Maritime and the Environment

“A Look to the Future”

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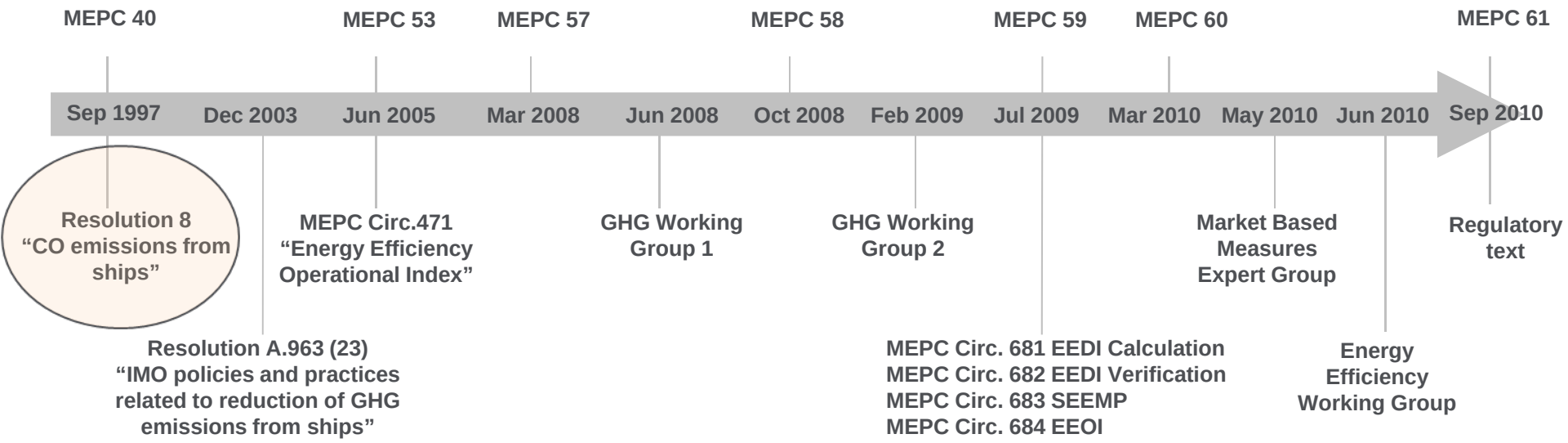
Setting the scene - IMO Energy Efficiency Activities



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Setting the scene

- The world needs to achieve an 80% reduction in GHG emission by 2050 to maintain the global 2 degree temperature increase and the 450ppm CO2 limits
- Emissions expected to be capped worldwide to achieve this

- IMO GHG studies show that:
  - GHG emissions from international shipping was 870 Mt in 2007
  - Predicted to rise by 30 to 55% by 2020
  - Predicted to rise by about 100 to 300% by 2050

- The above predicted rises work against the international requirements; so the trend to reverse the impact is in focus.

