ENOC Marine Workshop

Sustainability: The Future of Shipping

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DUBAI FESTIVAL CITY

Phones in “Silent Mode”

Sustainability

ENOC Group CEO

HE Saif Al Falasi

Director, OCIMF

Capt. Andrew Cassels

10th ENOC Marine Workshop

Sustainability – The Future of Shipping

Andrew Cassels, Director
Oil Companies International Marine Forum

Dubai, 18 September 2017

OCIMF

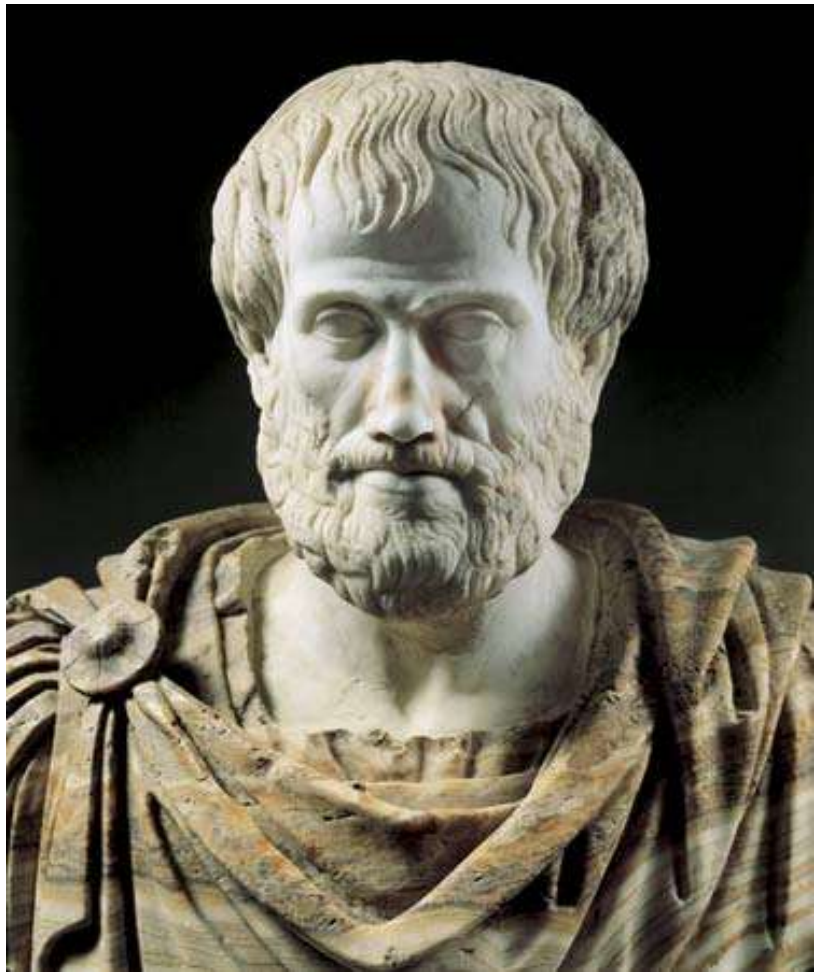
The whole is greater than the sum of its parts.....

Or so Aristotle is reputed to have said.

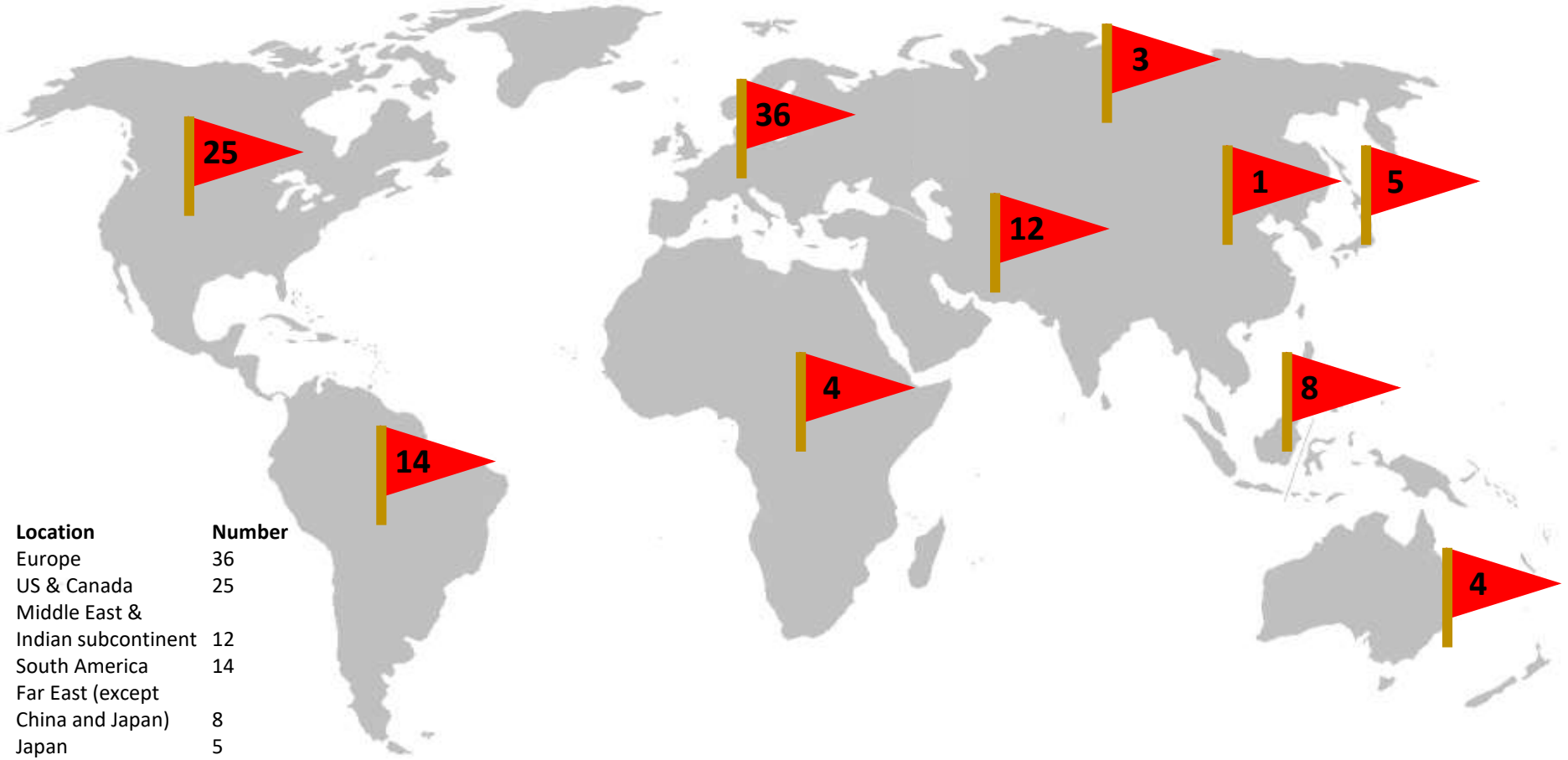
When we have a common vision and we collaborate selflessly we can achieve great things.

The **future** of tanker shipping and the **sustainability** of the sector is in our hands - but we have to work together to keep our sector in the lead.

Safety and Environmental Performance is paramount



OCIMF Member Locations (June 2017)



Location	Number
Europe	36
US & Canada	25
Middle East & Indian subcontinent	12
South America	14
Far East (except China and Japan)	8
Japan	5
Africa	4
Russia and Kazakhstan	3
Australia and New Zealand	4
China	1
Total	**112**

OCIMF at a Glance

OCIMF IN NUMBERS

47 years of OCIMF

4 principal committees

104 meetings

12 sub-committees/ focus groups AND **42** working groups/ task forces

3 PROGRAMMES: SIRE; OVID; MTIS

491 SIRE inspectors AND **370** OVID inspectors

SHIPS

8,604 ships inspected

142,795 Reports downloaded

21,155 Reports uploaded

in 2016

BARGES

6,739 barges inspected

24,136 Reports downloaded

8,256 Reports uploaded

in 2016

OFFSHORE VESSELS

2,553 offshore vessels inspected

1,374 Reports downloaded

2,634 Reports uploaded

in 2016

INTERNATIONAL MARITIME ORGANIZATION (IMO)

143 days of meetings

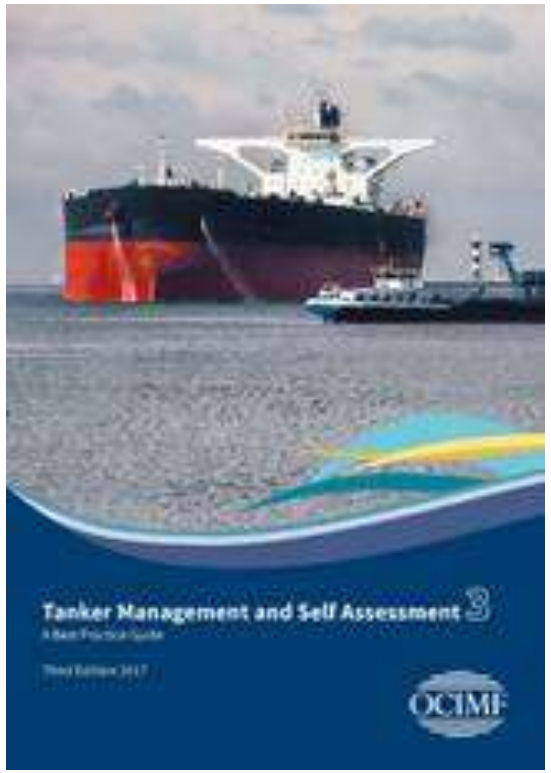
172 member states

>50 IMO conventions and protocols + hundreds of guidelines

39 books

51 information papers

TMSA 3



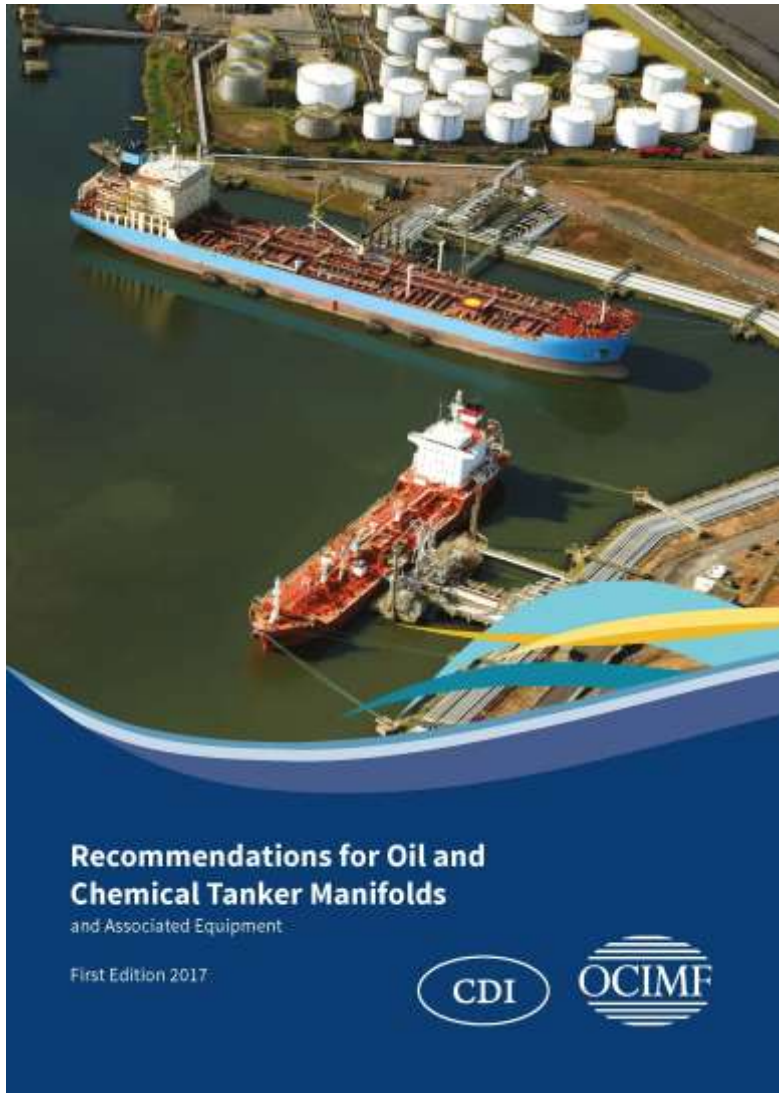
The Tanker Management and Self Assessment

We have.....

- Expanded best practice guidance to complement the KPIs and remove ambiguity and duplication.
- Streamlined and merged elements to improve consistency and make conducting the self-assessment easier.
- Introduced updated industry legislative requirements.
- Revised Element 6 and 6A - Cargo, Ballast, Tank Cleaning, Bunkering, Mooring and Anchoring Operations.
- Revised Element 10 – Environmental and Energy Management (previously Environmental Management) and incorporated the OCIMF *Energy Efficiency and Fuel Management* information paper.
- Added a new element: Element 13 – Maritime Security.

Half way through the 8 month transition phase, 50% of active TMSA 2 have been converted into TMSA 3

Recommendations for Oil and Chemical Tankers Manifolds and Associated Equipment



Recommendations for Oil and Chemical Tankers Manifolds and Associated Equipment

- Supersedes *Recommendations for Oil Tanker Manifolds and Associated Equipment* (fourth edition, 1991).
- Is now a joint publication with the Chemical Distribution Institute (CDI).
- Includes chemical tankers and dual classed oil/chemical tankers.
- Includes vessels below 16,000 tonnes deadweight.

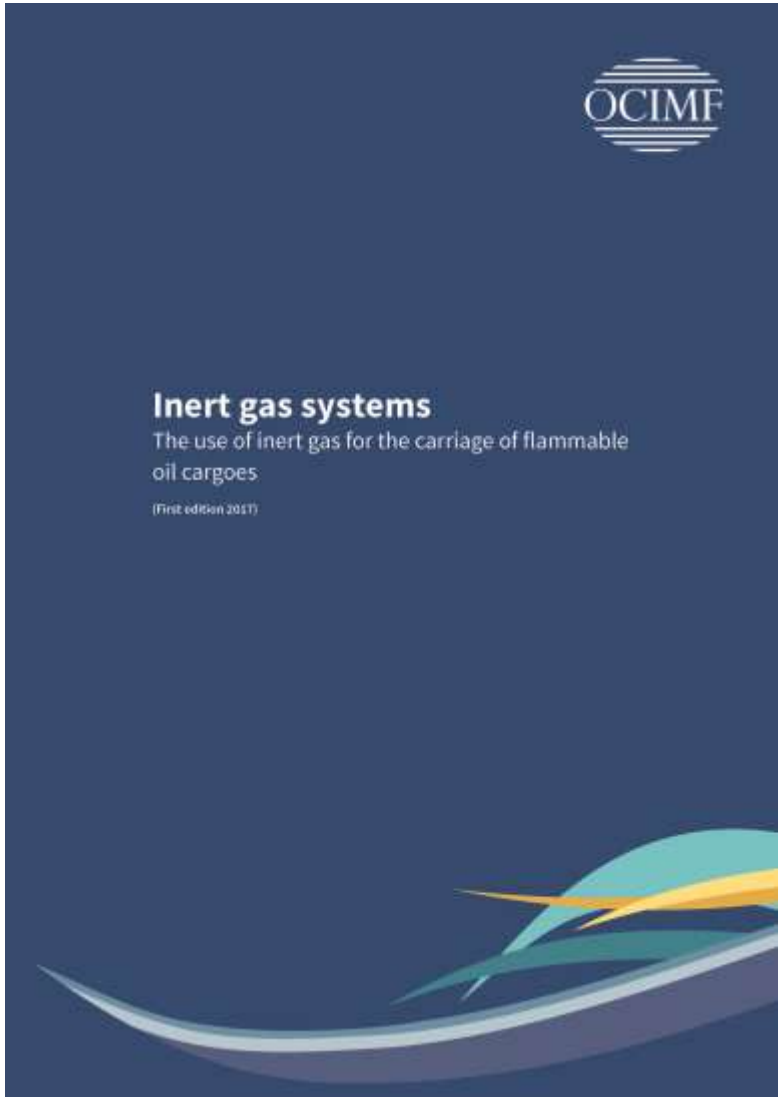
Inert Gas Systems

The use of inert gas for the carriage of flammable oil cargoes

- OCIMF fully supports the IMO introduction of the mandatory fitting to new build tankers 8,000 DWT and over, of an inert gas system when carrying flammable cargoes.

- OCIMF encourages the retro-active fitting of inert gas systems to existing tankers carrying flammable oil cargoes, not already covered by the SOLAS inert gas requirements.

- OCIMF encourages the fitting of inert gas systems to all new tankers carrying flammable oil cargoes, regardless of size.

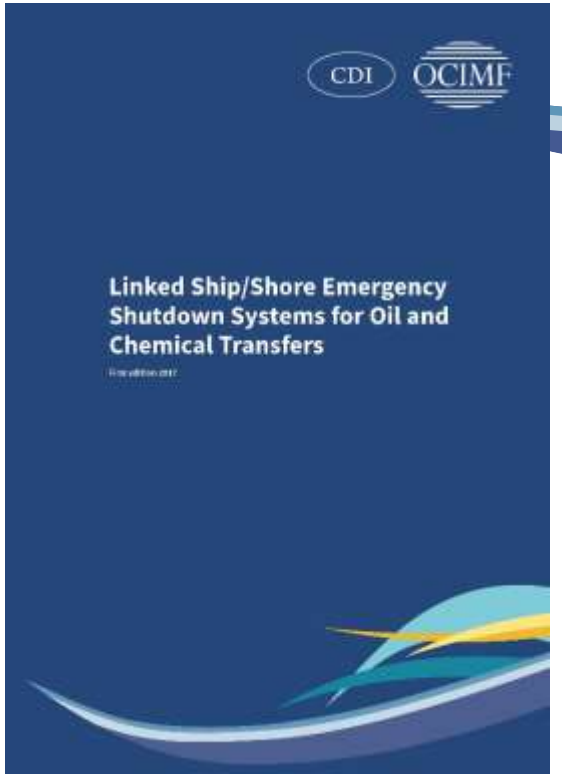


Linked Ship/Shore Emergency Shutdown Systems for Oil and Chemical Transfers

This OCIMF Information Paper recommends an Emergency Shutdown (ESD) connection that will link ship and terminal ESD systems, so that manual activation by the terminal or ship will stop cargo transfer operations.

Linked ship/shore ESD systems have been a standard safety feature of LNG transfer operations for many years.

This paper recommends a connection that should help terminals and vessels achieve that compatibility."



OVID Programme Recipient membership

The Offshore Vessel Inspection Database rules have been changed and now align with SIRE.

Access to OVID was restricted to OCIMF members but is now OVID reports can now be accessed by non-OCIMF members.

This improves access to vital vessel quality information to the wider offshore sector to improve safety and environmental performance

Mooring Equipment Guidelines

The 4th Edition of OCIMF Mooring Equipment Guidelines will be published in early 2018

Engaged with industry from mooring rope manufacturers, to ship builders and ship operators.

<u>This is an industry agreed document.</u>

We have clarified terminology, e.g. MBL, SWL, Nominal working load, etc.

- Chapter 1 is the revised philosophy.
- Chapter 2 is Human Factor considerations in the design, maintenance and operation of mooring system.
- Chapter 5 is a completely rewritten chapter on ropes with major learning on HMSF ropes
- Appendix A is the Mooring Management Plan

Publications – 2017 to date

Due release in 2017/early 2018

Books

- Mooring Equipment Guidelines 4
- Cargo Tank and Onboard Cargo Handling Management Guidelines for F(P)SOs
- Guidelines for Offshore Tanker Operations
- Construction Specification for Marine Loading Arms

Information papers

- Best Practice Guidelines for Personnel Transfer using Cranes on Tankers
- Northern Sea Route - Best Practices and Challenges
- Critical Spare Parts
- Guidelines for the Handing, Storage, Inspection and Testing of STS Hoses
- Industry Expectations for the Provision of Marine Terminal Information and Port Regulations
- Marine Terminals Impacted by Ice or Severe Sub Zero Temperatures
- Navigational Audits and Assessments - A Guide to Best Practice
- Ship Security - Guidelines to Harden Vessels
- Volatile organic compounds (VOC) emissions white paper

Sustainability – The Future of Shipping

I truly believe that the tanker sector is the best performing of all the shipping sectors.

We have many learnt lesson, sadly many of them the hard way....but we have learnt!

The world is ever changing and the challenge to get safer and clearer never does not diminish....there is more to more.

We should strive to learn before incidents happen and we can do that best by working together.

Through meetings like the ENOC Marine Workshop and working together with collectives like INTERTANKO, CDI, SIGTTO, ICS, BIMCO and OCIMF we help to make the industry sustainable for future generations.

Thank you

Thank you

OCIMF

A Voice for Safety

OCIMF.com

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We have come a decade

2007 to 2017


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Executive Director, EHSSQ &
Corporate Affairs, ENOC Group

Dr. Waddah Ghanem

Managing Director INTERTANKO

Katharina Stanzel

Sustainability

What does it mean?

"Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Sustainability in Shipping


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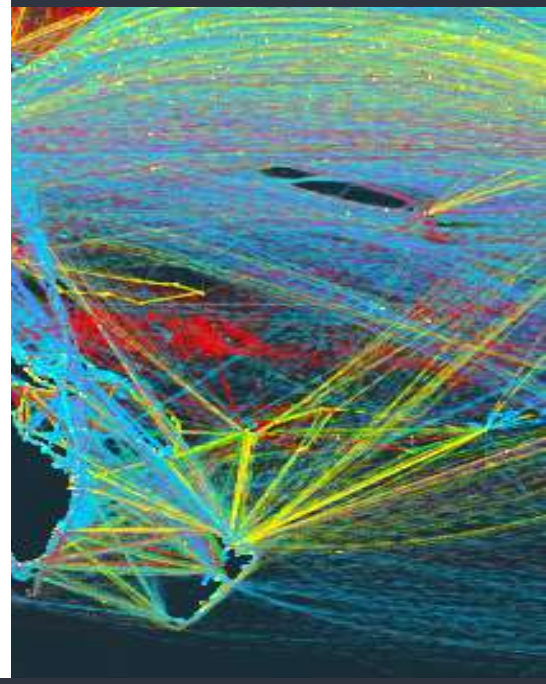
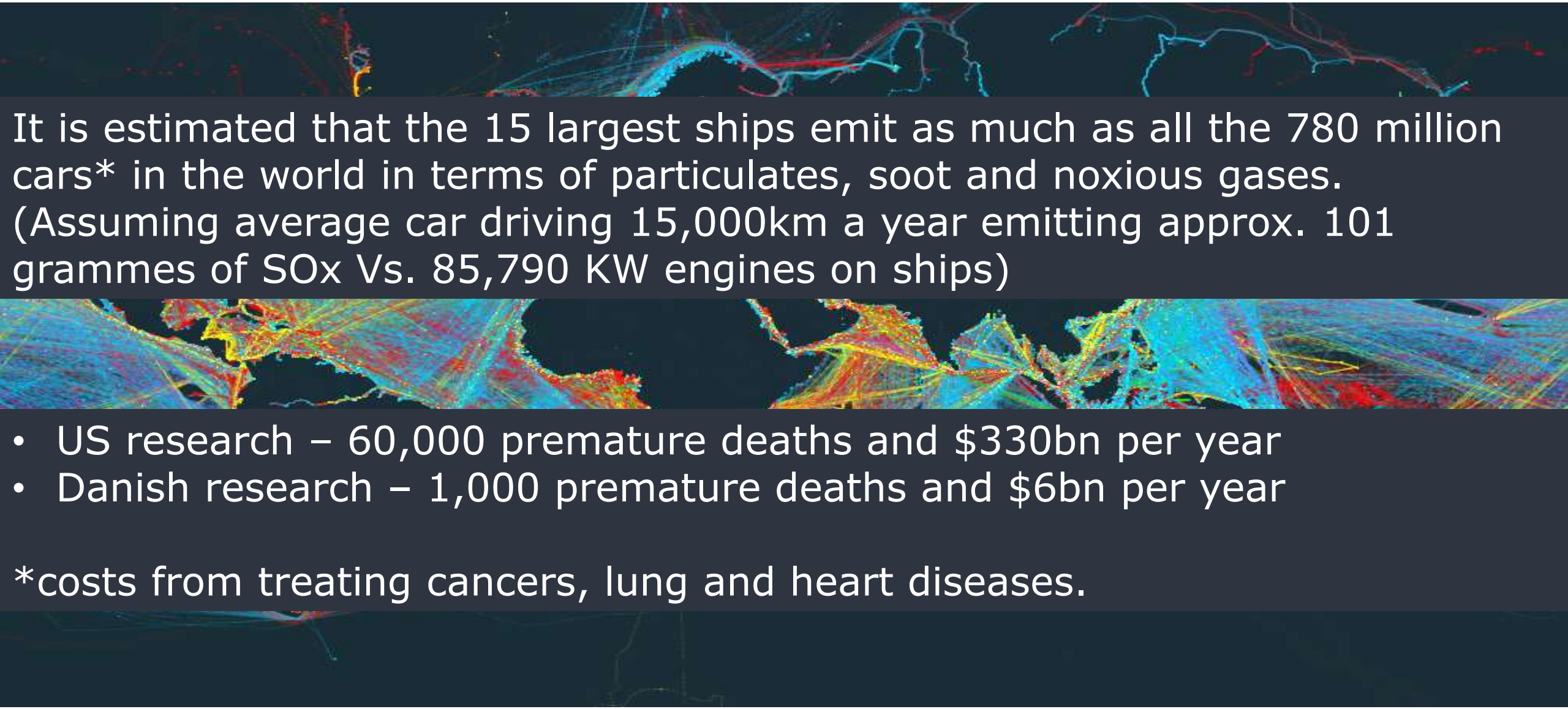
Shipping is responsible for

