

MARPOL Annex VI - Prevention of Air Pollution from Ships



National Workshop (virtual) on Ratification and Effective Implementation of
MARPOL Annex VI for Lebanon
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Dr Zabi Bazari
REMPEC Consultant

Content

Introduction

MARPOL Annex VI overview

Chapter 1 – General (Regs. 1-4)

Chapter 2 – Survey, certification & means of control (Regs. 5-11)

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Chapter 4 – Energy efficiency regulations for ships (Regs. 19-23)

Black carbon (Polar Code)

Methane (for ships using LNG)

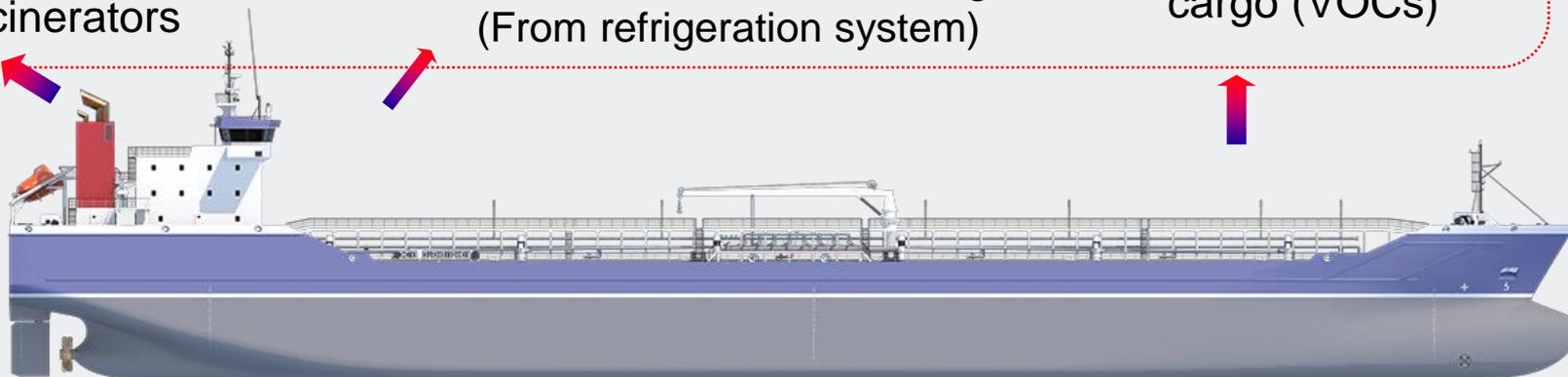
Sources of Pollution from Ships

Exhaust Gases (SO_x, NO_x, GHG, etc.) from:

- main and auxiliary engines
- boilers
- incinerators

Emissions of Freon/Halon gases
(From refrigeration system)

Evaporation from cargo (VOCs)



Sewage & Garbage

Oil spills

Loss of cargo

Loss by accidents –
ship cargoes & life

Bilge-water
disposal/ tank
washing

Emissions from
paint solutions

Ballast water
discharge

© Damen shipyards

International Convention for the Prevention of Pollution from Ships (MARPOL)

Air Pollution Conference 1997

- MARPOL: Main international convention covering prevention of operational or accidental pollution of the marine environment by ships
- Air Pollution Conference **1997** adopted new Annex VI “Regulations for the Prevention of Air Pollution from Ships” through adding a Protocol to MARPOL 73/78
- Entered into force May **2005**

Annex I	Annex II	Annex III	Annex IV	Annex V	Annex VI
Oil	Noxious Liquid Substances carried in bulk	Harmful Substances carried in Packaged Form	Sewage	Garbage	Air Pollution & Energy Efficiency

MARPOL Annex VI – Chapter 1

General

Regulation 1 - Application

1. The provisions of this Annex shall apply to all ships, except where expressly provided otherwise in Regulations 3, 5, 6, 13, 15, 16, 18, 19, 20, 21, 22 and 22A of this Annex

Application



All Ships

Does not apply



- When suffering damage to ship or equipment
- When saving life at sea
- When securing safety of ship
- Ship trials for research
- Emissions from sea bed activities
- Ships smaller than certain size
- Certain ship size and ship types based on specific regulations

Regulation 2 – Definitions

- A large number of terms are defined (more than 50).
- Example terms defined are:
 - **Emission Control Area** where the adoption of special mandatory measures to control NO_x or SO_x ...
 - **Fuel oil** means any fuel delivered to and intended for combustion including gas, distillate and residual fuels.
 - **Marine diesel engine** means any reciprocating internal combustion engine operating on liquid or dual fuel ... In addition, a gas fuelled engine installed on a ship constructed on or after 1 March 2016 ...
 - Various ship types
 - Etc.

Regulation 3 - Exceptions and Exemptions

- Regulations of this Annex shall not apply:
 - When **suffering damage** to ship or equipment
 - When **saving life** at sea
 - When **securing safety** of ship
 - Ship **trials for research**
 - Emissions from **sea bed activities** (for marine platforms)

Regulation 4 – Equivalents

1. **The Administration of a Party** may allow any ... apparatus .. or compliance methods used as an alternative if such ... appliances or compliance methods are at least as effective as that required by this Annex,
2. **The Administration of a Party** which allows such an alternative shall **communicate** to the Organization for circulation to the Parties the particulars thereof, for their information and appropriate action ...

Notifications from Parties are available through the IMO Global Integrated Shipping Information System (GISIS)

Example: **SOx Scrubbers**



Global Integrated Shipping Information System

<http://gisis.imo.org/Public/>

MARPOL Annex VI – Chapter 2

Survey, Certification and Means of Control

Regulation 5 – Surveys and Inspections

- Every ship of 400 gross tonnage or above shall be subject to the surveys specified below:
 - a. An **initial survey** before the ship is put into service or ...
 - b. A **renewal survey** at intervals specified by the Administration, but not exceeding five years,
 - c. An **intermediate survey** within 3 months before or after the second third anniversary date of the certificate....
 - d. An **annual survey** within 3 months before or after each anniversary date of the certificate...

- Surveys of ships ... shall be carried out by **officers of the Administration** or **RO** (Recognised Organisation)

Regulation 6 – Issue or Endorsement of Certificates

1. An **International Air Pollution Prevention (IAPP) Certificate** shall be issued, after an initial or renewal survey ..., to:
2. An **International Energy Efficiency (IEE) Certificate** shall be issued, after an initial survey....
3. A **Statement of Compliance** related to fuel oil consumption shall be issued to the ship

Regulation 7:

- Allows the Issue of a Certificate by another Party
- Prohibits issue of certificates to non-parties.

Regulation 8 – Form of Certificates

The **IAPP Certificate** and its **Supplement*** shall be drawn up in a form corresponding to the model given in **appendix I** to this Annex ...

Form of International Air Pollution Prevention (IAPP) Certificate (Regulation 8)

INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

Issued under the provisions of the Protocol of 1997, as amended by resolution MEPC.176(58) in 2008, to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 related thereto (hereinafter referred to as “the Convention”) under the authority of the Government of:

.....
(full designation of the country)

by

*(full designation of the competent person or organization
authorized under the provisions of the Convention)*

Particulars of ship*

Name of ship

Distinctive number or letters

Port of registry

Gross tonnage

IMO Number**

Guidance on the Supplement
to the IAPP Certificate
(MEPC.1/Circ.849)

Regulation 9 – Duration and Validity of Certificates

- An **IAPP Certificate** shall be issued for a period specified by the Administration, which **shall not exceed five years**.
 - Renewal details, dates, etc. given
- An **IEE Certificate** is valid for the **life of the ship**.
- A **Statement of Compliance** for fuel oil consumption DCS is valid for **one year**.

Regulation 10 – Port State Control on Operational Requirements

1. A ship, when in a port or an offshore terminal under the jurisdiction of another Party, **is subject to inspection by officers duly authorized by such Party**
2. ... the Party shall take such steps as to ensure that **the ship shall not sail** until the situation has been brought to order in accordance with the requirements of this Annex.

And other aspects

Regulation 11 – Detection of Violations and Enforcement

1. **Parties shall co-operate in the detection of violations** and the enforcement of the provisions of this Annex
2. **Any Party shall furnish to the Administration evidence**, if any, that the ship has emitted any of the substances in violation of the provisions of this Annex.
3. Upon receiving such evidence, **the Administration shall investigate the matter** and when sufficient evidence is available ..., **it shall act against the ship in accordance with its law** as soon as possible.

