain, optimised and integral to corporate delivery
- Value in local supply chain (75% of Model T within 50 miles of Detroit)

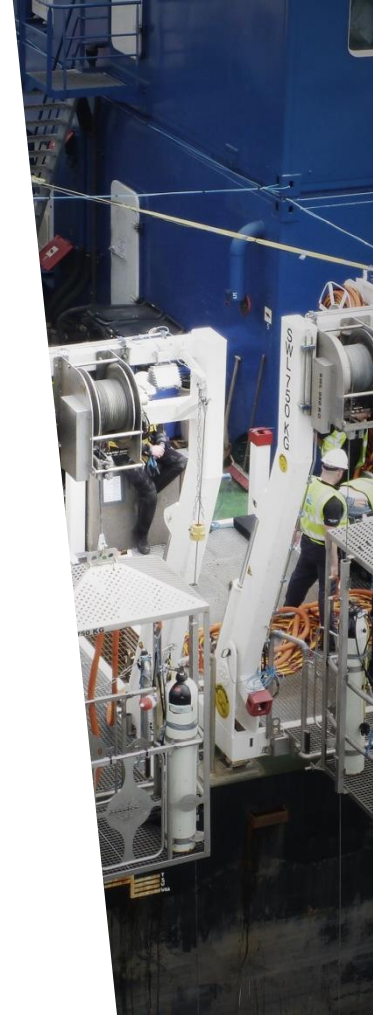


Approach: **Tried and tested**



UK manufacturing and support

- Elimination of Exchange Rate Risk
- Increased UK Employment – Improves inward investment opportunities
- Can be a factor in CfDs
- Facilitates use of well established UK Companies with proven track records such as JF
- Excellent infrastructure
- Lower mobilisation costs



Approach: **Tried and tested**



Economies of scale

- Any economy of scale needs volume
- In the wind sector the function of Govt appetite for financial support
- Renewable obligation was set to support up to 3GW/year to mid 2020's
- CfDs subject to auction and have limited allocation rounds
- Consequently expectation is in region of 800MW/year
- Concerted cost reduction needs commitment to volume from Govt to drive cost reduction and achieve the desired £100/MWhr goal
- Until commitment is made the supply chain will develop slowly and cautiously

But, much can be done and economies can be made by efficient procurement.

In operations:

- Goods - bunker fuels/oils and stores/spares
- Services - maintenance/repairs, personnel transfers, governance, insurance



Approach: **Tried and tested**

Technology innovation

The need for innovation can be spurred on by competition.

Innovation which reduces (or optimises) manual intervention and time offshore is:

- More cost-effective
- Safer
- Must not lead to reduced reliability

Innovative ideas leading to change must be subject of a formal management of change process, including appropriate RA's.



Approach: **Tried and tested**



Practical suggestions for reducing opex costs

- Invest in staff training to allow use of multi-skilled technicians/operators
- Challenge/look critically at current operating practices/procedures – revisit them
- e.g. Is it always necessary to use DP assets for diving?
- Risk assess alternatives of using mooring systems
- Optimise movement and management of assets and personnel
- Where possible single source supply services
- Consider outsourcing regular/routine functions



Approach: **Tried and tested**



James Fisher innovation

Using **IFS™** as part of the **OWMS™**, James Fisher can help to make a small but important step change in long term sustainable cost reduction in offshore wind.

James Fisher already applies its expertise to monitor some of the worlds largest and most valuable assets including the **Burj Khalifa** and **Forth Road Bridge** as well as over 75 offshore structures including wind turbines, FPSOs and TLPs in the oil and gas industry.



Reduces costs through the optimisation of fuel consumption



Facilitates the safe transfer of personnel



Mitigates against damage to monopiles and transition pieces

Approach: **Innovation**



Intelligent Fender System (IFS)™

Improving safety and increasing operational efficiency

IFS™ monitors live and cumulative push-on forces exerted on offshore structures, which sits behind a traditional bow fender modified to include load cells.

Offshore Wind Management System (OWMS)™

Delivering greater operational efficiency and cost-effectiveness

Providing full operational insight to enable enhanced decision making for offshore activities delivering powerful results.

