

Remote Controlled Ships

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IMCC

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Trusted to deliver excellence



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Aerospace

Civil



- Aero engines
- Helicopter engines

Defence



- Aero engines
- Helicopter engines

Marine & Industrial Power Systems

Marine



- Equipment systems
- Ship Design

Energy & Nuclear



- Gas turbines
- UK's nuclear powered subs

Power Systems



- Marine and land based power systems

55,000 people - in 45 countries



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Marine division

Commercial Marine



Naval



Service



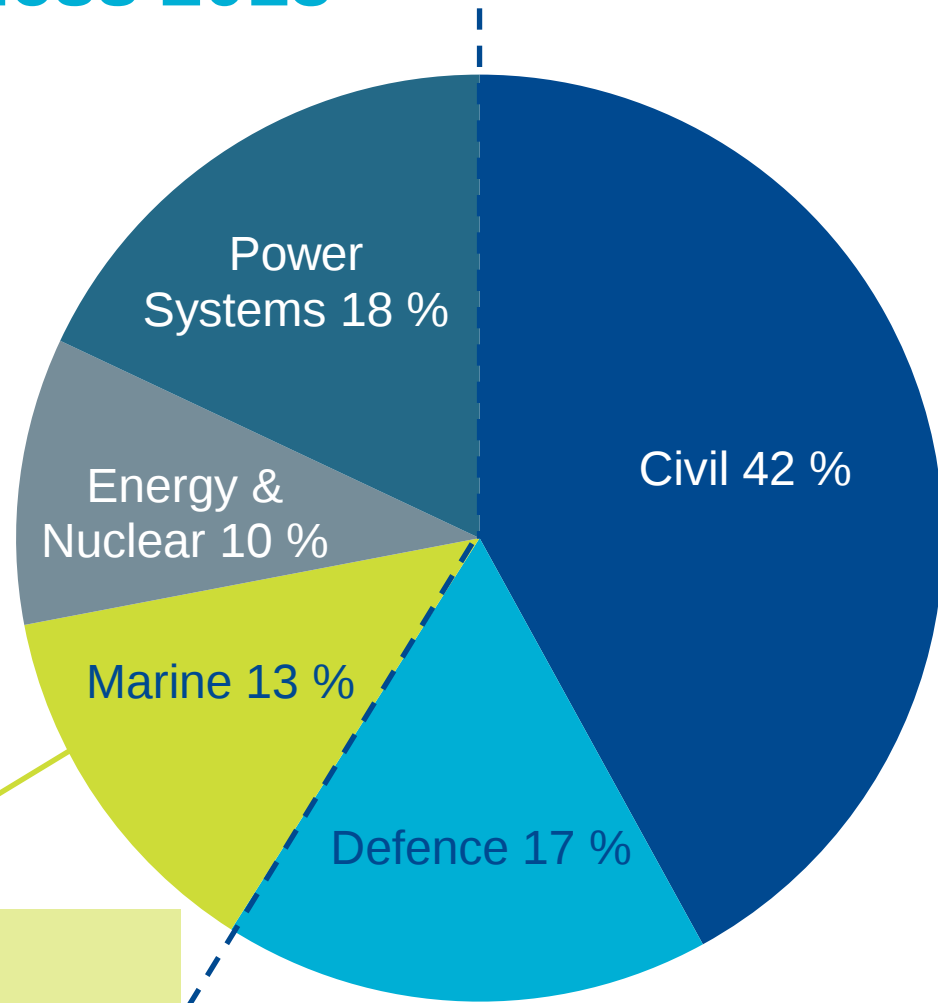
- Over 6.400 employees in 34 countries
- Over 30.000 vessels with our design and/or equipment



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Revenue by business 2013

MIPS



AERO

Marine FY2013

Order book: **£3,996M**

Underlying revenue: **£2,527M**

Underlying OE revenue: **£1,438M**

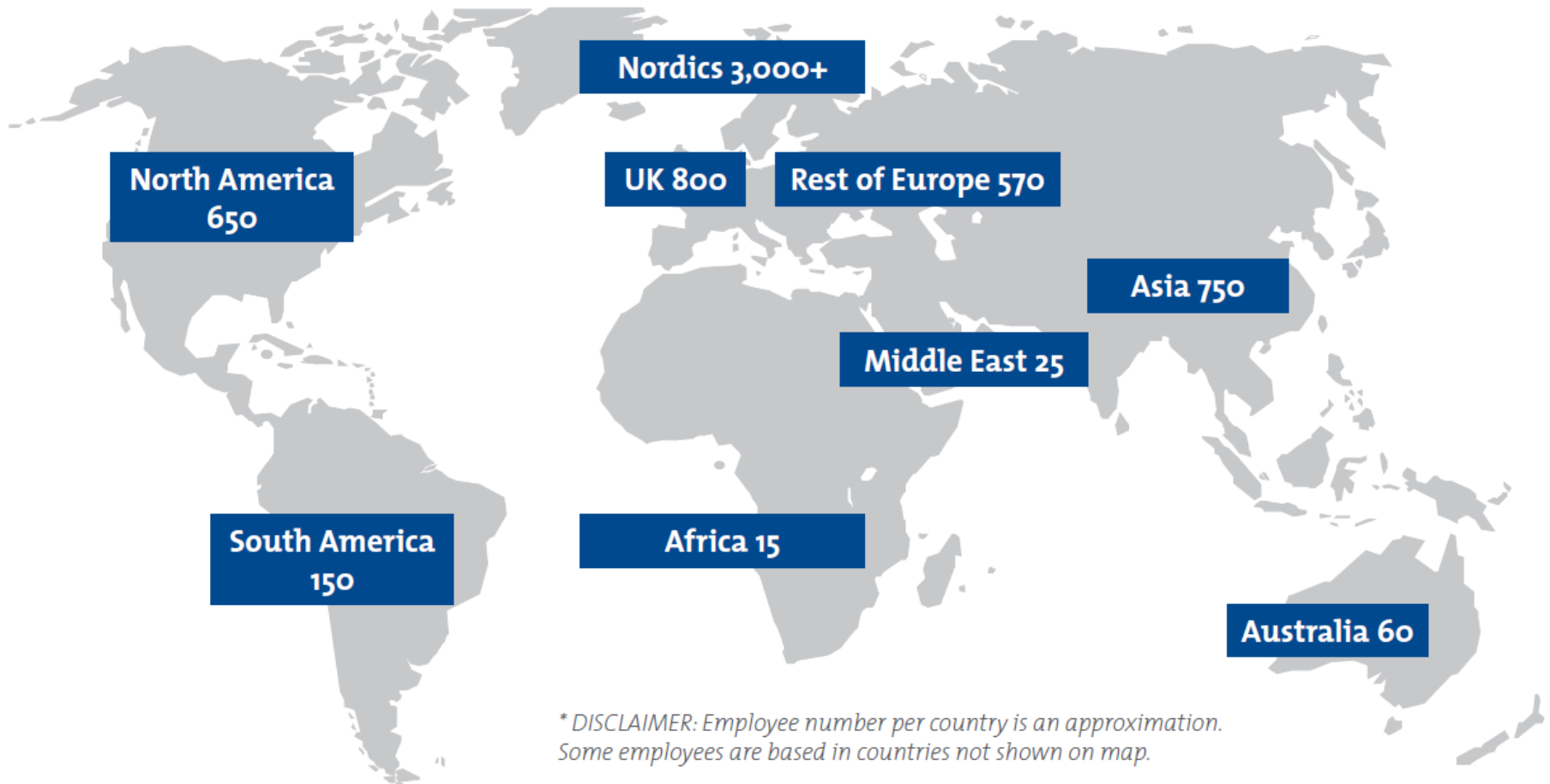
Underlying services revenue: **£1,089M**