And other aspects

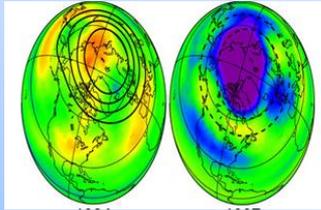
MARPOL Annex VI – Chapter 3

Requirements for Control of Emissions

MARPOL Annex VI – Chapter 3 regulations

Ozone Depleting
Substances

Reg.12



Volatile Organic
Compounds

Reg.15



Nitrogen Oxides
(NO_x)

Reg.13



Shipboard
Incineration &
Reception
facilities

Regs. 16 and 17



Sulphur Oxides
(SO_x) and PM

Reg.14



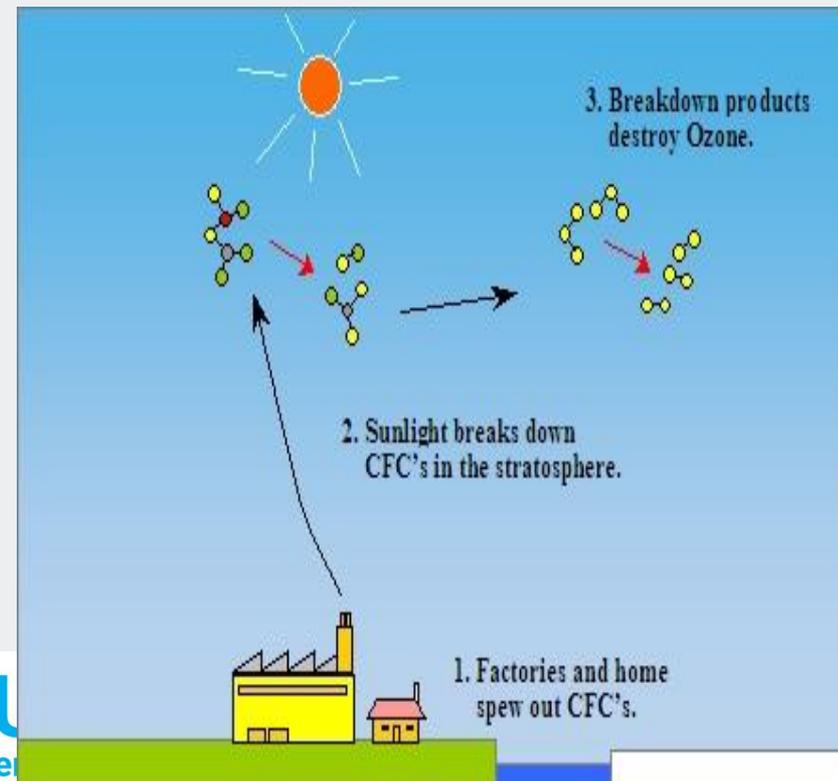
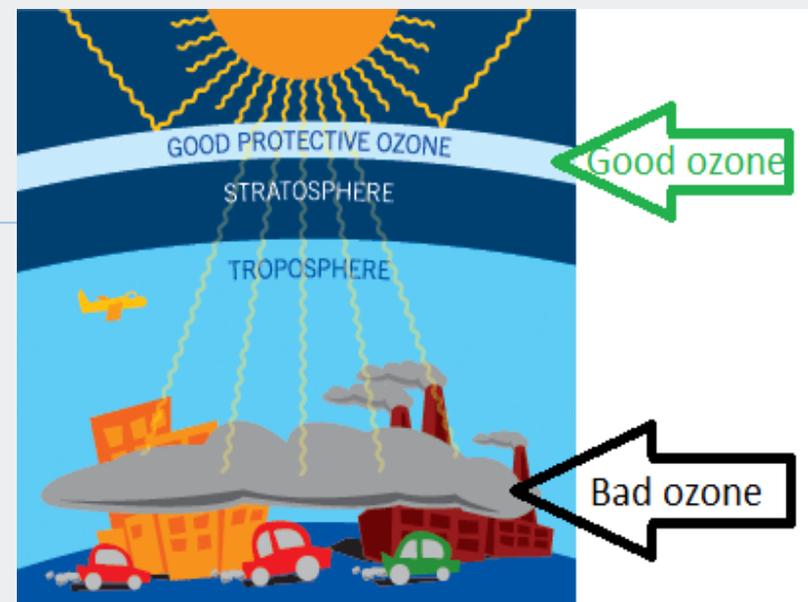
Fuel quality and
availability

Reg.18

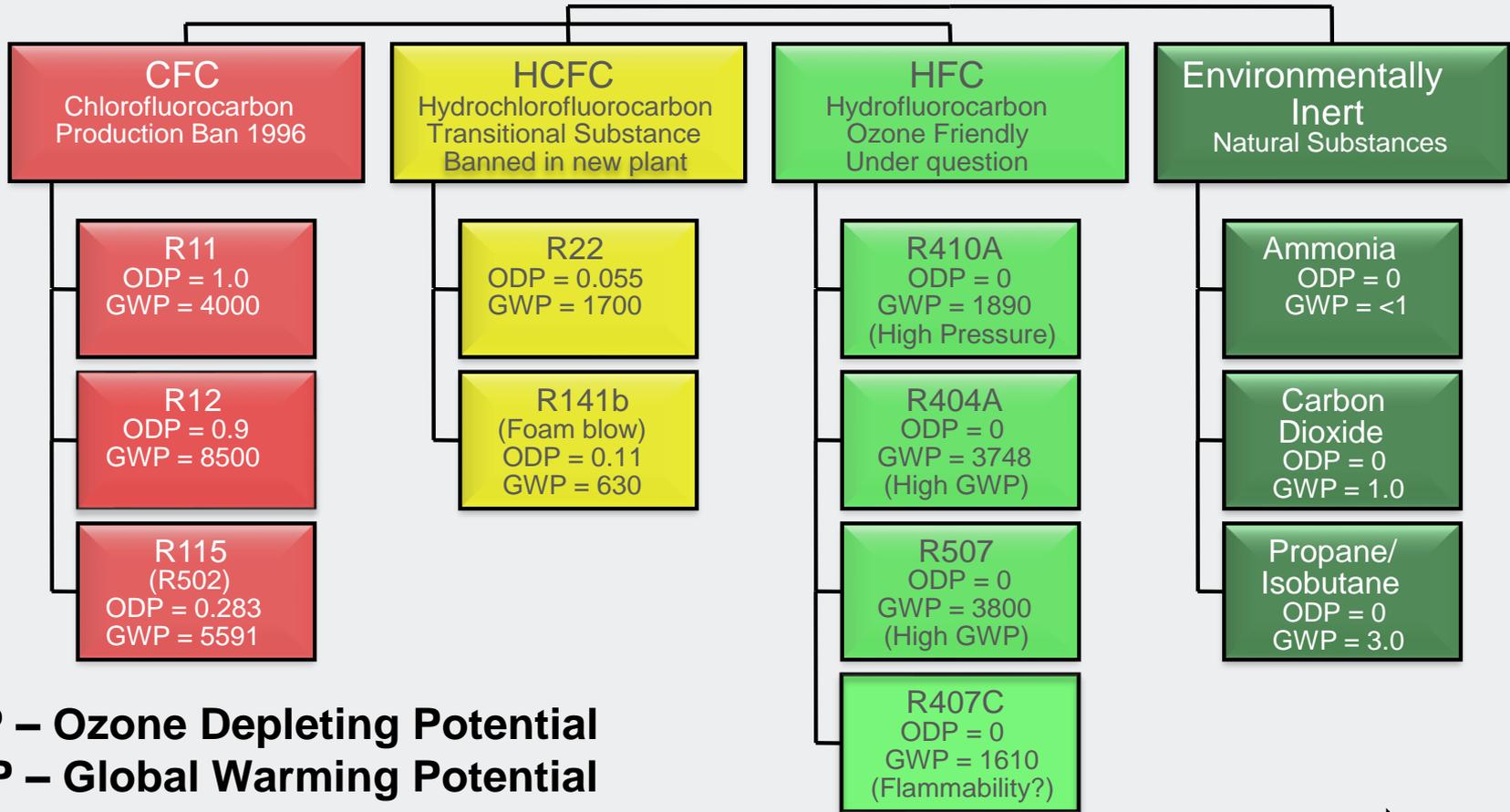


Regulation 12 – Ozone Depleting Substances (ODS)

- Ozone: O_3
- Ozone layer: ~25 km from Earth
- Function of Ozone layer: Protection of Earth from Ultra Violet sun lights.
- Ozone depletion: Refers to decline of Ozone layer (the ozone hole).
- ODS: Primary cause of ozone depletion is the presence of chlorine-containing gases (CFCs).
- ODS on board ship is used mainly in the refrigeration equipment and AC units.



Refrigerants: Family Tree, ODP, GWP



ODP – Ozone Depleting Potential
GWP – Global Warming Potential

Montreal Protocol aims to **phase out** the ODS gases.

Regulation 12 – Ozone depleting substances (ODS)

- Does not apply to **permanently sealed units** (Reg.12.1) with no refrigerant charging connections ...
- Any **deliberate emissions** prohibited (Reg.12.2)
- Other than Hydrochlorofluorocarbon (HCFC) all other ODS banned in new ships from **19 May 2005** (Reg.12.3.1)
- HCFC banned in new ships from **1 January 2020** (Reg.12.3.2)
- Delivery to **reception facilities** following removal (Reg.12.4)

Where the ODS containing equipment located on-board the ship?

- Supplement to IAPP Certificate - Maintain a list of equipment containing ODS (Reg.12.5)

2 Control of emissions from ships

2.1 Ozone depleting substances (regulation 12)

2.1.1 The following fire-extinguishing systems, other systems and equipment containing ozone depleting substances, other than hydro-chlorofluorocarbons, installed before 19 May 2005 may continue in service:

System or equipment	Location on board	Substance

2.1.2 The following systems containing hydro-chlorofluorocarbons (HCFCs) installed before 1 January 2020 may continue in service:

System or equipment	Location on board	Substance

How to find what has happened to ODS material and equipment?

Ships are required to complete an **ODS Record Book** (Reg. 12.6) for rechargeable systems

Entries in the ODS Record Book (Reg.12.7) include mass (kg) of substance used for:

- Recharge, full or partial, of equipment containing ODS;
- Repair or maintenance of equipment containing ODS;
- Discharge of ODS to the atmosphere;
- Discharge of ODS to land-based reception facilities;
- Supply of ODS to the ship.