Offshore Wind Turbine Installation Ship (OWTIS)™

Enabling safe and cost-effective solutions to turbine installations

A unique ship designed to enable wind farm developers to reduce significantly off-shore turbine installation costs.



Benefits

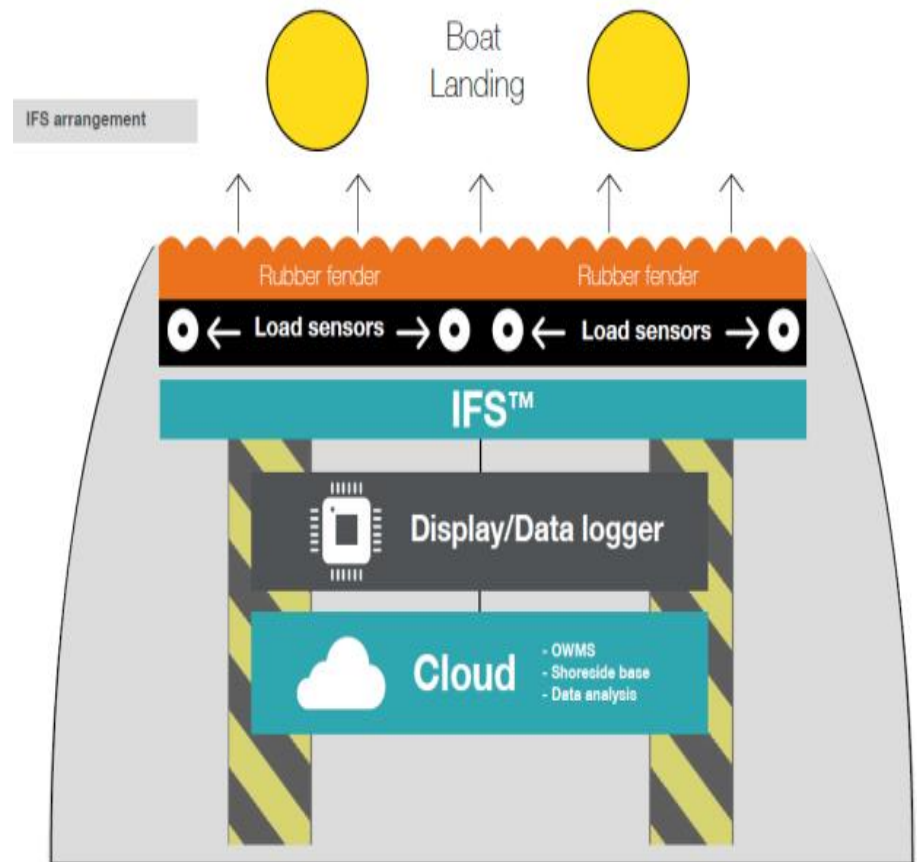
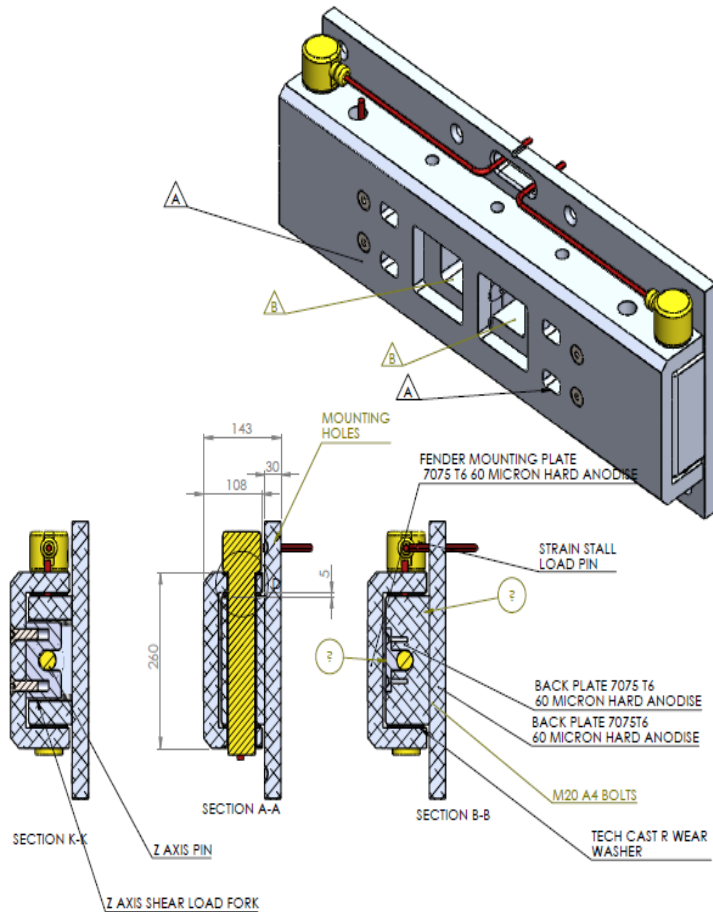
Originally developed with the intention of quantifying dynamic friction coefficients of rubber fenders and impact force against offshore wind turbines.