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Perspective

3 grams

18 grams

47 grams

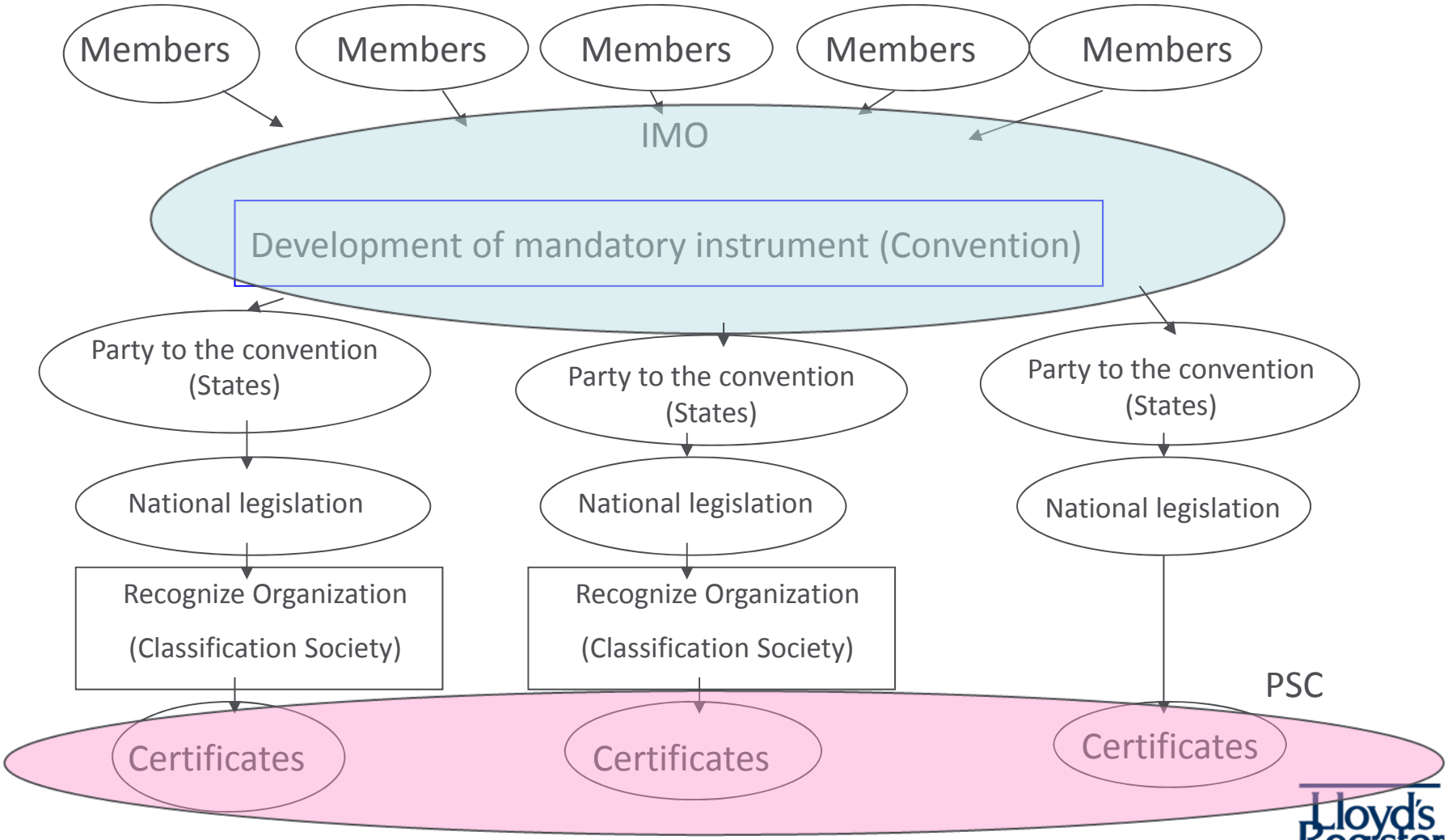
560 grams

Grams of CO2 emitted

by transporting 1 ton of cargo

1 km

IMO Overview



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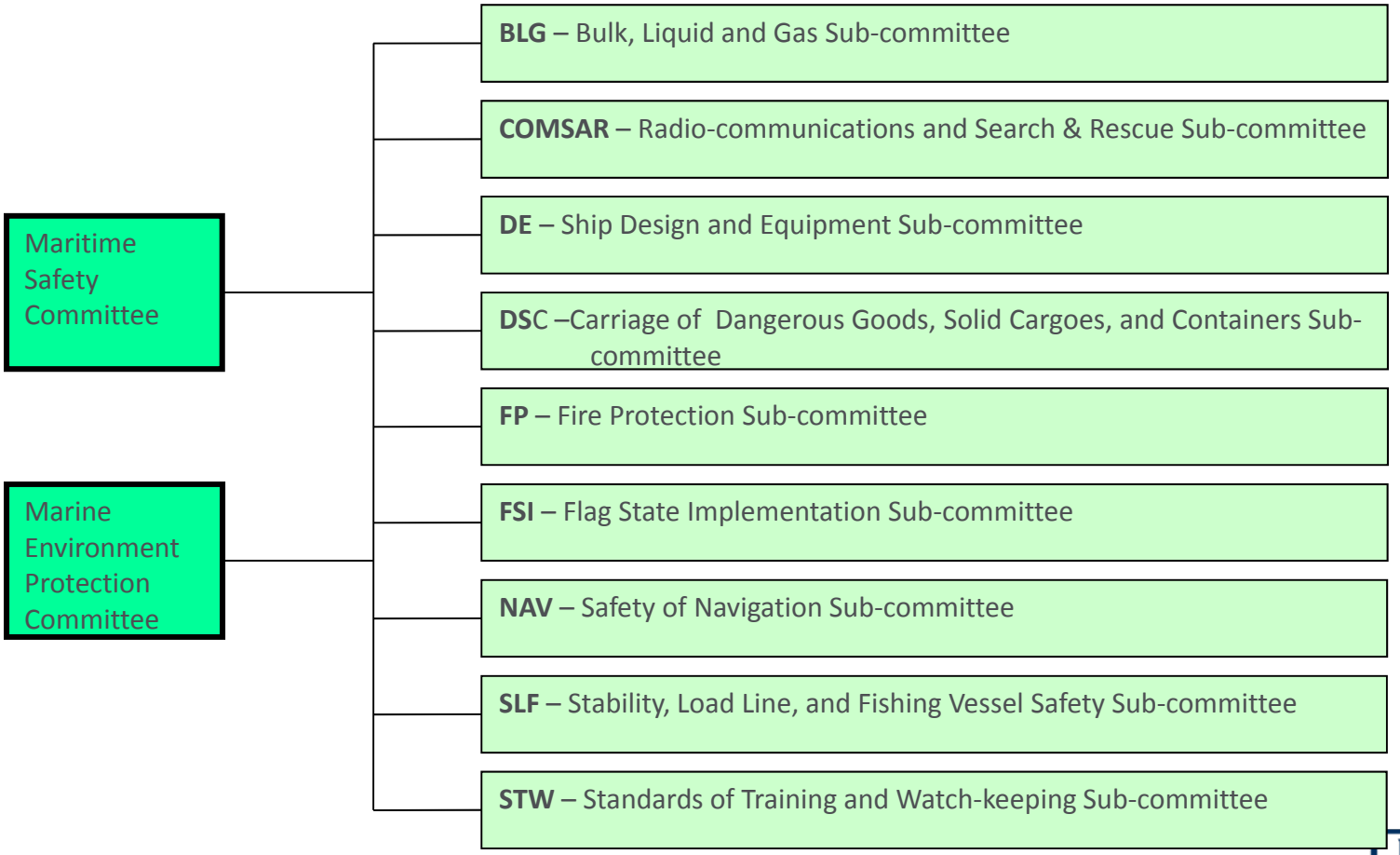
IMO Sub Committees



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MEPC - Marine Environmental Protection Committee

AFS - International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001

BWM - International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

MARPOL - International Convention for the Prevention of Pollution from Ships

Hong Kong International Convention For The Safe And Environmentally Sound Recycling of Ships, 2009