Description of Equipment	Date	Quantity kg	ODS Name	Discharge to atmosphere	Land base discharge	New Supply to ship	Remarks Ch. Eng. Signature
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	
				deliberate non-deliberate	Yes / No N/A	Yes / No N/A	

MARPOL Annex VI – Regulation 13

Nitrogen Oxides (NO_x)

Regulation 13 NO_x - Application

Applies to



Marine diesel engines ⇒ with a power output more than **130 kW** ⇒ installed on a ship constructed on or after 1 January 2000

Applies to



Marine diesel engines ⇒ with a power output more than **130 kW** ⇒ which undergo a **major conversion** on or after 1 January 2000

Applies to



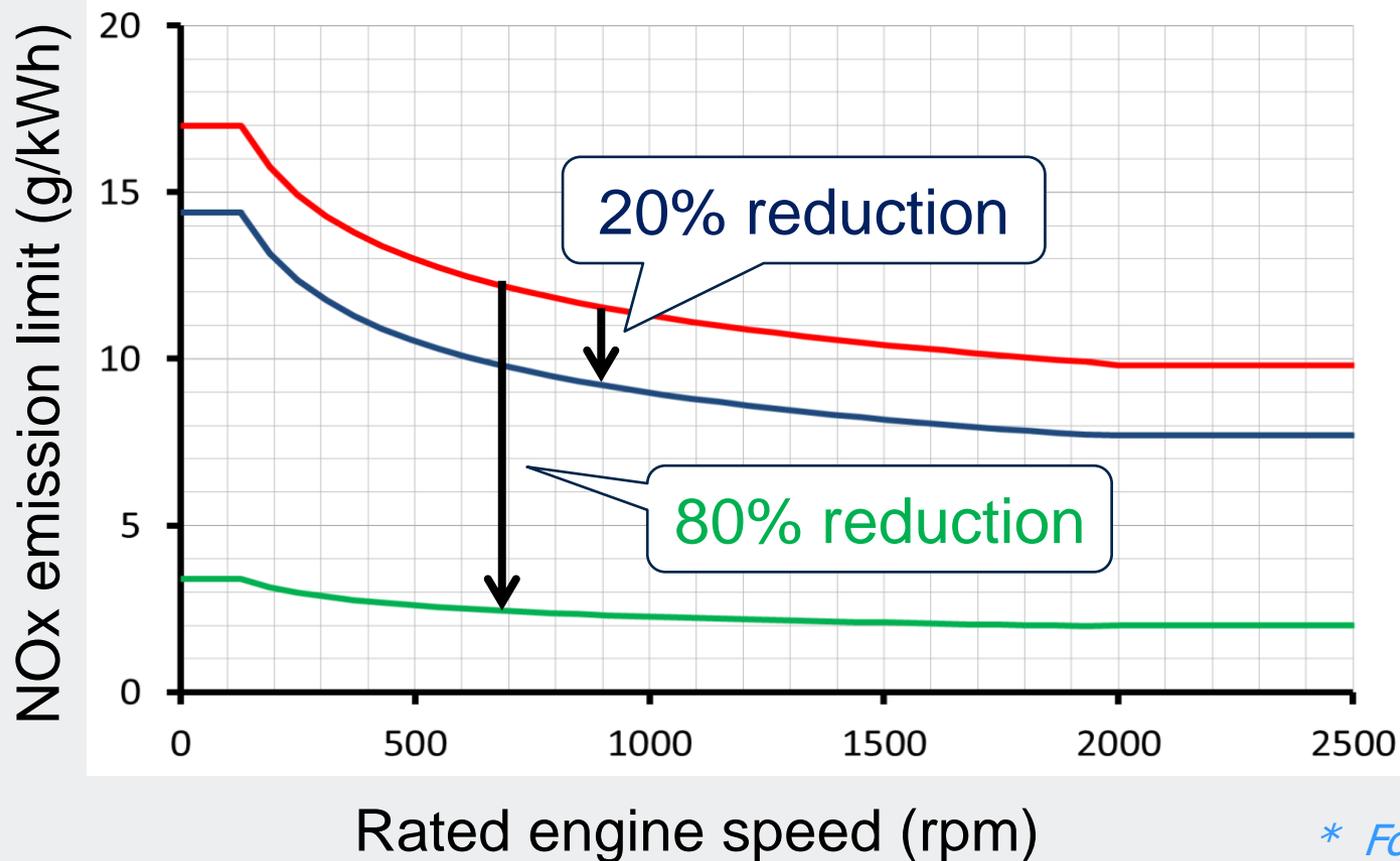
Marine diesel engines ⇒ with an Approved Method ⇒ Installed on a ship constructed on or **1 Jan 1990 to 31 Dec 1999**

Not applicable to



- Emergency marine diesel engines
- Marine diesel engines installed on lifeboats
- Any device or equipment intended to be used solely in case of emergency
-

Regulation 13 - NOx emission limits



Tier I

- Constructed on or after 1 Jan. 2000

Tier II

- Constructed on or after 1 Jan. 2011

Tier III*

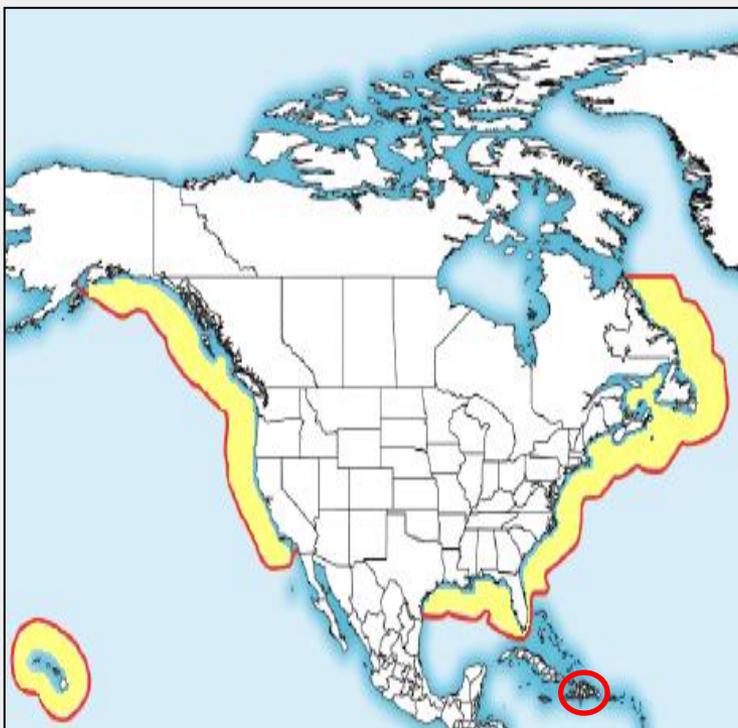
- Constructed on or after 1 Jan. 2016
- Applied in ECAs
- Tier II applied outside of ECAs

** For a ship operating within North American ECA and US Caribbean Sea Area ECA*

Tier III

Emission Control Areas (ECAs) for NO_x emission control

North America ECA + US Caribbean ECA for **ships constructed on or after 1 January 2016**



North Sea and Baltic Sea ECA NO_x :
Applicable to **ships constructed on or after 1 January 2021.**



Regulation 13 (NO_x) – Engine certification

- Test bed exhaust emission measurement according to NO_x Technical Code (NTC)
 - To demonstrate that NO_x is below the IMO Tier.
- **NO_x Technical File**
 - Information on performance and emissions tests + components, settings, operating values & adjustments to be observed
- Issue of **Engine International Air Pollution Prevention (EIAPP)** Certificate or statement of compliance for an engine:
 - Issued for each engine
 - Valid for the engines life (unless major conversion)
- If there are NO_x reductions technologies, specific certification rules applies.

There are options for ship-board measurement, verification and certification but not practiced due to complexity of measurements.

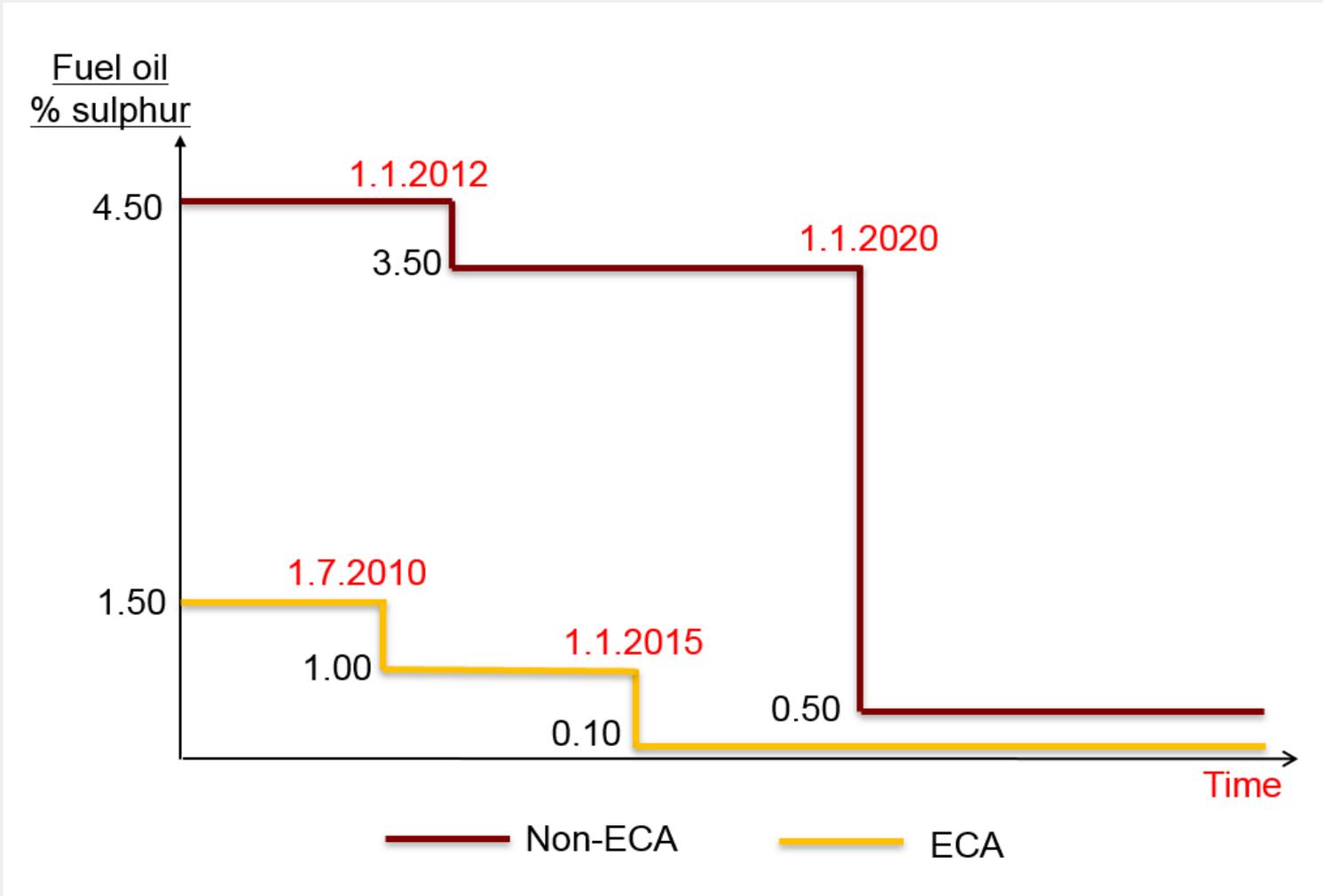
How to demonstrate compliance to Nox Regs.?