Through key stakeholder engagement, IFS™ has evolved into a complete solution:

- Provides live feedback and support in quantifying safe weather windows for personnel transfer
- Provides live feedback directly to the skipper enabling the fine tuning of vessel thrust and direction
- Helps monitor and record push-on forces ensuring foundation designed limits are not exceeded
- Assist in ensuring the optimum vessel/fender arrangement is put in place for increased **stickiness**
- Delivers cost-effective solutions through fuel optimisation
- Enable cross vessel data performance analysis
- Helps provide live data for the feedback to and coaching of vessel crews



Arrangement





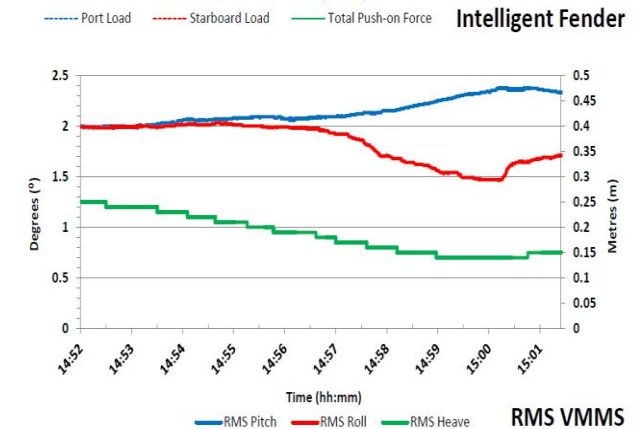
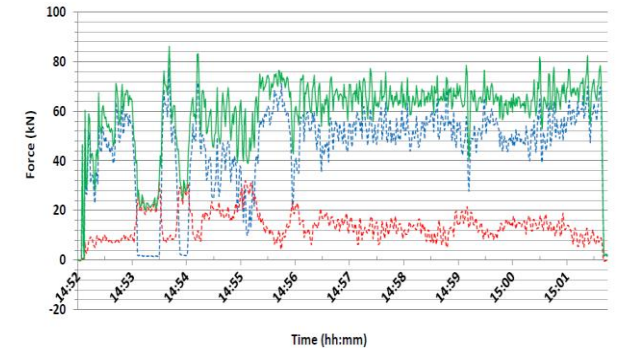
Data, trials and reporting

- Successful trials on Greater Gabbard wind farm
- Installed on **Dart Fisher** our offshore multi-purpose support vessel
- Chosen to support the Carbon Trust OWA project

Reports/Data:

- Customised to customer requirements
- Data available live or can be viewed remotely/retrospectively
- Detailed historic audit on a turbine by turbine, vessel by vessel basis

Date	16/03/2015	
Time	14:52:20	15:02:05
Location	IGC02	
Description of Event	Push-on for TP cleaning	
General Weather Conditions	-	
Average Wave height	-	
Vessel Name	Dart Fisher (James Fisher Marine Services)	
Skipper Name		