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MARPOL Annex's

Annex I - Prevention of Pollution by Oil

Annex II - Control of Pollution by Noxious Liquid Substances in Bulk

Annex III - Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form

Annex IV - Prevention of Pollution by Sewage from Ships

Annex V - Prevention of Pollution by Garbage from Ships

Annex VI - Prevention of Air Pollution from Ships

IMO MEPC 62

LR Report on MEPC 62

http://www.lr.org/sectors/marine/documents/225426-lr-imo-mepc-62-report.aspx

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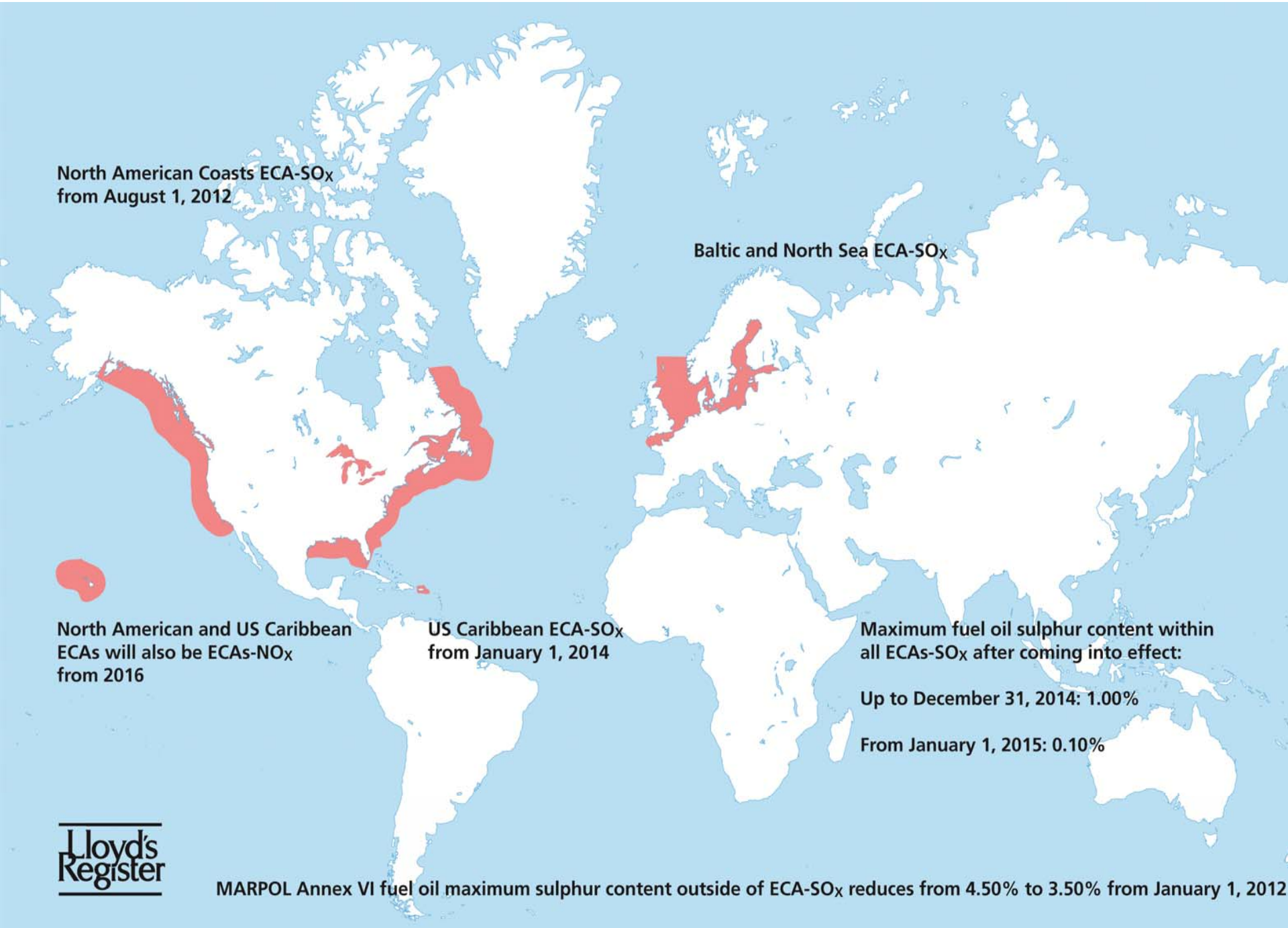
IMO MEPC 62

MARPOL Annex VI – Prevention of Air Pollution from Ships

Proposed ECA (Puerto Rico & U.S. Virgin Islands)

Adopted by MEPC Resolution 202(62) entry into force 1 Jan 2014

Application: to ships visiting the area from 1 Jan 2014 (legal entry into force 1 Jan 2013 and becoming effective following a 12 month period of grace per 14.7 of MARPOL Annex VI)