Underlying profit before financing: **£281M**



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More than 6,000 Marine employees worldwide



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A comprehensive range of products

- Focus on environmental friendly solutions based on the widest range of products in the marine industry

Ship design and integrated ship systems



Diesel and gas engines



Gas turbines



Automation and control (DP)



Propulsion systems



Steering systems



Electrical podded propulsors



Azimuth thrusters



Tunnel thrusters



Waterjets



Stabilising systems



Winch systems

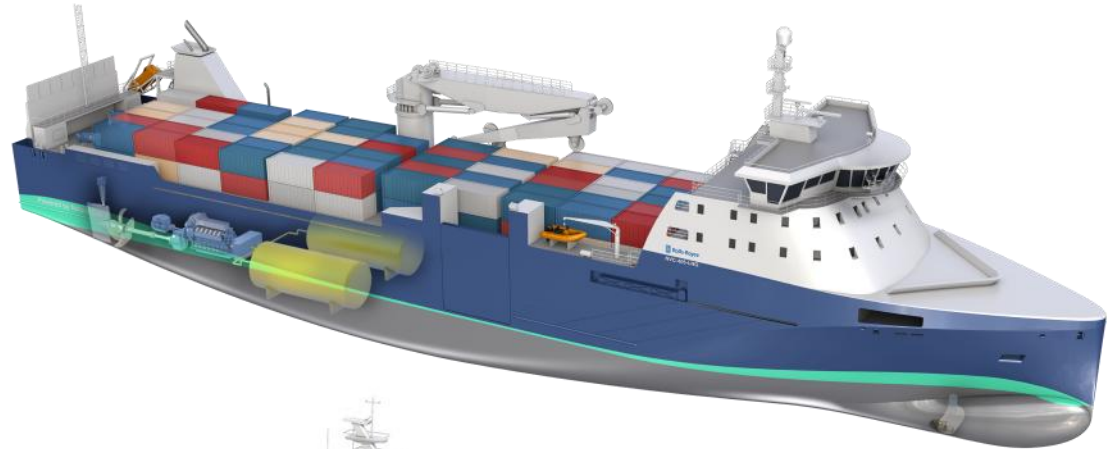


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Integrated systems capability

- Commercial vessels

- Ship design
- Diesel/ LNG engines
- Propulsion system
- Motion control
- Automation & control
- Dynamic positioning
- Deck machinery



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Worldwide support

- The global Marine service network
 - 24 hour availability worldwide
 - 54 service centres in 32 countries
 - More than 1.800 service personnel worldwide



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Fundamental Changes in Shipping

Historic changes:

- From sail to steam
- Coal to diesel
- Introduction of the container ship
- Cross Atlantic airlifts (end of the ocean liners)
-