- Presence of valid certificates and documents:
 - EIAPP Certificate
 - NO_x Technical File
 - Record books showing maintenance records and changes to engines
 - In case of NO_x changeover for ECA, details of changeover;
 - Detailed examination of each engine and the above to show validity and correct settings/practices

MARPOL Annex VI – Regulation 14

Sulphur Oxides (SO_x) and Particulate Matter

Regulation 14 – Fuel sulphur limits

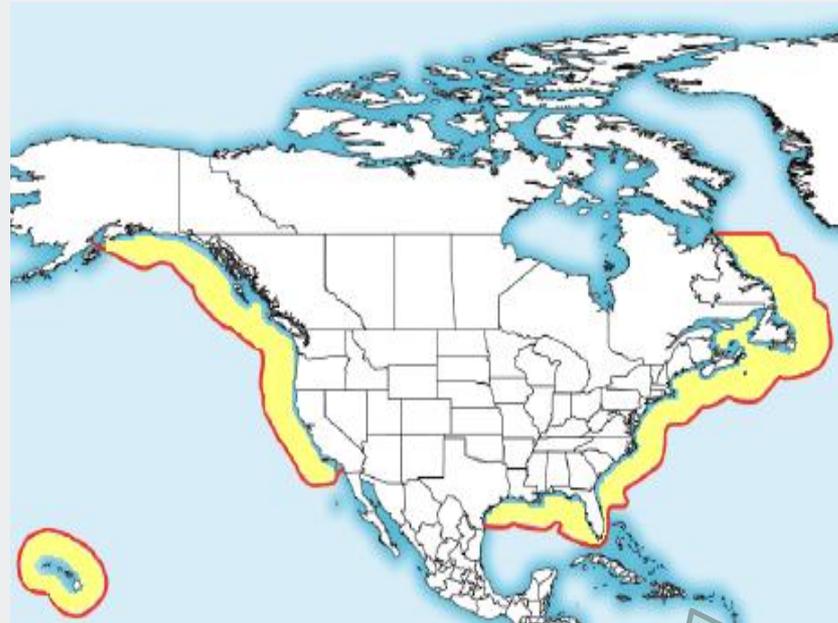


Emission Control Areas (ECAs) for SO_x emission control

North Sea and Baltic Sea ECAs



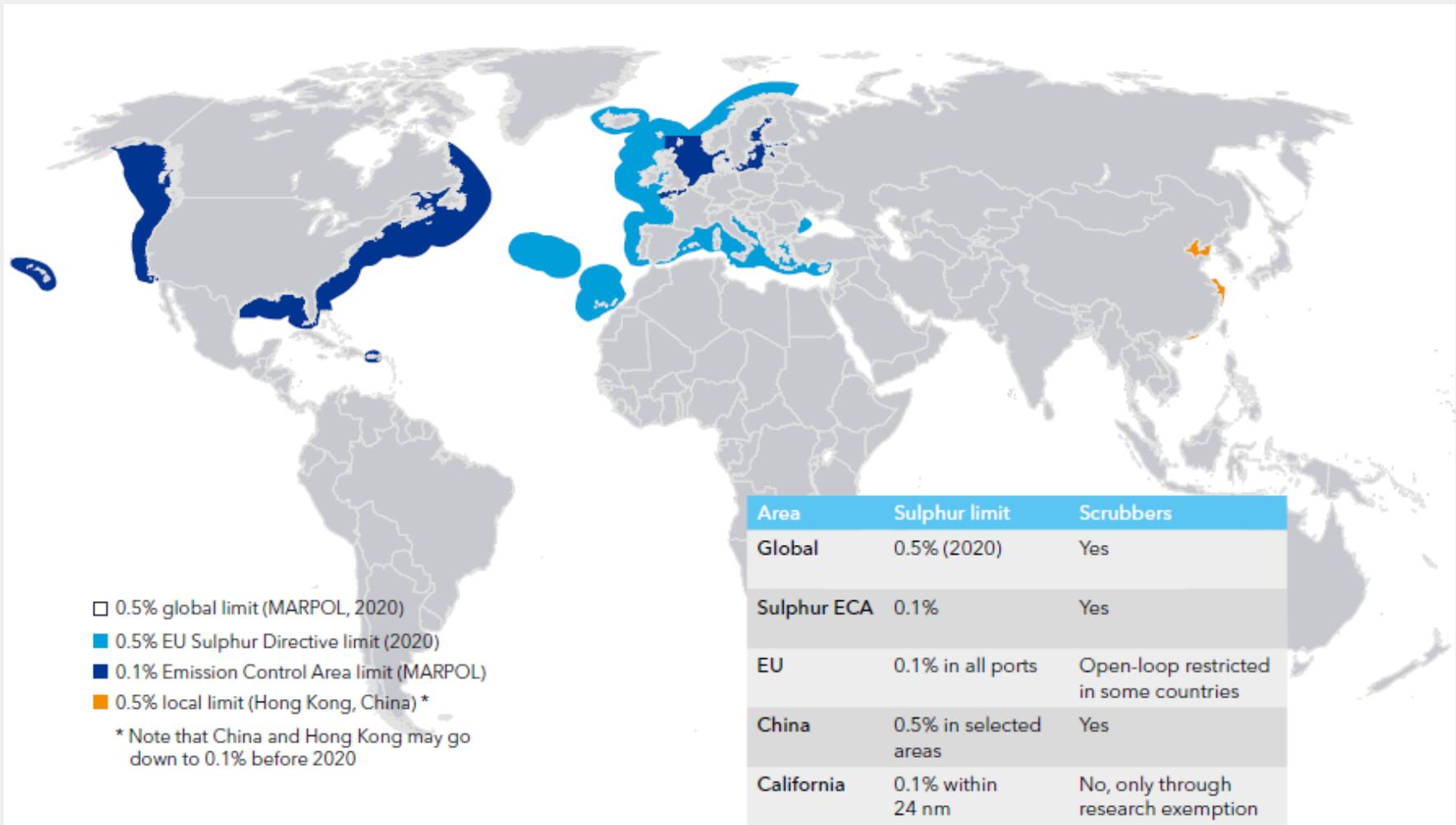
North American ECA (Effected from 01/08/2012)



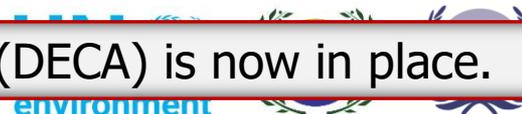
U.S. Caribbean ECA (Effected from 01/01/2014)



IMO ECA-SOx and non-IMO SOx control regions



Extended China Domestic ECA (DECA) is now in place.



SO_x compliance options

- **Multi-fuel options:** 2 or more separate fuels on-board, i.e. LS and HS fuel oils.
- **LNG as marine fuel or other alternative fuels:** Specific regulations applies.
- **SO_x scrubber systems:** Specific regulations applies (equivalent method: 2015 Guidelines for exhaust gas cleaning, resolution MEPC.259(68))

Demonstrating compliance to ECA for two-fuel option (Reg. 14.6)

- **Fuel Changeover Plan:** For ships with two fuels when and entering or leaving an ECA-SOx
- **Logbook/Record Book:** Record all the details of switching fuels including:
 - Volume of low sulphur fuel oils in each tank
 - Date,
 - Time
 - Position of the ship
 - Etc.

Compliance to 2020 Sulphur limit – Carriage Ban

- Carriage ban of carrying any fuel with sulphur $> 0.5\%$.
 - Unless scrubber is used.
- Ships can still carry high sulphur fuel as cargo but not as fuel.