North American Coasts ECA-SOX
from August 1, 2012
Baltic and North Sea ECA-SOX
North American and US Caribbean
ECAs will also be ECAs-NOX
from 2016
US Caribbean ECA-SOX
from January 1, 2014
Maximum fuel oil sulphur content within
all ECAs-SOX after coming into effect:
Up to December 31, 2014: 1.00%
From January 1, 2015: 0.10%
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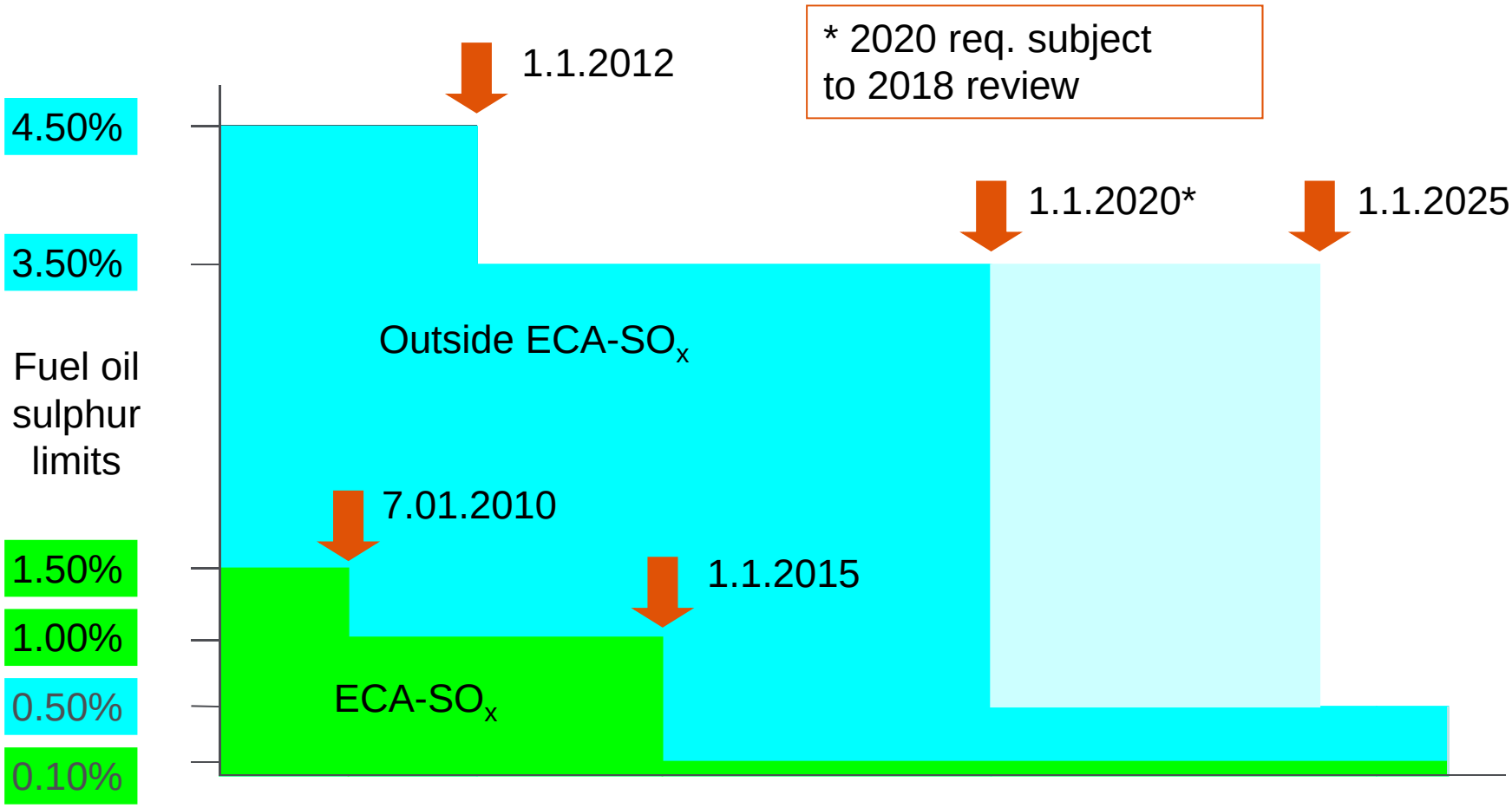
MARPOL Annex VI fuel oil maximum sulphur content outside of ECA-SOX reduces from 4.50% to 3.50% from January 1, 2012

IMO MEPC – SOx General Requirements



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IMO MEPC – SOx General Requirements

MARPOL Annex VI – **SOx (Reg. 14) - General Requirements:**

Global Sulphur Content Cap

Prior to 1 Jan 2012 => 4.5% (45,000 ppm)

On or after 1 Jan 2012 => 3.5% (35,000 ppm)

On or after 1 Jan 2020 => 0.5% (5,000 ppm)

ECA Sulphur Content Cap

Prior to 1 July 2010 => 1.5% (15,000 ppm)

On or after 1 July 2010 => 1.0% (10,000 ppm)

On or after 1 Jan 2015 => 0.1% (1,000 ppm)

Sulphur content to be documented by the supplier

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Future SO_x emission control areas ??

Date	Emission control areas in force	Status
Current	Baltic ECA-SO_x North Sea ECA-SO_x	In force
2012	North America	Adopted
2014	US Caribbean	Adopted
2016	Panama Canal	Assumed
2018	Japan	Assumed
2020	Malacca Straits Mediterranean	Assumed
2022	China	Assumed