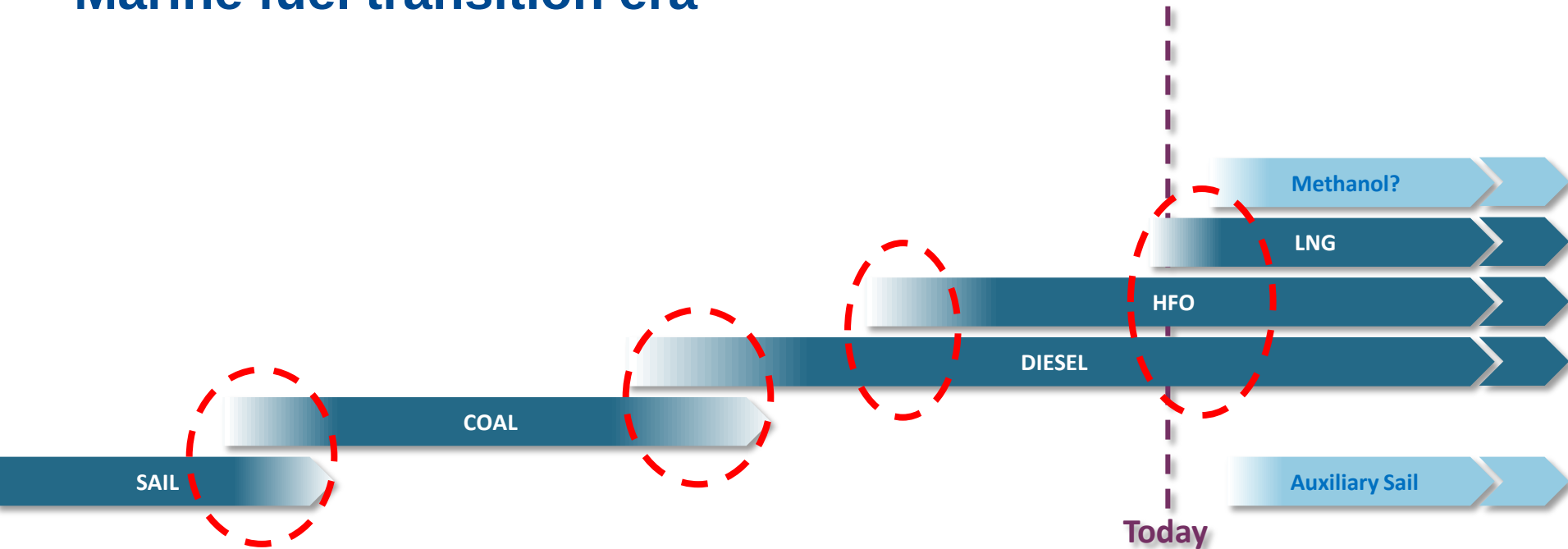
What will be the most fundamental changes in shipping during your career?



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Fundamental Changes in Shipping

Marine fuel transition era



We are at the dawn of a new marine fuel era!



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Fundamental Changes in Shipping

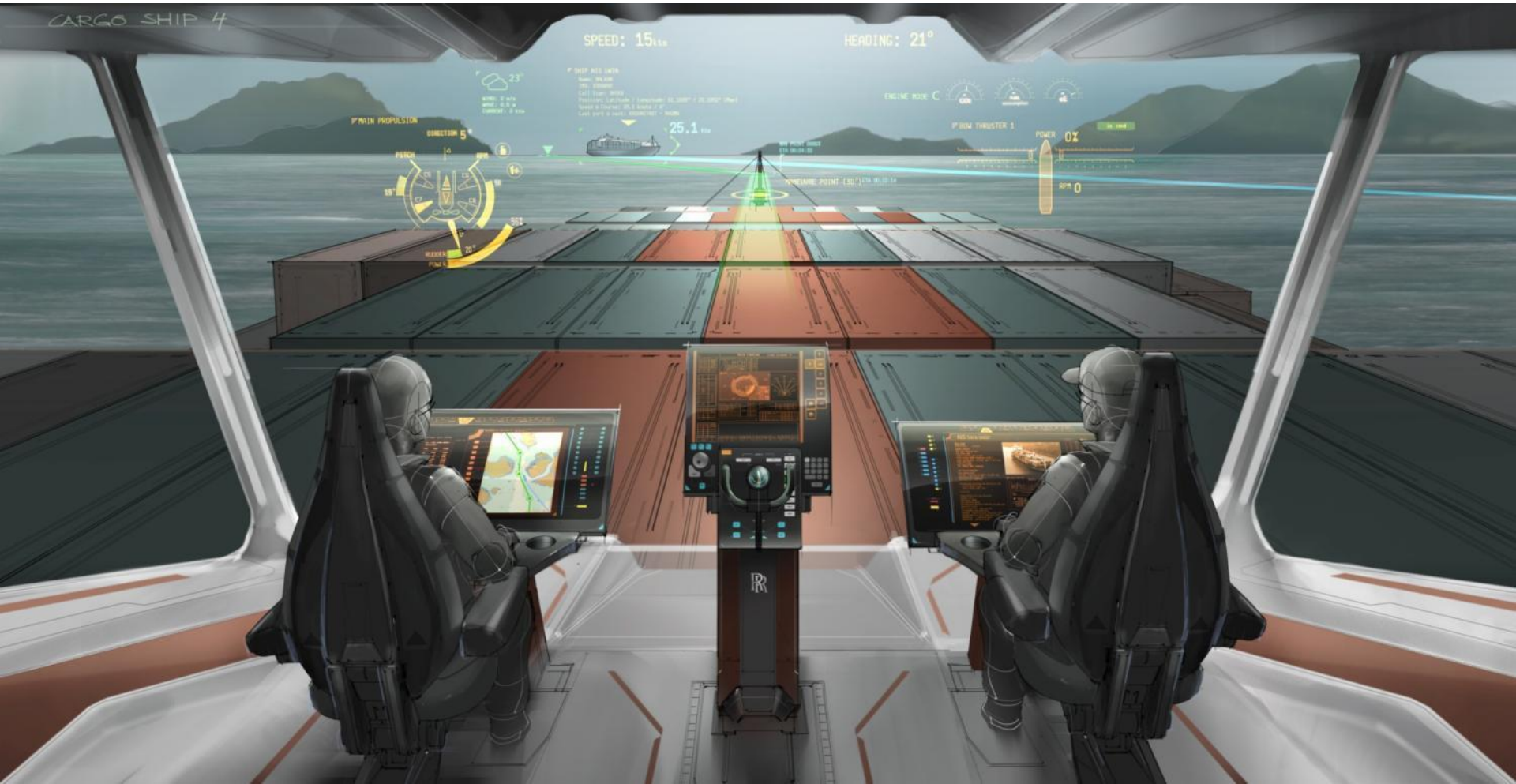
Next changes:

- LNG will become one of the main marine fuels
- Introduction of hybrid and battery propulsion
- **Introduction of unmanned ships**
- ...



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Ship Intelligence Trends Today



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Ship Intelligence Trends Today

Today:

- Navigation and station keeping
- Decision support
- Operational real time optimization
- Health monitoring
- Automated reporting

The trend is towards more intelligent and automated systems and the role of crew is becoming more supervision of the operation



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Why Remote Controlled Ships?