2020 sulphur cap – Guideline for consistent implementation (Resolution MEPC 320(74)), adopted May 2019

Guidelines intended for use by Administrations, port States, shipowners, shipbuilders and fuel oil suppliers. Main content:

- 1. Definitions** (DM, RM, ULSFO, VLSFO, HSHFO)
- 2. Ship implementation planning** for 2020 (cf: MEPC.1/Circ.878)
- 3. Impact on fuel and machinery systems:** distillate fuels (including distillate fuel with FAME) / Residual fuels / Key technical considerations for shipowners and operators / ISO Standard for residual fuels / Cylinder lubrication
- 4. Verification issues and control mechanism and actions:** Survey and certification by Administrations / Control measures by port States / Control on fuel oil suppliers / Information sharing related to non-compliances under MARPOL Annex VI
- 5. Fuel oil non-availability:** Guidance and information sharing on fuel oil non-availability / Standard format for reporting fuel oil non-availability (FONAR) – Appendix 1
- 6. Possible safety implications** relating to fuel oils meeting the 0.50% m/m sulphur limit – Appendix 2

MARPOL Annex VI – Regulation 15

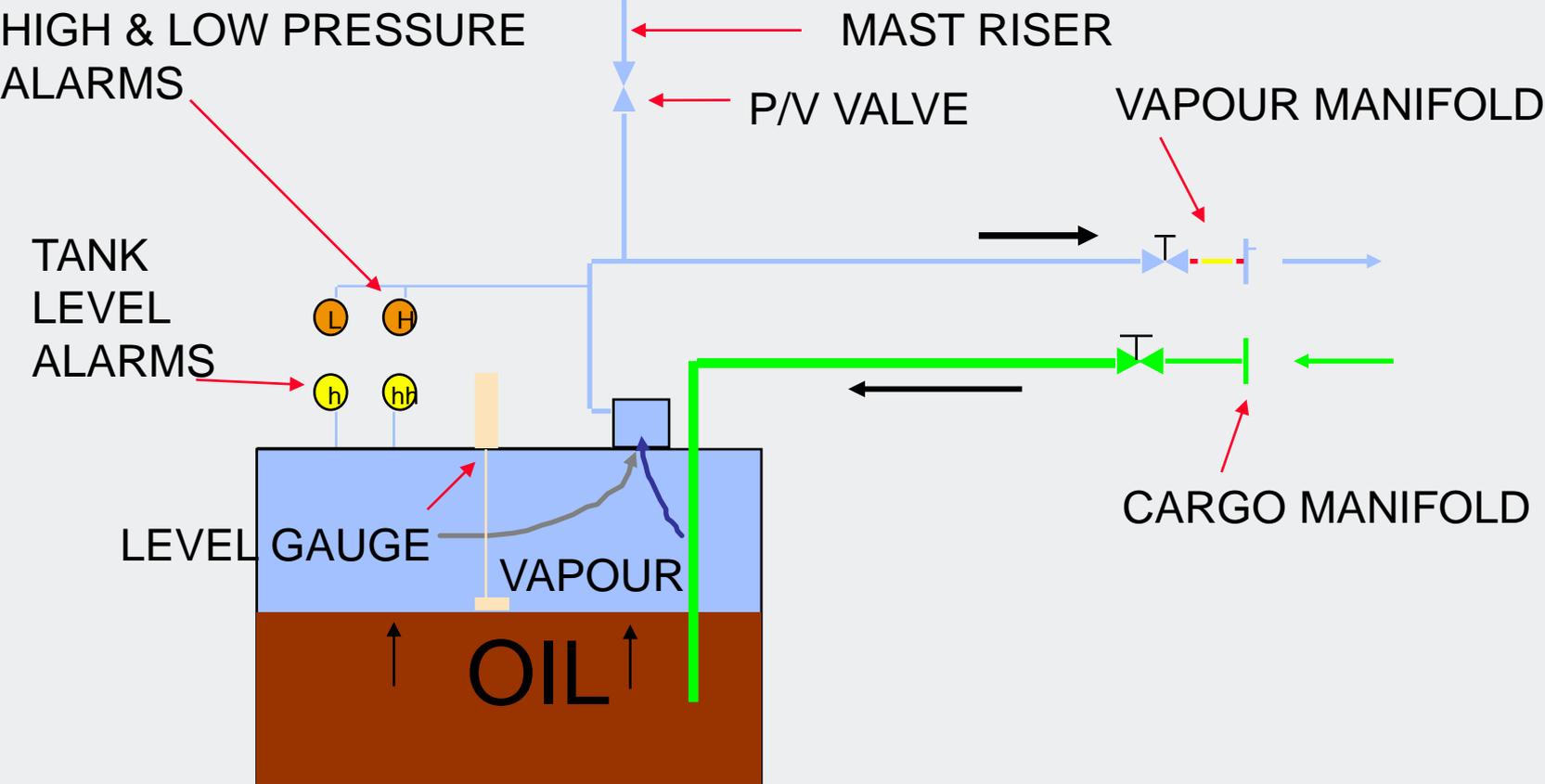
Volatile Organic Compounds (VOC)

What is VOC and its impact?

Volatile Organic Compounds (VOCs) are:

- Lighter parts of crude oil or their products that evaporates and discharged to atmosphere (mainly during ship loading with oil)
- Health issue: Can cause **cancer**
- Mainly from **oil tankers**
- Normally polluting the **port of loading**

How to reduce the VOC emissions: Use a Vapour Emission Control System (VECS)



Regulation 15 - VOC

- Regulation enables **ports and terminals** to implement VOC controls
- **VOC control from tankers** during loading/unloading of oil cargoes
- **Vapour Emissions Control System (VECS)** (MSC/Circ.585 guidelines)
- Crude oil tankers to have an approved **VOC Management Plan** (does not apply to gas carriers - Reg. 15.7)
- There are specific notification rules for VOC-control ports to follow.



MARPOL Annex VI – Regulation 16

Shipboard Incineration

Regulation 16 - Shipboard incineration

- **Prohibits incineration of (Reg.16.2):**
 - MARPOL Annex I, II & III cargoes,
 - Polychlorinated biphenyls (PCB),
 - Garbage containing heavy metals,
 - Refined petroleum products containing halogens,
 - Sewage and sludge oil not generated on board,
 - Exhaust gas cleaning system residues.

- **Permits incineration of:**
 - PVC – plastics (where type approved to do so) (Reg.16.3)
 - Sewage sludge and sludge oil (generated during normal operation of engines and boilers). This is not permitted in ports, harbours and estuaries (Reg.16.4)

Regulation 16 - Shipboard incineration – Design and Operation

- **Certificate** needed for all incinerators installed from 1 January 2000.

Certification according to: “2014 Standard Specification for Shipboard Incinerators” (Reg. 16.6.1).

- Incinerator shall be provided with a **manufacturer’s operating manual** which is to be retained
- Personnel to be **trained** in use (Reg. 16.7 – 16.8).
- All incinerators should have a combustion flue gas **outlet temperature monitoring system**.
- Etc.....

MARPOL Annex VI – Regulation 17

Reception Facilities

Regulation 17 – Reception Facilities

- Parties are obliged to provide facilities without causing delay for:
 - Reception of ODS in ship repair yards (Reg.17.1.1); and
 - Reception of Exhaust Gas Cleaning System residues (Reg.17.1.2)
- Reception of ODS in ship breaking facilities (Reg.17.1.3)
- If unable to provide reception facilities, Party shall inform IMO (Reg.17.3 & 17.4).
- Each Party shall notify the Organization When they are unavailable or alleged to be inadequate.

MARPOL Annex VI – Regulation 18

Fuel oil availability and quality

Regulation 18 – Fuel oil availability

- Parties to promote availability of compliant fuel oils (Reg.18.1)
- Ships found not to be in compliance (Reg.18.2.1)
 - Record of actions taken to achieve compliance
 - Need to demonstrate “best efforts” to obtain compliant fuel
- Ship should not be required to deviate or delay unduly the voyage in order to achieve compliance (Reg.18.2.2).
- Party required to take into account all relevant circumstances to determine action (Reg.18.2.3).
- Ship required to notify Administration and port of destination when unable to purchase compliant fuel (Reg.18.2.4).
- Party to notify the Organization when ship presents evidence of non-availability (Reg.18.2.5)



Global Integrated Shipping Information System

FONAR (Fuel Oil Non-Availability Reporting)

- If not in compliance, operators must:
 - Submit a FONAR
 - Notify Flag State
 - Notify Port State
- The FONAR means to capture information on:
 - Attempt to obtain compliant fuel
 - Non-availability of fuel
 - Attempt to find alternative sources of compliant fuel
 - Everything else to demonstrate best intentions.

APPENDIX 1

FUEL OIL NON-AVAILABILITY REPORT (FONAR)

Note:

1 This report is to be sent to the flag Administration and to the competent authorities in the relevant port(s) of destination in accordance with regulation 18.2.4 of MARPOL Annex VI. The report shall be sent as soon as it is determined that the ship/operator will be unable to procure compliant fuel oil and preferably before the ship leaves the port/terminal where compliant fuel cannot be obtained. A copy of the FONAR should be kept on board for inspection for at least 36 months.

2 This report should be used to provide evidence if a ship is unable to obtain fuel oil compliant with the provisions stipulated in regulations 14.1 or 14.4 of MARPOL Annex VI.

3 Before filing a FONAR, the following should be observed by the ship/operator:

.1 A fuel oil non-availability report is not an exemption. According to regulation 18.2 of MARPOL Annex VI, it is the responsibility of the Party of the destination port, through its competent authority, to scrutinize the information provided and take action, as appropriate.

3.2 In the case of insufficiently supported and/or repeated claims of non-availability, the Party may require additional documentation and substantiation of fuel oil non-availability claims. The ship/operator may also be subject to more extensive inspections or examinations while in port.

3.3 Ships/operators are expected to take into account logistical conditions and/or terminal/port policies when planning bunkering, including but not limited to having to change berth or anchor within a port or terminal in order to obtain compliant fuel.

Regulation 18 – Fuel oil quality

- Required properties of fuel oil identified (Reg.18.3).
- When bunkering fuel, receive a Bunker Delivery Note (BDN) (Reg. 18.5).
- BDN required to be retained for 3 three years (Reg. 18.6).
- BDN accompanied by representative sample, ... retained for 12 months (Reg.18.8.1).
- Inspection and verification by PSC (Reg.18.7.1 & Reg.18.7.2).