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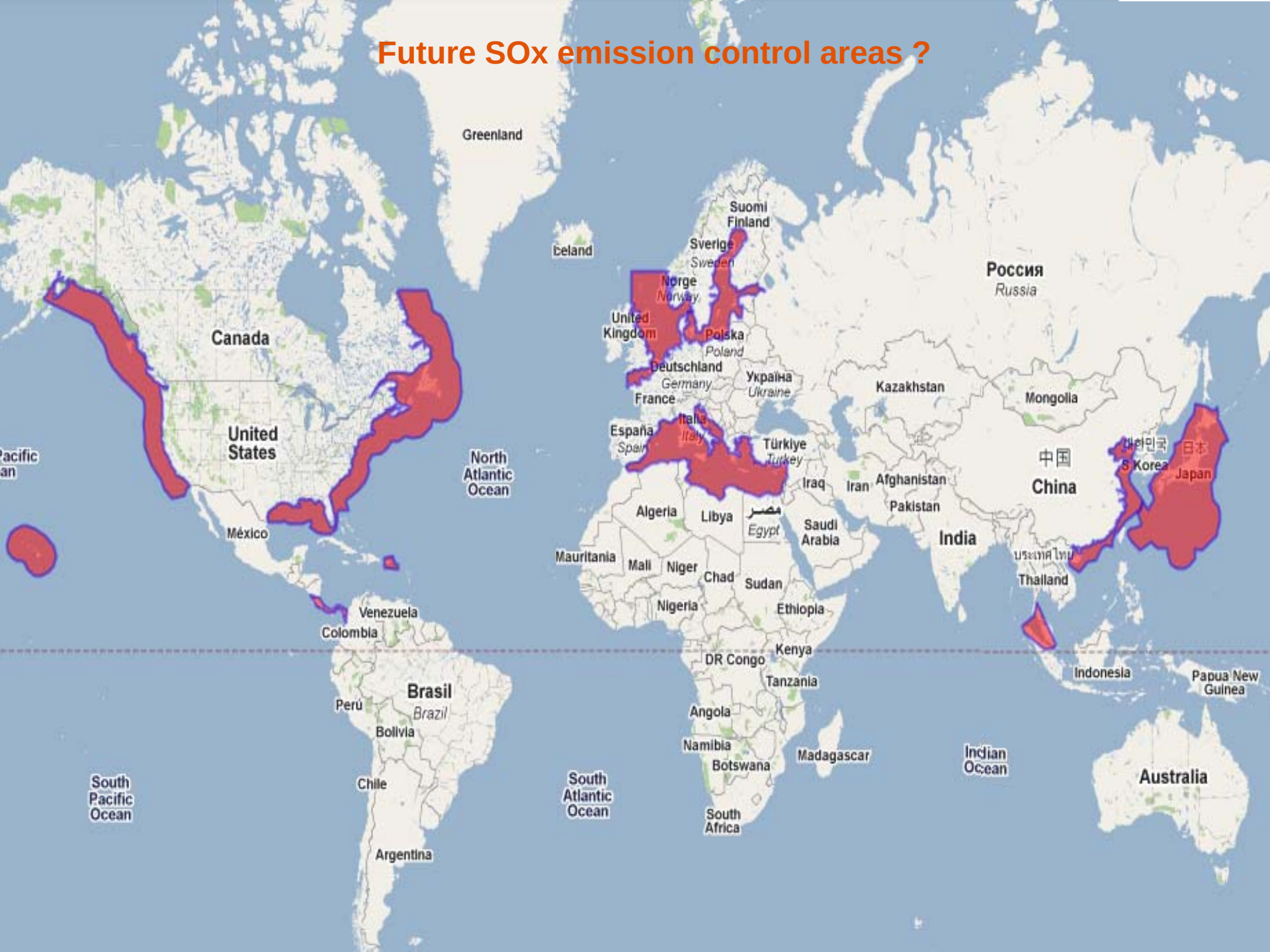
Future SOx emission control areas ?



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MARPOL Annex VI – Prevention of Air Pollution from Ships

New Chapter 4 – Reg. 22 – EEDI (Energy Efficiency Design Index) & SEEMP (Ship Energy Efficiency Management Plan)

Adopted by MEPC Resolution 203(62) entry into force 1 Jan 2013

Application: Generally speaking, new ships 400 gt and above, contract date of construction or keel on or after 1 Jan 2013, delivery on or after 1 July 2015

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Greenhouse Gas (GHG) Emissions

EEDI, EEOI, SEEMP Circulars & Guidelines

- MEPC .1/Circ 681 - Interim Guidelines on the Method of Calculation of the EEDI for New Ships
- MEPC .1/Circ 682 - Interim Guidelines for Voluntary Verification of the EEDI
- MEPC .1/Circ 683 - Guidelines for Development of a SEEMP
- MEPC .1/Circ 684 - Guidelines for Voluntary Use of Ship EEOI

IMO MEPC 62

Other Agenda Items

2. Harmful aquatic organisms in Ballast Water - BWM – related matters

3. Recycling of Ships

4. Prevention of Air Pollution from Ships

- Relevant non-mandatory instruments as a consequence of the revised MARPOL Annex VI & NOx Technical Code 2008
- Revised Specification of Marine Fuels (ISO: 8217:2010)
- Assessment of Availability of Fuel Oil
- Purchasing HCFCs in Foreign ports

5. Reduction of GHG Emissions

- Development of technical, operational and market-based measures
- EEDI (reference lines for each ship type)

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3 Environmental Challenges and 3 Questions for the Future

Environmental Challenges

- **Fuel of the future** – which includes but is not limited to the ultra low sulphur fuel discussion
- **Energy Efficiency** – the challenge of the “low carbon world”
- **Ballast Water Management** (& Treatment) – and its link to bio fouling

Questions??

- “What is best for my company?”
- “What do I need to think about in making my decision?”
- “Do the requirements interlink and hence a decision on one could restrict my choice in relation to other issues?”

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Evaluating the Risks Related to Emissions Reduction

- CAPEX vs. OPEX
  - Installation costs
  - additional fuel consumption
  - cost of bunkering and disposal of consumables
  - maintenance costs
- Commercial considerations
  - charterer preference
  - reduced port dues / taxes
- Future cost of carbon
- Investment horizon
- Stakeholder “requirements”

- Fuel availability and future fuel flexibility
- Availability of consumables
- Human resource requirements
- Risk of non-compliance
- Public perception