Innovation: Intelligent Fender System™

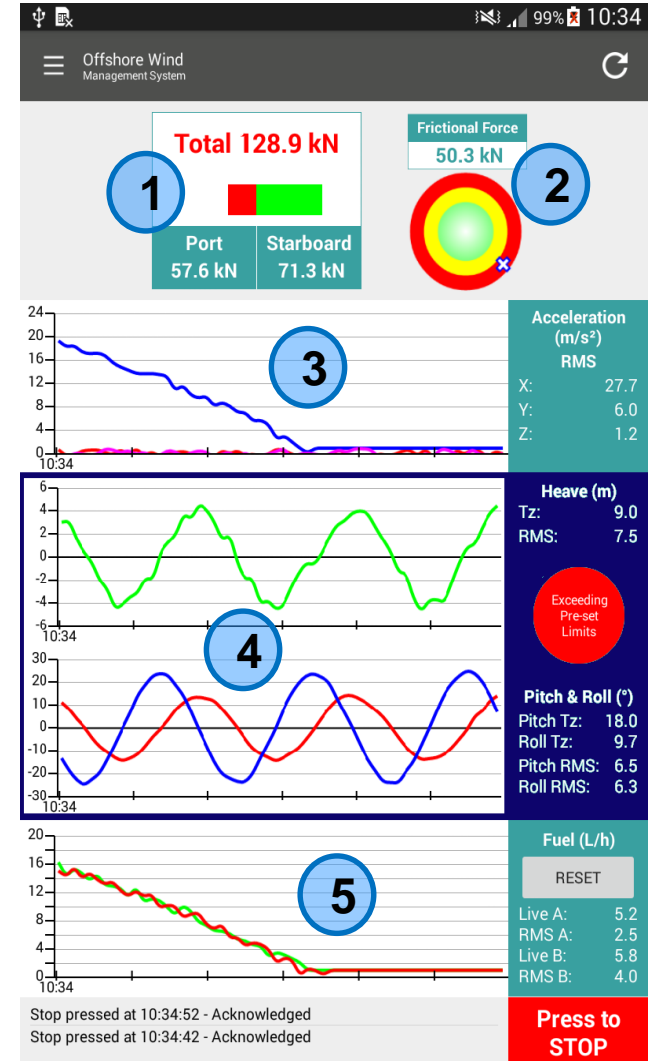


Data and display on the vessel

1. Live push-on forces
2. Live fender friction

And this information has most value to the operation when it's used as a component of the bigger picture.