Regulation 18 - Local suppliers of fuel oil

Parties are required to:

- Maintain a register of local suppliers of fuel oil (Reg.18.9.1)
- Local suppliers to provide a certified BDN and sample (Reg.18.9.2), and retain a copy of the BDN for 3 years (Reg.18.9.3)
- Take action against local suppliers of fuel oil that does not comply with that stated on BDN (Reg.18.9.4)
- Inform the Administration of a ship when ship is found to be non-compliant (Reg.18.9.5)
- Inform IMO of all cases of non-compliant fuel oil being supplied (Reg.18.9.6)



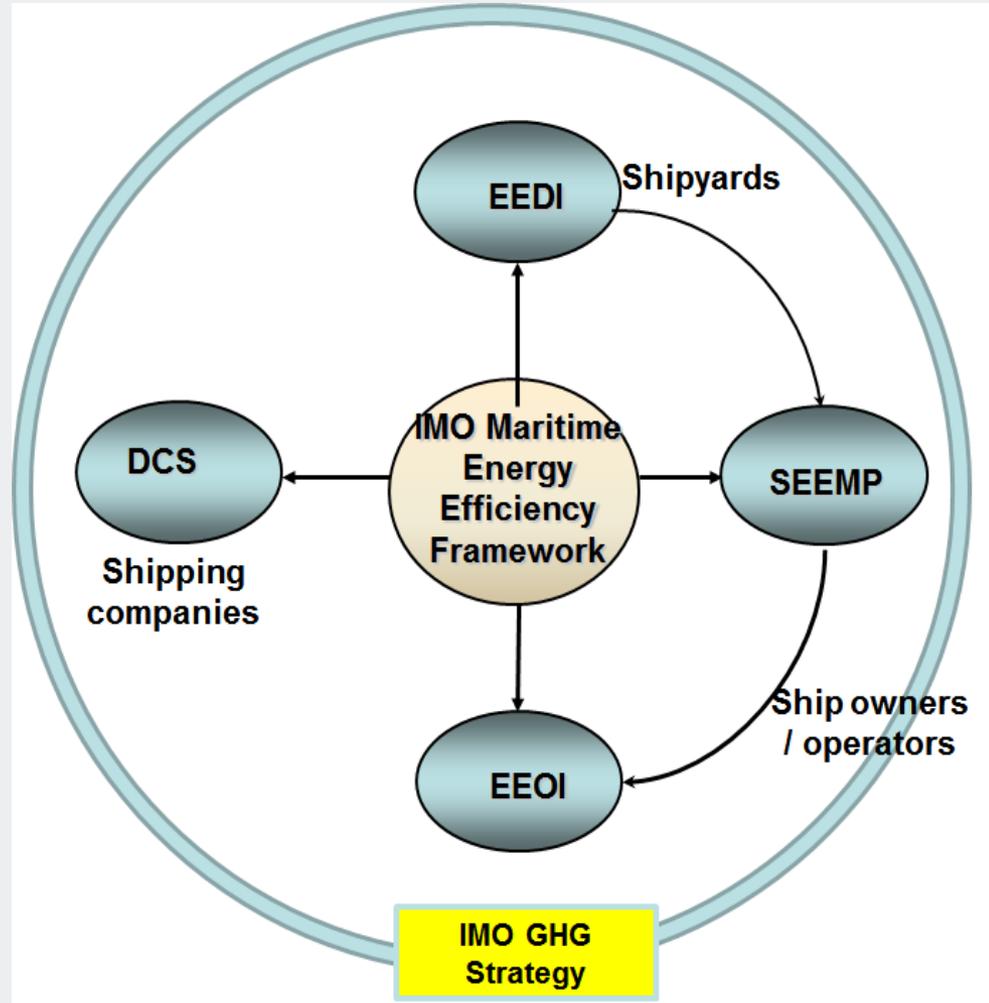
Global Integrated Shipping Information System

MARPOL Annex VI – Chapter 4

Energy efficiency regulations (CO2 emissions)

IMO shipping energy efficiency regulatory framework

- **EEDI and SEEMP:** Mandatory from 2013
- **DCS:** Mandatory from 2019
- **EEOI:** Voluntary
- **Initial IMO GHG Strategy:** Agreed in 2018 and under intense discussion



Res.MEPC.203(62) vs Res.MEPC.176(58)

Resolution MEPC.176(58)	Resolution MEPC.203(62)
<p>Chapter III</p> <ul style="list-style-type: none">Reg. 12 Ozone Depleting SubstancesReg. 13 Nitrogen Oxides(NOx)Reg. 14 Sulphur Oxides(SOx) and Particular MatterReg. 15 Volatile Organic Compounds (VOCs)Reg. 16 Shipboard IncinerationReg. 17 Reception FacilitiesReg. 18 Fuel Oil Availability and Quality	<p>Chapter III</p> <ul style="list-style-type: none">Reg. 12 Ozone Depleting SubstancesReg. 13 Nitrogen Oxides(NOx)Reg. 14 Sulphur Oxides(SOx) and Particular MatterReg. 15 Volatile Organic Compounds(VOCs)Reg. 16 Shipboard IncinerationReg. 17 Reception FacilitiesReg. 18 Fuel Oil Availability and Quality
	<p>Chapter IV</p> <ul style="list-style-type: none">Reg. 19 ApplicationReg. 20 Attained EEDIReg. 21 Required EEDIReg. 22 SEEMPReg.22A Data Collection System (DCS)Reg. 23 Promotion of technical co-operation and transfer of technology
Appendix I~VI	Appendix I~VI Appendix VIII Form of International Energy Efficiency(IEE) Certificate

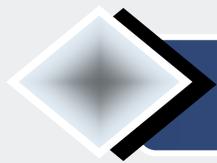


Regulation 19 - Applications

- This chapter **shall apply** to all ships of 400 gross tonnage and above.
- The provisions of this chapter **shall not apply** to ships solely operating in Flag's national waters.
- Regulation 20 and regulation 21 **shall not apply** to ships with **non-conventional propulsion** with the exception of cruise passenger ship with electric propulsion, and LNG carriers

Regulation 20 – Attained EEDI

- The attained EEDI shall be calculated for:
 - each new ship;
 - each new ship which has undergone a major conversion; and
 - each new or existing ship which has undergone a major conversion, regarded by the Administration as a newly constructed ship
- The above are applicable to ships defined in Regulations 2.25 to 2.35.
- The attained EEDI shall be specific to each ship and be accompanied by the EEDI Technical File
- The attained EEDI shall be calculated taking into account the IMO guidelines.
- The attained EEDI shall be verified, taking into account the IMO guidelines



Regulation 21 – Required EEDI

Regulatory limit of EEDI for a ship

Regulation 21.1 – Required EEDI

- Required EEDI is calculated for New Ships, or cases with major conversion.
- For ships defined in Regulation 2.25 to 2.31
- The Required EEDI shall be calculated as follows:

$$\text{Required EEDI} = (1 - X/100)^* (\text{Reference EEDI})$$

- Where
 - Reference EEDI is the EEDI from reference line
 - X is the reduction factor

Regulation 21.3 – Reference line (value)

- Reference line = $a * b^{-c}$

Table 2. Parameters for determination of reference values for the different ship types

Ship type defined in regulation 2	a	b	c
2.25 Bulk carrier	961.79	DWT of the ship	0.477
2.26 Gas carrier	1120.00	DWT of the ship	0.456
2.27 Tanker	1218.80	DWT of the ship	0.488
2.28 Container ship	174.22	DWT of the ship	0.201
2.29 General cargo ship	107.48	DWT of the ship	0.216
2.30 Refrigerated cargo carrier	227.01	DWT of the ship	0.244
2.31 Combination carrier	1219.00	DWT of the ship	0.488

Regulation 21: Reduction factor (X) for calculation of Required EEDI

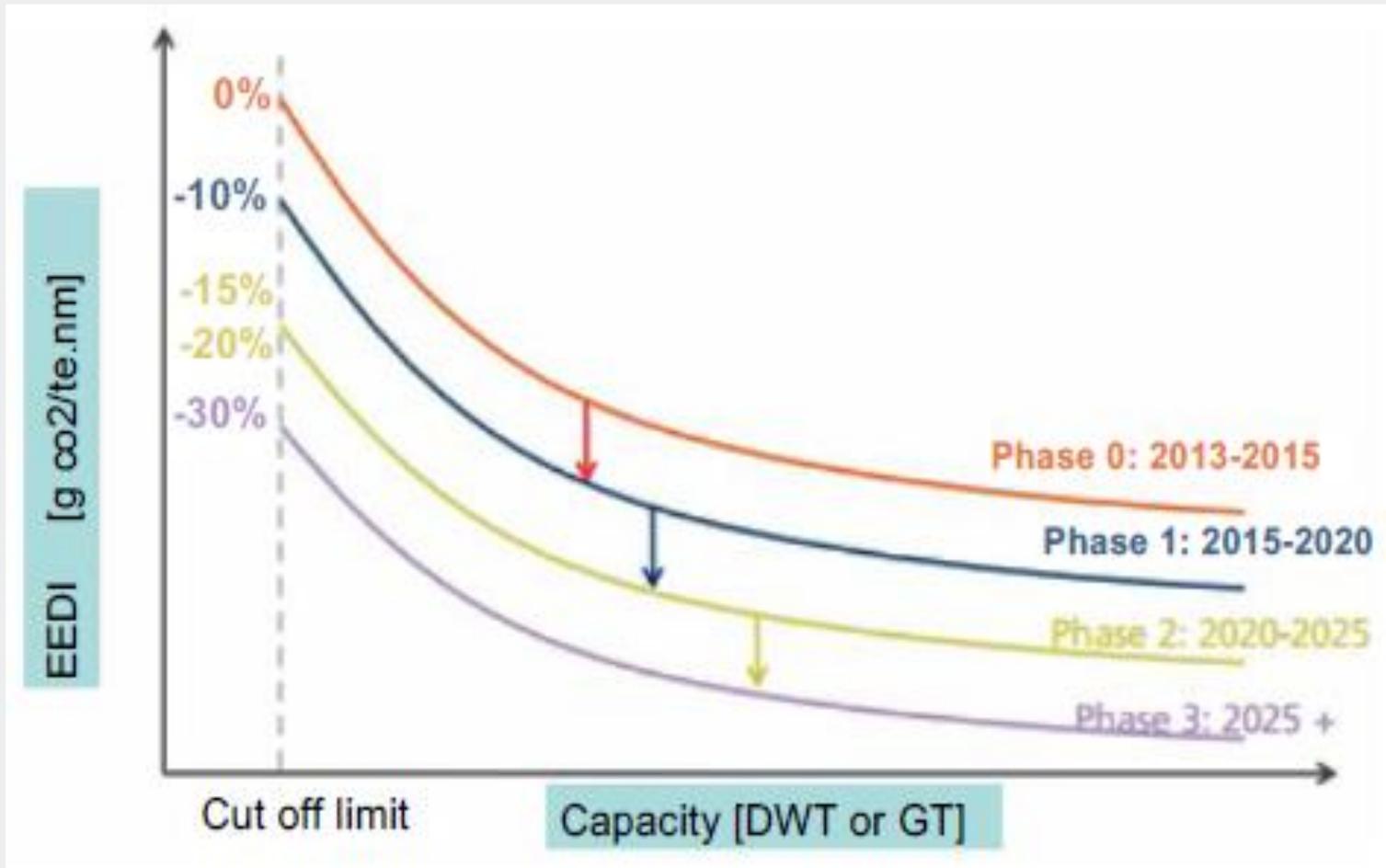
Reduction factors (in percentage) for the EEDI relative to the reference line for each ship type.