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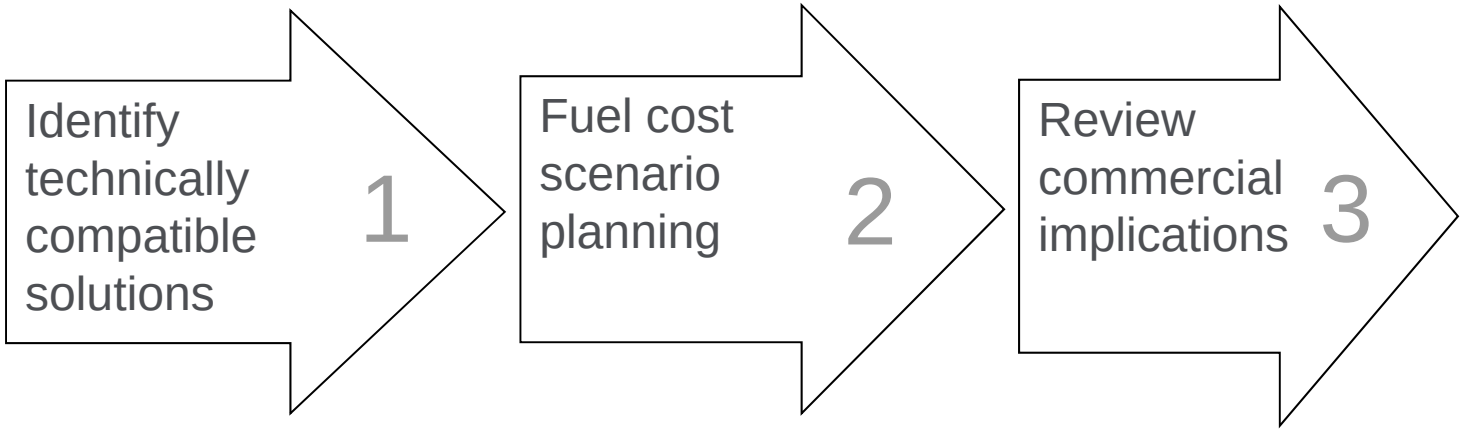
A Broad Approach to the Challenges Ahead

Many different solutions available
No single solution is suitable for all ships / all owners / all trades



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Summary of Challenges

Ballast Water Management & Treatment Technologies

Bio Security & Bio Fouling

- What is under development in relation to second or third generation systems?
- Would such developments affect your choice of treatment system?
- Could you retrofit a second or third generation system into a first generation system at low costs and with few engineering challenges?
- Availability of systems – how fast can a manufacturer deliver? It is possible that there will be waiting lists for delivery of systems?.
- Charter requirements – how flexible does the treatment system have to be to deal with shifting requirements?
- Beyond the current requirements, so what might come next – linked to USA EPA – and will the chosen treatment system manage that?
- Impact on other environmental media – are there any and if so how would you deal with them?
- Human element angle – what consideration would you have to make to ensure the system was easy to correctly operate?

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Summary of Challenges

The “Low Carbon World”

Energy Efficiency & the Fuel of the Future

- Do you accurately (to within 5% uncertainty level on a per voyage basis) know your fuel consumption? And do you have records to support that going back over seven years (as for financial records)?
- Future of fuel costs?
- Low sulphur fuels - will refineries in some parts of the world switch refining strategies and hence not produce heavy fuel oil any more? – this relates to security of demand as seen from the position of refineries
- Security of energy supply – will this drive choices and affect supply availability?
- Bunkering locations – will there be a switch from the fuel of choice being available everywhere to it only being available in specific locations? And could that impact charter rates?

Summary of Challenges

The “Low Carbon World”

Energy Efficiency & the Fuel of the Future

- Supply chain demand in relation to energy efficiency or fuel choices or environmental credentials either direct through charterer or indirect via main shippers?
- Regulation – will we see tighter energy efficiency requirements in some Port States such as China?
- What do you believe will be the next step in meeting the “low carbon world” that affects shipping and global trade? Will manufacturing remain in China or move?
- Ship design of the future – how much of the future do you need to consider now? That is how fast will developments related to hull form, paint choice, IT control systems, propulsion etc move to support the low carbon scenario?

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Meeting the Future Challenges – 3C's

- *Courage* – to challenge perceived wisdom and historical habits.

- *Capability* – to find the pragmatic and flexible solutions needed to achieve transformations.

- *Commitment* – to allocate sufficient resources, be they financial, people or time, to search for and find pragmatic innovative solutions.

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Thank you

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Role of Classification Societies

- Provision of **verification and certification** of international regulations and/or best practice industry standards and guidelines such as:
  - EEDI, EEOI
  - SEEMP
  - ISO14064 – GHG Accounting & Verification
  - ISO14001 – Environmental Management System
  - Environmental Notations

- Provision of **third-party independent consultancy** services
  - Energy services (efficiency, performance, benchmarking, audits, footprint, etc.)
  - Fuel advisory services (quality, alternative fuels, etc.)
  - Training and advice => information exchange