3. VMMS™ – Acceleration
4. VMMS™ – Heave, Pitch, Roll, Yaw
5. Live and average fuel consumption





Benefits

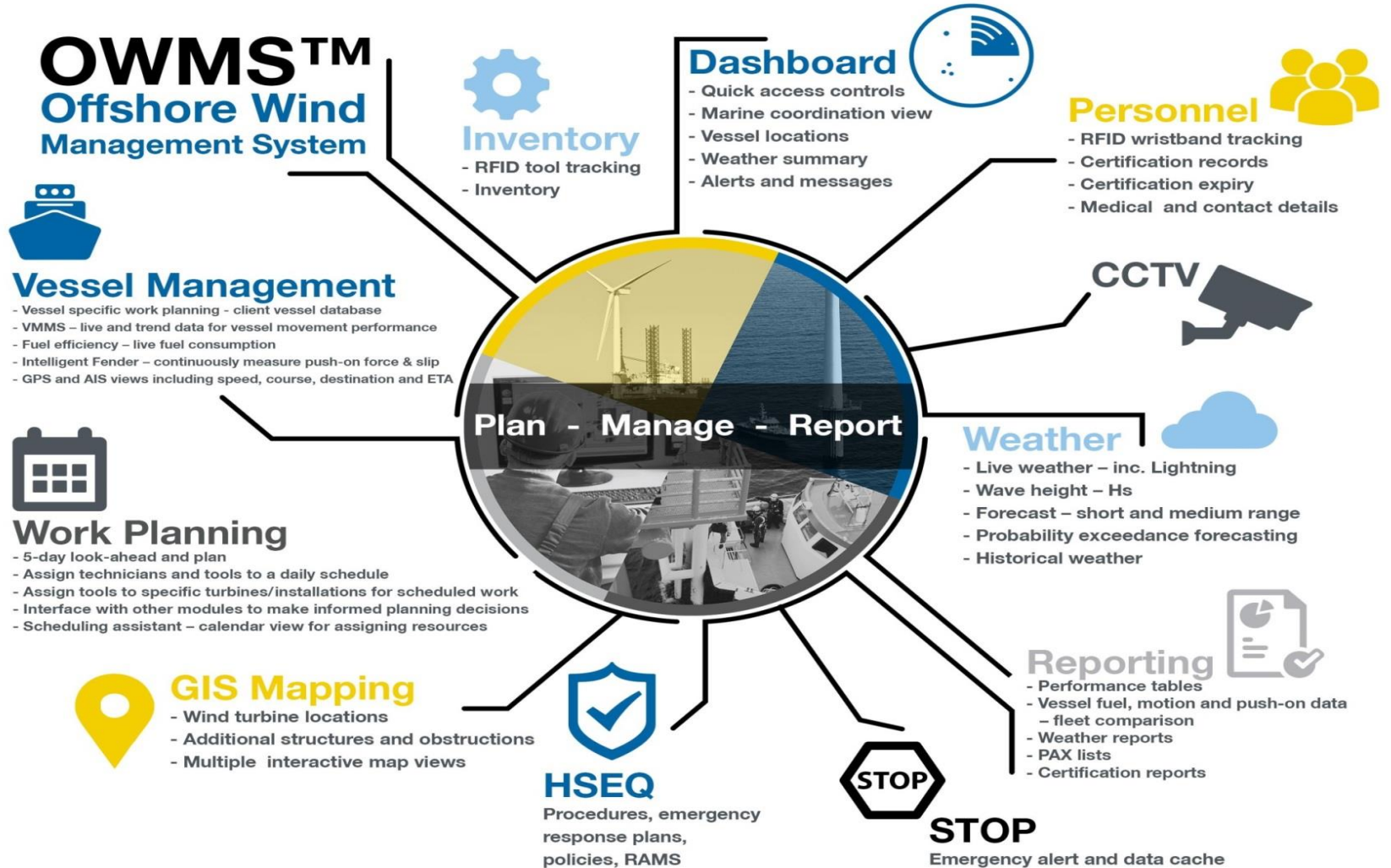
- Measures the forces generated by the vessel as it docks against a wind turbine
- Delivers accurate live data to vessel skipper during operations
- Provides historic data that can be analysed
- Develop understanding of cumulative effect of multiple boat landings
- Facilitates the safe transfer of personnel

Features

- Reduces costs through the optimisation of fuel consumption
- Helps assure the integrity of foundation structures
- Mitigates against damage to foundations and transition pieces
- Simple installation and removal
- Provides **real-time** information to support operational decisions
- Can be used for safety, analytical or corroborative purposes



Modules



Features

- Comprehensive tracking of offshore assets (personnel, vessels, high value tools)
- Quantifies vessel performance and fuel usage
- Sophisticated weather and sea monitoring, predictions and reporting
- Personnel tracking wrist band RFID technology
- Personnel activities and certification expiration management
- Intelligent Fender System™ monitoring turbine impact and push-on forces
- Vessel Motion Monitoring System™

