

# CIMAC WG5

## Regulatory Developments in Marine (IMO) Exhaust Gas Emissions

Dorte Kubel  
R&D Two-Stroke  
3 May 2022



# Agenda

Regulatory Developments in Marine - IMO

- 1 Black carbon**
- 2 Multiple Engine Operational Profiles**
- 3 Revision of SCR guidelines**
- 4 EGCS**
- 5 Methane (part of LCA Guidelines)**
- 6 (NOx and biofuel)**



# 1 Black Carbon

# Black Carbon

## IMO Timeline

2011

- Start of black carbon (BC) discussions in IMO

2015

- A definition and appropriate measurement methods for BC agreed

2021

- A ban on use of HFO in the Arctic from 2024 (practically 2029) adopted
- A voluntary resolution urging the use of distillates or other clean fuels in and near the Arctic adopted



# Black Carbon

## IMO Status and Next Steps

### Outcome of MEPC 77

- Voluntary resolution adopted, urging ships to switch immediately to distillates or “other cleaner fuels” in or near the Arctic to reduce Black Carbon (BC) emissions

### Outcome of PPR 9

- **Preference for FSN** as measurement method, but LII and PAS is still on the list
- Agreement to develop **recommendatory goal-based BC control measures**

### Next steps

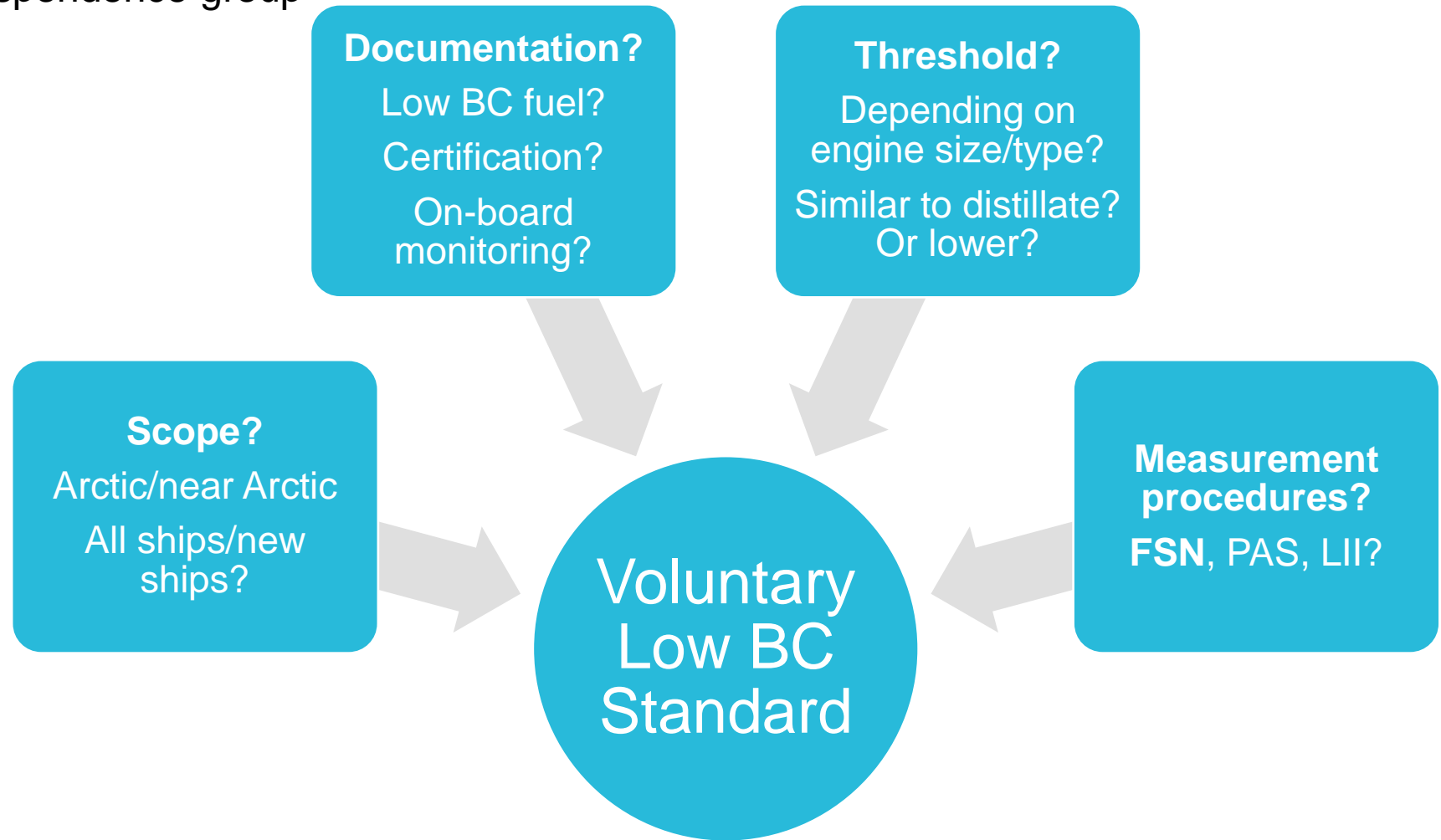
- Correspondence group to:
  - Develop “voluntary low BC Standard”\*
  - Further consider regulating BC
  - Report to PPR 10