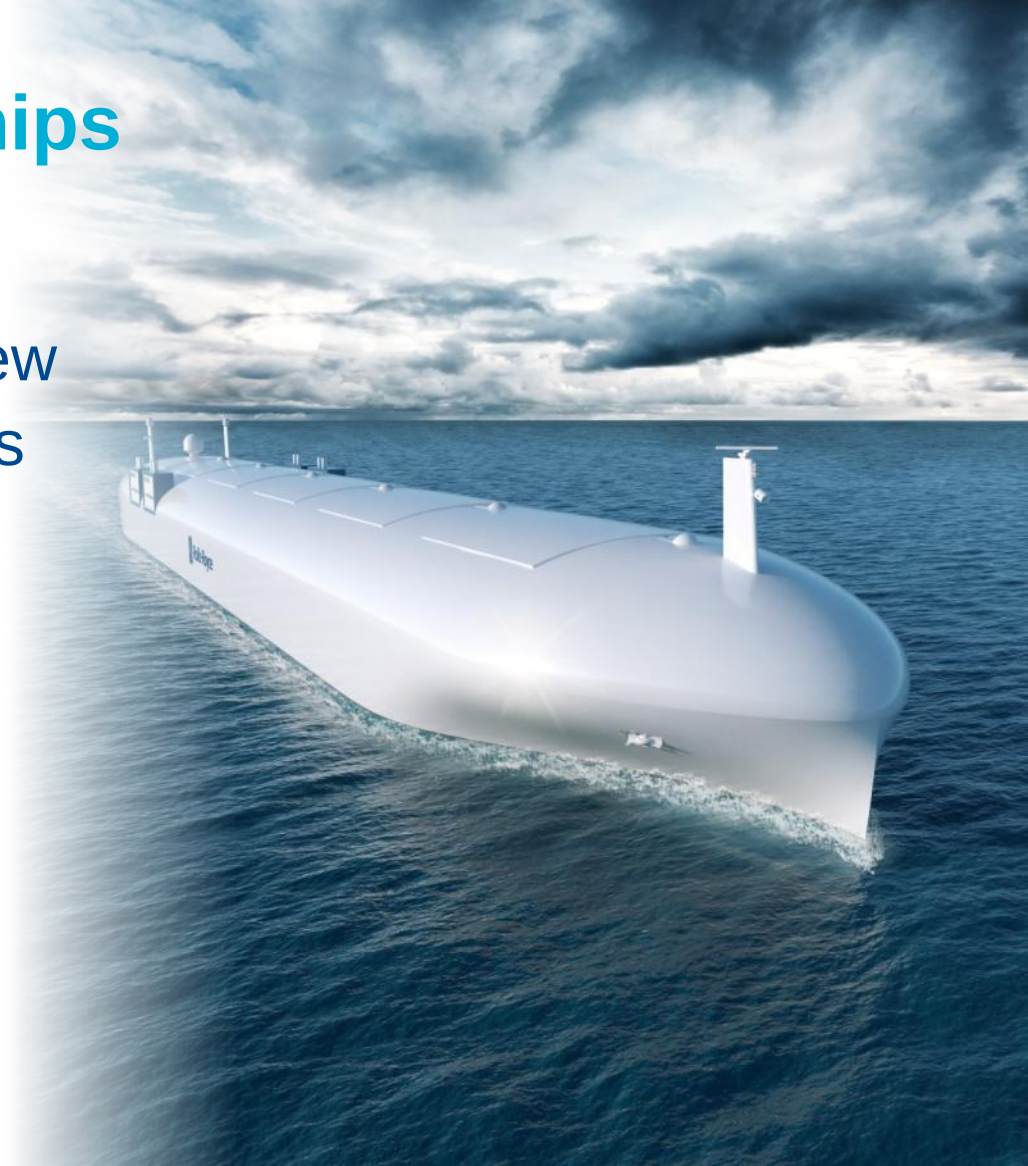
Making ship transport more efficient and safe!



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Remote Controlled Ships

- Reduced crew costs
- Access to competent crew
- Better working conditions for the seafarers
- Improved ship efficiency
- Improved safety
- Response to technology trends
 - Big data



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Other Unmanned Vehicles

- Airplanes
- Helicopters
- Cars
- Trains and subways
- Submarines
- ROV:s
- Offshore installations
- ...

It is not if, it is when...
Marine is only following today's trend!