- 90% of global trade
- 2% to 3% of global CO2 emissions.
- 8% to 9% of the global Sulphur oxide (SOx) emissions
- 18% to 30% of global Nitrogen oxide (NOx) emissions



- 70% of ship emissions are within 400km of land.
- 85% of ship emissions are in the northern hemisphere

Media & Academic perspective

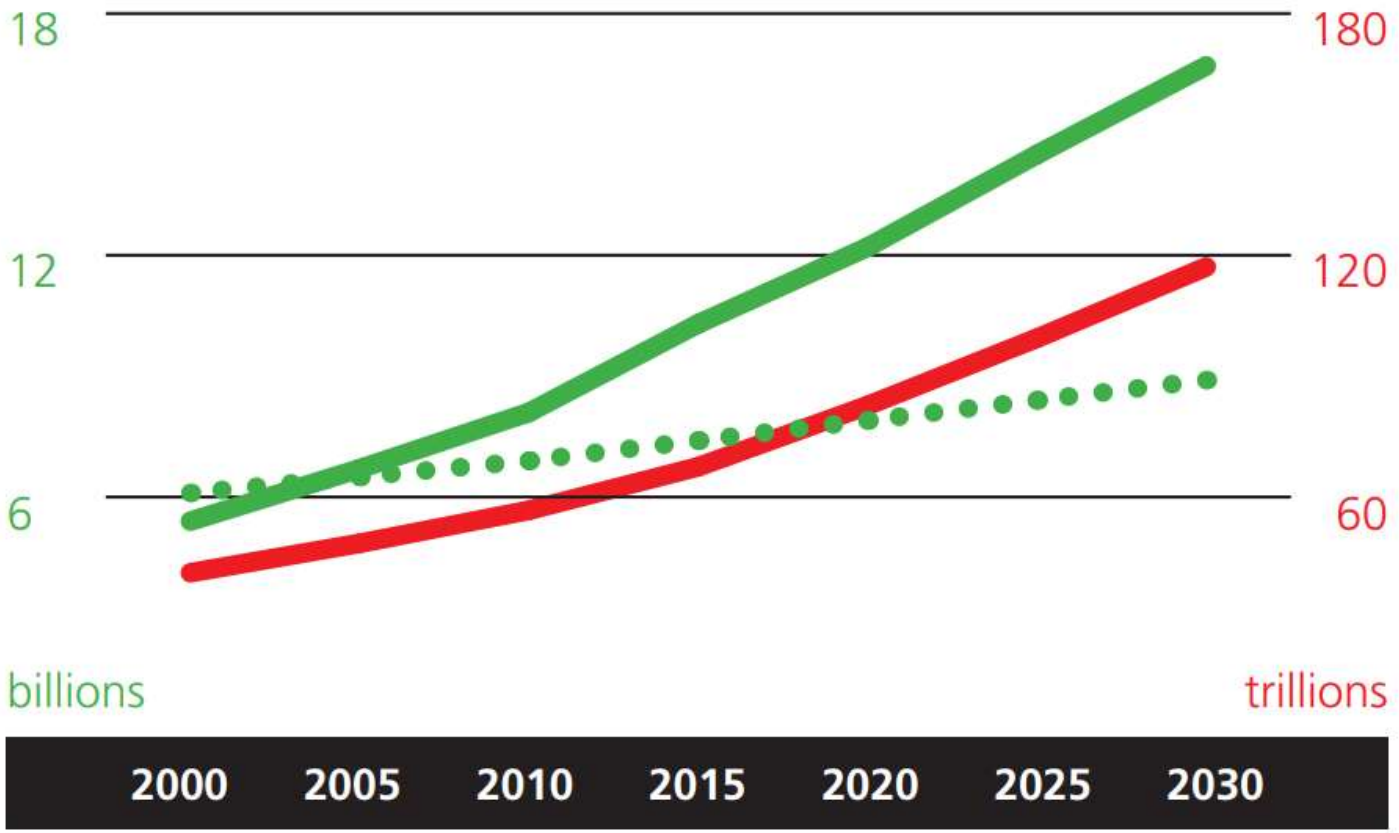


It is estimated that the 15 largest ships emit as much as all the 780 million cars* in the world in terms of particulates, soot and noxious gases. (Assuming average car driving 15,000km a year emitting approx. 101 grammes of SOx Vs. 85,790 KW engines on ships)

- US research – 60,000 premature deaths and $330bn per year
- Danish research – 1,000 premature deaths and $6bn per year

*costs from treating cancers, lung and heart diseases.

Predicted increases in World GDP, Sea Trade and Population

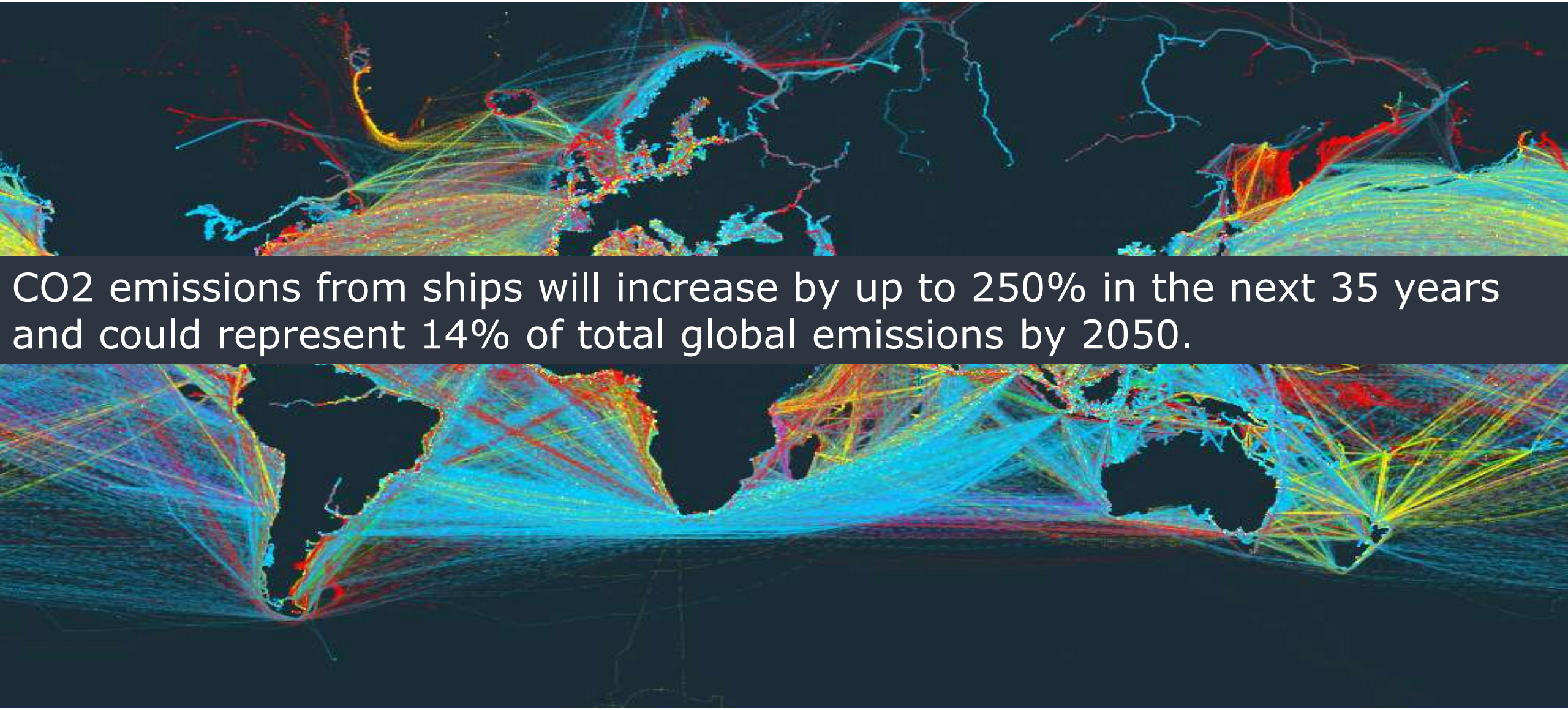


World seaborne trade carried in tonnes (billions)
World economy GDP in US $ (trillions)
World population (billions)

Sources: IHS, OECD, UN

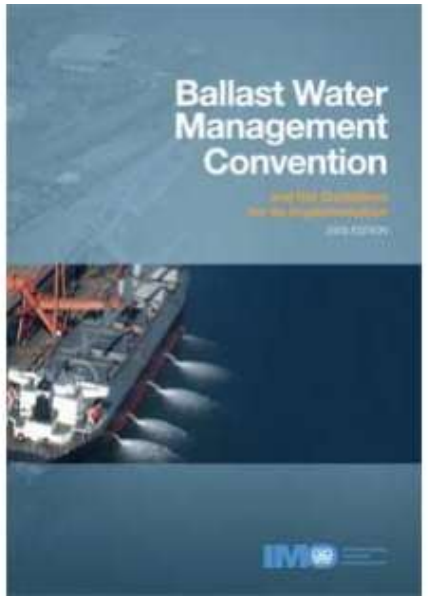
Maritime Trade Will Continue to Expand (with Global GDP and Population)

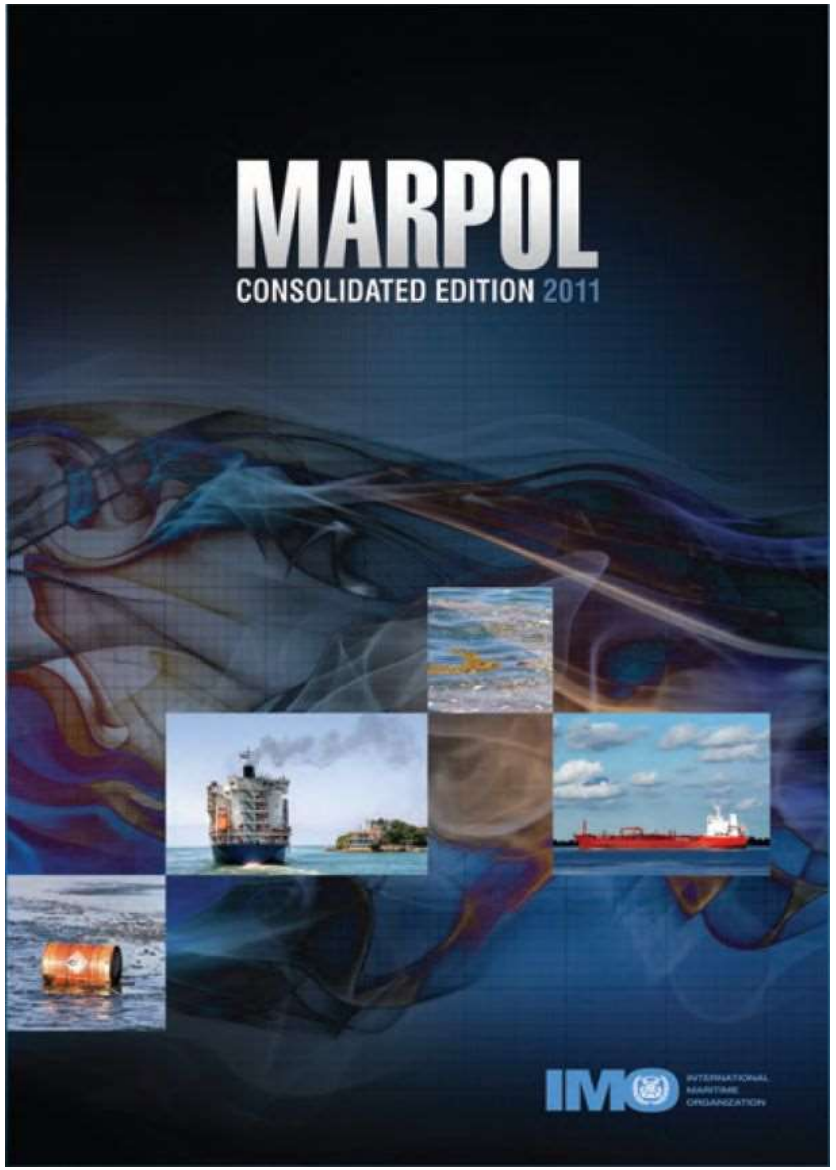
Predicted Increase

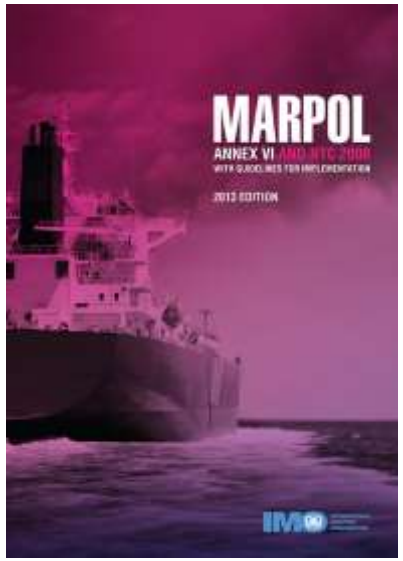


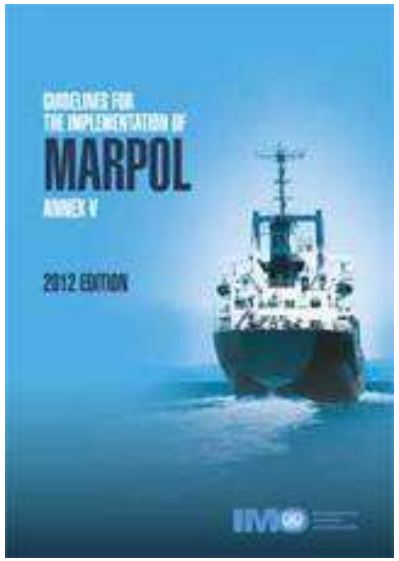
CO2 emissions from ships will increase by up to 250% in the next 35 years and could represent 14% of total global emissions by 2050.

IMO Environmental Legislation

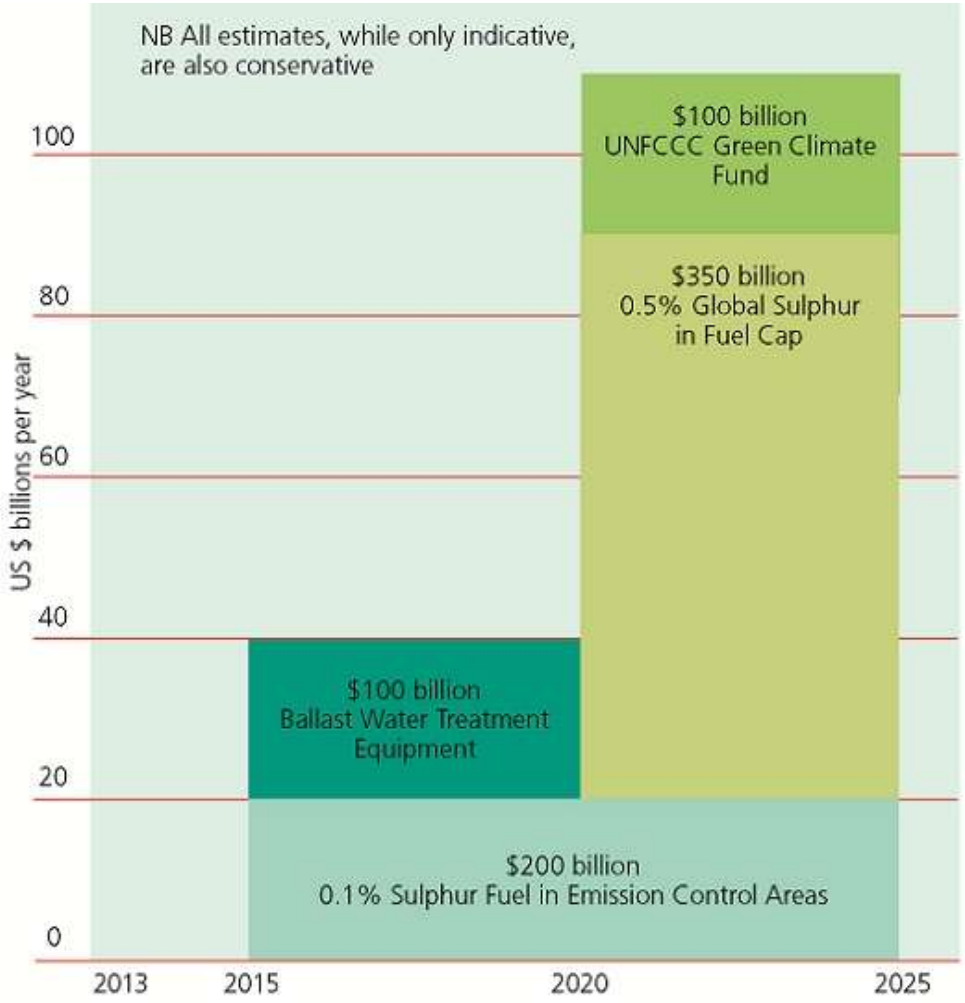








Shipping Faces Half Trillion Dollar Environment Costs



Potential cost to global shipping of new environmental regulations over the next decade (2015 to 2025)

50 billion dollars per annum

Ironically, most of the expensive environmental regulations that are about to enter into force were conceived in a different world, at a time when shipping markets were booming

Sinking under a big green wave?

Technical Director,
INTERTANKO

Dragos Rauta

Head of New Buildings & Projects,
Minerva Marine Inc

Vaia Chatzigianni

MINERVA MARINE Inc.

Owners experience on the installation/operation of Ballast Water Systems

Dubai September 2017

Vayia Hatziyianni Head of NB and Projects- Minerva Marine

MINERVA MARINE Inc.

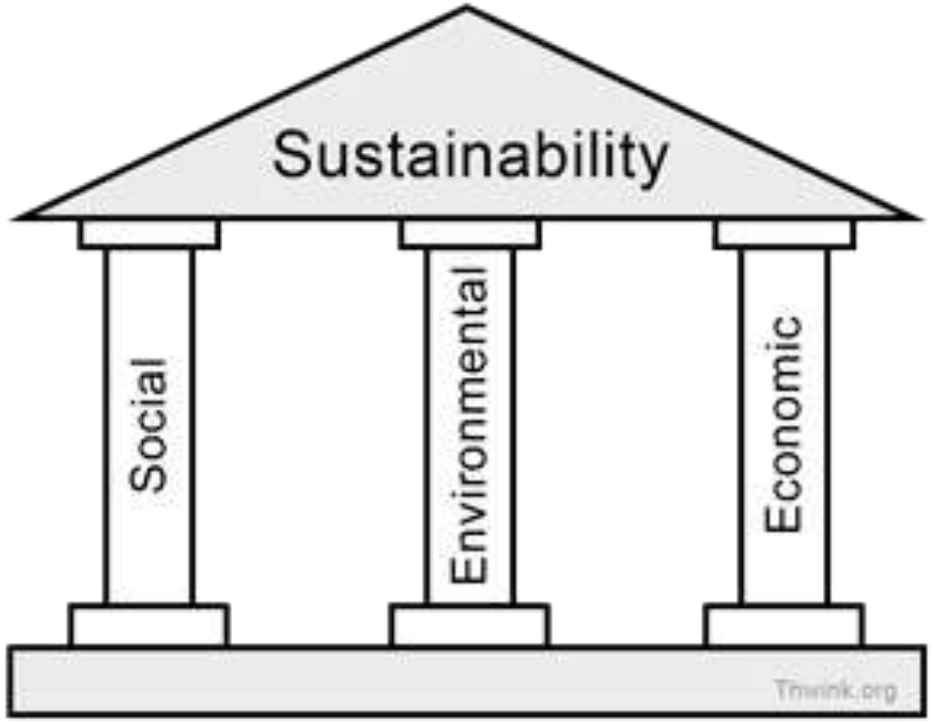
Minerva quickly grew from a tanker manager of 6 vessels in 1996 to **one of the world's largest Aframax fleet operators** today.

Has further expanded its operations to include MR, Suezmax and VLCC vessels in the tanker segment and Capesize vessels in the bulk carrier segment.

Total Fleet number	Number
Crude/Product Tankers	61
Bulk Carriers	5
Total fleet length	15.5 km
Total dwt	7.7 millions

Company Overview

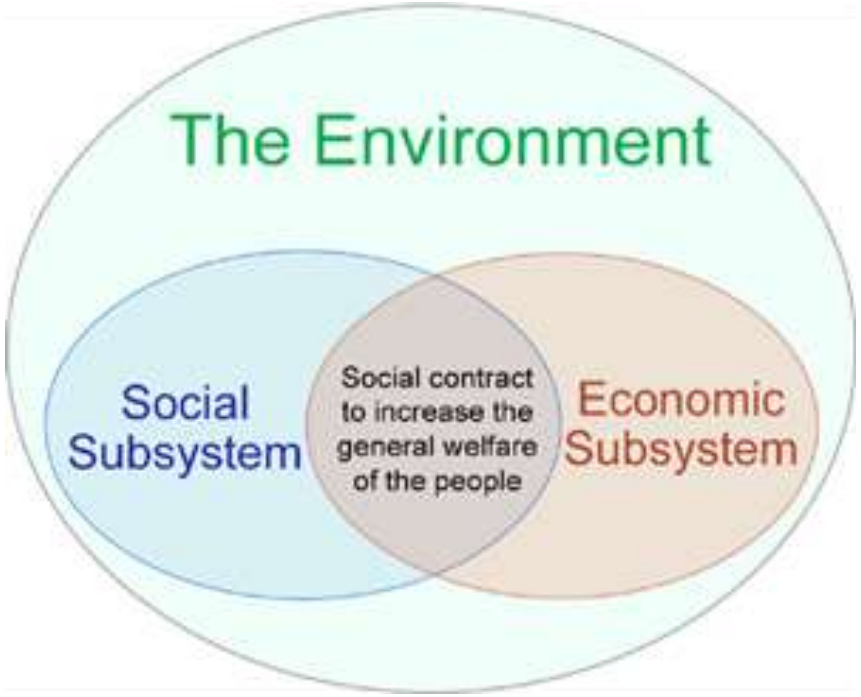
MINERVA MARINE Inc.



The three pillars of sustainability consisted of at least the economic, social, and environmental pillars.

Most national and international problem solving efforts focus on only one pillar at a time.