\*) Using PPR 9/8/1 (Denmark and Finland) and PPR 9/8/4 (IMarEST) as a basis

# Black Carbon

To be considered by correspondence group



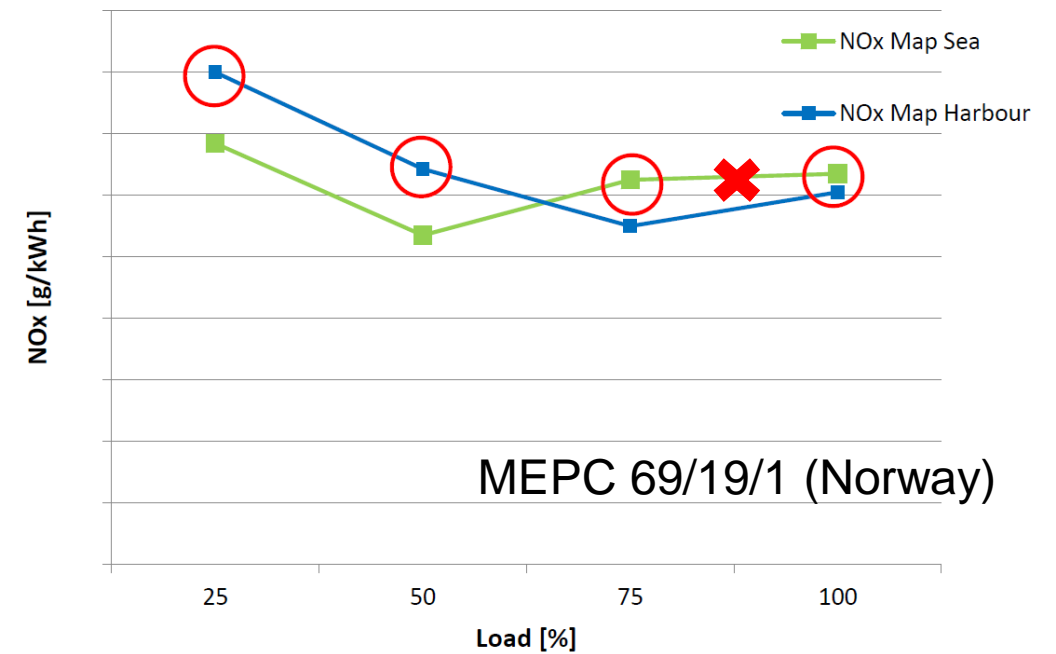
# **2 Multiple Engine Operational Profiles**

# Multiple Engine Operational Profiles

AKA: „NOx maps“ or „Emission Modes“

## Background

- The conditions for use of Multiple Engine Operational Profiles (EOPs) raised in IMO in 2016.
- Limited progress in IMO due to the pandemic.
- EUROMOT had submitted a detailed proposal to PPR 9:
  - Conditions for use of multiple EOPs ○
  - “Not-to-exceed” / control of off-cycle NOx emissions ✖





# Multiple Engine Operational Profiles

## IMO Status and Next Steps

### Conclusion of PPR 9

- **Use of multiple engine operational profiles allowed**, provided the use does not weaken the effectiveness of the NOx regulation.
- Concept for control of off-cycle NOx emissions to be further considered.