	Size	Phase 0 1 Jan 2013 – 31 Dec 2014	Phase 1 1 Jan 2015 – 31 Dec 2019	Phase 2 1 Jan 2020 – 31 Dec 2024	Phase 3 1 Jan 2025 onwards
Bulk Carriers	>20,000 Dwt	0%	10%	20%	30%
	10-20,000 Dwt	n/a	0-10%*	0-20%*	0-30%*
Gas tankers	>10,000 Dwt	0%	10%	20%	30%
	2-10,000 Dwt	n/a	0-10%*	0-20%*	0-30%*
Tanker and combination carriers	>20,000 Dwt	0%	10%	20%	30%
	4-20,000 Dwt	n/a	0-10%*	0-20%*	0-30%*
Container ships	>15,000 Dwt	0%	10%	20%	30%
	10-15,000 Dwt	n/a	0-10%*	0-20%*	0-30%*
General Cargo ships	>15,000 Dwt	0%	10%	15%	30%
	3-15,000 Dwt	n/a	0-10%*	0-15%*	0-30%*
Refrigerated cargo carriers	>5,000 Dwt	0%	10%	15%	30%
	3-5,000 Dwt	n/a	0-10%*	0-15%*	0-30%*

* The reduction factor is to be linearly interpolated between the two values depending on the vessel size. The lower value of the reduction factor is to be applied to the smaller ship size.

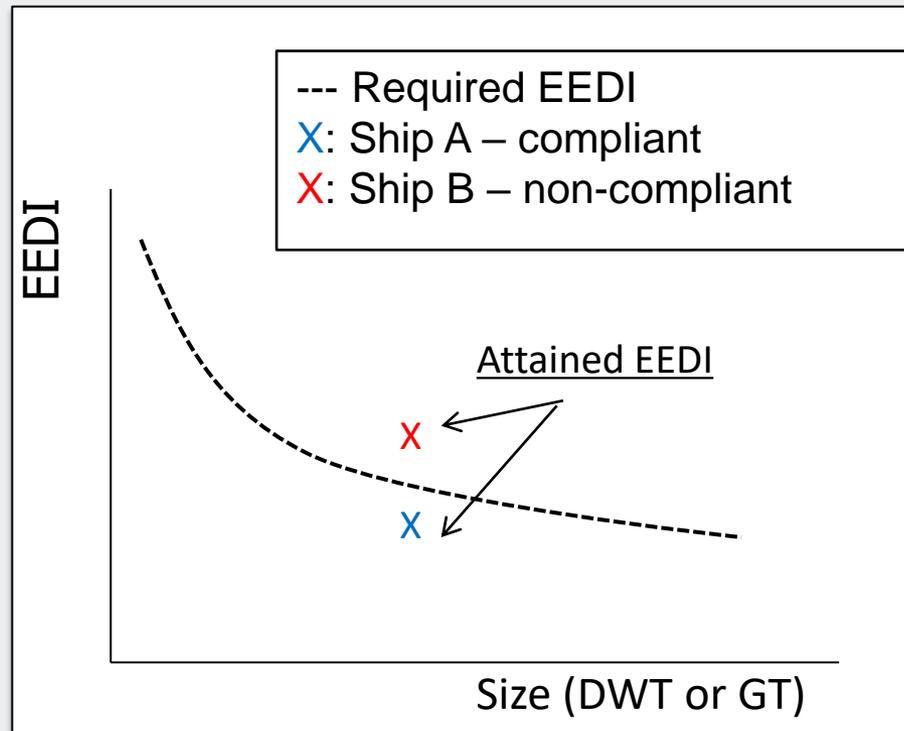


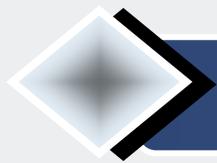
Required EEDI for different phases as a function of ship size



Regulation 21.1 – Regulatory requirement

Attained EEDI \leq Required EEDI





Regulation 22 - SEEMP

Regulation 22 - SEEMP

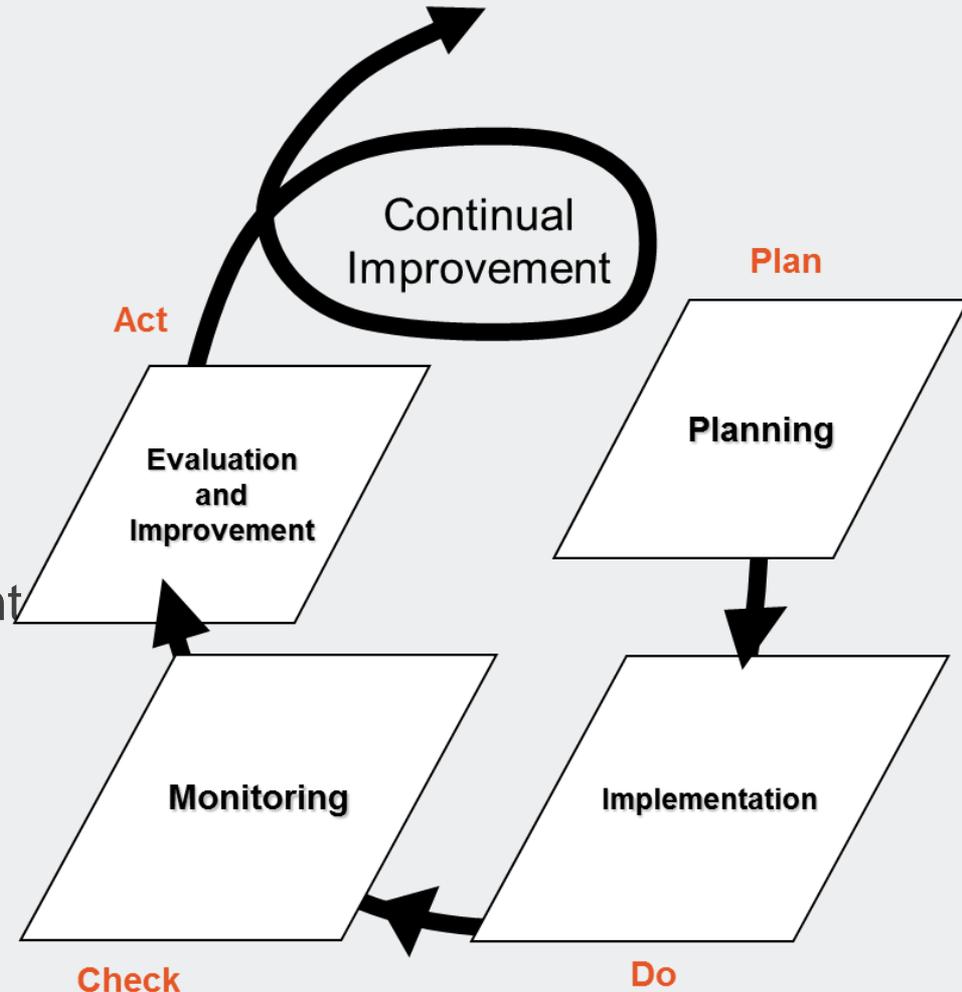
Regulation 22

Ship Energy Efficiency Management Plan (SEEMP)

- 1 Each ship shall keep on board a ship specific Ship Energy Efficiency Management Plan (SEEMP). This may form part of the ship's Safety Management System (SMS).
- 2 The SEEMP shall be developed taking into account guidelines adopted by the Organization.

SEEMP framework (see details in the relevant Guidelines)

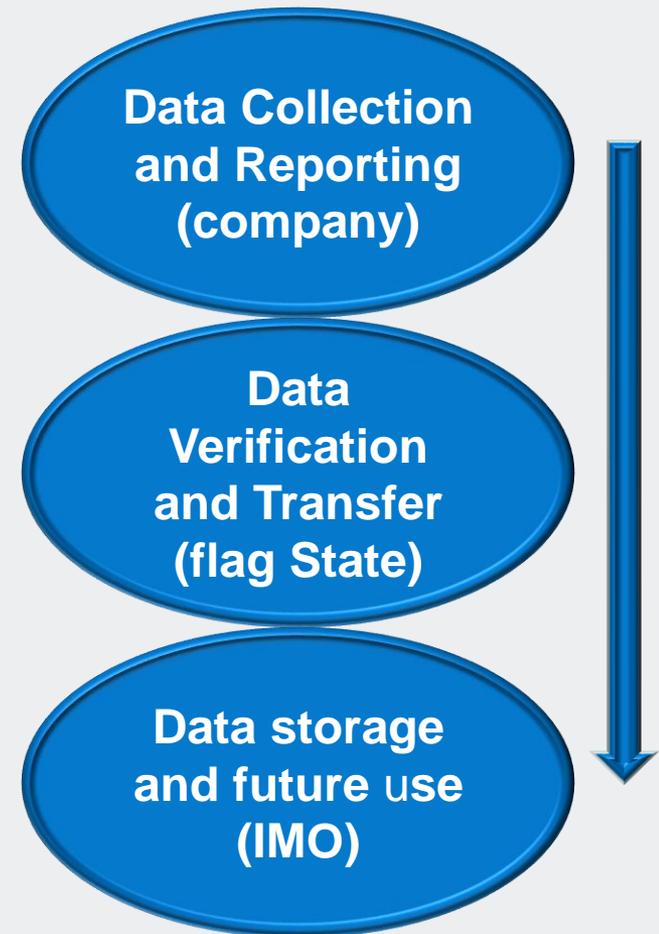
- SEEMP works through four steps:
 - Planning,
 - Implementation
 - Monitoring, and
 - Self-evaluation
- Continuous improvement cycle for improving ship energy management
- Within the SEEMP, a number of Energy Efficiency Measures are documented for implementation.