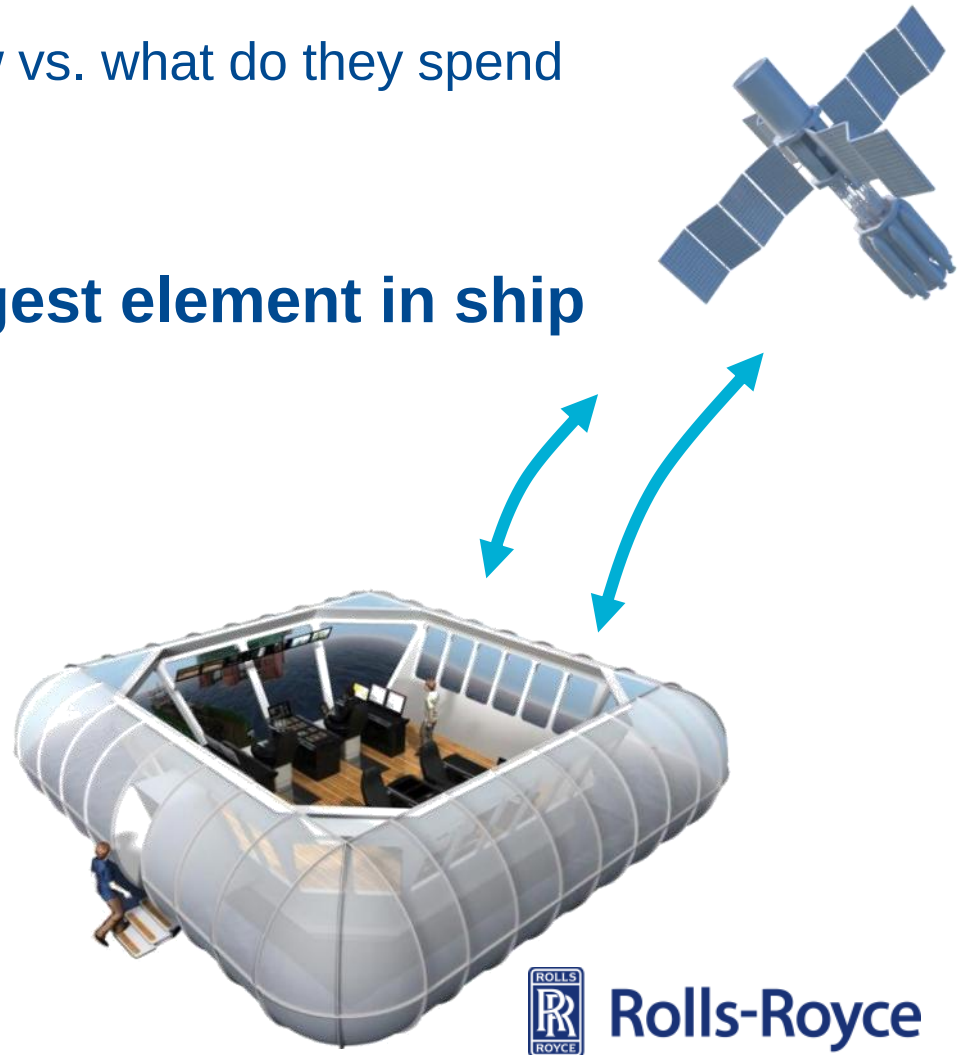
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Crew Competence

How to best utilise the skills of the crew?

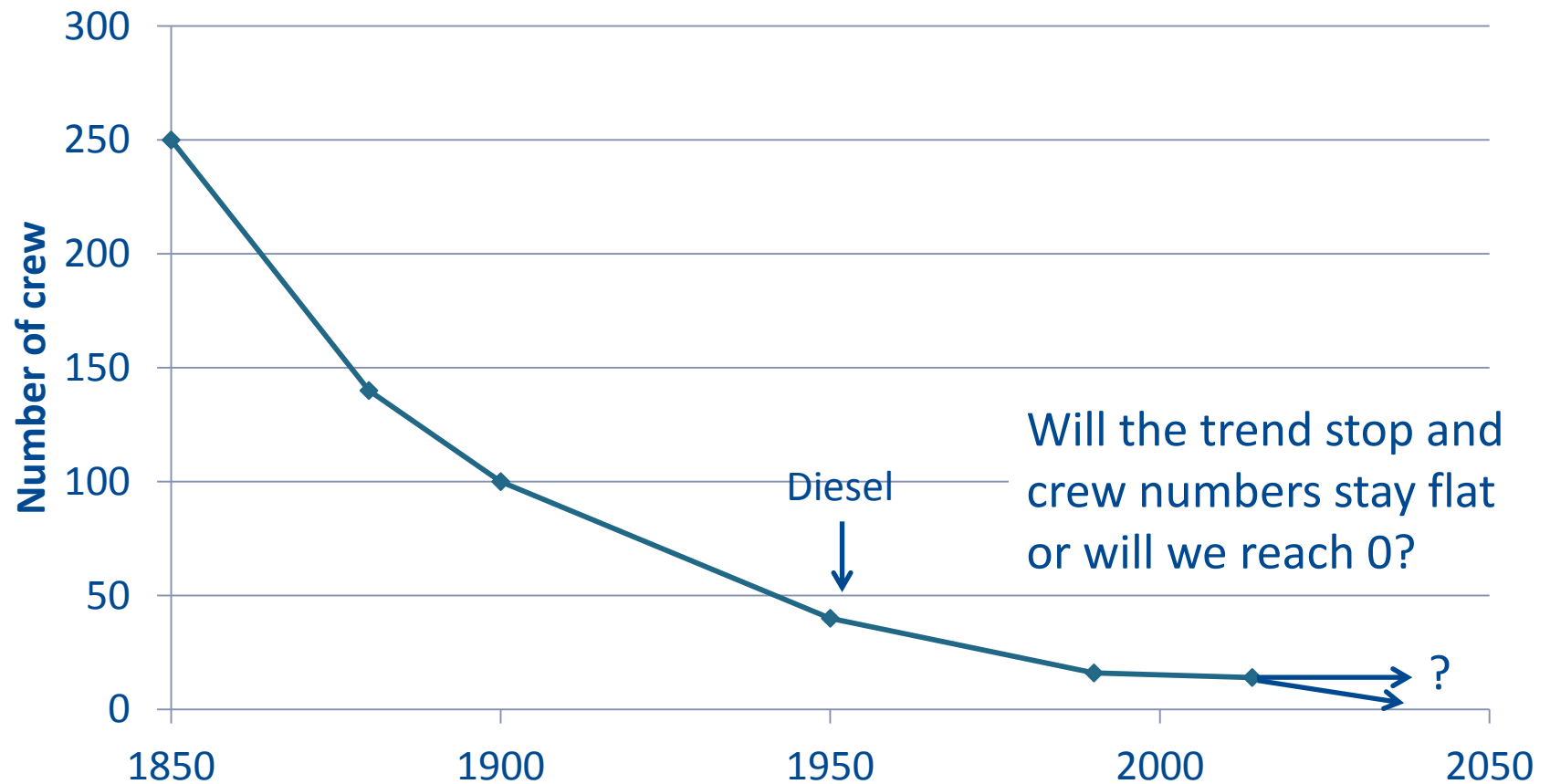
- What is the core skill of the crew vs. what do they spend their time doing?