### Next steps

- Correspondence group to:
  - Develop of amendments to IMO regulation to **clarify the conditions for the use of multiple EOPs**
  - Further **consider control of off-cycle NOx emissions** (outside mode-points)
  - Clarify the need for definitions of terminology and application related to **EIAPP test cycles**
  - Report to PPR 10 (2023)

# **3 Exhaust Gas Cleaning Systems (Scrubbers)**

# Exhaust Gas Cleaning Systems

## IMO Status and Next Steps

### Guidelines for EGCS

- Revision started in 2013
- **MEPC 77** approved of revised guidelines for exhaust gas cleaning systems (EGCS)

### Harmonization of risk and impact assessment of discharge water from scrubbers:

- **PPR 9** agreed on “Risk and impact assessment guidelines” and “Guidance on the delivery of EGCS residues”
- **Next steps :**
  - MEPC 78 (June 2022) expected to approve Guidelines and Guidance prepared by PPR 9
- **Outstanding issues (PPR 10):**
  - Development of amendments to MARPOL Annex VI to reflect the harmonized approach
  - Establishment of database for discharge water analysis results (chemical and toxicological)

# **4 Revision of SCR Guidelines**

# Revision of SCR Guidelines

## IMO Status

### Status

- Proposal to MEPC 77 to revise the SCR guidelines (ACS et al.)
- EUROMOT submitted INF-paper on IACS UI 112

### Outcome of MEPC 77:

- General agreement on a new output on revision of the SCR guidelines.
- Several delegations supported the EUROMOT submission
- Output would need further improvement
- New proposals invited to a future session of the Committee

MARINE ENVIRONMENT PROTECTION  
COMMITTEE  
77th session  
Agenda item 11

MEPC 77/11/2  
3 August 2021  
Original: ENGLISH  
Pre-session public release: ☒

#### WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

New output proposal to revise the 2017 SCR Guidelines, as amended

Submitted by Marshall Islands, Panama, Singapore, United Arab Emirates and IACS

MARINE ENVIRONMENT PROTECTION  
COMMITTEE  
77th session  
Agenda item 11

MEPC 77/INF.6  
16 September 2021  
ENGLISH ONLY  
Pre-session public release: ☒

#### WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

Assessment on certification of SCR systems and application of IACS Unified  
Interpretation MPC112 Rev.1

Submitted by EUROMOT

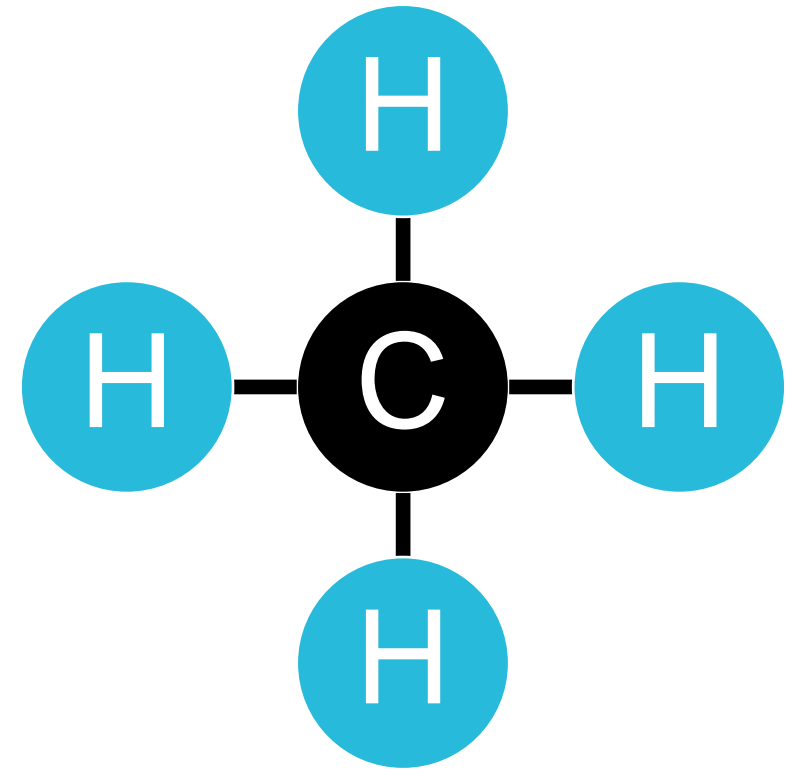
# **5 Methane** **(LCA Guidelines)**

# Methane Emissions

Context: Guidelines for the assessment of lifecycle GHG intensity of marine fuels