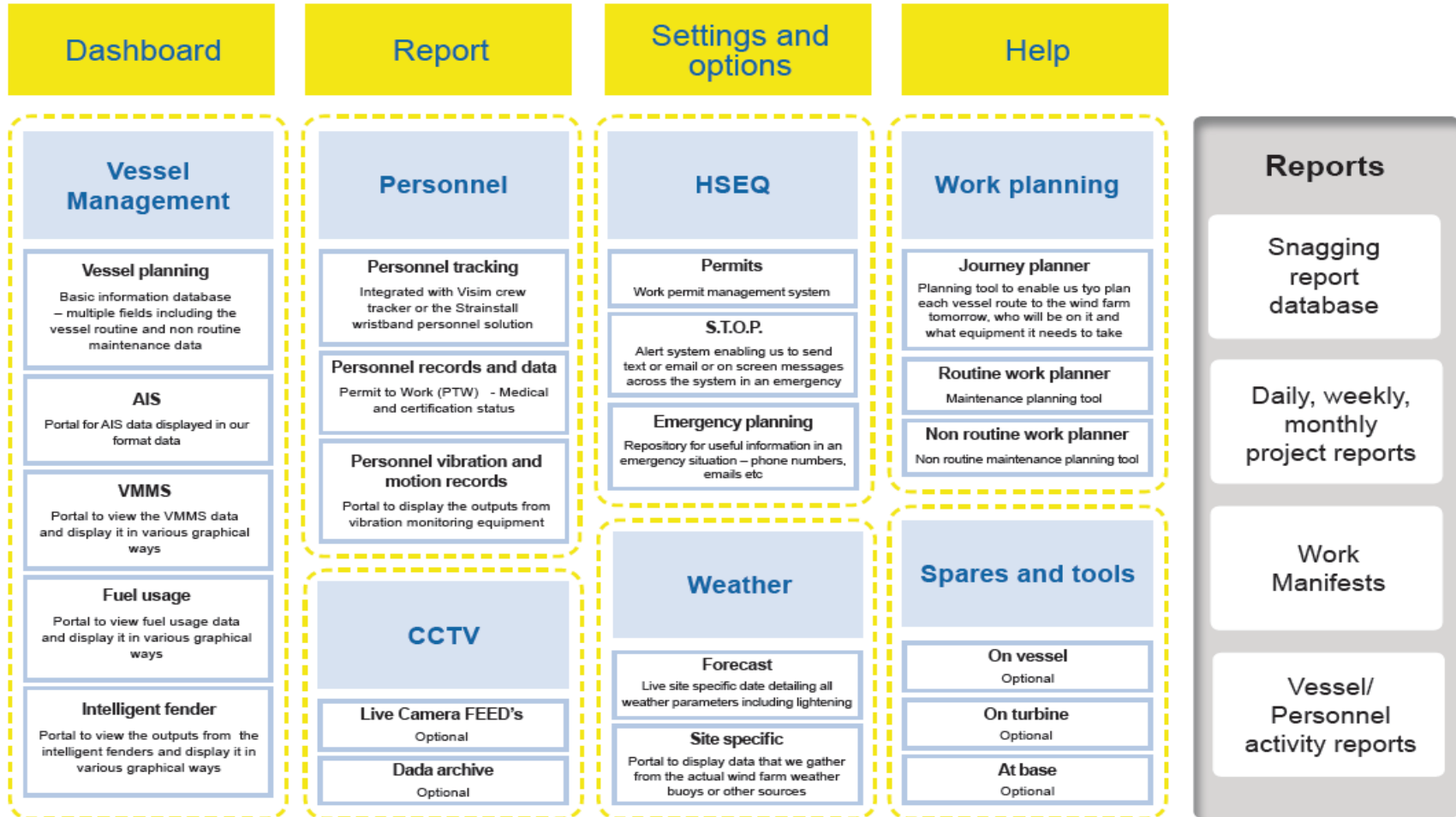
Benefits:

- Complete marine management system through one web-based portal
- Fully customisable and scalable system depending on project requirements
- Enables efficient offshore wind farm operations
- Quantifiable cost savings





Systems architecture





Delivering cost-reductions

“Recent wind farm projects have indicated that costs have stabilised at around £140 per MWh...”

How will our **innovation**, demonstrated through OWMS contribute to this?

IMPROVED WORKFLOW = IMPROVED OPERATIONS

WHICH LEADS TO...