Regulation 22A – Fuel Consumption Data Collection system for ships

IMO Data collection and reporting framework

- Regulations for mandatory measurement and reporting of the ship's annual fuel consumption.
- The system have three main elements:
 1. Data collection and reporting by ships (company)
 2. Data verification by Flag State and delivery to IMO
 3. Data storage in a centralised database at the IMO.



IMO ship fuel DCS: Main features

- Applicable to ships greater than 5000 GT.
- Annual reporting with no need for voyage data.
- IMO number for ship identification
- Company responsible for submission of data.
- Flag Administration responsible for data verification.
- Compliance through having a Statement of Compliance (SOC) issued annually.
- Aggregated data to be submitted and stored in an IMO database

IMO ship fuel consumption DCS : Types of data to be reported

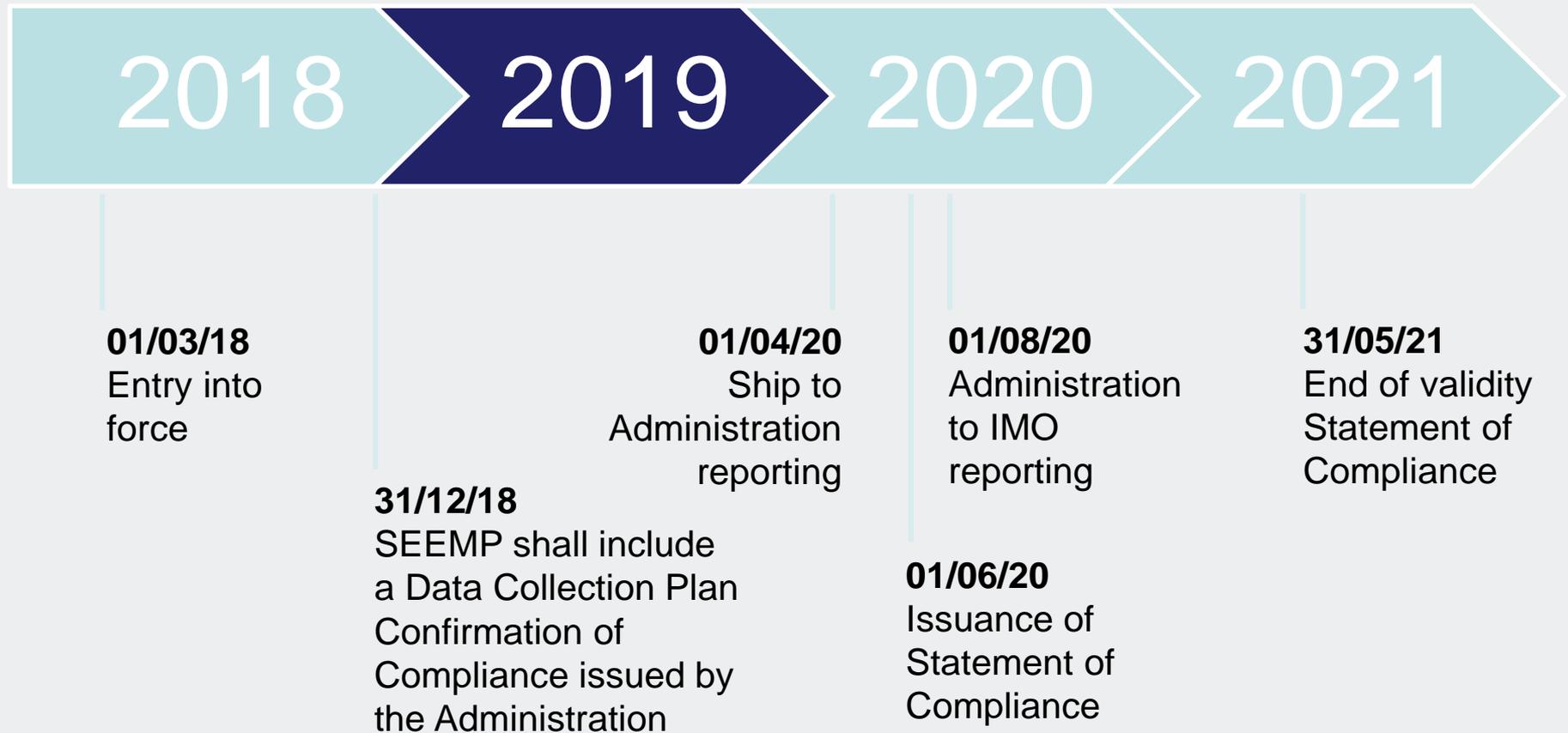
The following data to be reported annually:

- Ship IMO number
- Technical characteristics of the ship:
 - Ship type
 - Gross Tonnage
 - Net tonnage
 - Deadweight at summer load line
 - Main and auxiliary engine MCR (Maximum Continuous Rating)
 - EEDI, if applicable
 - Ice class, if applicable
- Total annual fuel consumption by fuel type
- Distance travelled
- Hours underway

IMO ship fuel consumption DCS: Ship fuel oil consumption measurement

- Three main methods to be used:
 - **Use of BDN** plus additional ship-board fuel stock check.
 - **Use of regular ship-board fuel stock check**
 - **Use of fuel flow meters.**
- The methodology to be specified in SEEMP Part II: **Data Collection Plan**
- All the relevant data and calculations to be retained by ship for a set period.

IMO ship fuel DCS: Regulatory timetable



Verification aspects – Statement of Compliance

- Verification is the responsibility of Flag Administration
- What will be verified:
 - The **data collection method** and process (to be included in SEEMP)
 - The **actual data** submitted and their compliance with the agreed process
- A **Statement of Compliance (SOC)** will be issued for each calendar year by Administration.
- The SOC and disaggregated data should be retained on-board the ship for a set period (for at least the period of its validity).

"Appendix X
Form of Statement of Compliance – Fuel Consumption Reporting
STATEMENT OF COMPLIANCE – FUEL CONSUMPTION REPORTING

Issued under the provisions of the Protocol of 1997, as amended by resolution MEPC.XXX(XX), to amend the International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978 related thereto (hereinafter referred to as "the Convention") under the authority of the Government of:

.....
(full designation of the Party)

by

(full designation of the competent person or organization authorized under the provisions of the Convention)

Particulars of ship[†]

Name of ship

Distinctive number or letters

IMO Number[‡]

Port of registry

Gross tonnage

THIS IS TO CERTIFY:

IMO ship fuel DCS: Reporting and IMO database

- It is the responsibility of the Flag Administration to transfer the relevant data to the IMO database.
- IMO will set up a “Fuel Oil Consumption Data Base”.
- IMO will store the data in the above data base.
- Access to database by MARPOL Annex VI Parties will be possible but ships will remain anonymous.

**Aggregated Annual
Data (by Flag)**



**IMO Ship Fuel Oil
Consumption
Database**

The IMO Fuel Oil Consumption database is now part of the GESIS and Administrations will have access to it.

Initial IMO GHG Strategy

Initial IMO GHG Strategy: Main targets

- **Total GHG emissions from international shipping**
 - To peak as early as possible..
 - Reduce the **total annual emissions by at least 50% by 2050** as compared to 2008.
- **Ship operational energy efficiency**
 - Energy efficiency of shipping (tonne CO₂/tonne.mile cargo) to **reduce by an average of at least 40% by 2030, with main aim of reaching 70% by 2050**, as compared to 2008.

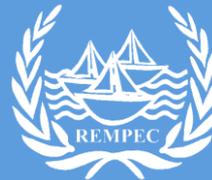
How to do it: By identifying and regulating new Energy Efficiency Measures

- Initial IMO GHG Strategy advocates the energy efficiency activities as below:
 - **Short term measures:** Are those that can be defined and finalised between 2018 and 2023.
 - **Mid-term measures** are those that will be those beyond short term and for discussion by the IMO between 2023 and 2030.
 - **Long-term measures** are those measures that are going to be finalized, regulated and agreed by the IMO beyond 2030.

IMO GHG Strategy status

- Agreed in 2018
- Being debated mainly in two areas:
 - **Measures** to be developed and regulated
 - **Impact assessment** on countries
- Revised version by 2023.
- MEPC has already debated some short term measures and the following has moved forward:
 - **EEXI**: A similar scheme as EEDI but for existing ships.
 - **CII (Carbon Intensity Index)**: An operational efficiency indicator for measurement of energy efficiency of ships.
 - **EEDI**: Further increase in Reduction Factors (X) and bringing forward dates for Phase 3.
- There are requests for IMO to include debate on **MBM** on the agenda..

REMPEC, an IMO / UNEP Centre assisting the Mediterranean coastal States in ratifying, transposing, implementing and enforcing international maritime conventions related to the protection of the marine environment



Thank you

Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)
Maritime House, Lascaris Wharf, Valletta, VLT 1921, Malta
T: +356 21 337 296/7/8 | F:+356 21 339 951
rempec@rempec.org

www.rempec.org