## Background:

- IMO's Initial GHG Strategy lists Guidelines for the assessment of lifecycle carbon/GHG intensity of marine fuels (LCA guidelines) as a candidate short-term measure
- ISWG-GHG 9 (Sept. 2021) agreed to:
  - Develop LCA Guidelines covering CO<sub>2</sub>, **CH<sub>4</sub>** and N<sub>2</sub>O,
  - To **address methane slip in the context of the LCA guidelines** (not as a separate regulation).

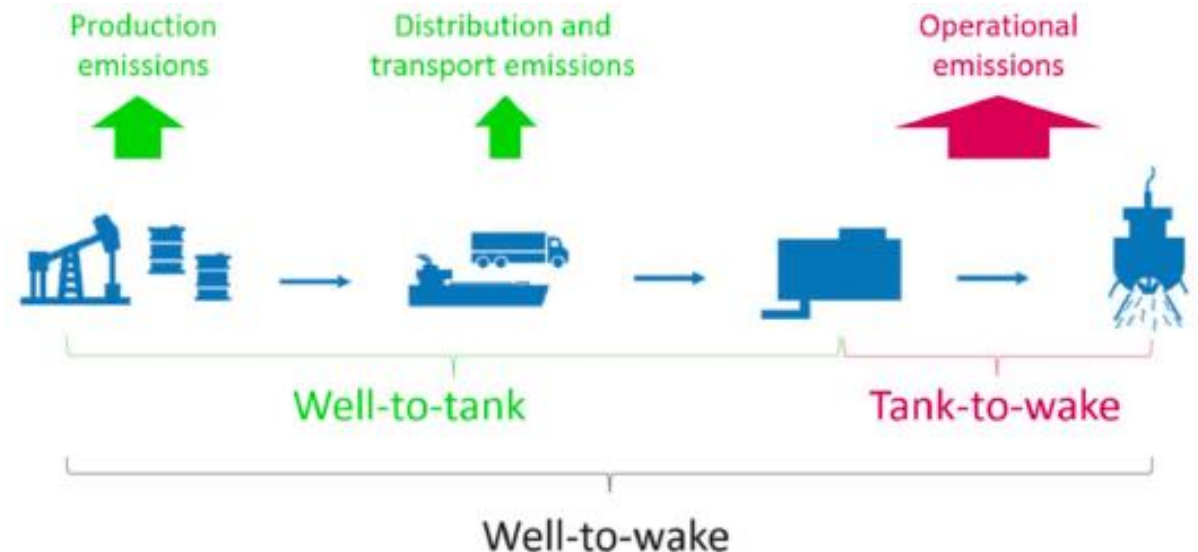


# LCA Guidelines

Guidelines for the assessment of lifecycle GHG intensity of marine fuels

## Outcome of ISWG-GHG 11 (April 2022)

- Agreement to develop LCA Guidelines for main current and expected future marine fuels.
- Will cover **Well-to-Tank** and **Tank-to-Wake** emissions of CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>.
- The GWP100 will be used as a basis. **The GWP20 may be included for comparative purposes.**
- Other sustainability issues also to be addressed.
- The LCA Guidelines will be a stand-alone technical tool.





# LCA Guidelines

Guidelines for the assessment of lifecycle GHG intensity of marine fuels

## MEPC 78 (June) to establish a correspondence group:

- Identify main initial fuel production pathways and feedstocks
- Develop methodologies for the calculation and certification of **Well-to-Tank and Tank-to-Wake GHG emissions** of marine fuels
- Consider sustainability aspects (other than GHG)
- Consider **measurement of actual methane slip using NOx Technical Code procedures (cycle value)\***
- Report to MEPC 79 (December 79)

## To be considered at a later stage:

- Default emission values for Well-to-Tank emissions
- The implementation in existing and/or future GHG reduction measures

\*) MEPC 78/7/13 (Rep. of Korea)