Ballast water and sustainability



- **Mitigate environmental problems of biodiversity allocation and minimize the cost of its restoration**
- **Social benefit to society from cleaner seas, protection of local biodiversity**
- **Improve regulations at international and regional level so as to be effective**

Ballast water regime and sustainability

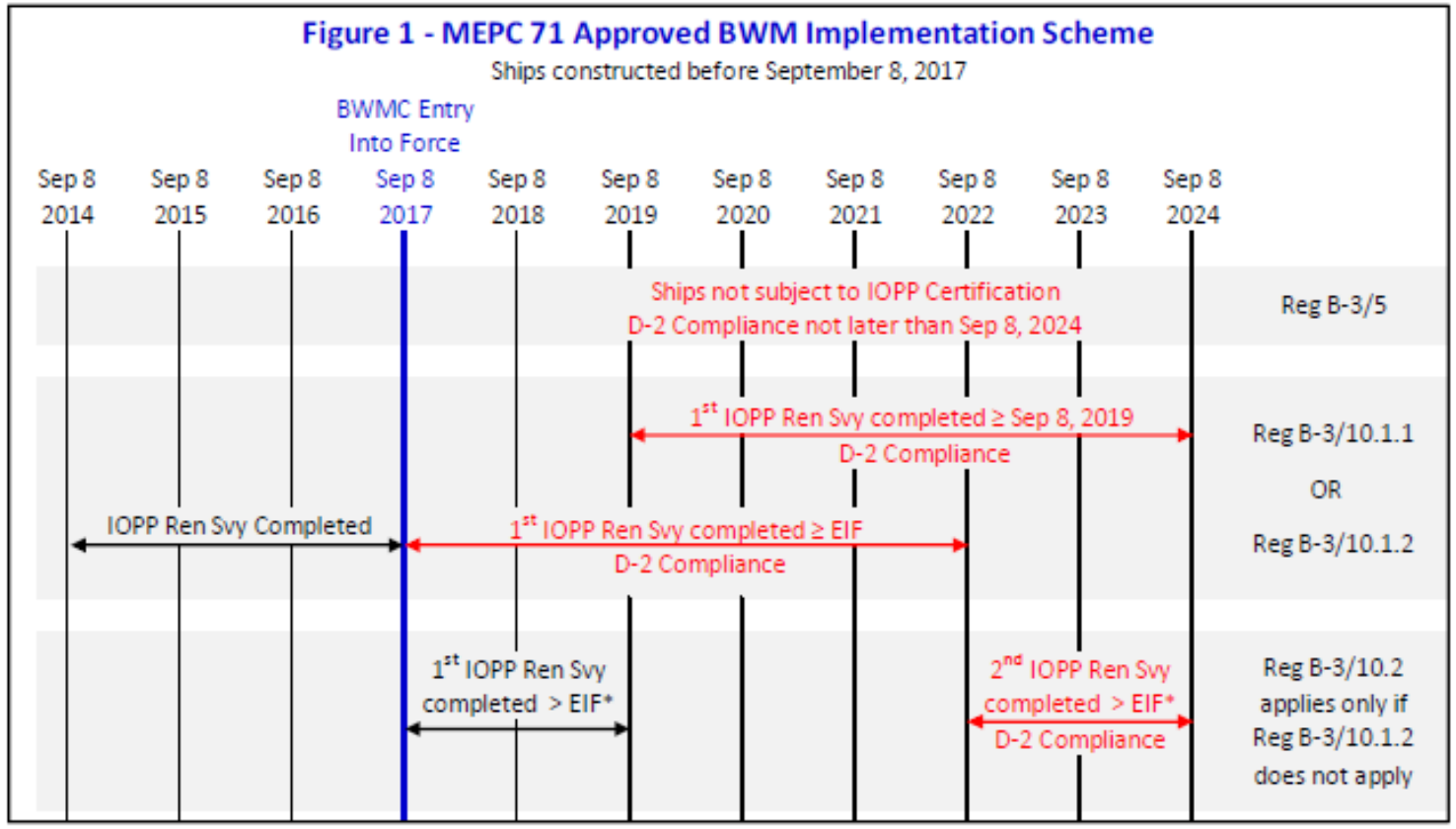
MINERVA MARINE Inc.

The 71st session of the IMO Marine Environment Protection Committee (MEPC 71) was held from 3 to 7 July 2017, at the IMO headquarters in London.

In regard to the retrofitting schedule of the Ballast Water Treatment Systems (BWTS) given in regulation B-3 of the BWM Convention, MEPC 71 decided on a further two years' delay compared to the previously agreed retrofitting schedule.

Fitting date for new building should be in accordance to the new construction (keel laid) on/or after 8 September 2017.

BW Convention enforcement MEPC 71 results



MEPC 71 results

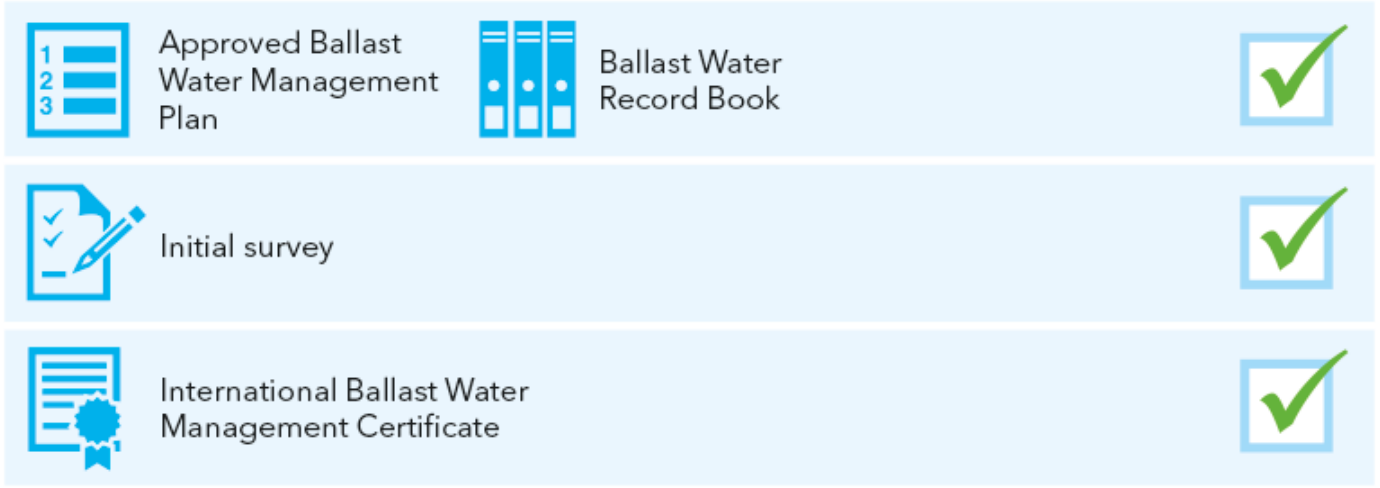
US has not ratified the BW Convention. Vessels trading in US must be in compliance with:

a) CFR 33 CFR Part 151 46 CFR Part 162 Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters;

b) US EPA VGP

c) Individual state requirement

US BW regulations



The BWMC requires each vessel to carry an International BWM Certificate, issued by flag states

Extension letters for US trading should be ensured

Compliance Preparation

Compliance issues: Approval status and limitations including in the type approval, USCG approval status, differentiation factors.

Performance issues : Matching dose level with the biocide demands, explanation of operating principals and biocide control mechanism incorporated in the system.

Safety issues (focus on the installation and operation) : Description of identified safety issues, propose mitigation issues (risk assessments that have been made, infrastructure of the system, lessons learned).

Operational issues : What is the skill level or training requirements needed, required maintenance, CAPEX the OPEX and spares, redundancy issues.

Environmental issues: Effluent discharges, stricter regulations on effluent discharges, disposal of the by-products (UV lamps, chemical by-products, drain etc.)

BWM system Operational concerns

During the analysis of the Type approval specific limitations in regards to the Salinity, temperature, Holding time, Dosage, Discharge limits, UV intensity, revealed.

	TRO	LIMITATIONS	NOTES
X	10 ppm	>6 psu>5 ˚C	
Y	5ppm	0-50 ˚C	Minimum holding time 48 hours
Z	2.5 ppm	None listed	
F	10 ppm	> 10psu	
M	20 ppm	None listed	Max discharge concentration 0.003 TRO

*Example -chlorination systems

BWTS limitations

MINERVA MARINE Inc.

Power Consumption

Footprint

Compatibility with vessels outfitting

Unit flow range

Location limitations

Other..

*Example based on type approval analysis

	Flow rates (m3/h)	Footprint (m3)	Power (kw)
A	500-5,000	7.2-18.4	20-157
B	60-6,000	2.1-16.3	10-114
C	50-3,000	No report	No report
D	30-10,000	0.14-2.6	2-150
E	200-6,500	6-30,2	26-224

BWTS limitations and installation issues

Preparation part/vessel takes 9 but up to 12 months.

Duration relies on many factors including availability of equipment, dry docking availability, approval and certification process.

Goal is to streamline the whole process.

Installation preparation

Feasibility study (3D scanning, analysis of the vessels infrastructure, matching vessel-BWTS)

Engineering study (modeling, isometric drawings, installation specification)

Installation (dry docking selection, prefabrication, commissioning and installation)

Post monitoring (Plan maintenance, procedure development, sampling and performance monitoring)

Installation - Retrofit Plan

Engineering challenges: Space availability, Structural modifications, Pumping Head, Piping modifications, Powering & Electrical integration, Automation.

Planning/resources and cost challenges:

-FAT
-Commissioning
-Dry docking
-Training
-Sampling
-Post monitoring

Installation studies Challenges

Crew training: Crew training program ensuring sufficient understanding of regime, requirements and familiarization/operation with the equipment should be developed.

Performance monitoring: KPI's development and operational monitoring, VGP requirements.

Sampling: Design the sampling system as per requirements. Difficulties to find laboratories and comply with sampling transfer time.

Installation/Operation Challenges

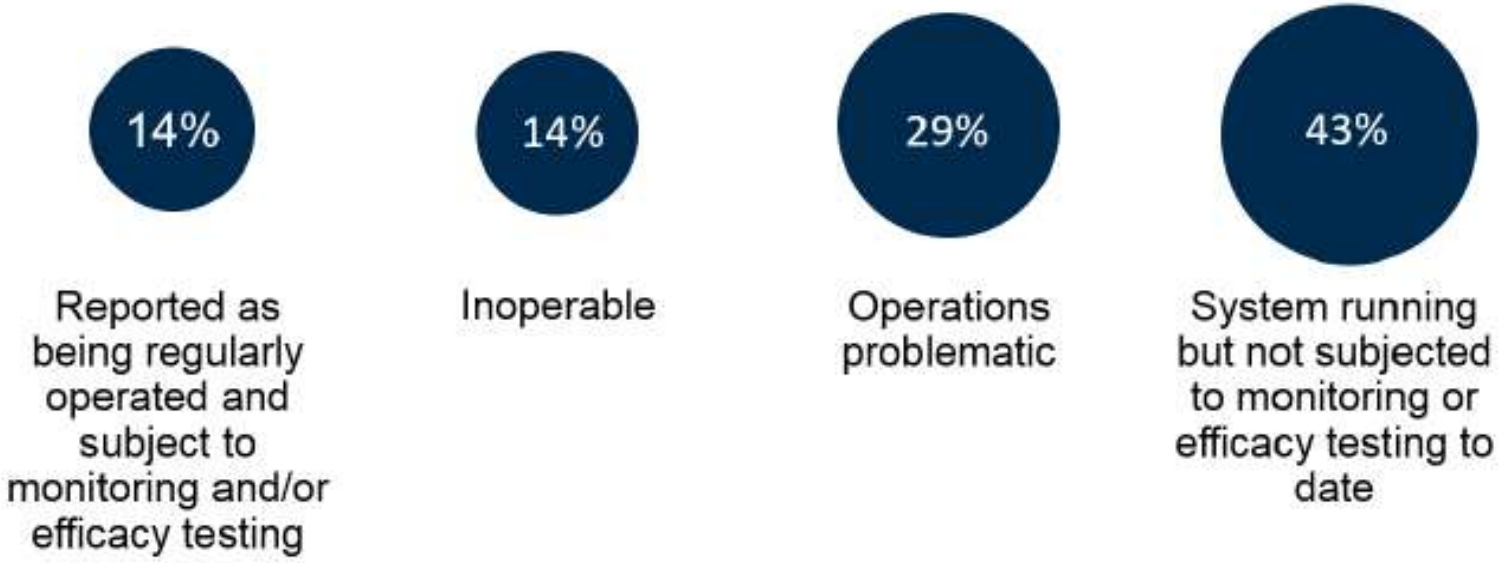
Defective parts: Detector, TRO analyzer, DP sensors TRO display, TRO sensors, rectifiers, neutralization pumps.

Sensors: unreasonable alarms, calibration failed

Software issues: (malfunctions and updates), reporting function is missing

Other: Limited supply network, Neutralization and consumables/service engineers availability, training network.

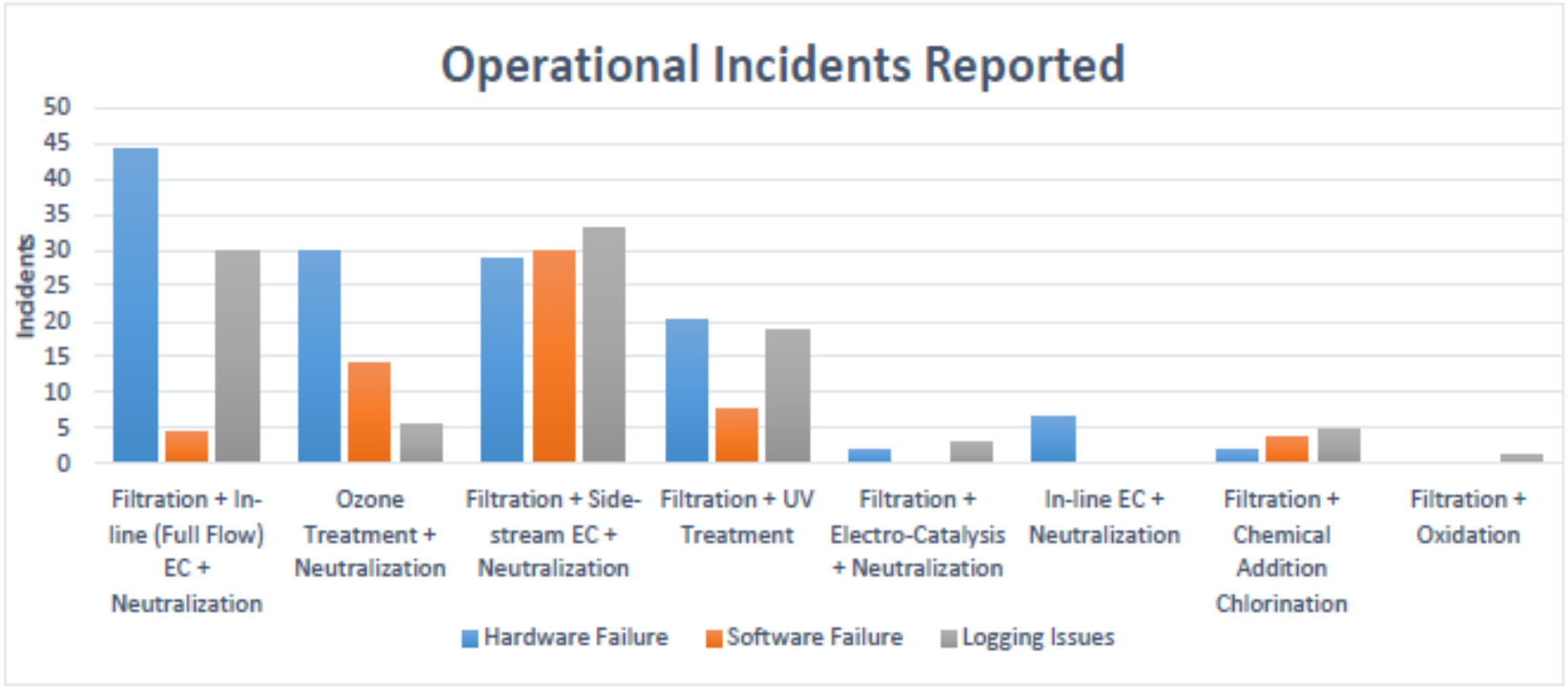
Issues during operation



*Source: ABS report, August 10, 2017

Based on n ABS survey using information on 220 BWM Systems

Limited/problematic reported experience



*Source: ABS report, August 10, 2017

Limited/problematic reported experience

- **The cargo profile/ operation of the vessels will be influenced in many cases. (ballast pump head, no gravity operation, imposed limitations from the BWT system).**

- **Financial burden for the ship-owner. The OPEX of the vessel be increased.**

- **Some makers may not acquire USCG type approval. Some vessels will not acquire BW extension for US trading.**

Considerations

- **Risk assessment for human health and the environment is based on information provided by the manufacturer of the BWMS and assessed from IMO.**

- **Heavy workload burden to the operators for installing and operate the system vs strict requirements.**

- **Learning from the operation of the systems has started but it is in a preliminary stage.**

Considerations

- **Other effects such as the formation of potentially toxic disinfection by-products, are already discussed from stakeholders.**

- **As soon as the Convention enters into force and BWMS are installed on board ships real data from monitoring will reveal.**

- **In preparing for this future challenge, the marine industry could benefit from the expertise and experience available in other areas of water treatment.**

Future considerations

MINERVA MARINE Inc.

Thank you

Head of Maritime Advisory ME, DNV GL

M Shahrin Osman

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Sustainability : The Future of Shipping

10th ENOC Marine Workshop

M Shahrin Osman

18 September 2017

Contents

- Setting the scene

- DNV GL Research Paper on Low Carbon Shipping Towards 2050
  - Developing a model
  - Key findings & next steps

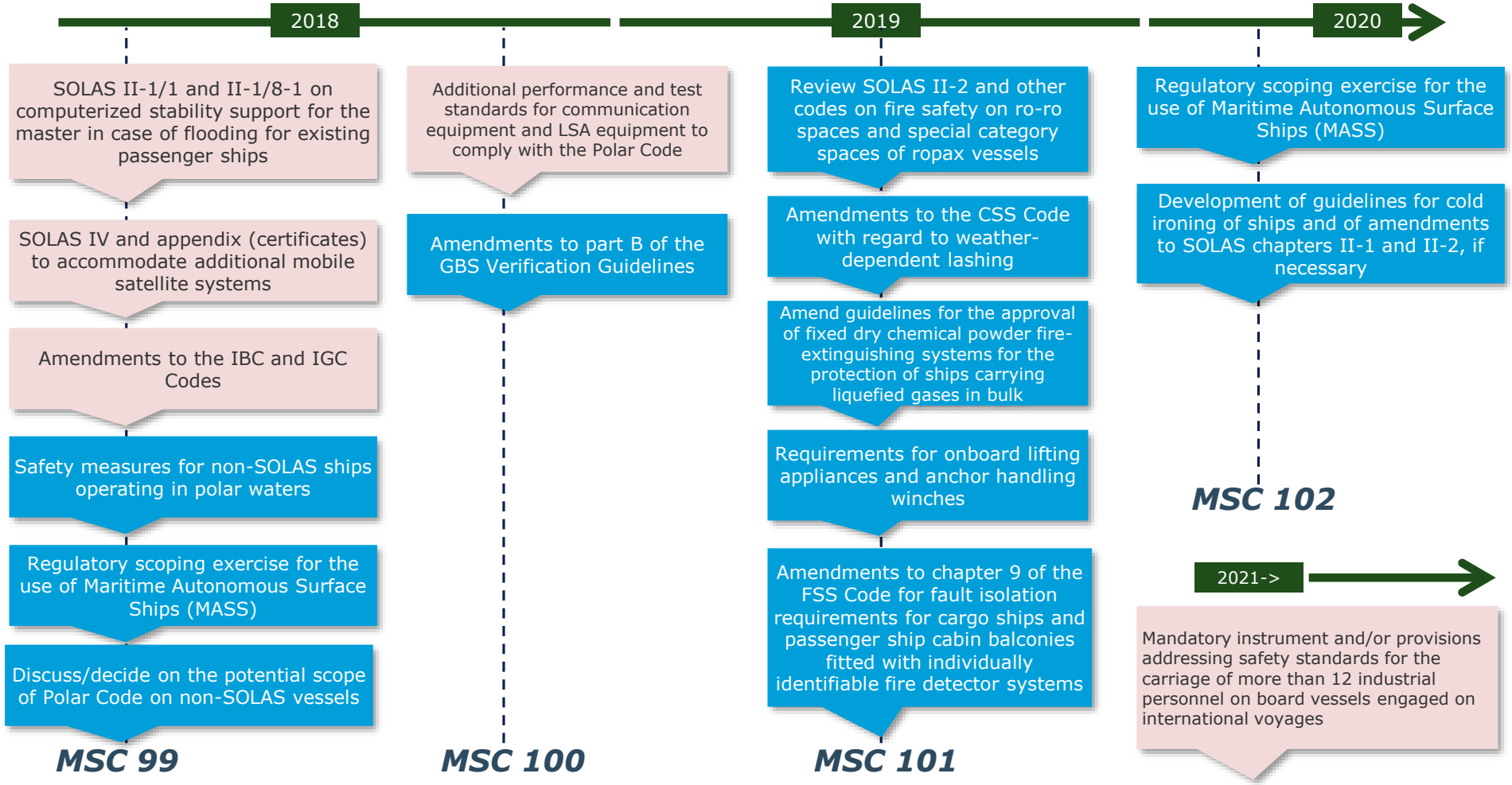
- Digital Twin
  - Integrate operational performance knowledge into next generation ship design
  - Joint Industry Project

Updated

Major IMO decisions – Safety

Adoption of amendments to mandatory instruments

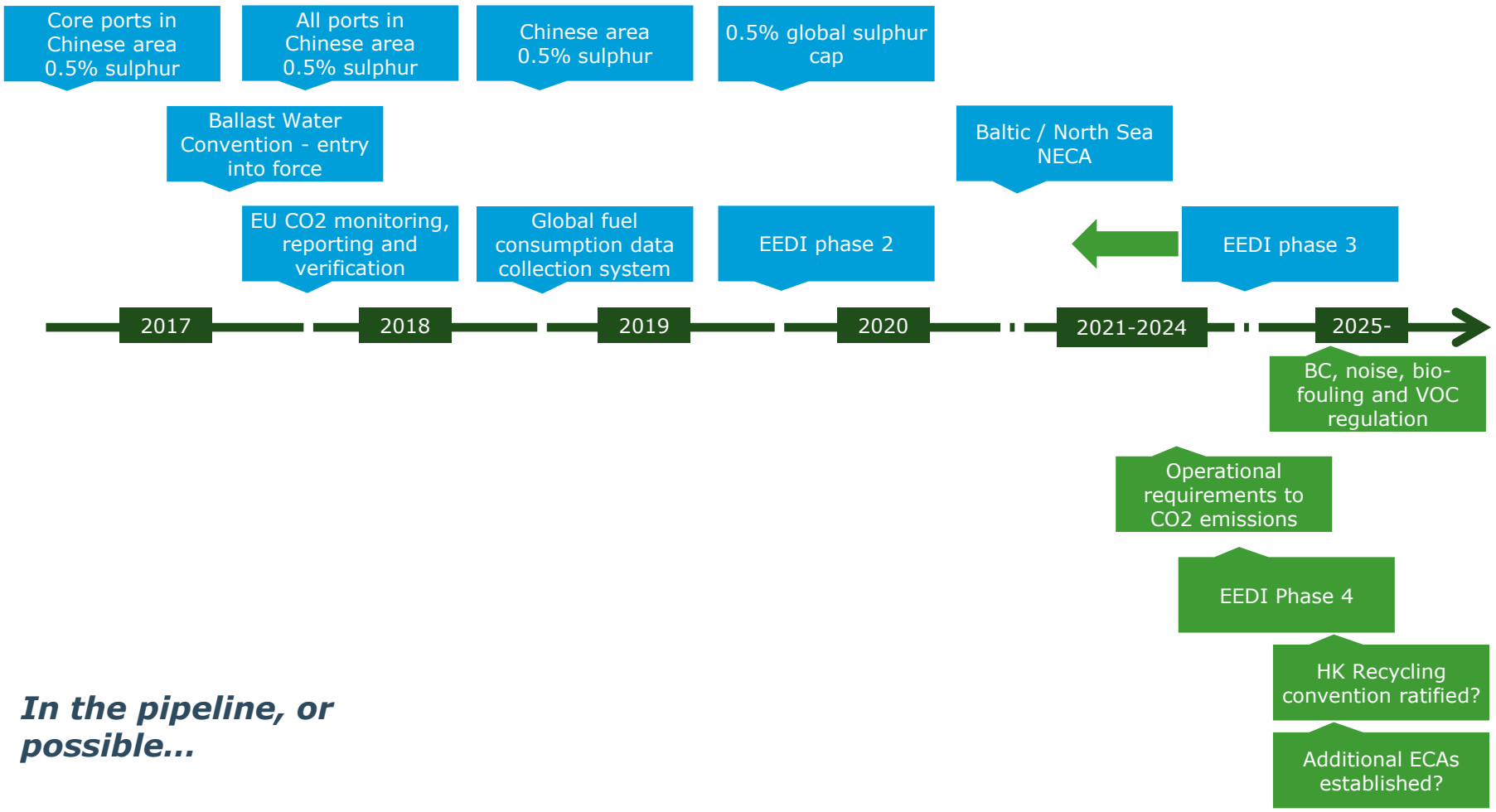
Reviews, new/amended guidelines and decisions