Crewing can be the 2nd largest element in ship running costs after fuel



Crew Trends

Crew size for ocean going ships



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Remote Operations

Better working environment

- Safe
- Comfortable
- Close to family and friends

Attract young people to shipping



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Safety

A remote controlled ship must be as safe or safer than a conventional ships!

- New aids to the navigation of ships
- Most marine accidents are related to human errors
- Redundant machinery with predictive maintenance schemes will improve reliability
- Automatic safe mode if loss of control occurs

Unmanned operation is not suited for all types of ships – we will still have seafarers at sea in the future



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Safety



What is safer?

- 20 persons onboard a vessel in the North Sea in a raging storm, or
- 2 persons in a control room on land?



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Piracy

Unmanned ships are easier to protect and more difficult to hijack

No hostages

- Less interest for pirates
- Military intervention is less risky

IT security is vital

- New type of threat
- Sufficient IT security solutions are already available (e.g. military airplane drones)



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Remote Controlled Ships - Features

NO DECK HOUSE

MORE CARGO

LOWER COSTS



NO HOTEL SYSTEMS

- Water production
- Water heating
- AC
- Sewage treatment
- ...

LOWER LWT



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Remote Controlled Ships - Features

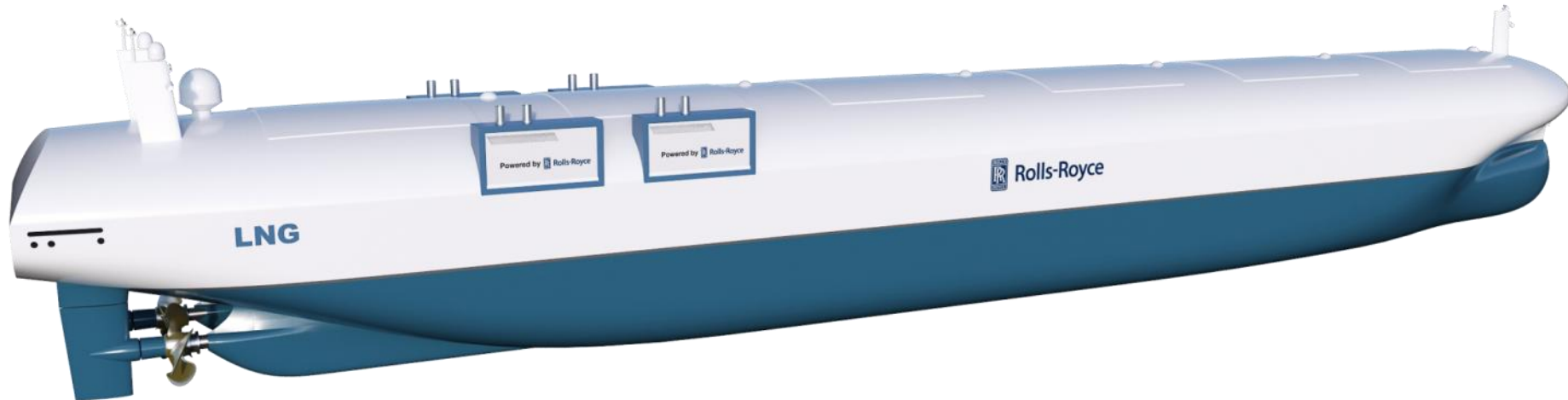
NEW POSSIBILITIES

- New machinery locations
- Novel machinery types
- Better cargo handling
- ...

BETTER WEIGHT DISTRIBUTION

COMMUNICATIONS

- Ship-to-shore
- Ship-to-ship
- IT security
- ...



REDUNDANT MACHINERY

LOWER POWER DEMAND

- Lower resistance from reduced LWT
- Lower hotel load
- ...



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Remote Control or Autonomous?

Remote control

- Port operations
- Navigation in congested areas
- Advanced manoeuvring situations
- ...



Autonomous operation

- Navigation at open sea
- Information analysis
 - Complete ship traffic overview
- Route and speed optimisation
- ...