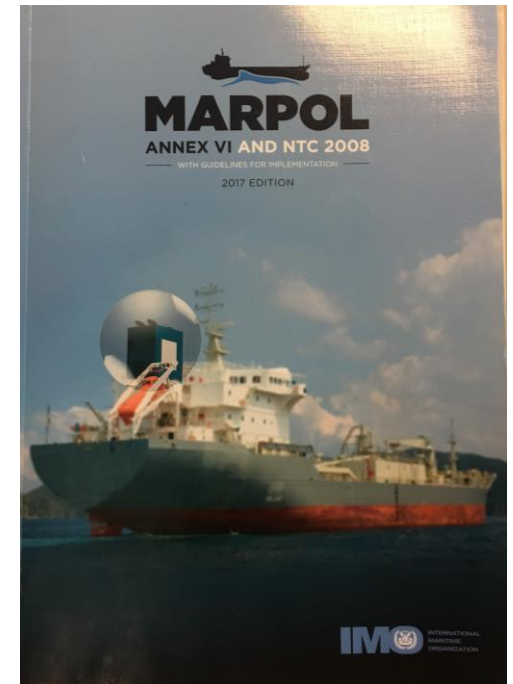
# 5 NOx and Biofuel

# Biofuels and NOx

Strictly  
confidential

## Background

- Regulation 18.3.2 of MARPOL Annex VI:
  - **Fuels not derived from petroleum refining shall not cause an engine to exceed the applicable NOx limit.**
- No guidance in MARPOL/NOx Technical Code on how to demonstrate compliance.
- IACS had proposed a unified interpretation (UI) to PPR 9 to clarify Reg. 18.3.2.



# Biofuels and NOx

Strictly  
confidential

## Conclusion of PPR 9

- UI **allowing for the use of biofuels and biofuel blends without assessment of NOx emissions.**
- Condition: The engine can be operated in accordance with the components/settings set out in its Technical File.
- Applies only to biofuels (not synthetic fuels)
- The UI is expected to be **formally approved by MEPC 78 (June 2022).**



# Thank you very much!

Dorte Kubel  
[dorte.kubel@man-es.com](mailto:dorte.kubel@man-es.com)  
R&D Two-Stroke



# Disclaimer short

All data provided on the following slides is for information purposes only, explicitly non-binding and subject to changes without further notice.

# Black Carbon

Correspondance Group

## Terms of Reference:

1. Develop draft guidelines on “**recommendatory goal-based control measures**” to reduce the impact on the Arctic of Black Carbon emissions from international shipping
2. Review existing data on the recommended Black Carbon measurement methods (FSN, PAS, LII) to be used in conjunction with such draft recommendatory goal-based control measures with a view to:
  - identifying **the most suitable measurement method(s)** to be followed,
  - identifying the related sampling, measurement, reporting and calibration procedures;
  - identifying how to develop and apply **potential threshold (limit) value(s) for Black Carbon**;
  - gathering relevant information on the development of a standard approach to the characterization of marine fuels in terms of their aromatic and paraffinic nature; and
3. **Further consider regulating or otherwise directly control Black Carbon emissions** from marine diesel engines (exhaust gas) to reduce the impact on the Arctic of Black Carbon emissions from international shipping,

# Fit for 55

## What is the Fit for 55 package?

- 13 proposals for new EU regulation from EU Commission.
- Aim: Reduce GHG emissions by 55 % by 2030 (compared to 1990).
- Most relevant for marine:
  - **Fuel EU Maritime**
  - Shipping in the Emission Trading System (ETS)
  - (Energy Taxation Directive)
  - (Alternative Fuels Directive)
  - (Renewable Energy Directive)
- To be negotiated over the next 1-2 years.





# FuelEU Maritime

Goal: Increase Share of Renewable and Low-Carbon Fuels

## Methodology

- Addresses on Well-to-Wake (WtW) emissions of GHG\* (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O)
- Default factors for GHG<sub>TTW</sub> and GHG<sub>WTT</sub> for all fuels.
- Actual values may be used if certified\*\*.
- Energy from electricity counts as zero in WtT perspective.
- Reward factor for wind propulsion (up to 0.95)
- Fleets with 'compliance deficit' shall pay penalty
- Penalties will be paid to an EU fund promoting renewable marine technologies

$$\text{GHG Intensity (gCO}_2\text{eq pr MJ)} = \frac{\text{GHG}_{\text{WTT}} (\text{fuel}) + \text{GHG}_{\text{TTW}} (\text{fuels})}{\text{Energy used (fuel + electricity)}}$$

\*) 100 years GWP used for CH<sub>4</sub> and N<sub>2</sub>O    \*\*) Procedures to be developed for certification of TTW and WTT emission factors.