Updated

Regulatory timeline towards 2030 - Environment

Adopted



In the pipeline, or possible…

MARITIME

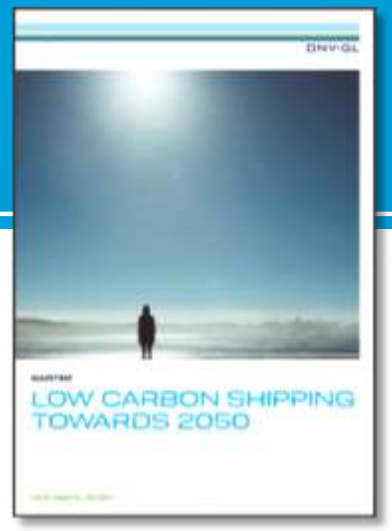
Low Carbon Shipping Towards 2050

DNV GL Forum at Nor-Shipping

M Shahrin Osman

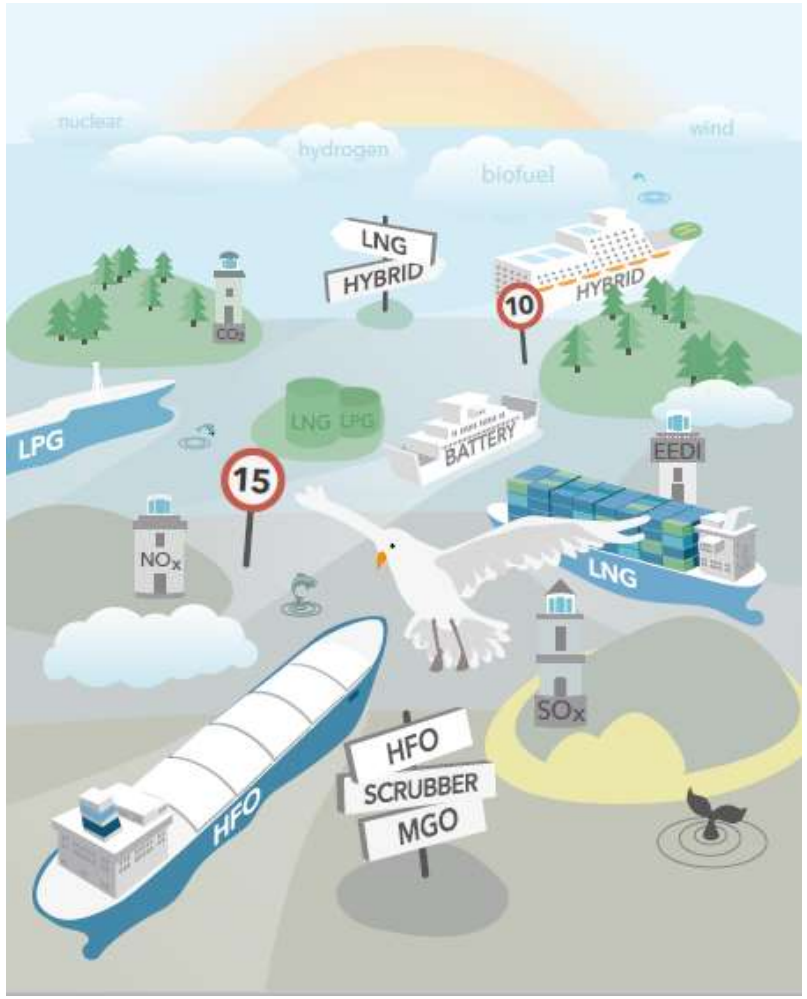
18 September 2017

Team members:
C. Chryssakis, H.W. Brinks, A.C. Brunelli, T.P. Fuglseth, M. Lande, L. Laugen, T. Longva, B. Raeissi, H.A. Tvete

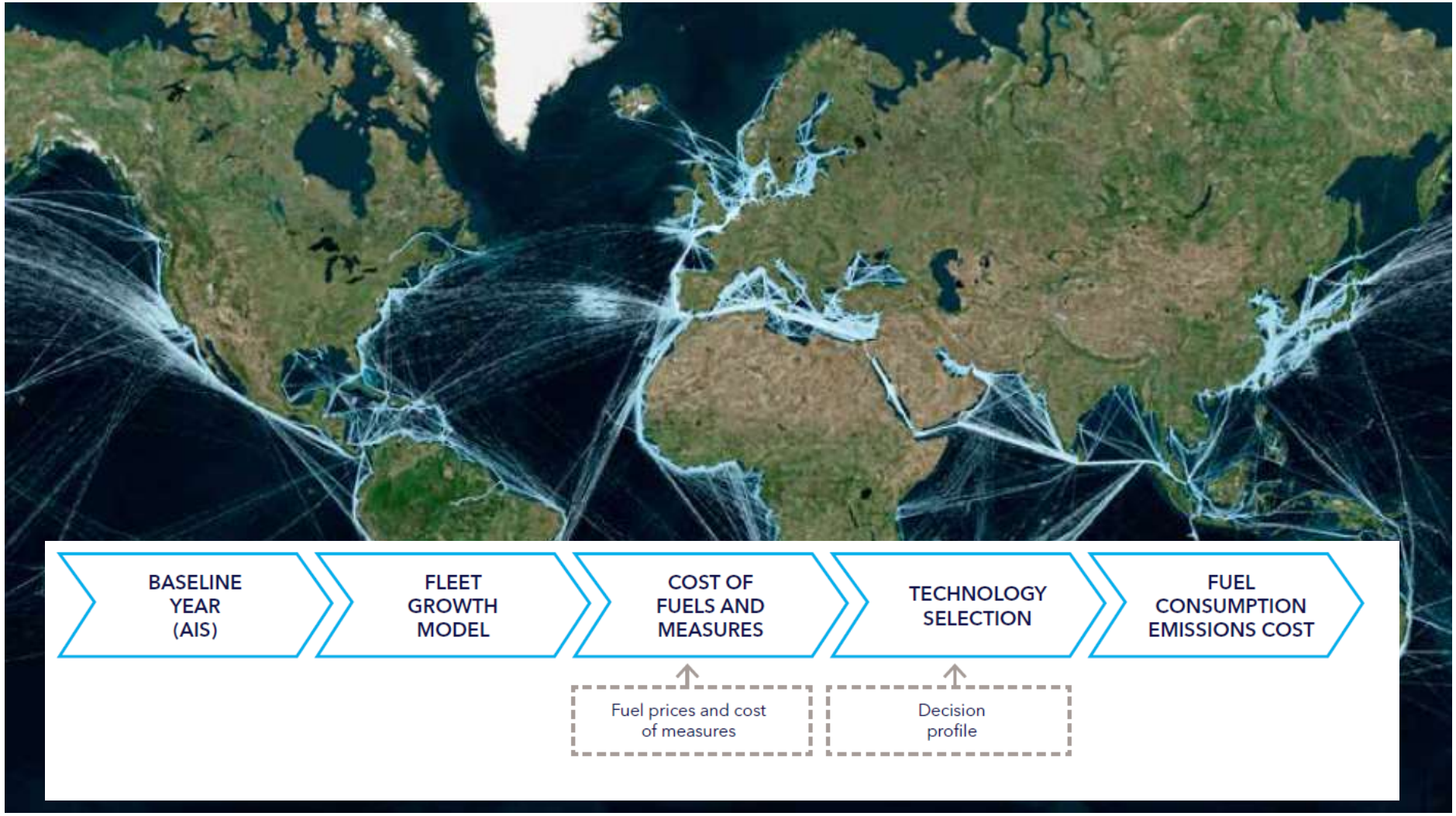


Key Questions

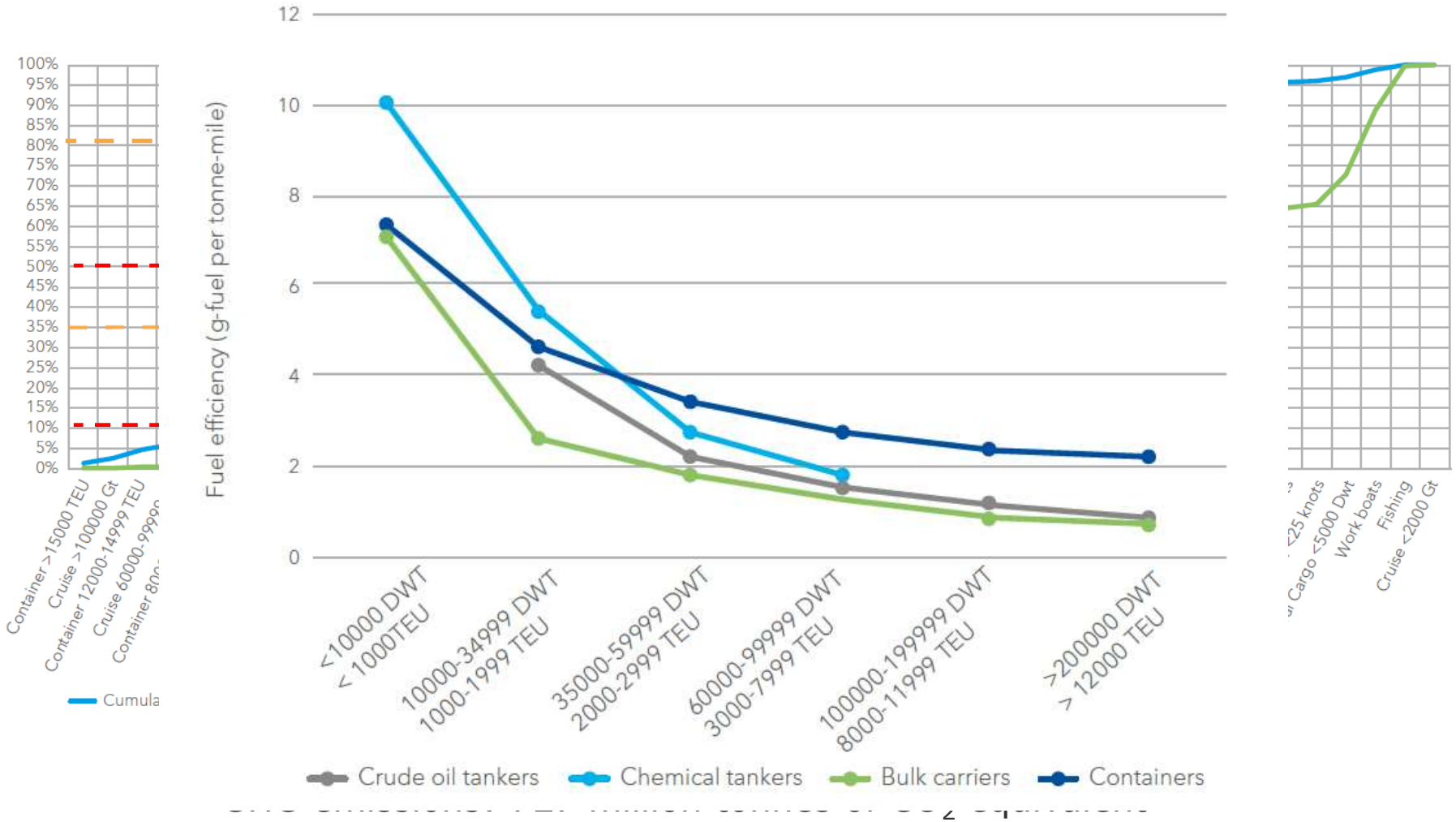
- Evaluate GHG emissions from shipping from today until 2050
  - How much can shipping reduce CO_2
  - Fuels & Technology availability
  - At what cost – Which technologies for which ship segments



Model Overview



Analysis of existing fleet

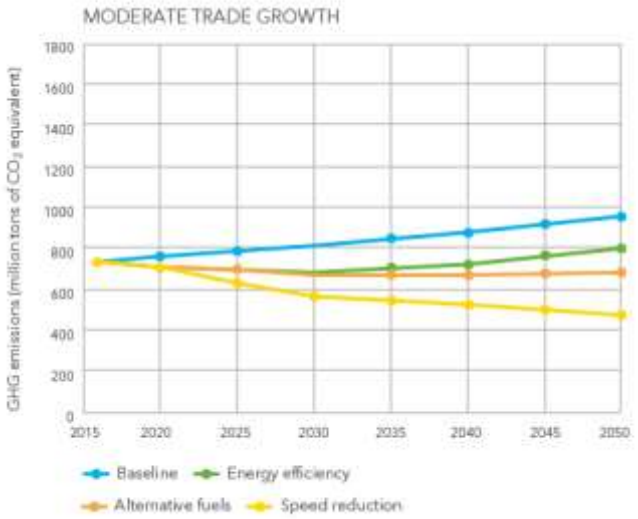


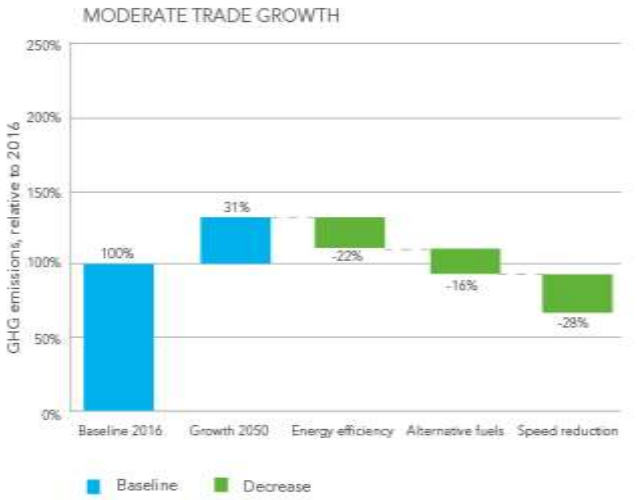
Fuel & Energy Efficiency Measures

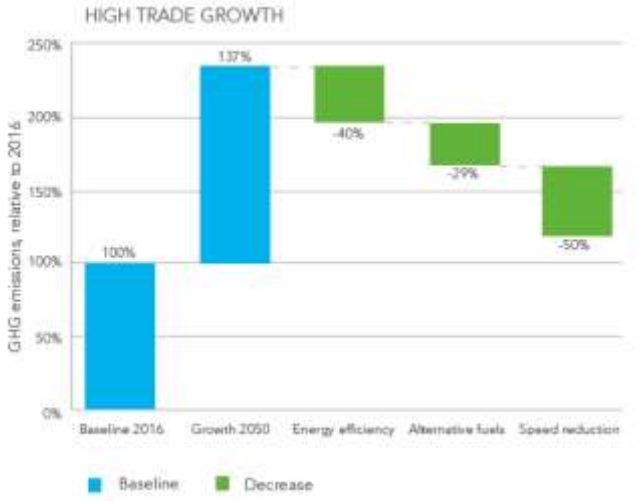
- Fuels
  - MGO & LSFO
  - **HFO & Scrubbers**
  - LNG
  - LPG
  - Methanol
  - Biodiesel
  - Biogas
  - Biomethanol
  - Hydrogen
  - Electricity
  - Nuclear

- Energy Efficiency
  - Machinery
  - Hydrodynamics
  - Operational
  - Cold Ironing
  - Wind/Solar
- Logistics
  - Speed Reduction (?)
- Carbon Offset
  - Fuel price