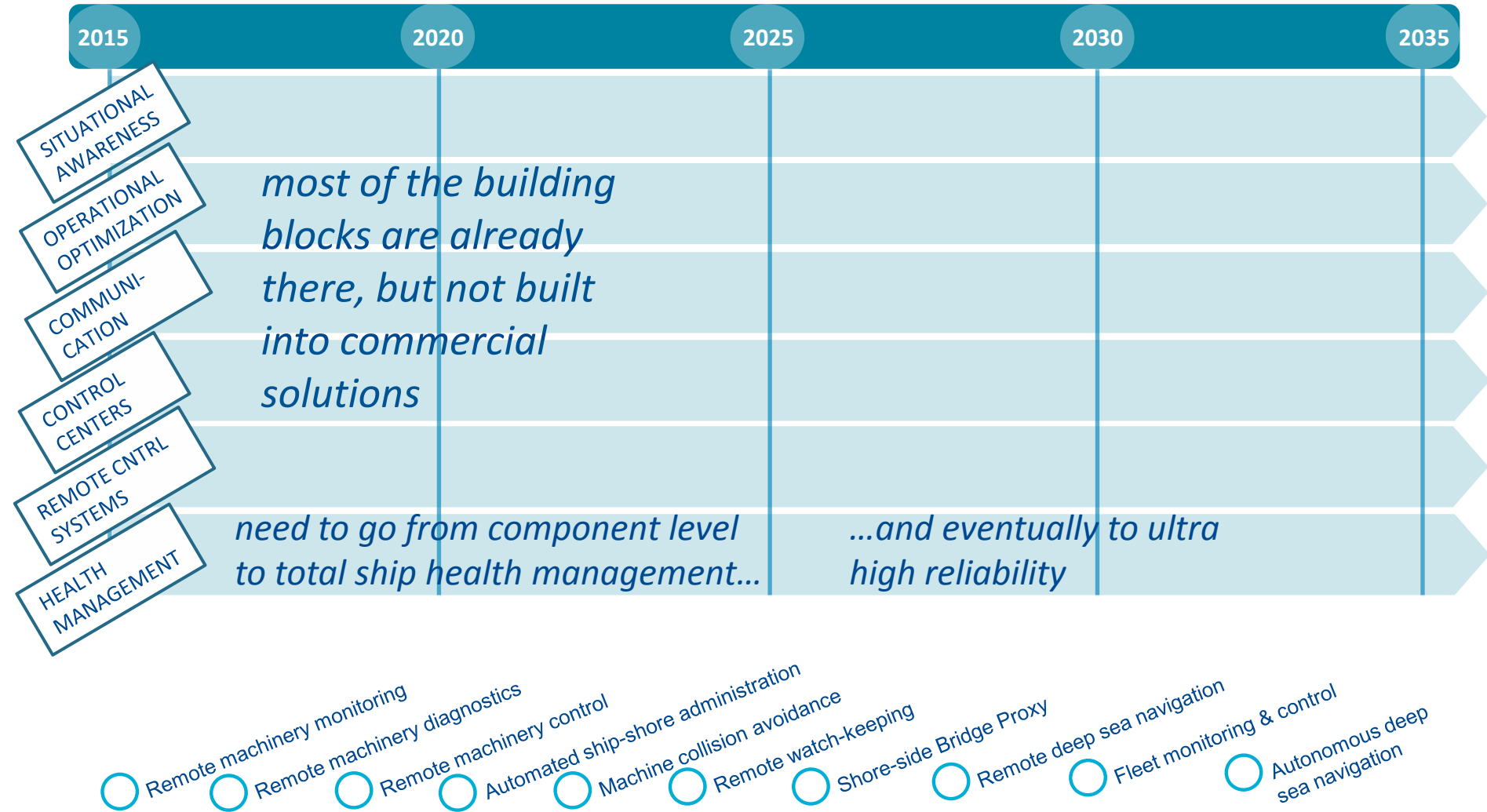
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ROADMAP for Unmanned Ships



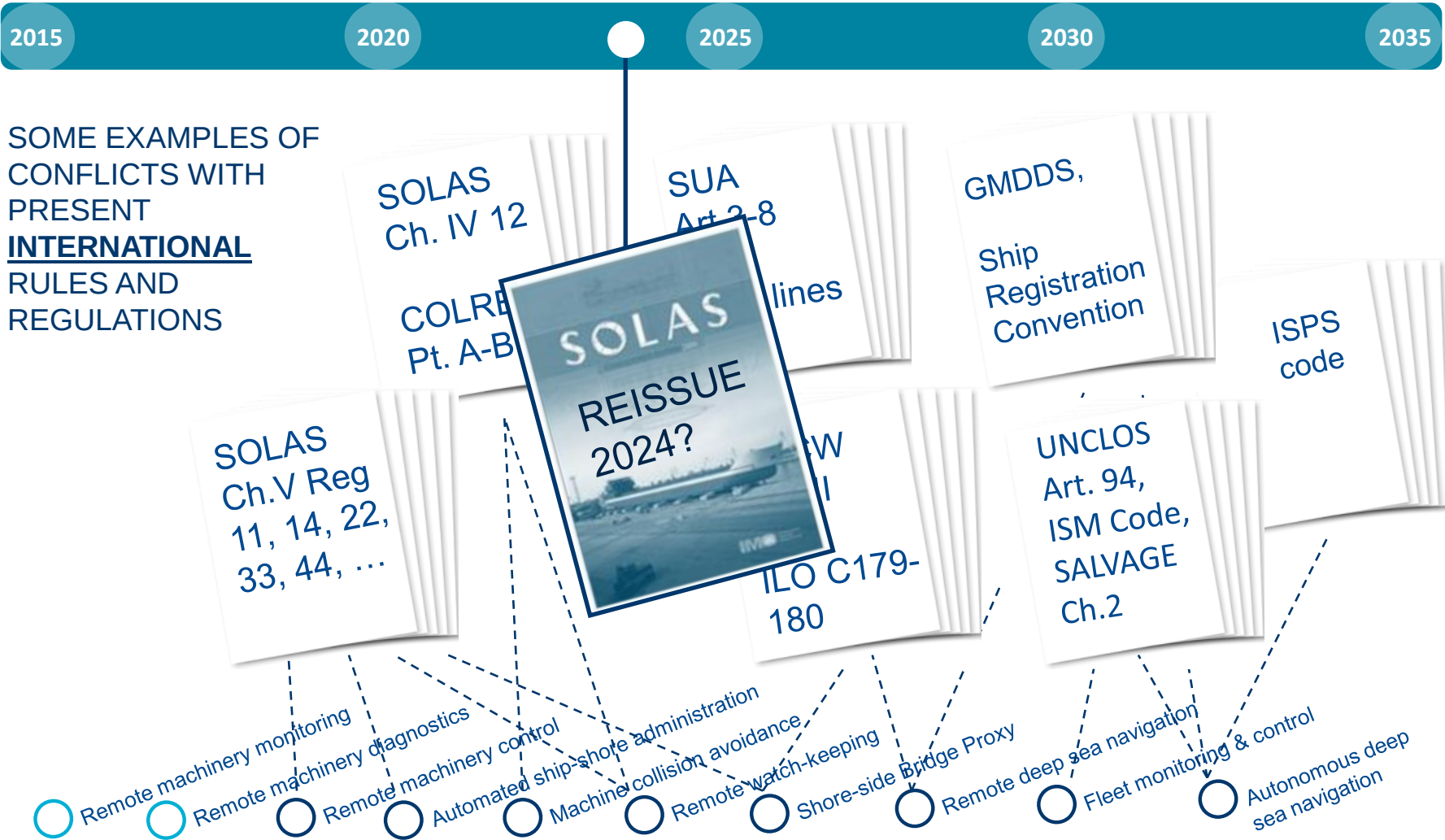
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Technology Development