INCREASED SAFETY

INCREASED OPERATIONAL HOURS

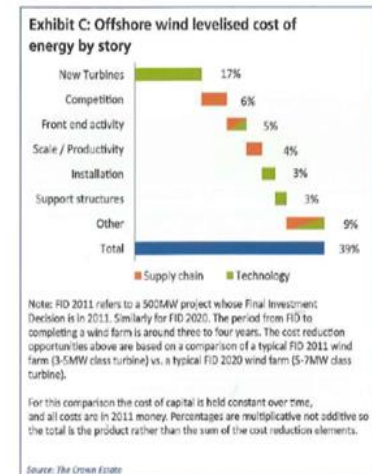
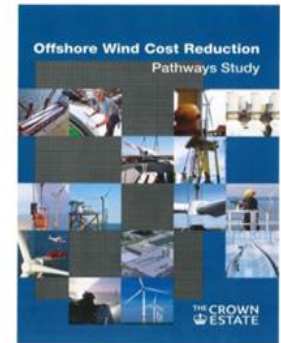
INCREASED NO. TURBINE VISITS

INCREASED RETURN ON INVESTMENT

INCREASED VALUE

LIGHTER CARBON FOOTPRINT

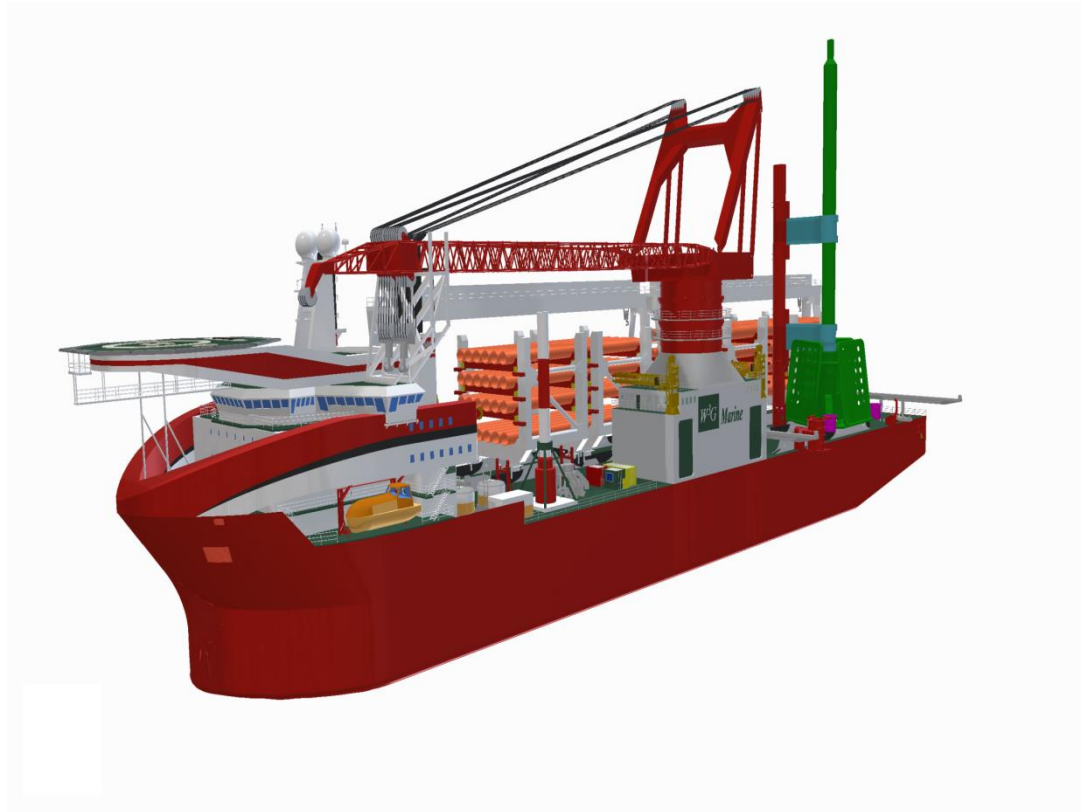
REDUCED COST



Delivering cost-reductions

Developing innovative solutions to service **Round Three wind farms**, James Fisher can provide OWTIS™ as a viable option to support offshore wind farm construction utilising:

- Deck deployment systems
- Hydraulic sea-fastenings
- Deck rail transportation

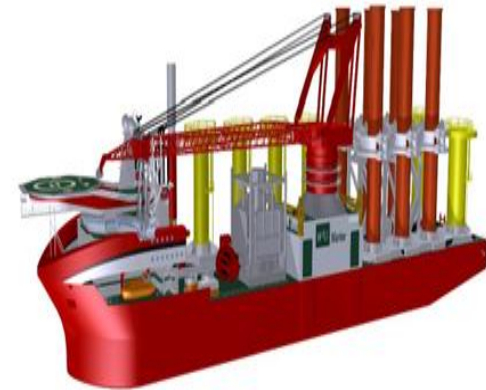


Innovation: **Offshore Wind Turbine Installation Ship™**



Key design features

Length:	194m
Breadth:	38m
Depth moulded:	14m
Draught:	7.5m
Speed:	13knts
SWL:	30m 1,500T
Positioning:	Pedestal on vessel centre
Positioning:	Dynamic positioning (DP) class 2
Accommodation:	109 Comfort class





Benefits

Solution already successfully used from floating crane vessels	
OWTIS™ advantage	What does this mean?
<ul style="list-style-type: none"> • Large cargo capacity 	<ul style="list-style-type: none"> • 48 x 120t piles or 5 x 800t or 3 x 1,200t jackets
<ul style="list-style-type: none"> • Rail system to move cargo away/into crane radius 	<ul style="list-style-type: none"> • Maximises use of deck space, and speeds up loading
<ul style="list-style-type: none"> • Clear deck 	<ul style="list-style-type: none"> • Space for high structures
<ul style="list-style-type: none"> • Harsh weather capability – working in up to 2.5 - 3mHs, transit unrestricted (inc. Jacket sea fastening) 	<ul style="list-style-type: none"> • Maximised utilisation. • Do not have to seek shelter in severe weather.
<ul style="list-style-type: none"> • Short weather window – all offshore activities < 6 hours 	<ul style="list-style-type: none"> • Maximises utilisation
<ul style="list-style-type: none"> • High transit and port turnaround speed 	<ul style="list-style-type: none"> • Maximised efficiency of high cost asset. • Allows multi port supply chain strategy option
<ul style="list-style-type: none"> • Improved safety 	<ul style="list-style-type: none"> • Reduced personnel exposure - minimal deck work • No small boats
<ul style="list-style-type: none"> • Low carbon footprint 	<ul style="list-style-type: none"> • Autonomy • High vessel efficiency

Features

- 1,500t offshore crane positioned near vessel's centreline to minimise motion and increase workability in higher sea states
- Deck carriage design incorporating skid system allows efficient transport of cargo because entire deck utilised for cargo storage
- Able to carry safely 6 x 650t or 5 x 800t jacket foundations stowed vertically
- A floating solution for all installation operations – Dynamic Positioning
- Versatile - can be used in Oil and Gas, De-Commissioning or Project Sectors



Features

- Improved offshore safety reducing foundation installation risks
- Autonomous operation and reduced personnel offshore working hours, reducing installation cost. No need for additional small boats
- Fewer tasks performed offshore (including no requirement for jacking which removes a weather constraint in open sea)
- Ability to transit with deck cargo in rough weather, reducing weather downtime and increasing utilisation and flexibility
- Can readily load out at different ports/manufacturing bases. Increases foundation supply options
- Unique seafastening and deck carriage system minimises port loading time and allows efficient transportation and installation of foundations
- Work activity in predefined modules enabling safe use of weather windows
- Minimises deck working operations
- Significant safety improvement

Anticipated to reduce installation costs by £1m per turbine



Summary

Applying innovation is key to delivering cost reductions, but defining the areas of potential need underpins its success.

1. Contracting strategy
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 - b) Improving safety
 - c) UK manufacturing and support
 - d) Economies of scale
 - e) Technologies innovation (examples below)
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Summary: **Innovation in delivering Offshore Wind**

James Fisher has the capability and capacity to support the development and delivery of offshore wind whilst reducing the levelised cost of energy LCOE.

Over the next ten years c.7,000 wind turbines will have been installed in the UK waters of the North Sea.

Innovation will be at the core of our endeavours to ensuring safety whilst reducing cost through an integrated UK supply chain.

We plan to be part of that future...