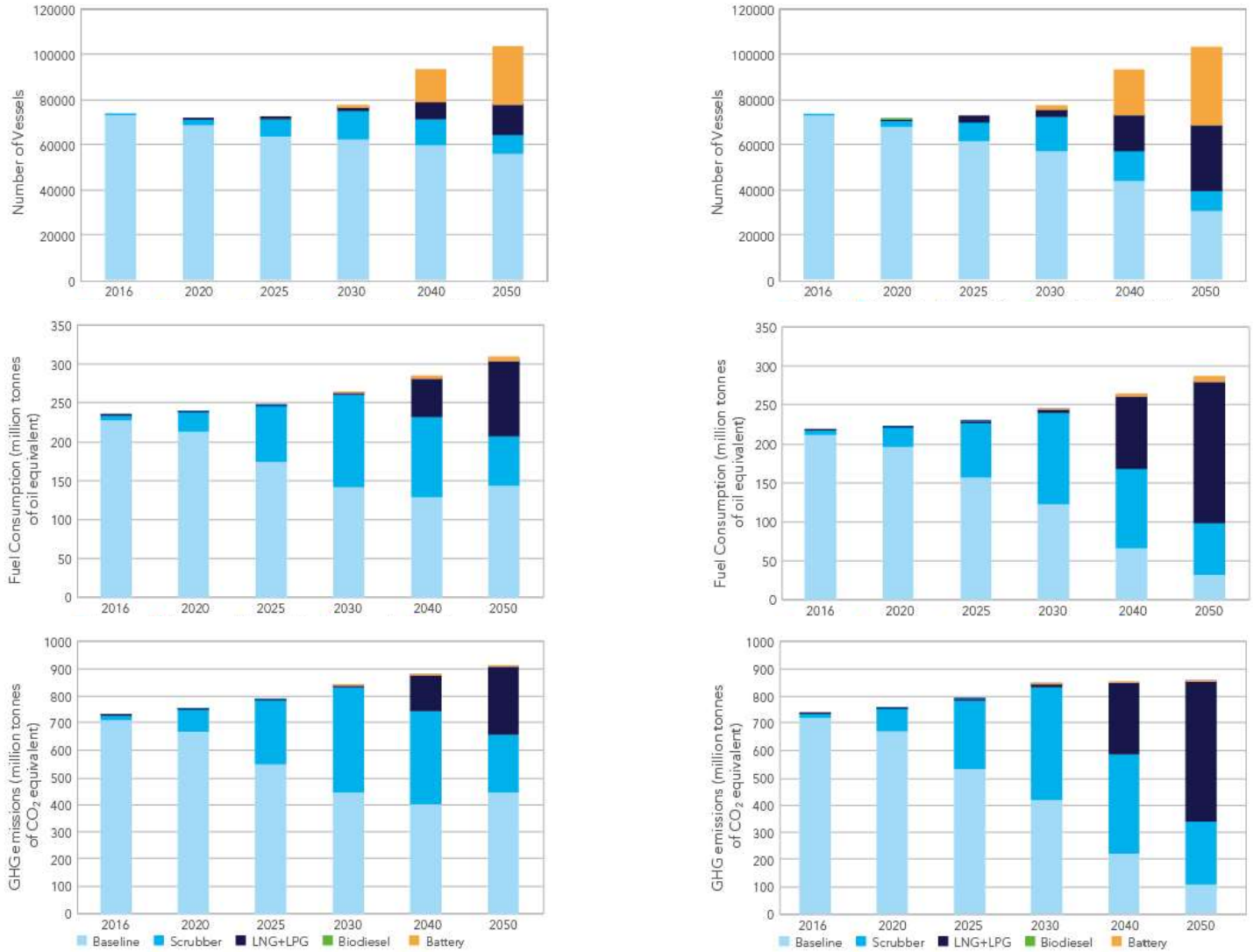
Impact of trade growth



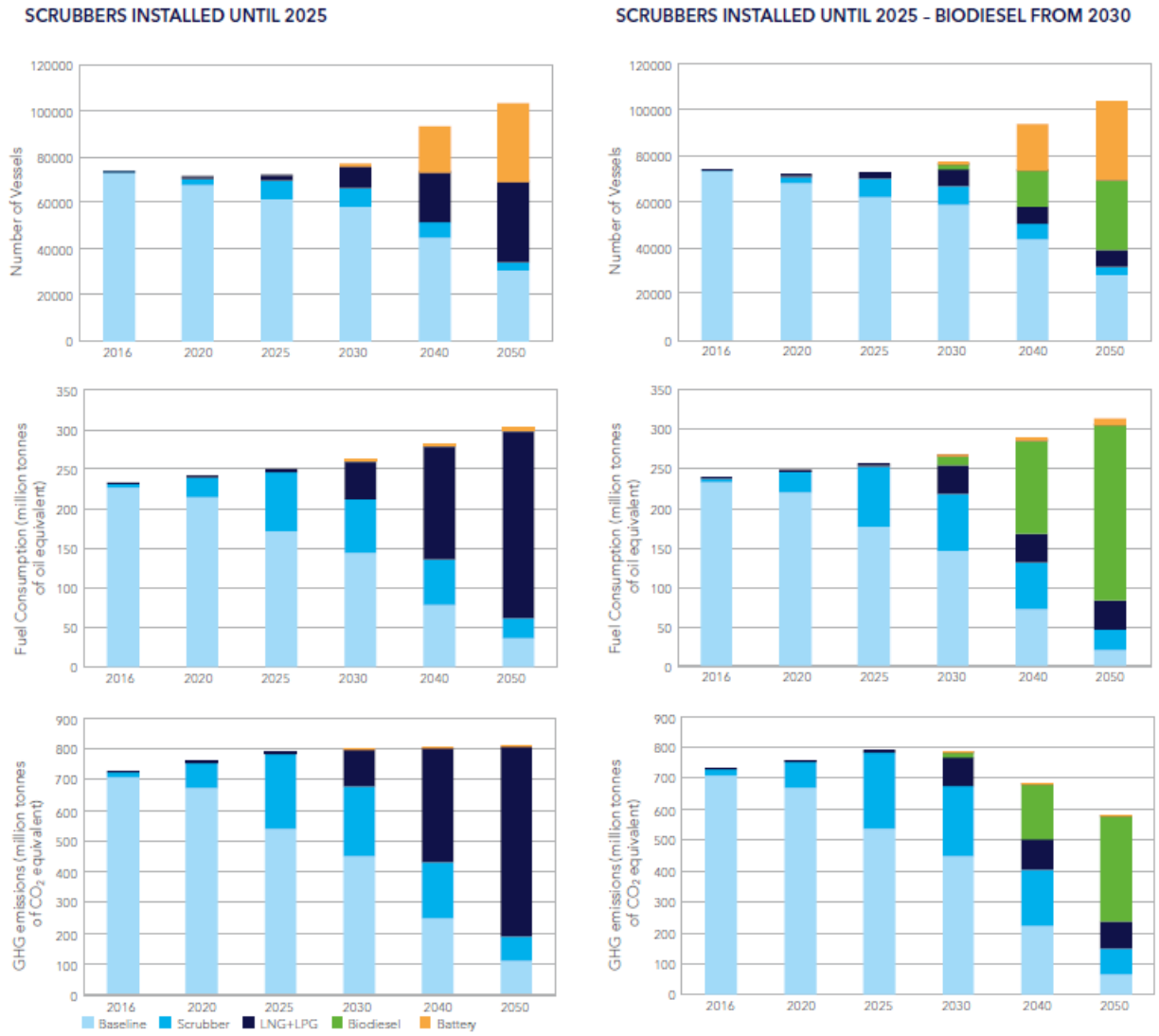




Impact of Investment Horizon

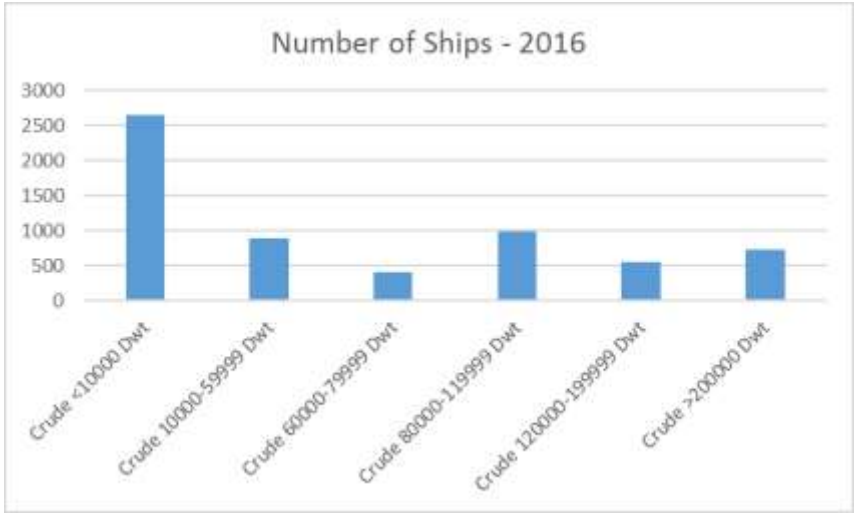


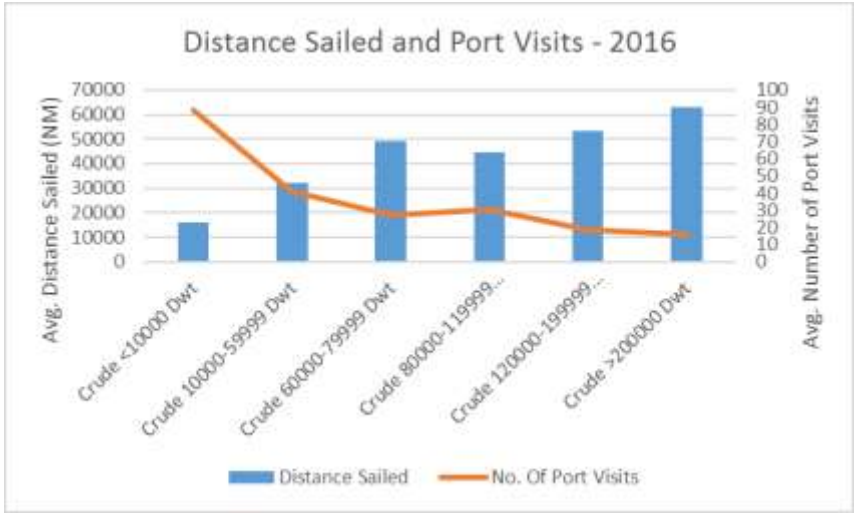
Scrubbers vs. Low Carbon Fuels

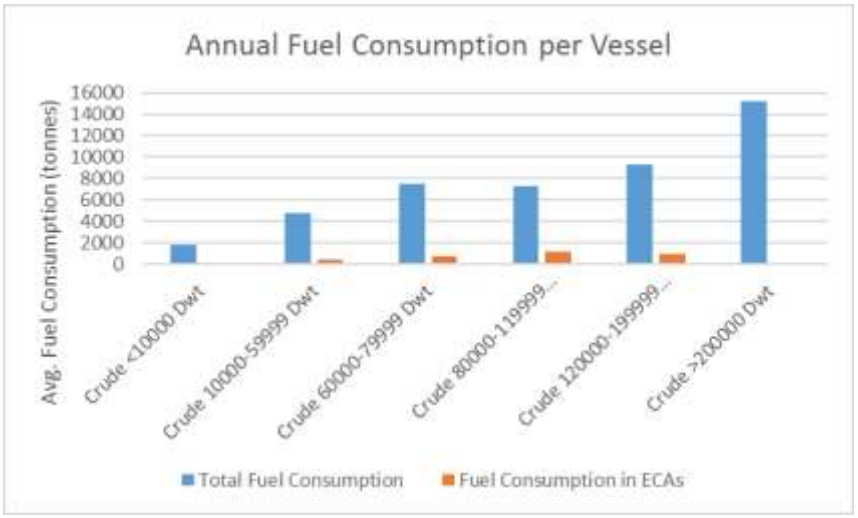


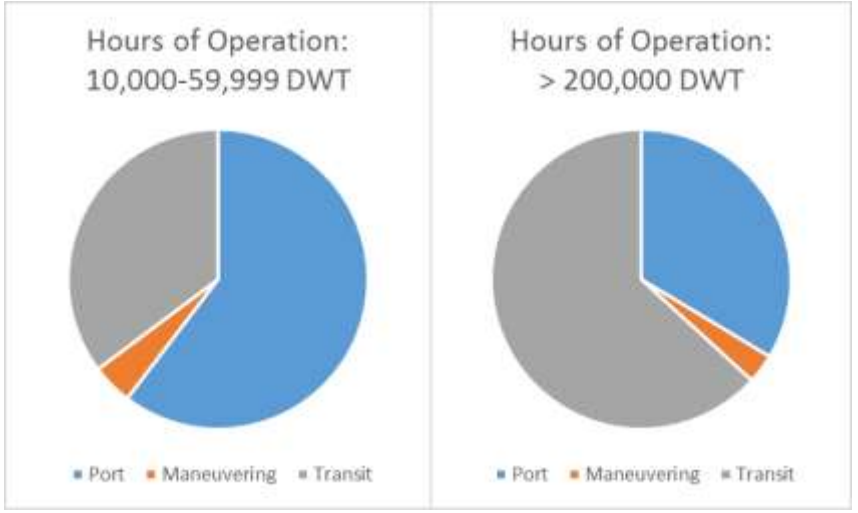
Oil Tankers

Oil Tankers: Statistics from 2016

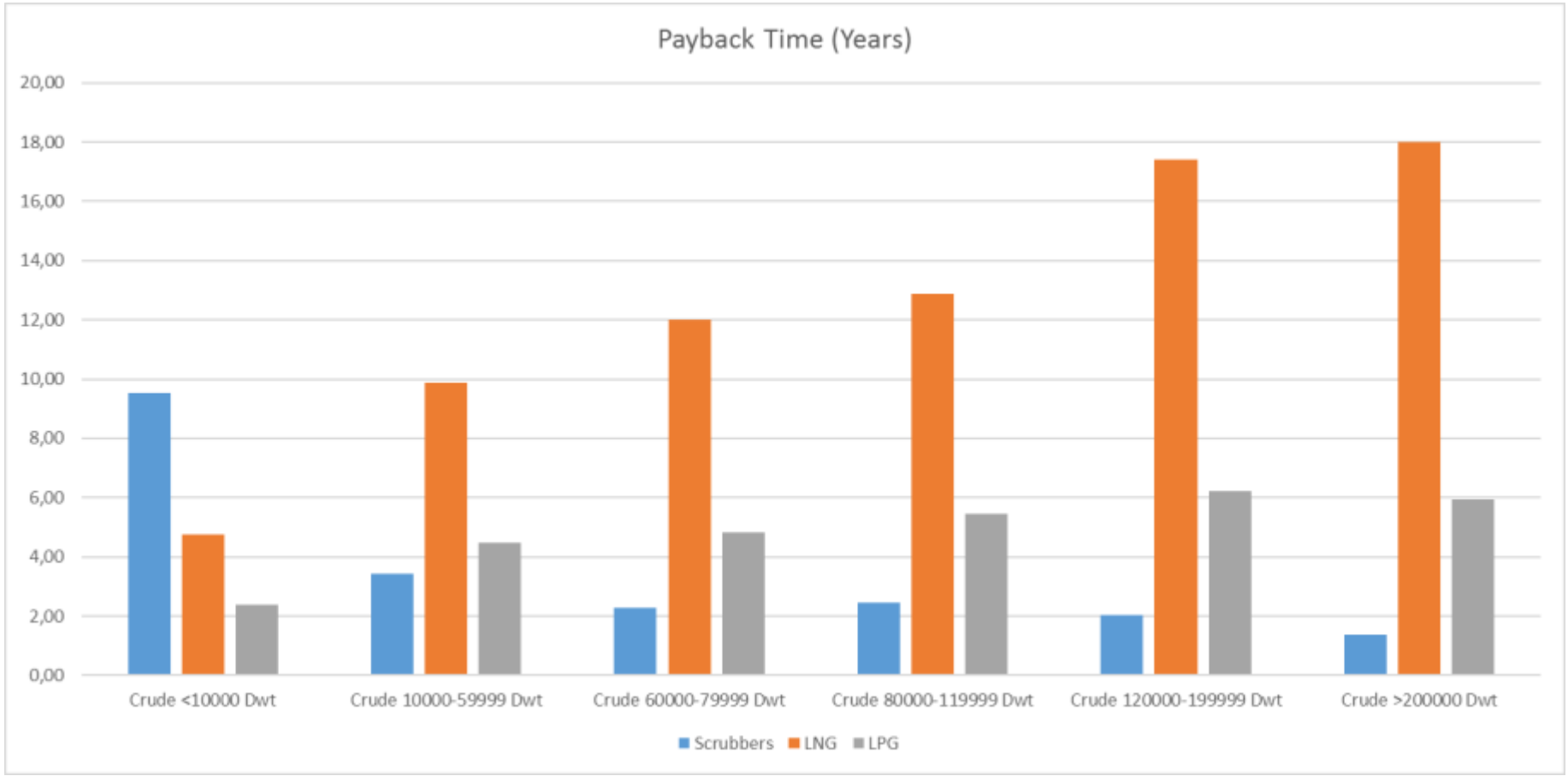








Payback Time for Scrubbers, LNG, LPG (Newbuildings)



Note: Only indicative results, assuming operations after 2020 with LSFO. The exact payback times will depend on actual fuel prices and operations (fuel consumption, ECA exposure) of each vessel.

Moving Forward

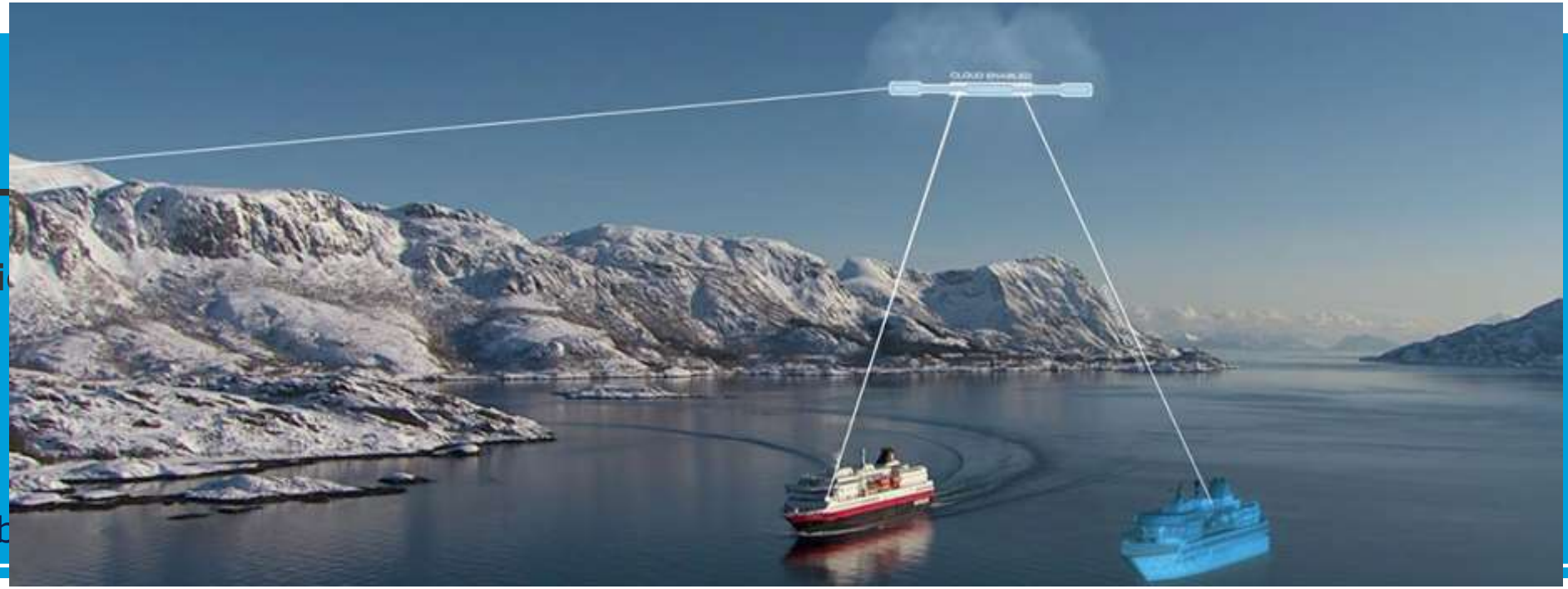
- Shipping decarbonisation is challenging but possible
- Start as early as possible
- Importance of differences between ship types
- Measures
  - Low Carbon Fuels
  - Energy Efficiency
  - Speed reduction
  - Carbon pricing

- DNV GL GHG Model for
  - Ship owners
  - Local authorities
  - Policy makers

MARITIME

Digital T

Presentati



M Shahrin

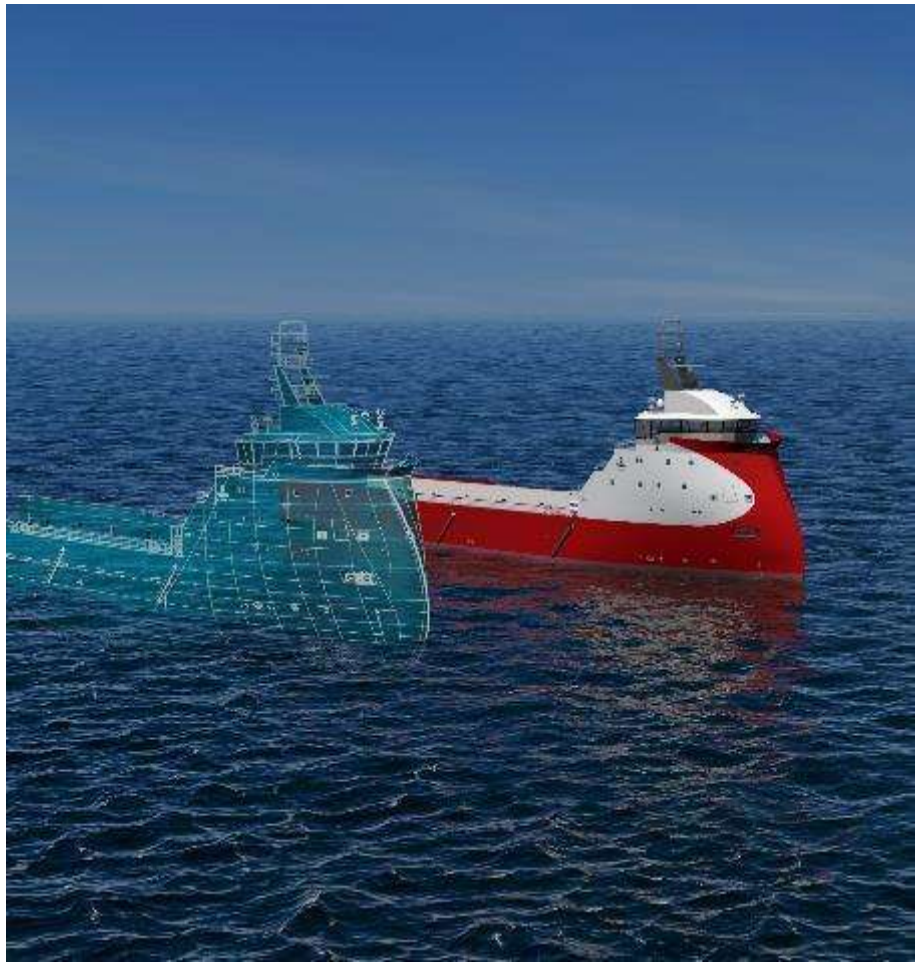
18 Septemb

Digital Twin –

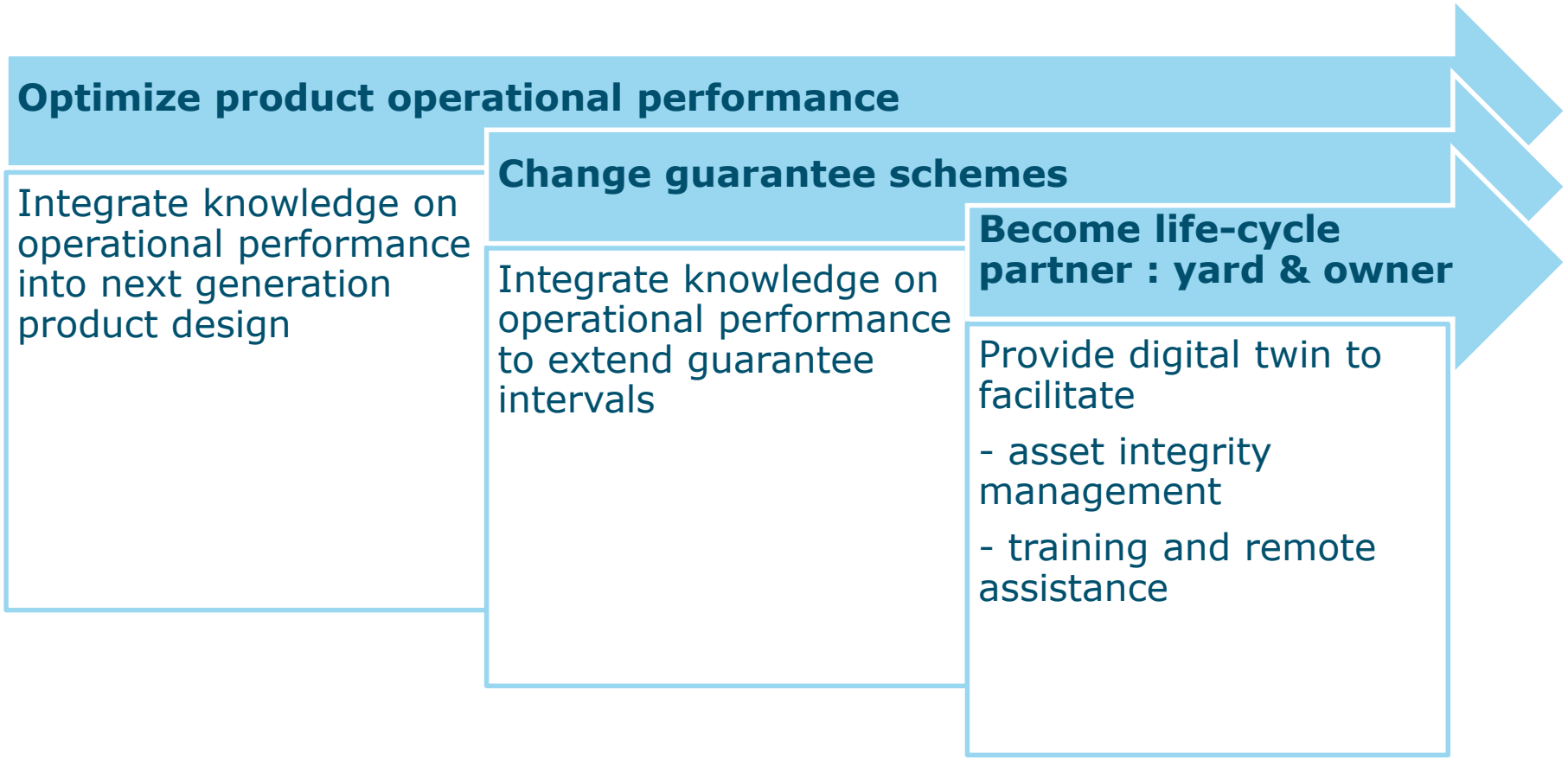
Sustainability through design and complete life cycle approach

What is a digital twin

- The digital twin is a simulation environment plus the digital copy of the physical asset, describing its
  - functions
  - arrangement
  - properties
- The digital twin can be used for optimizing
  - Design and production
  - Approval and commissioning
  - Operation
- DNV GL presented Nauticus Twinity in 2015 and it integrated positioning with engine performance.



Digital twin will facilitates continuous improvement in ship design by incorporating real-life performance during operational phase



The Digital Twin at the center of digital Ship Asset Ecosystem to analyse on ship's integrity, risk and performance

The Digital Twin

Fleet Manager

NPS

Performance Management

Neo

B A

Data Ingest

Data cleaning

Data QA

Data alignment

Digital Asset Custodian

Class Data

DNV·GL

Public Data

API

MY DNV GL

API's

Stakeholders

On Board

BUSINESS ANALYTICS

COLLABORATION

API

API

API

API

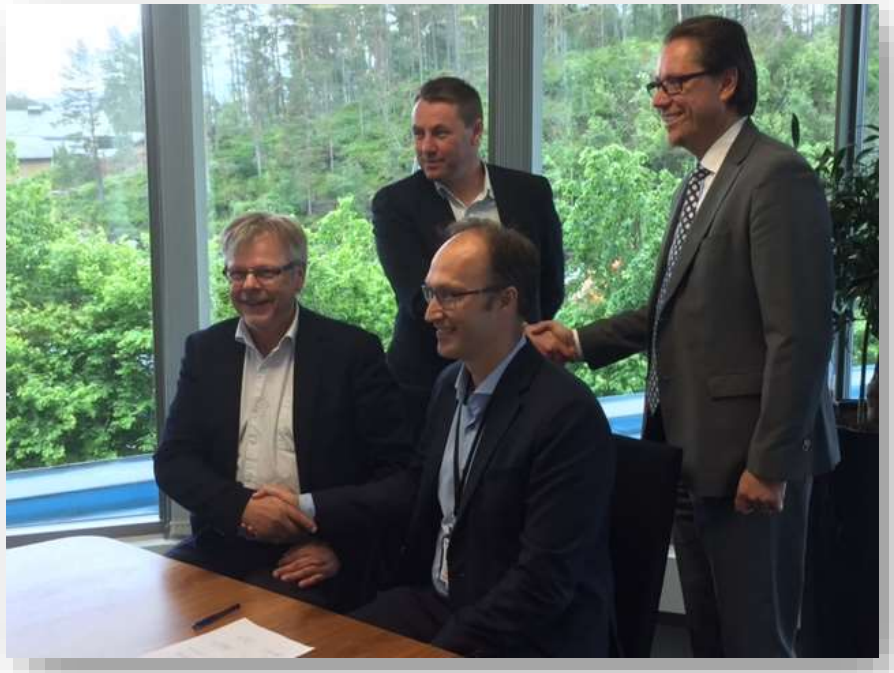
Harvesting Performance data

Harvesting Inspection data

Harvesting Sensor data

Harvesting Incidents, quality issues, ...

Memorandum of understanding signed in Ålesund 21 June 2017



Signing parties – RRM, NTNU, SINTEF and DNV GL

The signing parties agree to pursue a joint industry project (JIP) with the objective of creating a simulation platform and model library for industrial maritime applications. The overarching goal is to enable time-domain co-simulation of a complete vessel with all its equipment and systems including their interaction. Such a digital twin will form basis for novel ways of designing, constructing, verifying and operating new maritime applications such as autonomous ships.

The JIP will be launched in Q4/2017 with an open call and is planned to be kicked-off in Q1/2018

MoU aims to create an open source digital platform for use in the development of new ships that are safer, smarter and sustainable

- A virtual test bench to assess the safety and performance of a vessel and its systems, both **before its construction** and through its **lifecycle**.

"This is a very concrete example of how digitalization can contribute in making our most important **ocean space industries more efficient**" Henning Borgen, President SINTEF Ocean

"We are entering a new era with the accelerated uptake of more IT-technology in shipping. Digitalization of information flows will have a **positive impact on safety and environmental performance**. " Remi Eriksen, Group President & CEO DNV GL

Thank you

M. Shahrin Osman, *M.Sc*
Head of Digital Solutions & Advisory Middle East
Maritime Region South East Europe and Middle East

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SAFER, SMARTER, GREENER

Technical Director, IPIECA

Rob Cox

IPIECA

Low Sulphur Marine Fuel:

- *How did we get here?*
- *What might the future hold?*

Dubai: September 18, 2017

THE GLOBAL OIL AND GAS INDUSTRY ASSOCIATION FOR ENVIRONMENTAL AND SOCIAL ISSUES

www.ipieca.org

What is IPIECA?

- Global oil and gas association for environmental and social issues
- Formed in 1974 following the launch of UNEP
- The only global association involving both the upstream and downstream oil and gas industry
- Membership covers over half of the world's oil production

http://www.ipieca.org

IPIECA

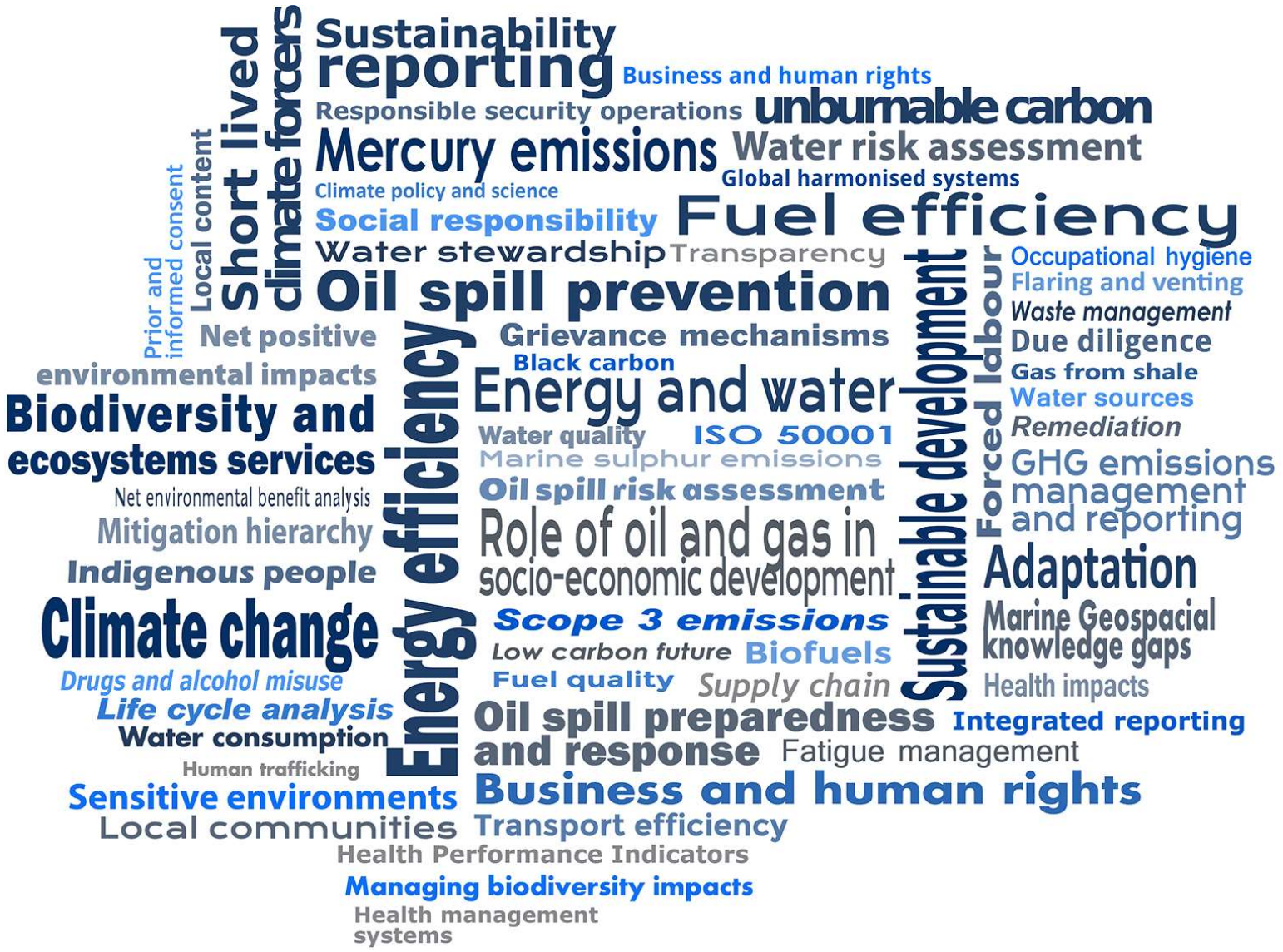
IPIECA Members

Corporate members

Associate members

Association members

Addressing a wide range of topics



IPIECA

Implementation of Global S Cap: observations

1. The IMO decision is firm and final – it will not change
2. The resulting changes in supply and demand balances are substantial and are likely to have repercussions beyond marine fuels to other markets
3. Future level of scrubber penetration (pre- and post 2020) remains a significant uncertainty factor and affects “market signals” on investment. Recent estimates imply fewer conversions
4. Little time is left for these preparations – IMO’s timeline for developing implementation measures (hopefully completion mid-2019) is tight
5. All actors will need to prepare: shipping, refining and bunker fuel suppliers… and communicate across sectors (but not internally)
6. Why not internally? Like any other business the refining industry is subject to anti-trust and competition law and cannot poll its members internally on ability to supply