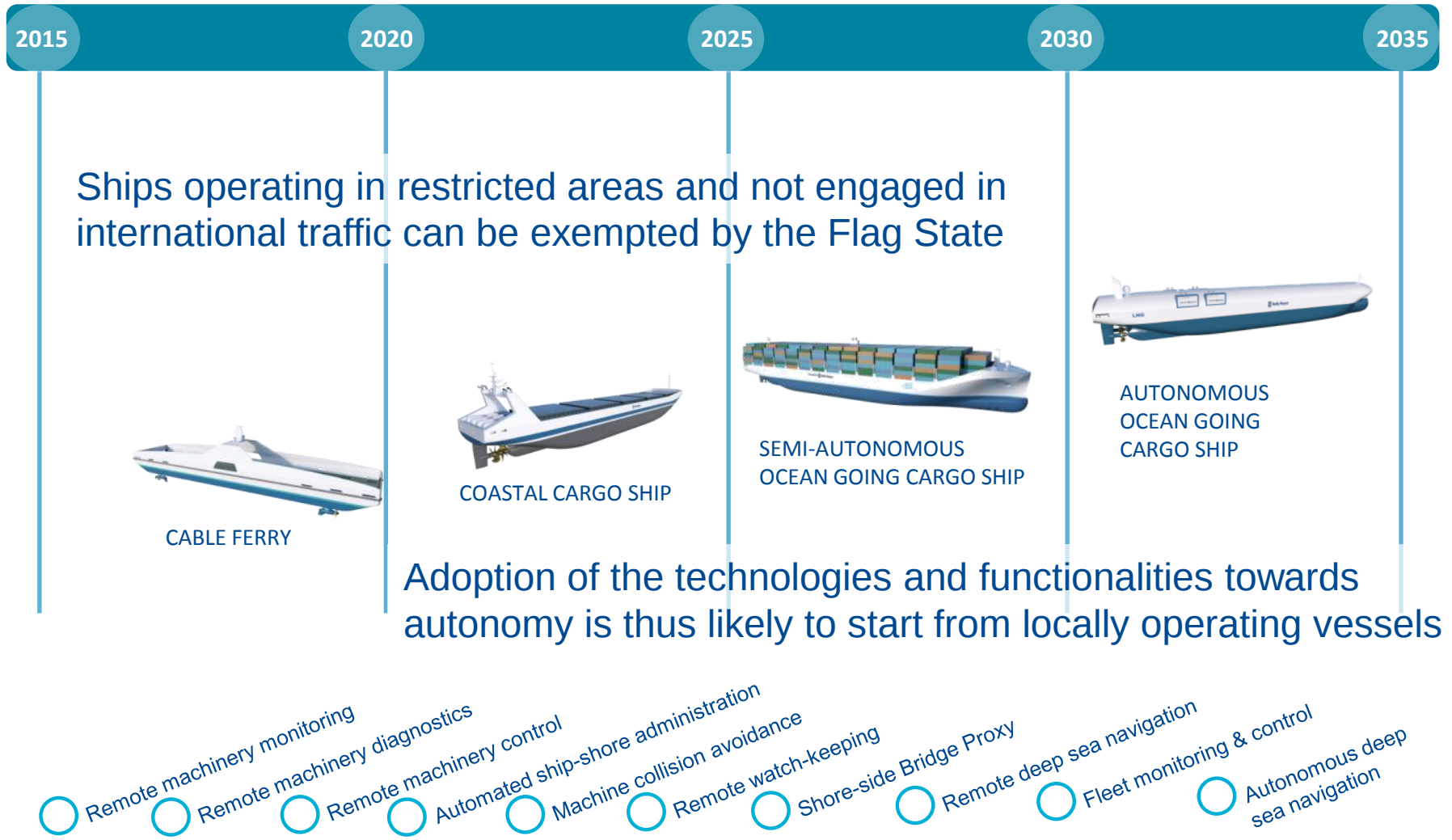
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International Regulatory Obstacles



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Potential Timeline For Ship Concepts



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Summary

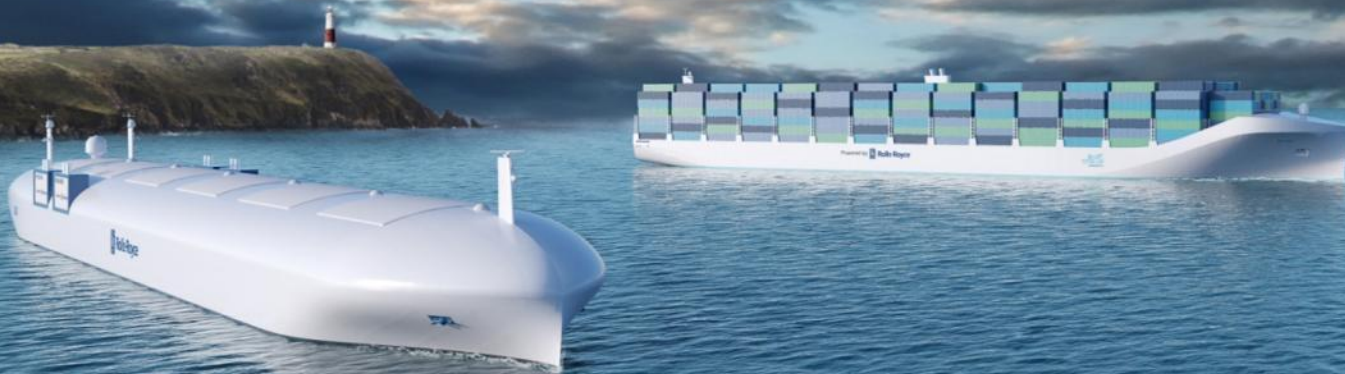
Ship intelligence – main technology trend in shipping

One of the most fundamental changes in shipping you will experience is the introduction of unmanned ships



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Better Power for a Changing World



Thank You for Your Attention!



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