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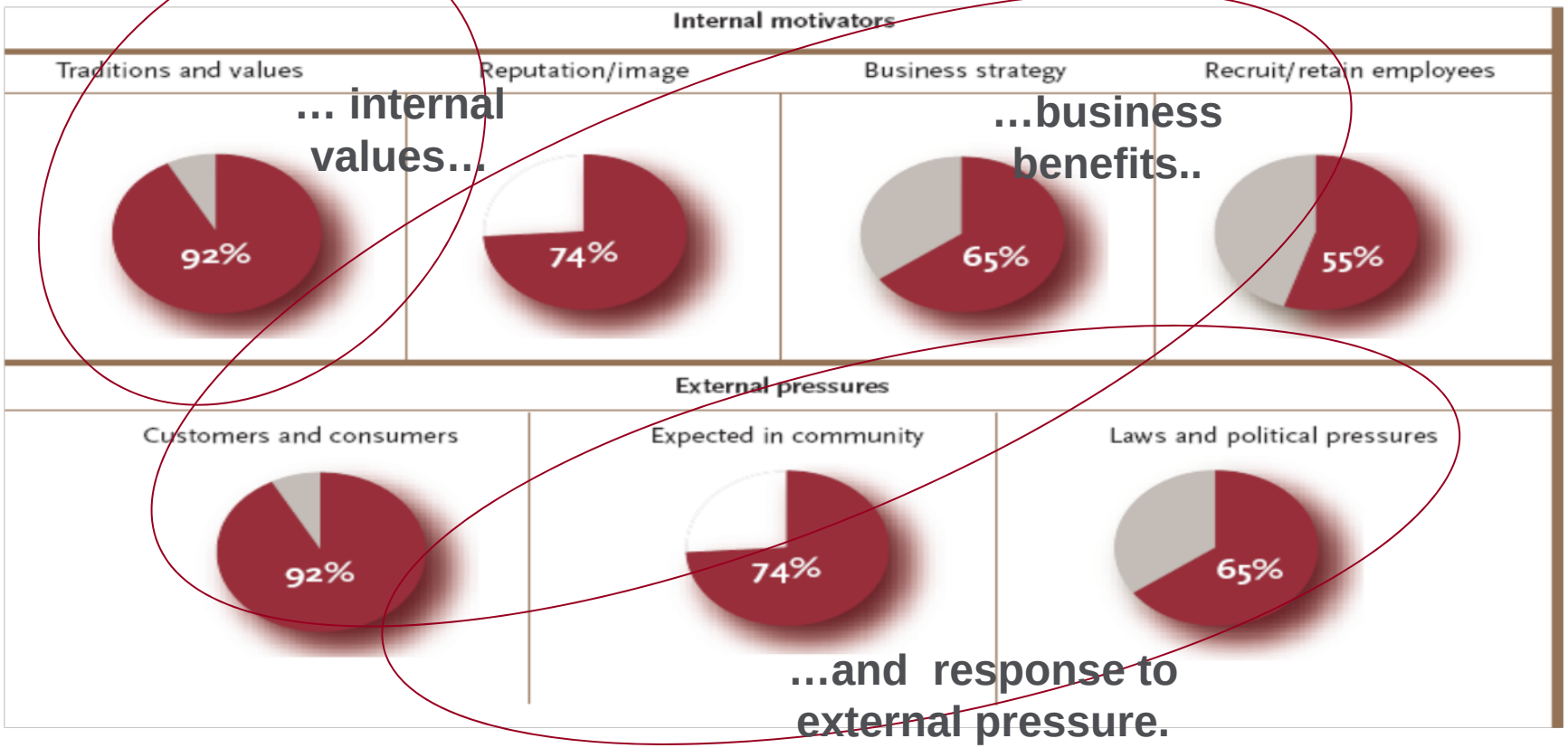
Why do it? Because our Response to Green Issues are driven by a combination of…



US National Survey, 2005 by Boston College

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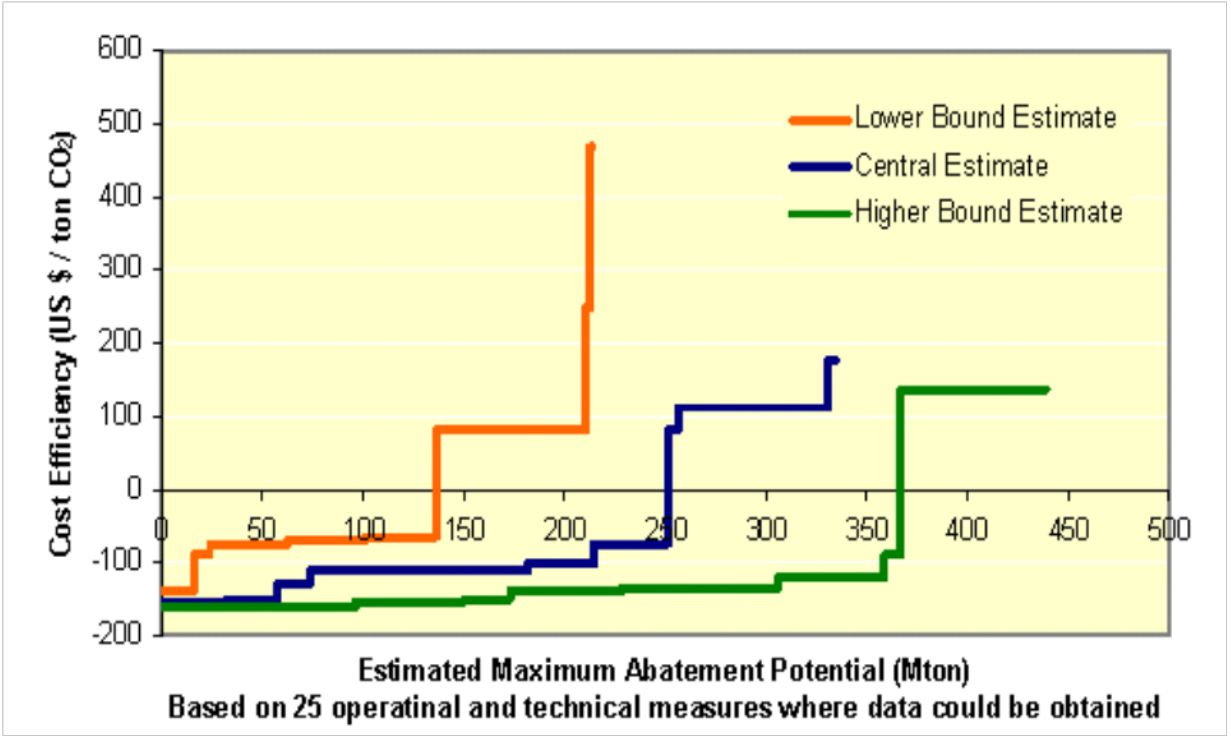
Marginal CO_2 Abatement