Dealing with changes

- Bunker Fuel Sulphur regulation changes

  - Evolutionary changes:
    - 4.50% S to 3.50% S
    - 1.50% S to 1.00% S

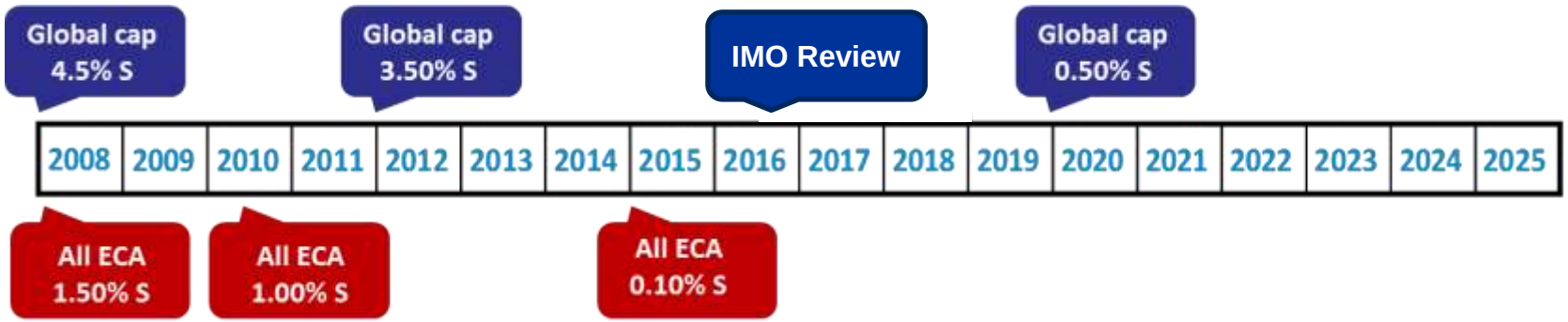
    → Tightening fuel specification - adjustments within refinery processes

  - Paradigm shifts
    - 1.00% S to 0.10% S: from LSFO to MGO
    - 3.50% S to 0.50% S: from HSFO to desulphurized distillate and/or resid streams

    → Major change in fuel type, implemented globally over a large volume in a short transition time - major shift in refinery operations needed to produce marine fuels

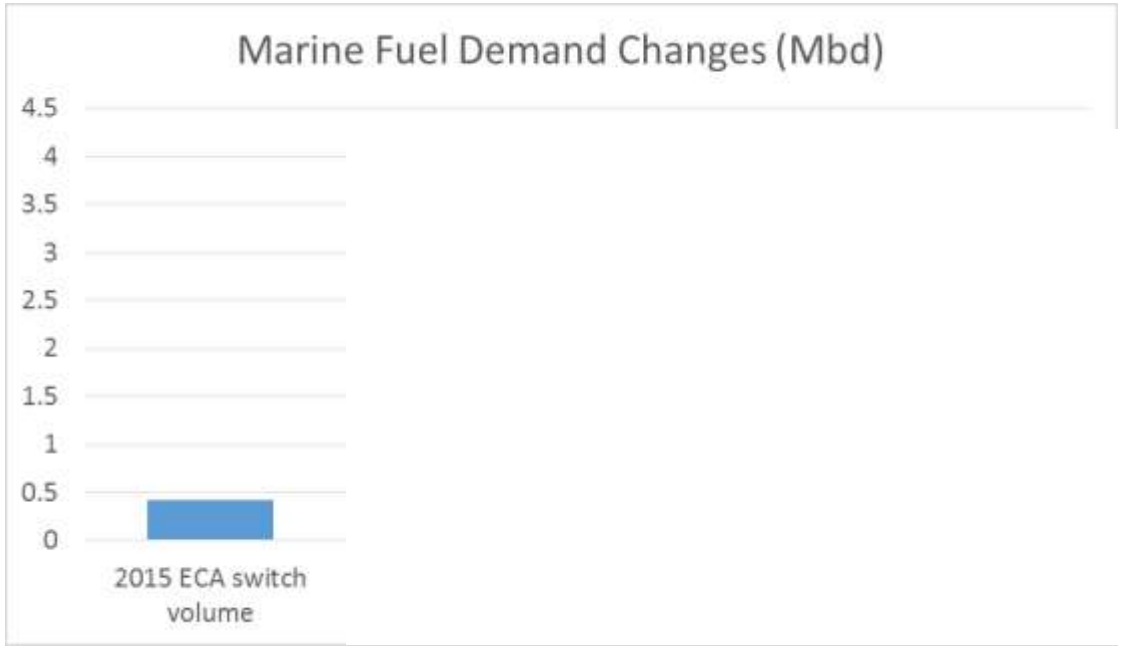
    - Refining changes to produce new marine fuels
    - Refining changes to process fuels no longer needed on the market

2015 ECA Fuel S Change



2015 ECA

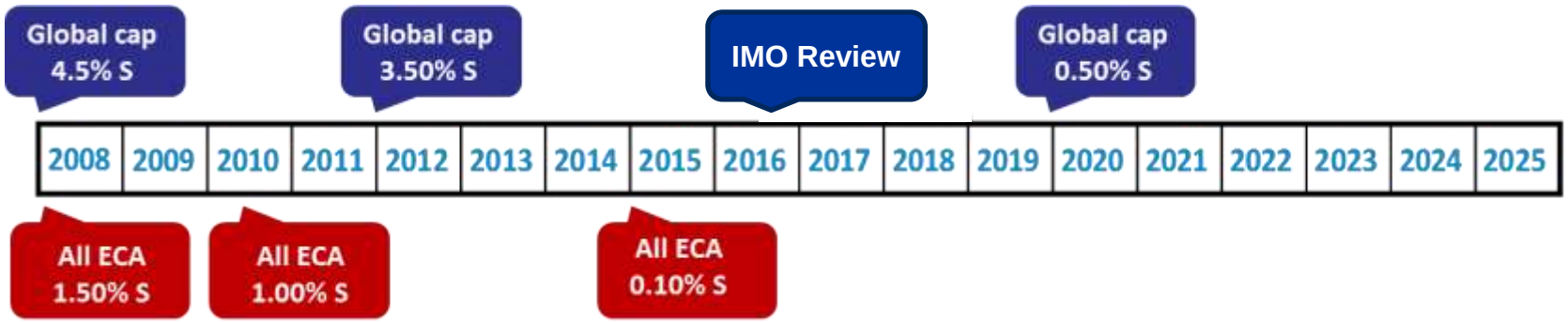
- 1% HSFO → 0.10% MGO



MARPOL = IMO's International Convention for the Prevention of Pollution from Ships
MEPC = IMO's Marine Environmental Protection Committee

Data sources:
BP Statistical Review of World Energy, June 2015
Marine and Energy Consulting Ltd, Outlook for Marine Bunker & Fuel Oil to 2035, May 2014
EnSys/Navigistics, Supplemental Marine Fuel Availability Study, 15 July 2016

The Challenge

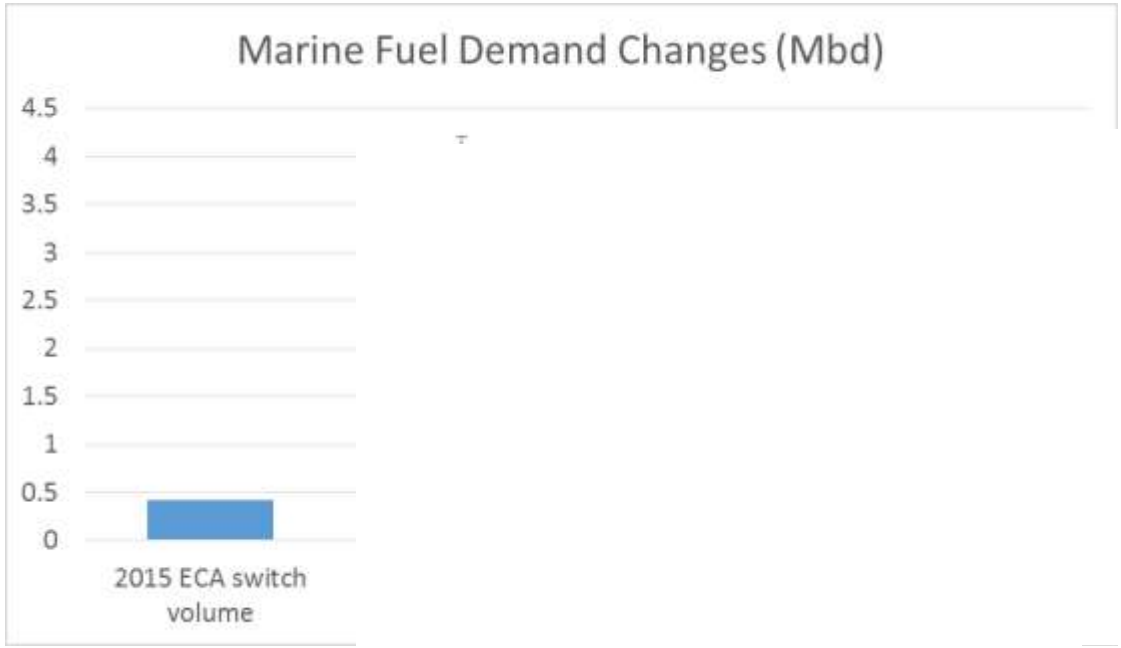


2015 ECA

- 1% HSFO → 0.10% MGO

2020

- 3.50% HSFO → 0.50% Fuel



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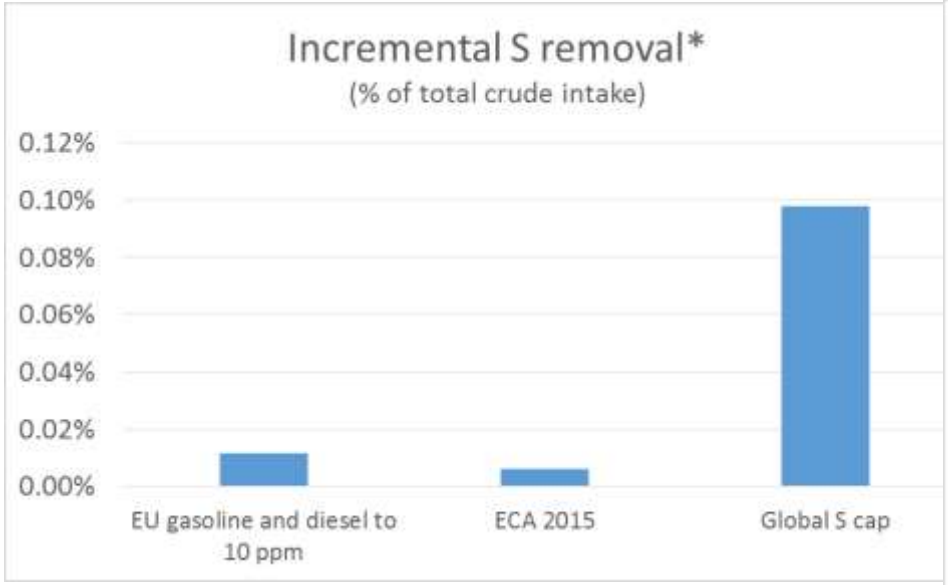
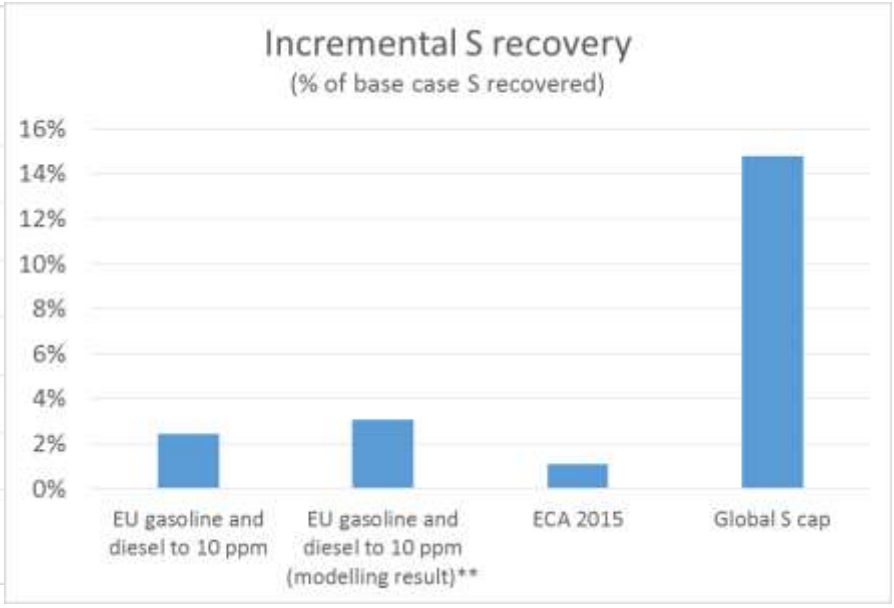
Global S cap – A very significant step change

- Scope of regulatory change in S specifications

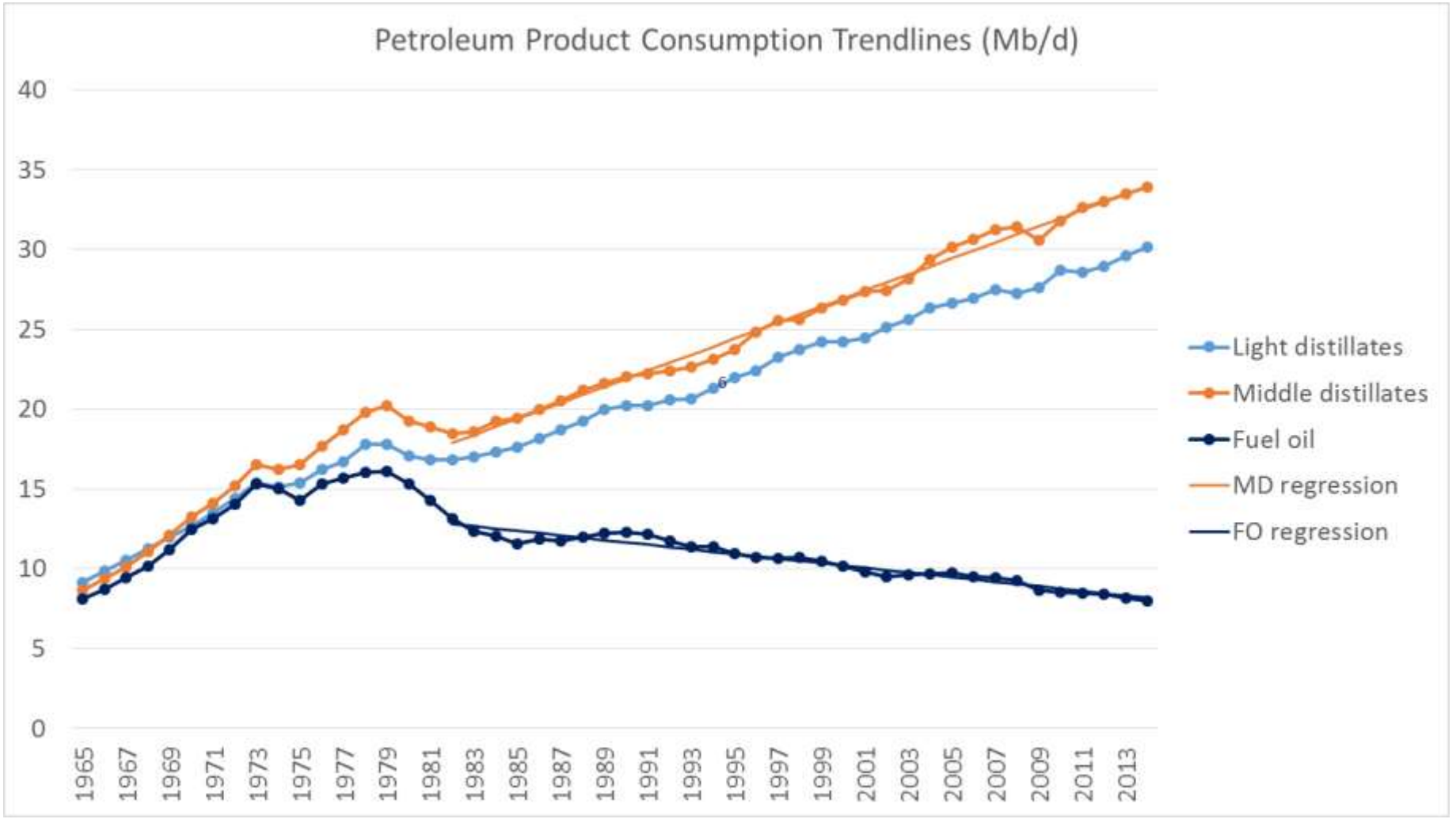




** Includes additional S removed from other products

* Incremental S to be removed as elemental S, S contained in coke or S removed in waste gas SOx abatement unit. Global S cap duty estimated based on actual average fuel oil S level of 24500 ppm (MEPC 69/5/7)

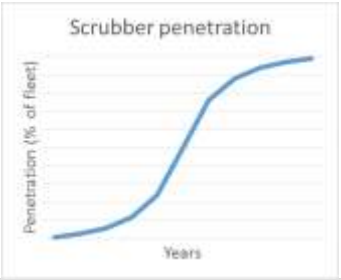
Product Trends

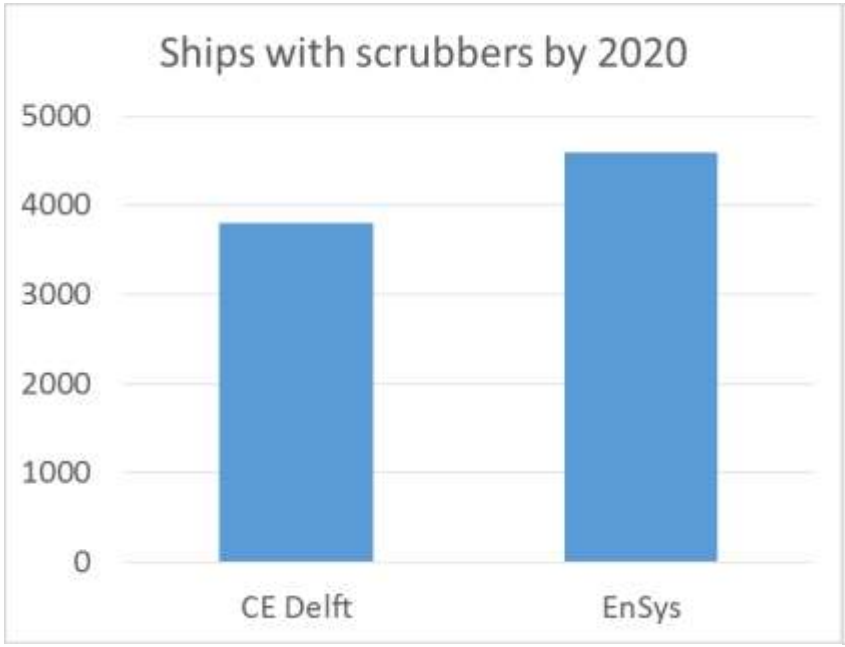


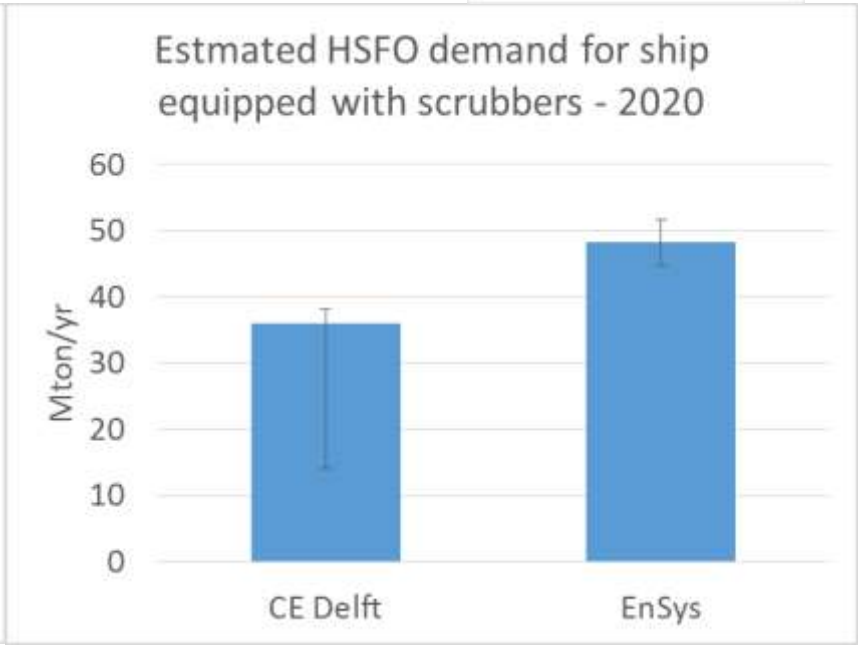
Data source: BP Statistical Review of World Energy, June 2015

Scrubber Penetration

- Effective switch volume depends on scrubber penetration by 2020
- Factors affecting scrubber installations:
  - Economics – pay back period based on spread HSFO – 0.50% S fuel
  - Expectation on how spread may evolve
  - Dry dock schedule of ship
  - Scrubber suppliers and shipyard capacities
- S-curve to model penetration



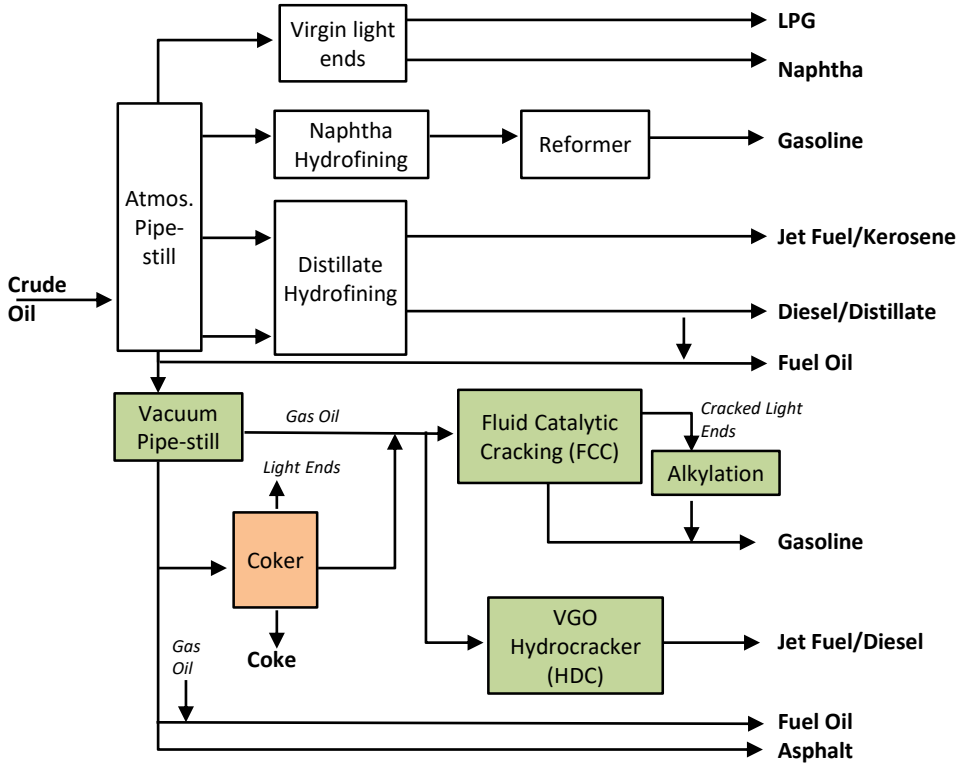


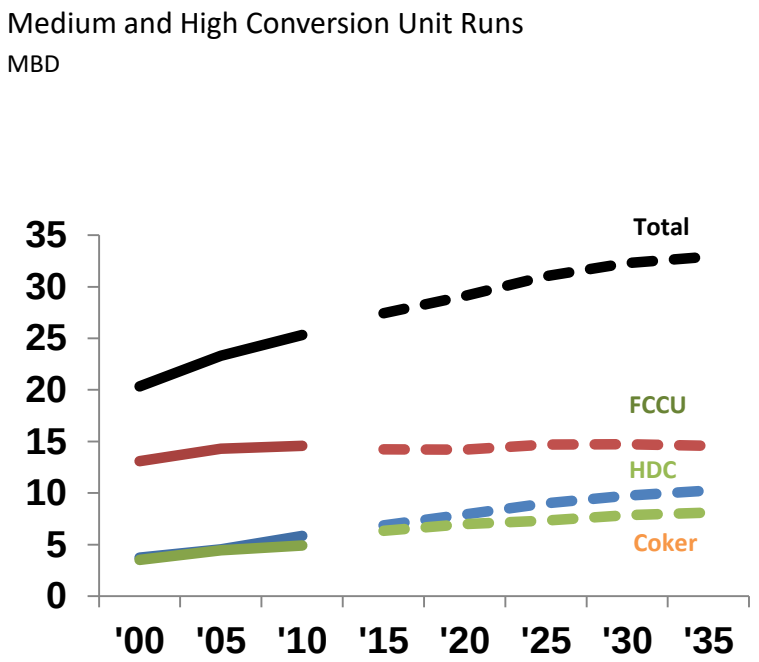


Data sources: CE Delft, Assessment of Fuel Oil Availability – Final Report, July 2016
EnSys/Navigist6cs, Supplemental Marine Fuel Availability Study, 15 July 2016