# FuelEU Maritime

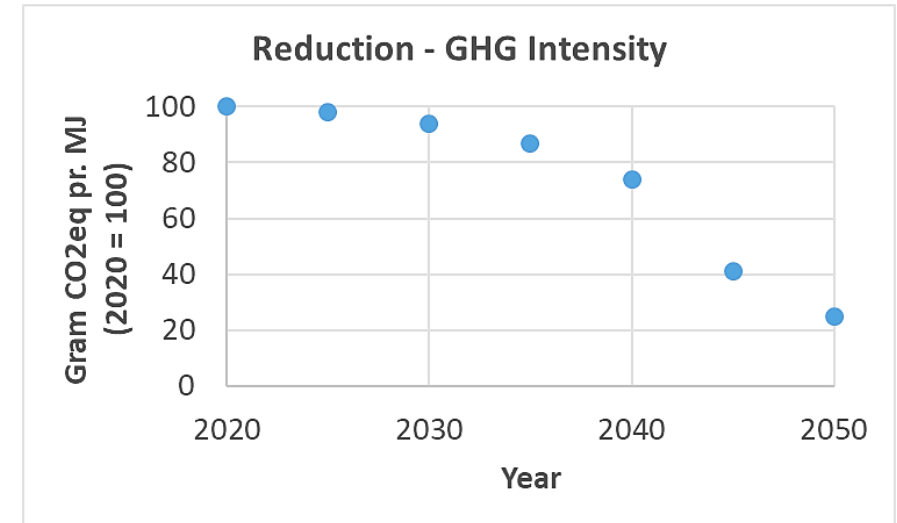
Goal: Increase Share of Renewable and Low-Carbon Fuels

## Directive Scope

- Ships above 5000 GT\*
- All energy used on internal EU voyages and port stays and half of energy used on voyages departing from/arriving at EU-ports to/from non-EU ports.

## Main Elements

- Energy use based on fuel bunkered. Closely coupled to the MRV bunker reporting system
- Reduction of the annual average GHG intensity of energy used by ships.
- Sustainability criteria for biofuels.
- On-shore power supply (OPS) for passenger & container ships mandatory from 2030.
- Pooled compliance rewarding overcompliance



\*) Excluded applications are navy, government, fishing, dredger, ice-breaker, pipe-layer or offshore installation activities

# FuelEU Maritime

## Tank-to-Wake emission factors

Default factors given for a wide range of fossil, bio and synthetic fuels.

Methane slip factors from 4th IMO GHG study.

Actual values certified by means of laboratory testing or direct emissions measurements may be used.

The Commission is empowered to adopt delegated acts in accordance with Article 26, in order to supplement this Regulation by establishing the rules on conducting the laboratory testing and direct emissions measurements.

Class / Feedstock	Pathway name	LCV [MJ/g]	CO <sub>2,eq WtT</sub> [gCO <sub>2,eq</sub> /MJ]	Energy Converter Class	C <sub>f CO<sub>2</sub></sub> [gCO <sub>2</sub> /gFuel]	C <sub>f CH<sub>4</sub></sub> [gCH <sub>4</sub> /gFuel]	C <sub>f N<sub>2</sub>O</sub> [gN <sub>2</sub> O/gFuel]	C <sub>slip</sub> As % of the mass of the fuel used by the engine
	HFO ISO 6217 Grades RME to RMK	0,0405	13,5	ALL ICES	3,114 MEPC245 (66) Regulation (EU) 2015/757	0,00005	0,00018	-
				Gas Turbine				
				Steam Turbines and Boilers				
				Aux Engines				
	LNG	0,0491	18,5	LNG Otto (dual fuel medium speed)	2,755 MEPC245 (66) Regulation (EU) 2015/757	0	0,00011	3,1
				LNG Otto (dual fuel slow speed)				1,7
				LNG Diesel (dual fuel slow speed)				0,2
				LBSI				N/A