Cost Curve, 2020



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Compliance scenario 1

HFO + distillate

Operational location	From 2015			From 2020		
	Main Eng	Aux Eng	Boiler	Main Eng	Aux Eng	Boiler
Outside ECA(SOx) On passage	HFO	HFO	HFO	DMB	DMB	DMB
Outside ECA(SOx) In port	-	HFO	HFO	-	DMB	DMB
Inside ECA(SOx) On passage	DMA	DMA	DMA	DMA	DMA	DMA
Inside ECA(SOx) In port	-	DMA	DMA	-	DMA	DMA
EU Alongside	-	DMA	DMA	-	DMA	DMA

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Compliance scenario 2

Scrubbed HFO + distillate

Operational location	From 2015			From 2020		
	Main Eng	Aux Eng	Boiler	Main Eng	Aux Eng	Boiler
Outside ECA(SOx) On passage	HFO	HFO	HFO	HFO + scrubber	DMB	DMB
Outside ECA(SOx) In port	-	HFO	HFO	-	DMB	DMB
Inside ECA(SOx) On passage	HFO + scrubber	DMA	DMA	HFO + scrubber	DMA	DMA
Inside ECA(SOx) In port	-	DMA	DMA	-	DMA	DMA
EU Alongside	-	DMA	DMA	-	DMA	DMA

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Compliance scenario 3

Scrubbed HFO + LNG

Operational location	From 2015			From 2020		
	Main Eng	Aux Eng	Boiler	Main Eng	Aux Eng	Boiler
Outside ECA(SOx) On passage	HFO	HFO	HFO	HFO + scrubber	LNG	DMB
Outside ECA(SOx) In port	-	HFO	HFO	-	LNG	DMB
Inside ECA(SOx) On passage	HFO + scrubber	DMA	DMA	HFO + scrubber	LNG	DMA
Inside ECA(SOx) In port	-	DMA	DMA	-	LNG	DMA
EU Alongside	-	DMA	DMA	-	LNG	DMA

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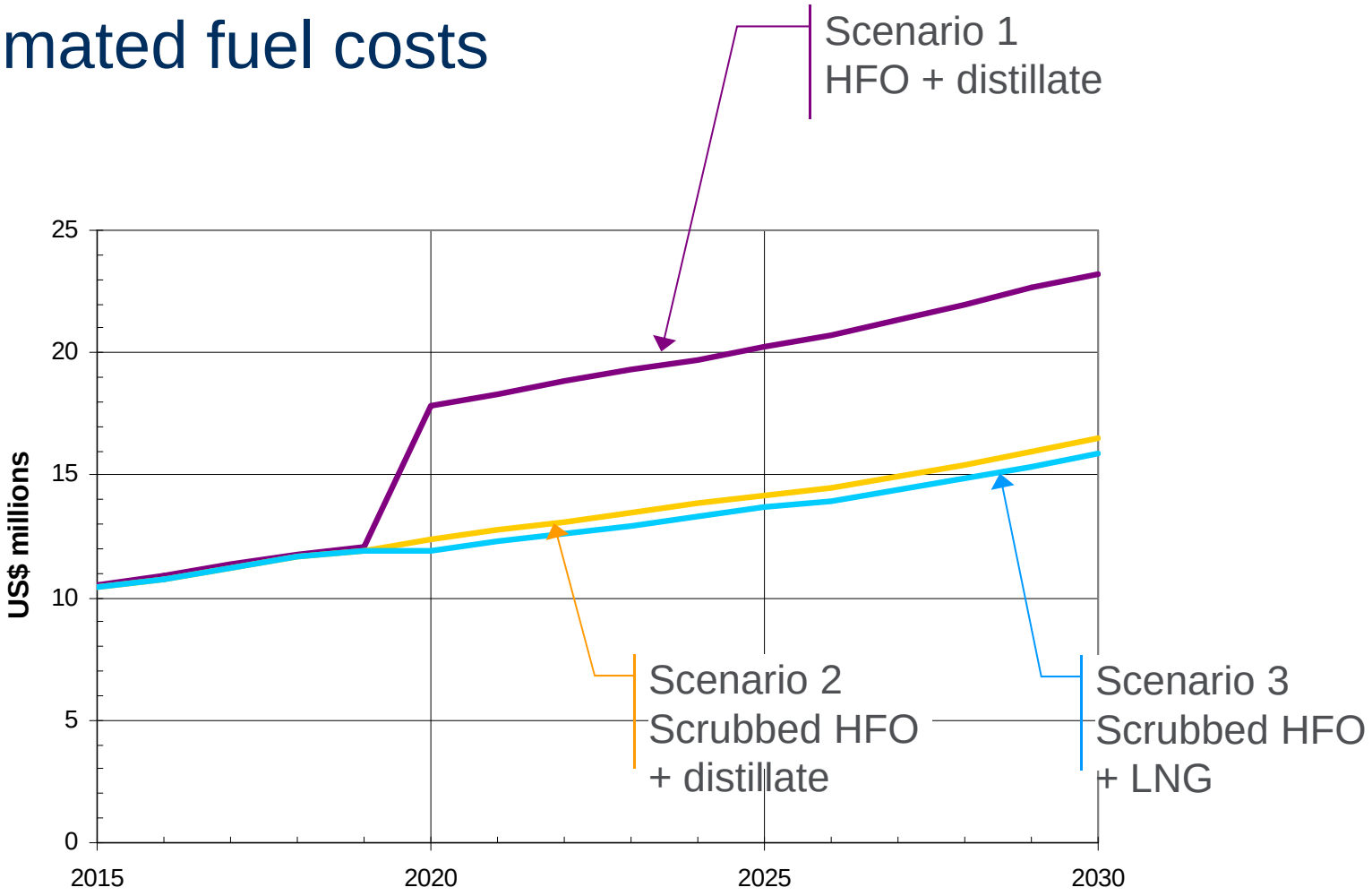
Estimated fuel costs



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