Note: 1 Mton/yr = ~18.4 kbd

Lighter Product Mix Requires Higher Conversion Complexity





Low Conversion Refinery

Additional Medium and High Conversion Processing

Additional High Conversion Processing

Source: ExxonMobil

Summary - availability

- Refining is an integrated business with numerous interdependencies – changes impact what products can be produced – all fractions must be used
- Refining industry preparation for the 2020 implementation
  - Industry has track record of responding to regulatory changes
  - Investments are based on global market conditions and regulatory outlook
  - Decisions will be made by **individual refiners**
  - Difficult to predict how well supply and demand will balance
  - Other market actors and supply chains affected – e.g. road transport fuels

Future Marine Fuel Mix

- Fuel availability modelling studies pointed at fuel quality aspects that will need attention
  - Meeting commercial fuel specifications – but these will evolve
  - Flash Point
  - Stability
  - Compatibility
  - Concerns over the emergence of “boutique” fuels that meet spec but could cause compatibility problems
- What can we expect in the real world?
  - 0.50% S demand will likely be met by a mix of components (distillates, low Sulphur residuals) and new fuel oil formulations as the market responds over time and new streams are introduced
  - Too early for details – new formulations will depend on initiatives by individual suppliers
  - ISO 8217 is considering 0.50% S developments in their next revision cycle
  - LNG will start to play a role in meeting marine fuel demand

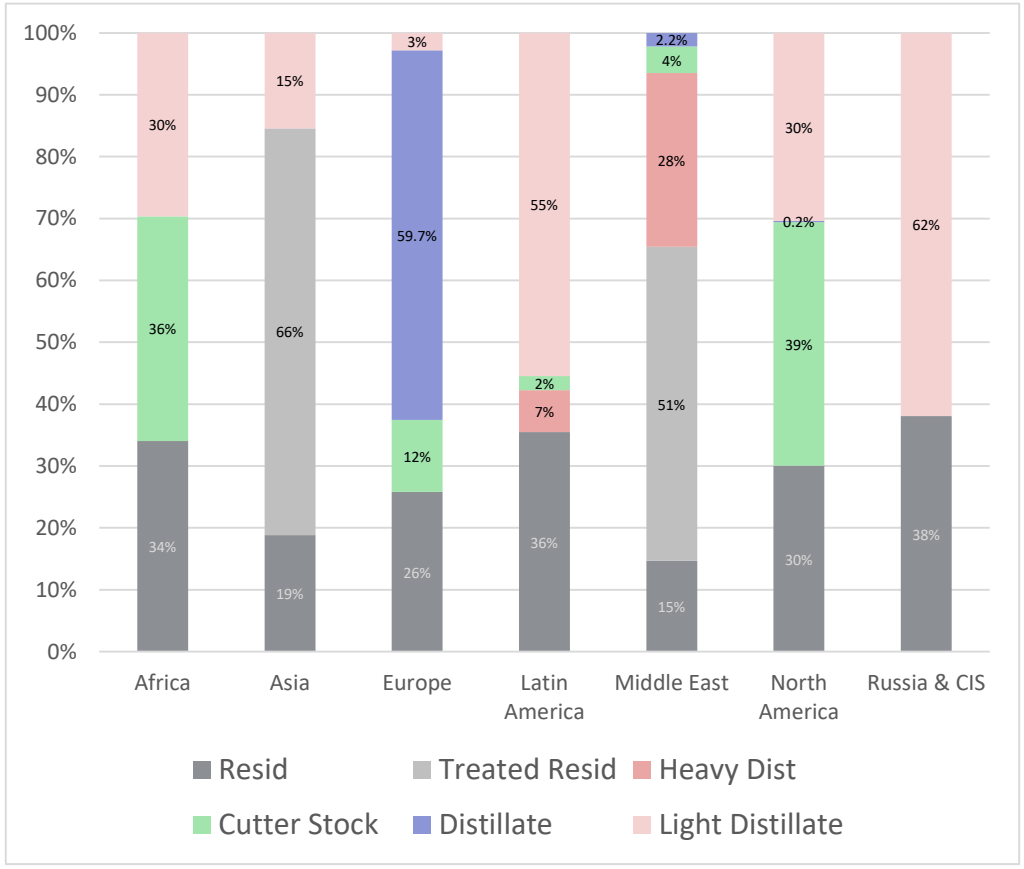
Standards development process : ISO 8217

- ISO/TC 28/SC 4/WG 6 aims to produce a sufficiently detailed, technically balanced and realistic standard
- Each edition of the standard offers improved quality control
- ISO/TC 28/SC 4/WG 6 considers:
  - Vessel's machinery developments including on board treatment limitations
  - Fuel oil production and global availability
- Changing fuel manufacturing processes and use of new blend components will alter the nature of low sulfur fossil fuels
  - Legislative requirements
  - Safety and health of ship and crew
  - Appropriate and scientifically valid test methods and specification limits

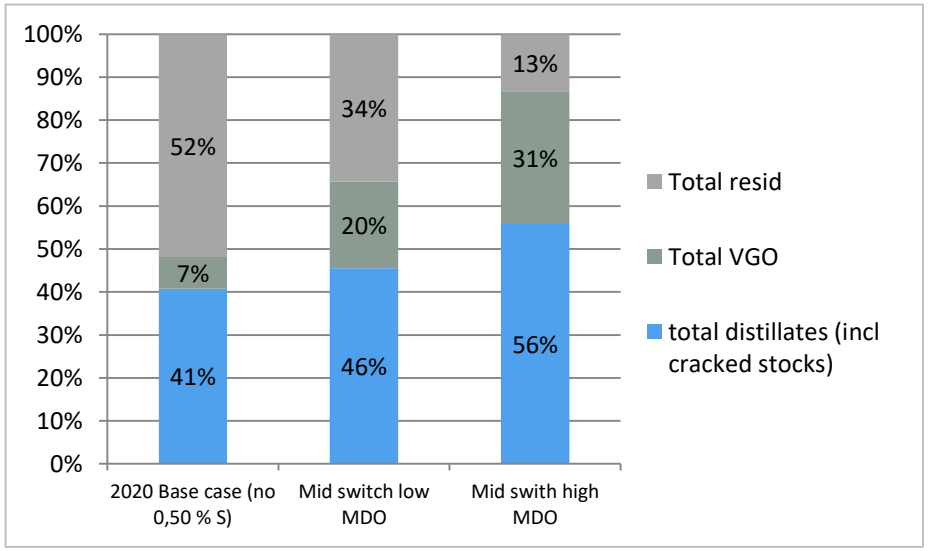
What did the two studies say about fuel components?

Comparison CE Delft vs Ensys-Navigistics component types (%)

CE Delft



Ensys



Source: ISO/TC28/SC4/WG6

ISO 8217:2017 published 19 March 2017

Changes to Scope:

- The term Fuels includes:
  - Hydrocarbons from petroleum crude oil, oil sands and shale
  - Hydrocarbons from synthetic or renewable sources, similar in composition to petroleum distillate fuels
  - Blends of the above with FAME component where permitted

Changes to General Requirements

Additional distillate grades: DFA,DFZ and DFB: up to 7 v% FAME

DMA/DFA and DMZ/DFZ: max 1.00 % S

DMB: max 1.50 % S

DMA/DFA and DMZ/DFZ winter grade: cloud point and CFFP: to be reported

Next steps

ISO/TC 28/SC 4/WG 6 continues its work

- Looking into other testing methodologies to alert for unstable fuel blends
- Categorisation of fuels, to consider:
  - Sulphur: ULSFO, VLSFO, HSFO (Inside ECA and Outside ECA)
  - Heated or non-heated (RM/DM)
  - Conventional and new fuels.

Aspects to be considered:

- Past experience of (new) 0.10% S fuels
- Predictions of the 0.50% characteristics
- Current and future fuel system and machinery arrangement capabilities
- Ships understanding of what is termed as ‘fit for use’
- High sulphur fuels to be considered for EGCS and shore power operators

Going forward: what's important?

- Availability is market – driven and will sort itself out … eventually. The important things in the short – term are:
- Fuel stability and compatibility
- The availability of a detailed FONAR system based on "best efforts"
- Ensuring that a minimum number of fuel types need to be carried on board

Marine Fuel Stability and Compatibility – Issues, Tests and Management

Issues:

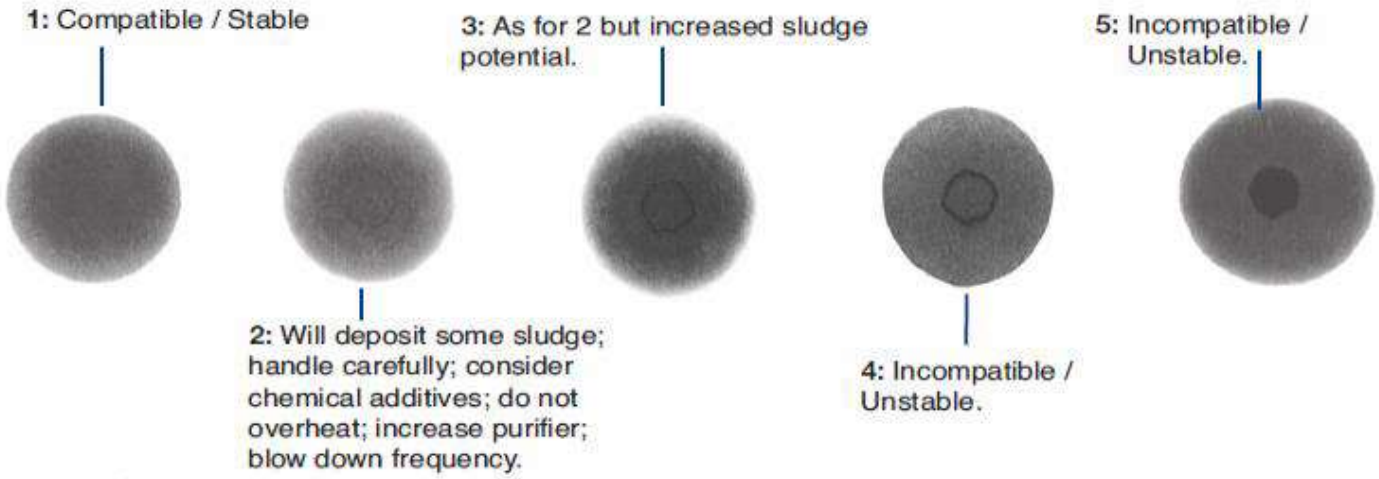
Fuel stability: The potential for a fuel to change condition in storage in certain circumstances, depending on its resistance to breakdown

Fuel compatibility: The tendency of fuels to produce deposits when mixed. The issue may immediately occur when fuels co-mingle

Marine Fuel Stability and Compatibility – good practices

- Avoid mixing bunker fuels from different sources wherever possible
- Store fuels separately until compatibility testing has been carried out
- Do not mix straight-run fuel oil [the product of atmospheric or vacuum distillation] with a cracked [additionally processed] one – if not possible keep the ratio to a minimum
- Do not mix fuels with greatly dissimilar densities
- Where possible choose fuels with similar viscosities *and* densities
- Do not mix a fuel oil with a marine diesel oil or marine gas oil

Marine Fuel Stability and Compatibility – Tests



The commonly used ASTM D4740

On-board spot test: do we need additional test methods?

The drive to decarbonize marine fuels

- **2011 – IMO adopted a new chapter 4 of MARPOL Annex VI** applicable to all ships of >400 GT and above, irrespective of flag. There are two key elements:
  - Energy Efficiency Design Index (EEDI)
  - Ship Energy Efficiency Management Plan (SEEMP),
- **2013** – New chapter 4 enters into force,
- EEDI Phase 0 – ships must meet baseline.
- EEDI phase 1 from 2015 - requires ships to be up to 10% more fuel efficient than the EEDI baseline (depending on size).
- EEDI Phase 2 from 2020 - up to 20% reduction in energy consumption from baseline
- EEDI phase 3 from 2025 - up to 30% more efficient than the EEDI reference

CURRENT STATUS: EEDI Phase 2 will not change but requirements for phase 3 are under review and may be tightened and/or moved forward

The drive to decarbonize marine fuels

Part 2 – the 'three step plan'

- Phase 1 - data collection, starting in 2019 under Regulation 22 A
- Phase 2 – data analysis
- Phase 3 - policy decisions based on the data
- Ships >5,000 GT to start collecting and reporting data to an IMO database from the start of 2019 (agreed in October 2016).
- Ships will have to collect consumption data for each type of fuel oil they use, and additional, specified data according to a methodology set out in the Ship Energy Efficiency Management Plan (SEEMP).

The drive to decarbonize marine fuels

Part 3 – the IMO 'roadmap' to control GHG

- Approved at MEPC 70 in October 2016
- Linked with the three-step plan but also influenced by the Paris Agreement
- MEPC 70 agreed three years of data would be used for the IMO framework for reducing GHG emissions but the need to respond the Paris Agreement means the first strategy should be adopted in early 2018, to enable the IMO to report its initial strategy to UNFCCC in late 2018.
- The 'roadmap' included a plan to carry out a Fourth IMO GHG Study for the period 2012 to 2018. That study is expected to be initiated in 2019
- The strategy to be adopted in **2018** should contain a list of possible short, mid-, and long-term measures, to be revised as appropriate as additional information becomes available. It will be revised and firmed up in **2023** when the IMO should have sufficient data from its mandatory fuel consumption data collection to make an informed decision

Our common goal going forward

1. All actors need to have a compliance mindset
2. Prompt action is required – identify all that needs to be in place for a successful transition in 2020
3. As refiners we will, in tandem with others, offer a way forward, e.g. workshops with key stakeholders in different regions
   - Identifying preparatory steps for shipping, bunker suppliers
   - With others, develop guidelines for changeover processes
   - Develop and disseminate guidance on fuel compatibility testing – both before 2020 and on board post 2020
   - Generate input to the IMO implementation measures process
4. Work with the various alliances: Trident Alliance, Proposed Fuels Europe Refining Alliance

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Training and Accreditation Manager

OCIMF

Capt. Oliver Pointon

10th ENOC Marine Workshop – 18th September 2017

SIRE Developments

VIQ 7

- New VIQ being developed
- Structure will remain the same with 13 chapters.
- Reduction in the number of questions, net approx. 70 decrease.
- New questions relating to new developments, BWM, Cyber Security etc.
- Chapter 9 being changed to comply with new guidance coming from MEG review.
- Officer's Matrix will also be reviewed

VIQ 7

- Direct link between VIQ and TMSA being developed.
- Proposed to have text finalised by end of 2017.
- 3 month integration required.
- Proposed ‘go live’ date is early 2Q 2018.

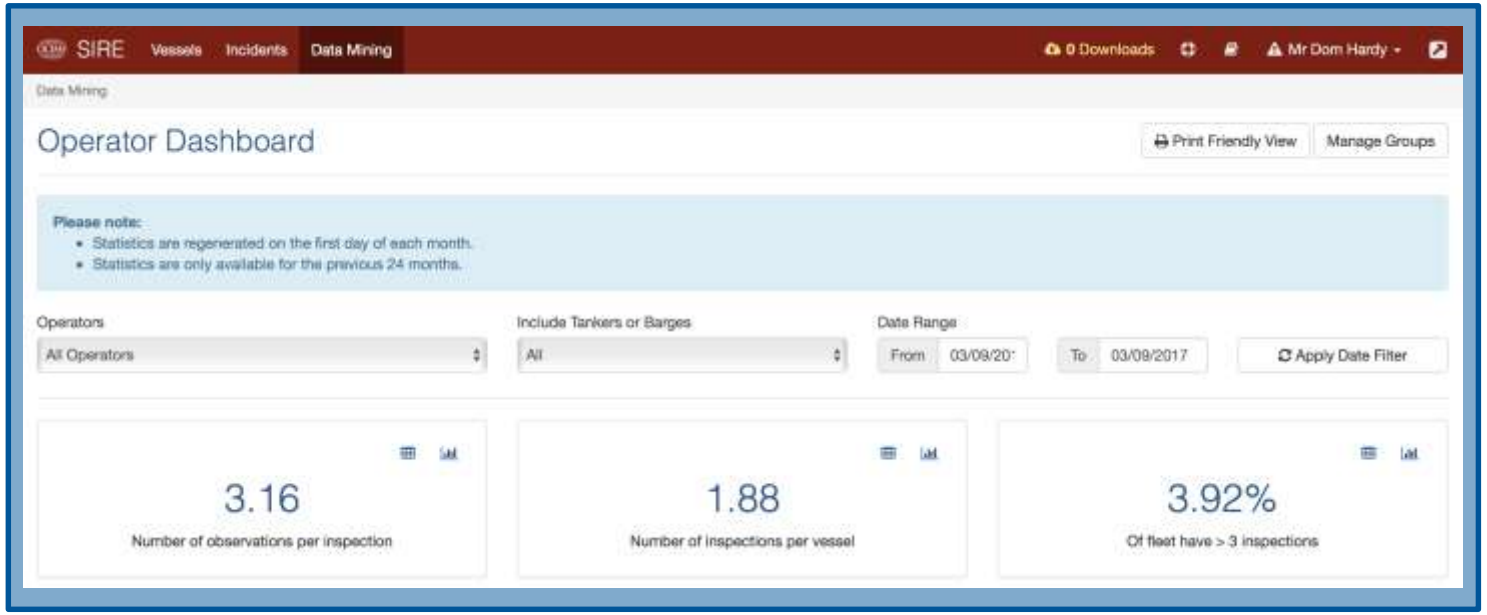
Audited Inspections.

- In September 2016, audit process changed.
- Every audited inspection will result in a report being produced.
- In the event of an inspector failing the audit, the auditor will complete and submit the report.
- It is hoped that this will encourage ship operators to allow audited inspections on their vessels.

Data Mining and Webservices.

- Data mining of the SIRE data has been available to OCIMF members for about 4 years.
- Datamining recently extended to Ship operators to allow them to compare their performance against the entire SIRE database.
- Ability to compare ship owner association if members of one and the ship owner association has registered. (Currently only one – INTERTANKO)
- Webservices extended to ship operators to allow them to take their reports in data format rather than a PDF document.

Operator Data Mining – Main page: Data Filters and Key KPIs



The area at the top of the Data Mining **Operator Dashboard** allows the user to filter the data by:

- Their fleet
- The whole SIRE database
- Specific groups such as Intertanko (if they are a member)

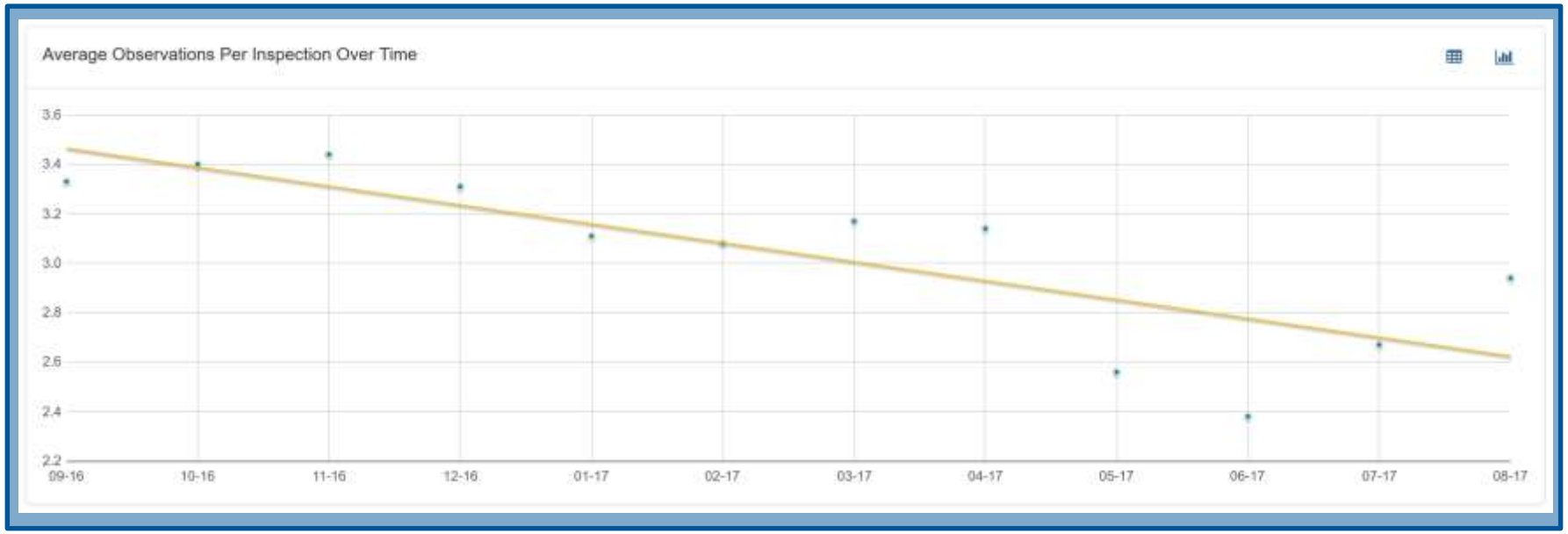
The **Date Range** can be specified within the last 24 months.

Operator Data Mining – Main Page: Observation and Operation Charts

The charts show which:

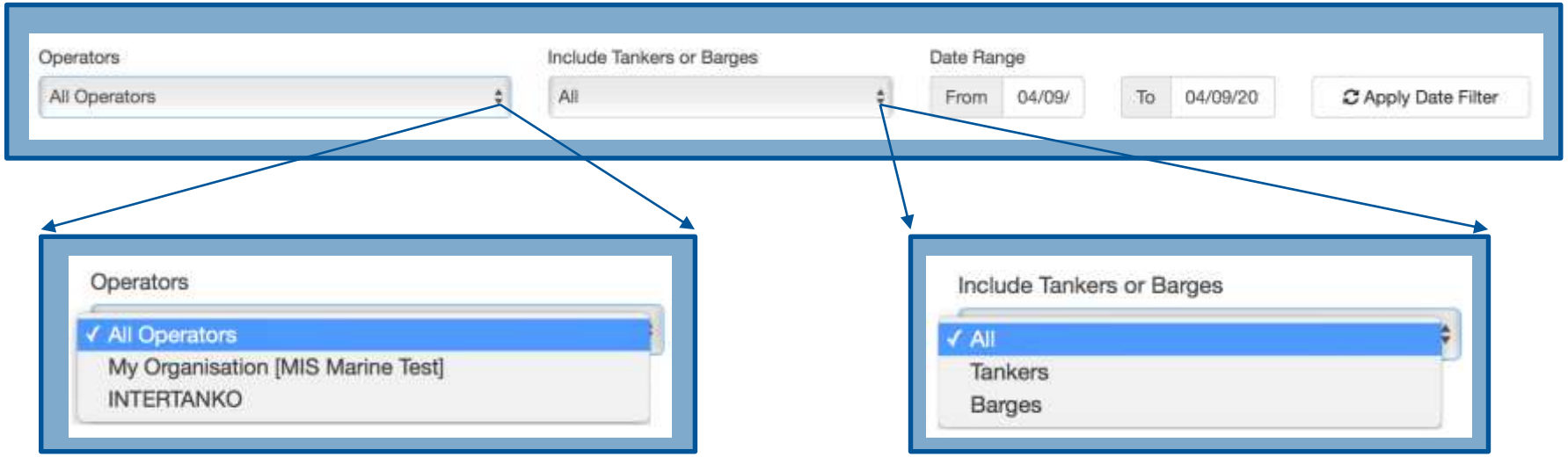
- **Observations** are most commonly raised
- **Operations** were most commonly seen across the fleet
- **Inspection** report chapters raised the most Observations
- **Questions** were repeatedly seen in observations (recurrent being observed more than once on a vessel in a year)

Operator Data Mining – Main Page: Observation Trend Graph



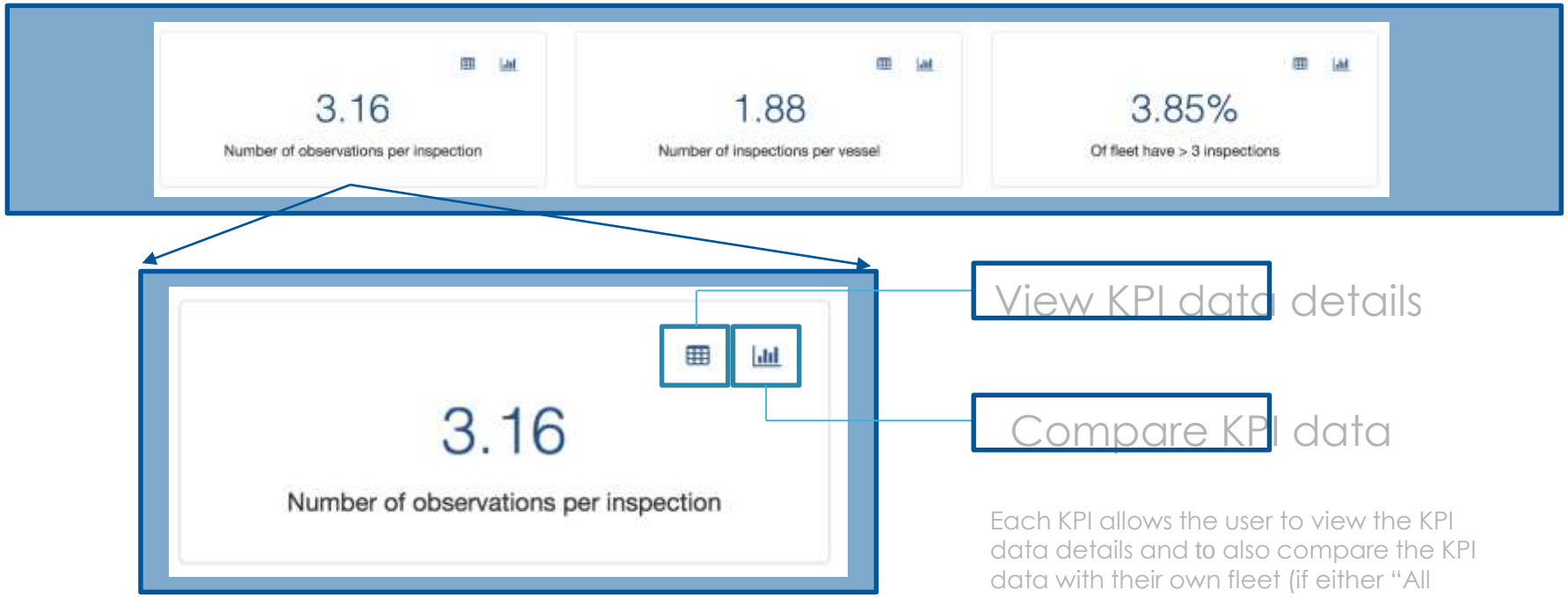
The **Observation Trend Graph** highlights how the number of **Observations Per Inspection** are changing over the specified date range.

Search / Filter Bar



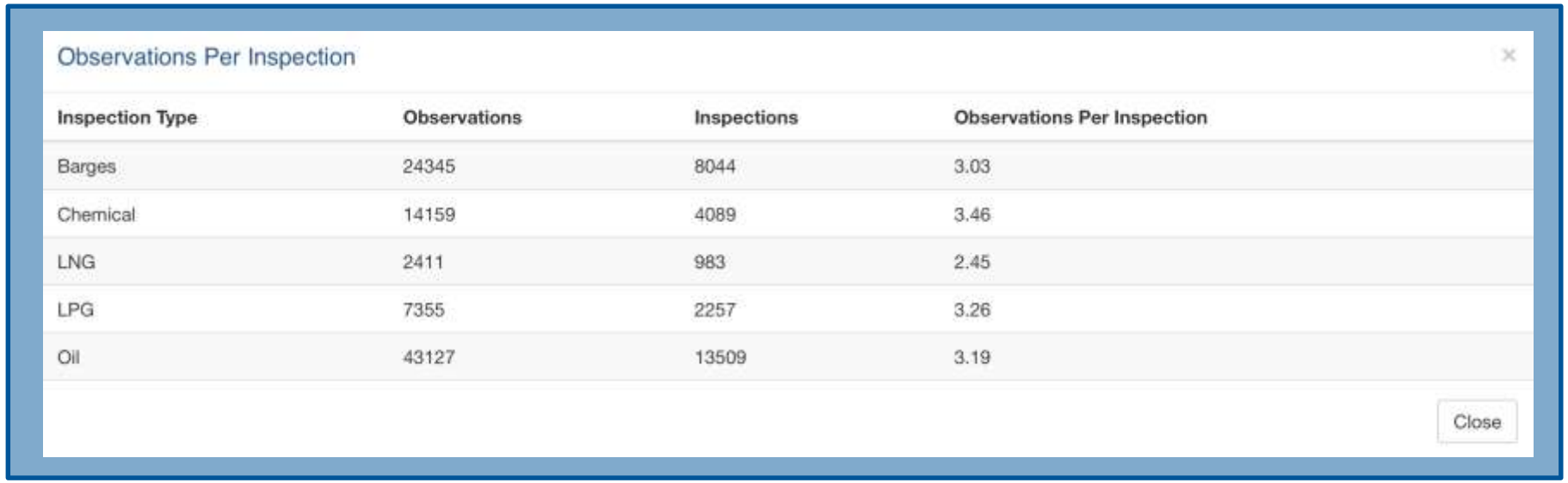
The page-top filters allow the user to customise the data shown.

KPI panel



Each KPI allows the user to view the KPI data details and to also compare the KPI data with their own fleet (if either "All Operators" or a fleet group is selected).

View KPI Data Details



Observations Per Inspection

Inspection Type	Observations	Inspections	Observations Per Inspection
Barges	24345	8044	3.03
Chemical	14159	4089	3.46
LNG	2411	983	2.45
LPG	7355	2257	3.26
Oil	43127	13509	3.19

Close

This screenshot demonstrates the **View KPI Data Details** screen for the **Observations Per Inspection KPI**.

Compare KPI data

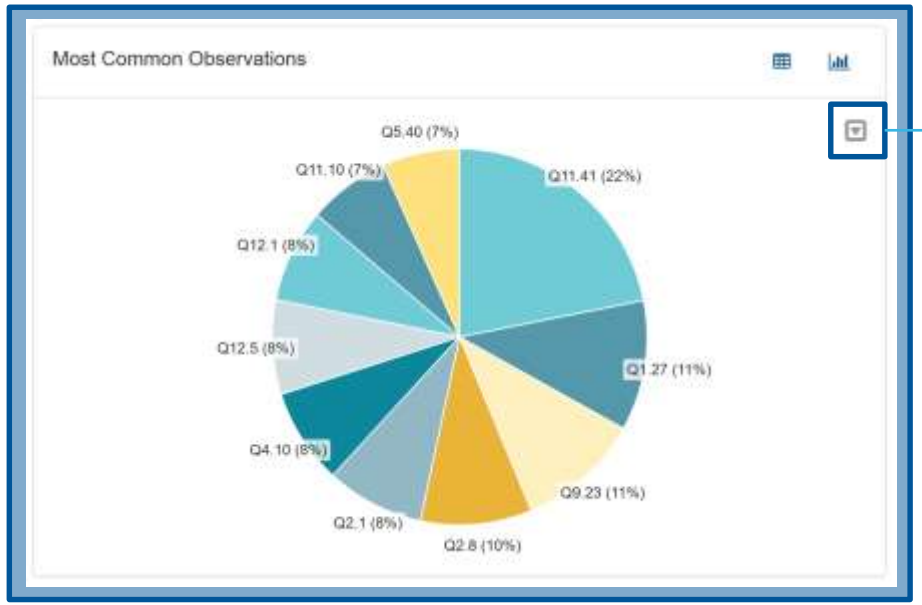
Average Observations Per Inspection

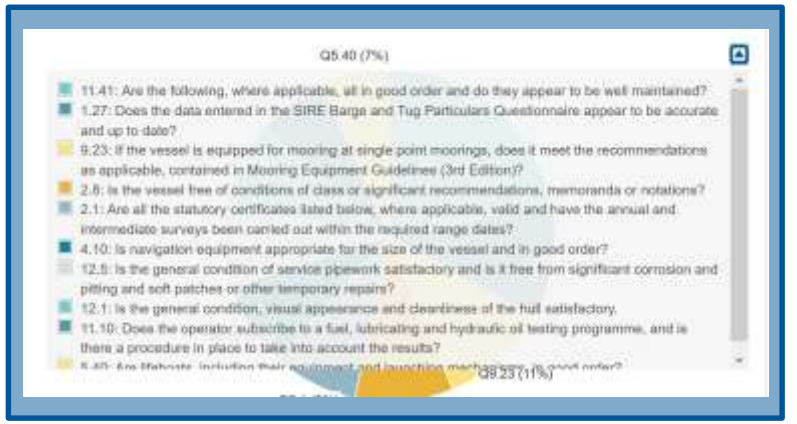
3.16	2.9
All OCIMF Data	MIS Marine Test

Inspection Type	Observations (All OCIMF Data)	Inspections (All OCIMF Data)	Obs per Inspection (All OCIMF Data)	Observations (MIS Marine Test)	Inspections (MIS Marine Test)	Obs per Inspection (MIS Marine Test)
Barges	24333	8041	3.03	0	0	0
Chemical	14133	4079	3.46	37	13	2.85
LNG	2409	981	2.46	0	0	0
LPG	7334	2252	3.26	90	37	2.43
Oil	43041	13479	3.19	186	58	3.21

This screenshot demonstrates the **Compare KPI Data** screen for the **Observations Per Inspection** KPI.

Observation charts



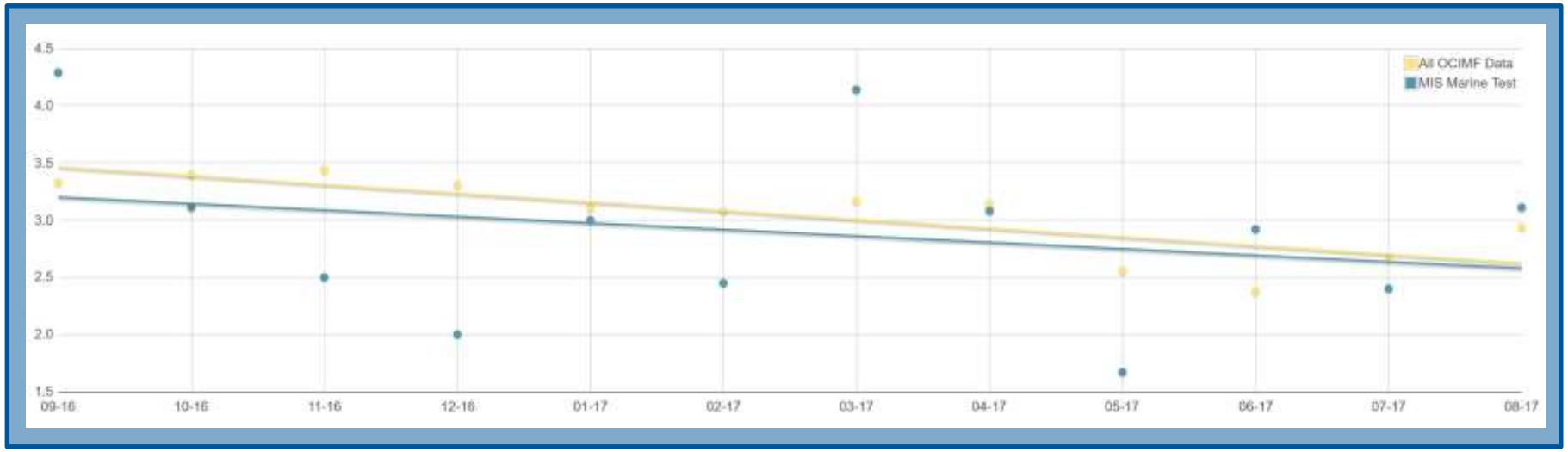


Charts are provided for the

- Most Common Observations
- Spread of Observations Across Inspection Report Chapters
- Recurrent Observations in the Fleet

Clicking the drop-down icon shows the pie chart legend.

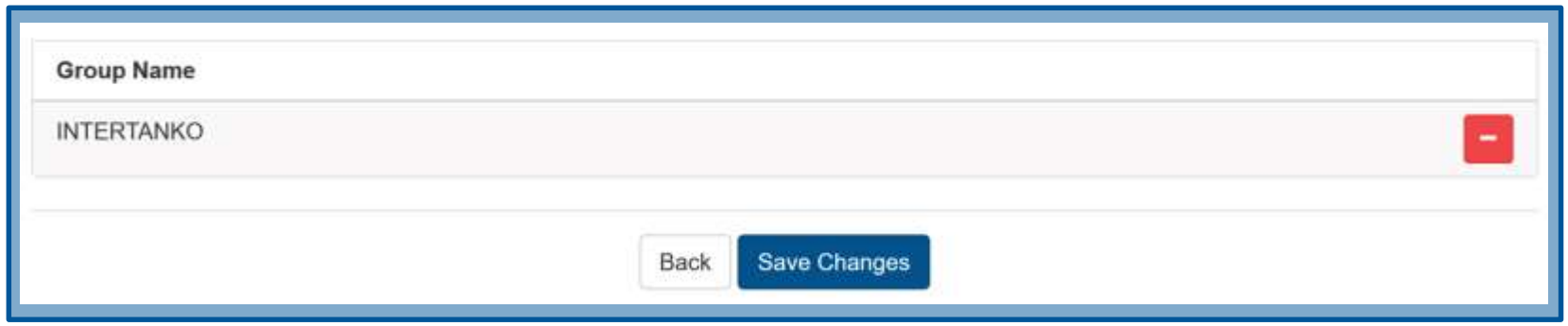
Average Observations Per Inspection – Trend Chart Data Comparison



Selecting the **Data Comparison** option for the **Average Observations Per Inspection** graph shows how an operator's trend compares to that of all OCIMF data.

Fleet group management (Intertanko)

Select the **Manage Groups** options at the top of the page to view available fleet groups.



If the fleet group manager has selected the user operator as an eligible member, the operator can elect to have their anonymous data included in that group's analysis.

SIRE Performance.

SIRE Programme Performance

Jan – July 2017 Statistics

SIRE Programme Participants

The table below shows the numbers and types of the participants registered in SIRE in 2017:

Type of Participants	Number of new organisations registered in SIRE in 2017		Total number of registered organisations as at 31/07/17
Submitting Members	3		94
Recipient Members	16		302
Port State Controls	3		64
Vessel Operators	164		2169
Inspectors	Cat 1	14	494
	Cat 2	0	2
	Cat 3	2	115
Third Party Vetting Contractors	0		12

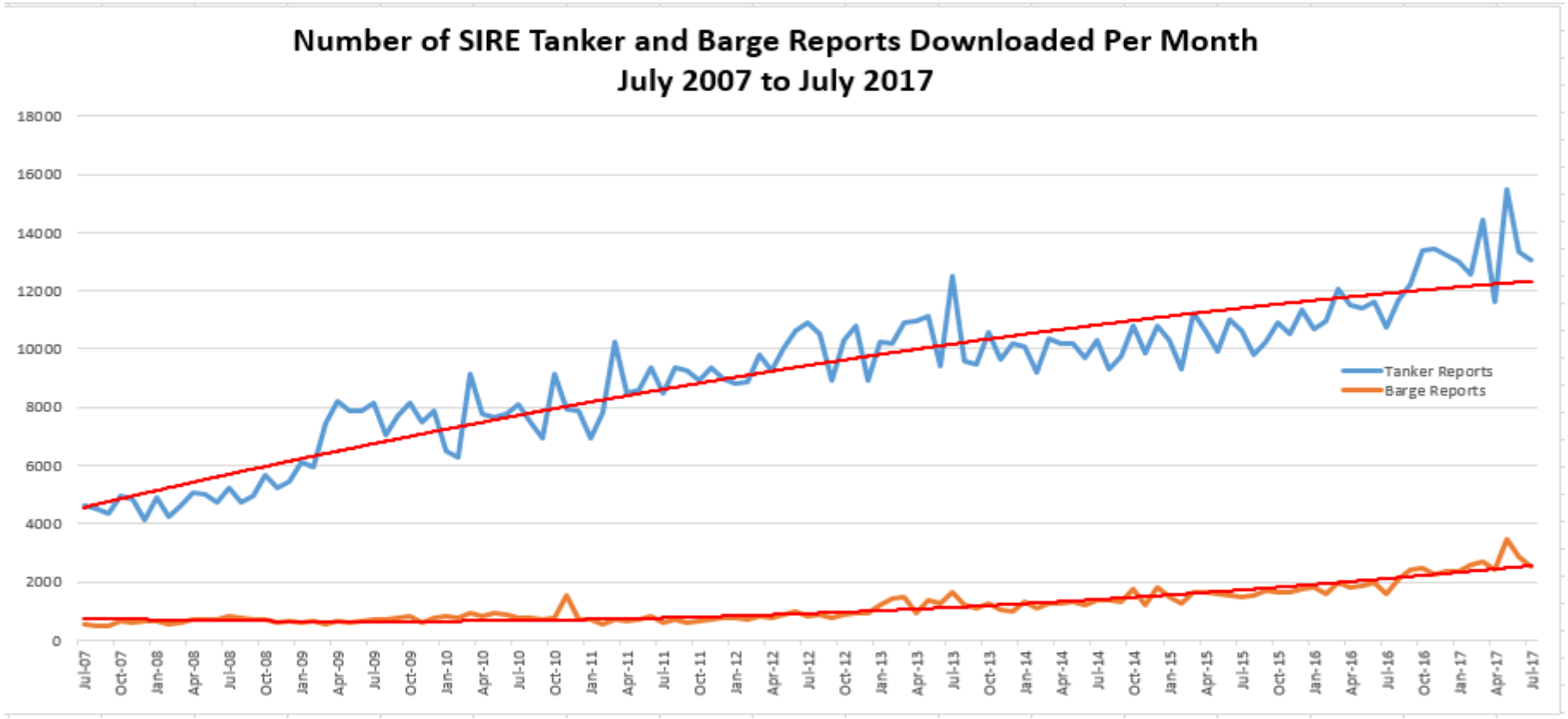
Sire Stats for 2016/17

2017 SIRE Key Statistics			2016 SIRE Key Statistics		
Name	**Tanker**	**Barge**	**Name**	**Tanker**	**Barge**
Inspection reports requested	82011	16579	Inspection reports requested	142884	24136
Inspection reports submitted	11119	4293	Inspection reports submitted	21108	8244
Inspection reports requested by PSC	578	4	Inspection reports requested by PSC	968	2
Total vessels registered	20870		Total vessels registered	20227	
Vessels registered less than 12 months old	1430		Vessels registered less than 12 months old	1453	
Reports less than 12 months old	21498	8163	Reports less than 12 months old	21103	8244
Reports 12 to 24 months old	20575	8138	Reports 12 to 24 months old	20002	7735
Distinct vessels inspected in 12 months	8738	6675	Distinct vessels inspected in 12 months	8595	6722
Ratio of reports to vessels	2.46	1.22	Ratio of reports to vessels	2.46	1.23
Number of Particulars	10747	6199	Number of Particulars	10385	5832
Number of particulars submitters	1203	262	Number of particulars submitters	1174	231
Number of particulars less than 12 months old	9555	5591	Number of particulars less than 12 months old	9335	5226

Extrapolating forward

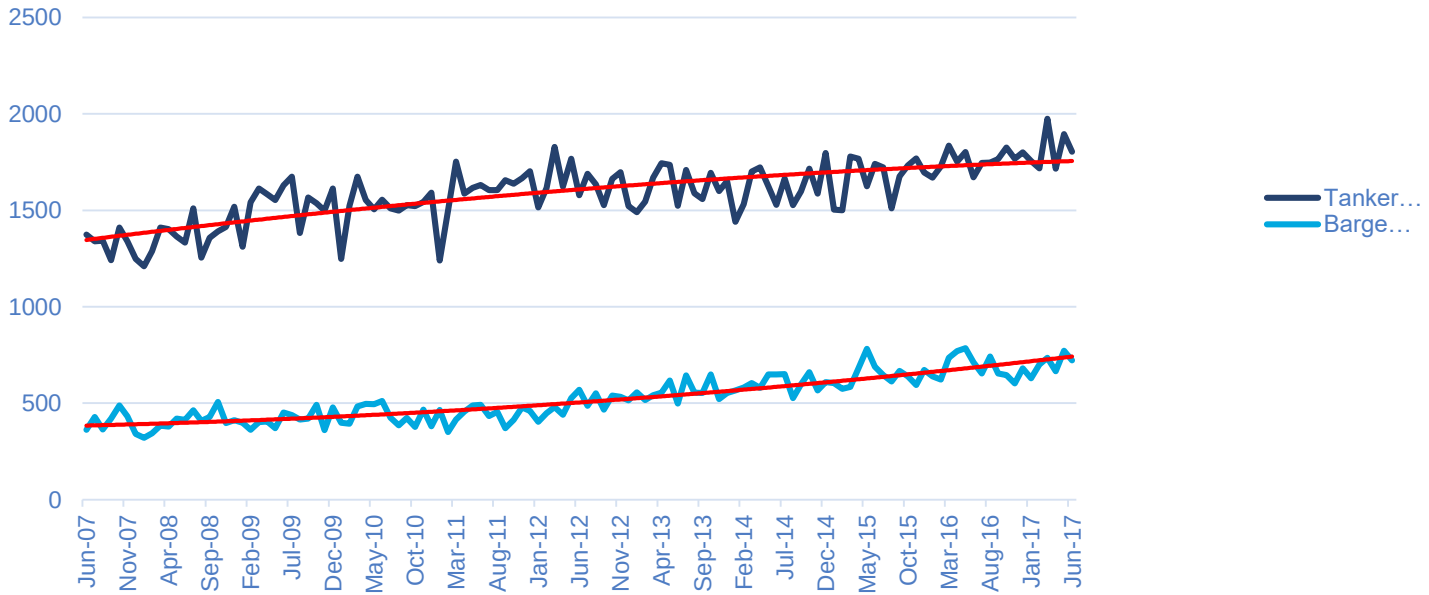
Tanker reports requested for 2017 – 164,022 (14% increase on 2016)
Barge reports requested for 2017 – 33,158 (37% increase on 2016)
Tanker reports submitted for 2017 - 22,238 (5.4 % increase on 2016)
Barge reports submitted for 2017 - 8.586 (4.2 % increase on 2016)

SIRE Reports Downloads



	2009	2010	2011	2012	2013	2014	2015	2016	Average annual increase
Tanker Reports	89822	92577	105775	117726	124780	120578	125837	142884	+6.01%
Barge Reports	8068	10318	8091	10057	14813	16204	18853	24136	+17.27%

Number of SIRE Tanker and Barge Reports Submitted Per Month June 2007 to June 2017



SIRE Programme and Webservices Availability

	SIRE Programme	Webservices
January 2017	100%	99.9%
February 2017	99.9%	99.8%
March 2017	100%	100%
April 2017	100%	100%
May 2017	100%	99.9%
June 2017	100%	100%
July 2017	100%	100%
Average uptime	**99.98%**	**99.94%**
Estimated Total Downtime (unplanned)	**43 min 12s**	**2h 09m**

SIRE Programme and Webservices Reliability

2017 Planned Maintenance Downtime Events

Date	RackSpace Reference	Maintenance	Downtime Initiated (BST)	Downtime Duration
Sun 01 January 2017	161215-14336	Monthly (Dec) App Server Pro-active patching	17:00	Under 5 minutes
Sun 29 January 2017	170113-06034	Monthly (Jan) App Server Pro-active patching	17:00	0 mins – no restart required
Sun 30 March 2017	170316-10088	Monthly (Mar) App Server Pro-active patching	17:00	3 minutes
Sun 30 April 2017	170413-10730	Monthly (Apr) App Server Pro-active patching	17:00	3 minutes
Sun 07 May 2017	170331-07062	Bi-annual DB Server Updates	16:00	2.75 hours
Sun 28 May 2017	170511-11946	Monthly (May) App Server Pro-active patching	17:00	Under 5 minutes
Sun 2nd July 2017		Monthly (Jun) App Server Pro-active patching	17:22	10 minutes

Programme Reliability

SIRE	Webservices
99.92%	99.9%

Barges

Global Inland and Coastal Barging Focus Group.

- Greater emphasis on barge safety by OCIMF members.
- Current TOR of the regional workgroups are narrow and only cover the SIRE system as it applies to barges.
- New global group identified to look at overall barge safety issues.
- Regional groups TOR's will be expanded to cover safety issues.

Regional Barge Groups

- Currently there are three regional barge groups:-
  - North America
  - South and central America
  - Europe
- Barge strategy being developed for area East of the Arabian Gulf. May entail more than one regional group being established.
- There are currently4 different BIQs and BPQs
- The three listed above plus an International variant.
- Further variants may be developed.

A Voice for Safety

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