

# Sustainable Shipping: Regulatory Overview

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# Project purpose

- Understand current and potential future regulations related to air emissions from vessels

# Project

## Research

(Nov – Feb)

- Int'l federal
- States
- Destination ports

## Operators

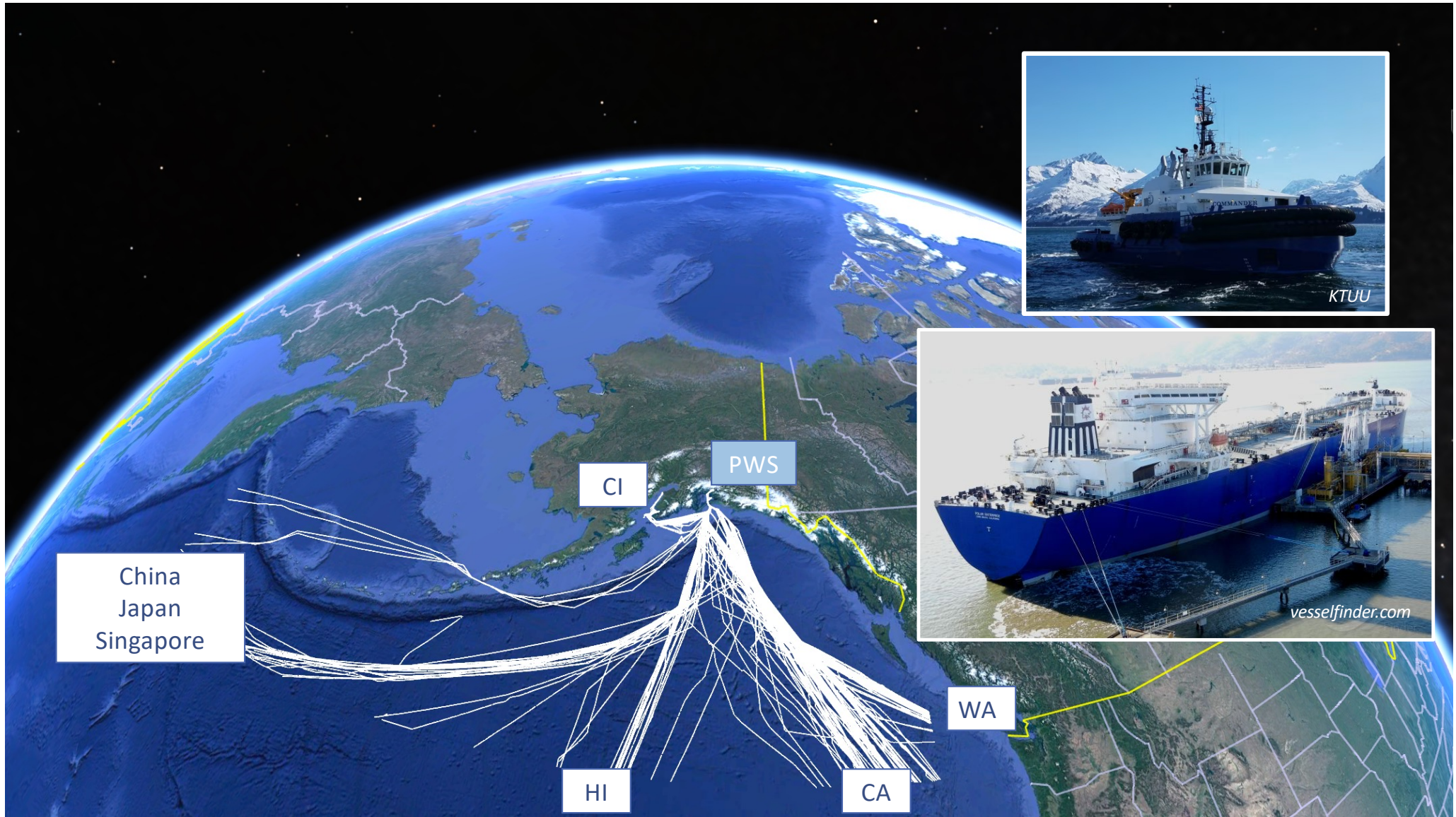
(Feb - Mar)

- Interview
- Other
- (more?)

## Report

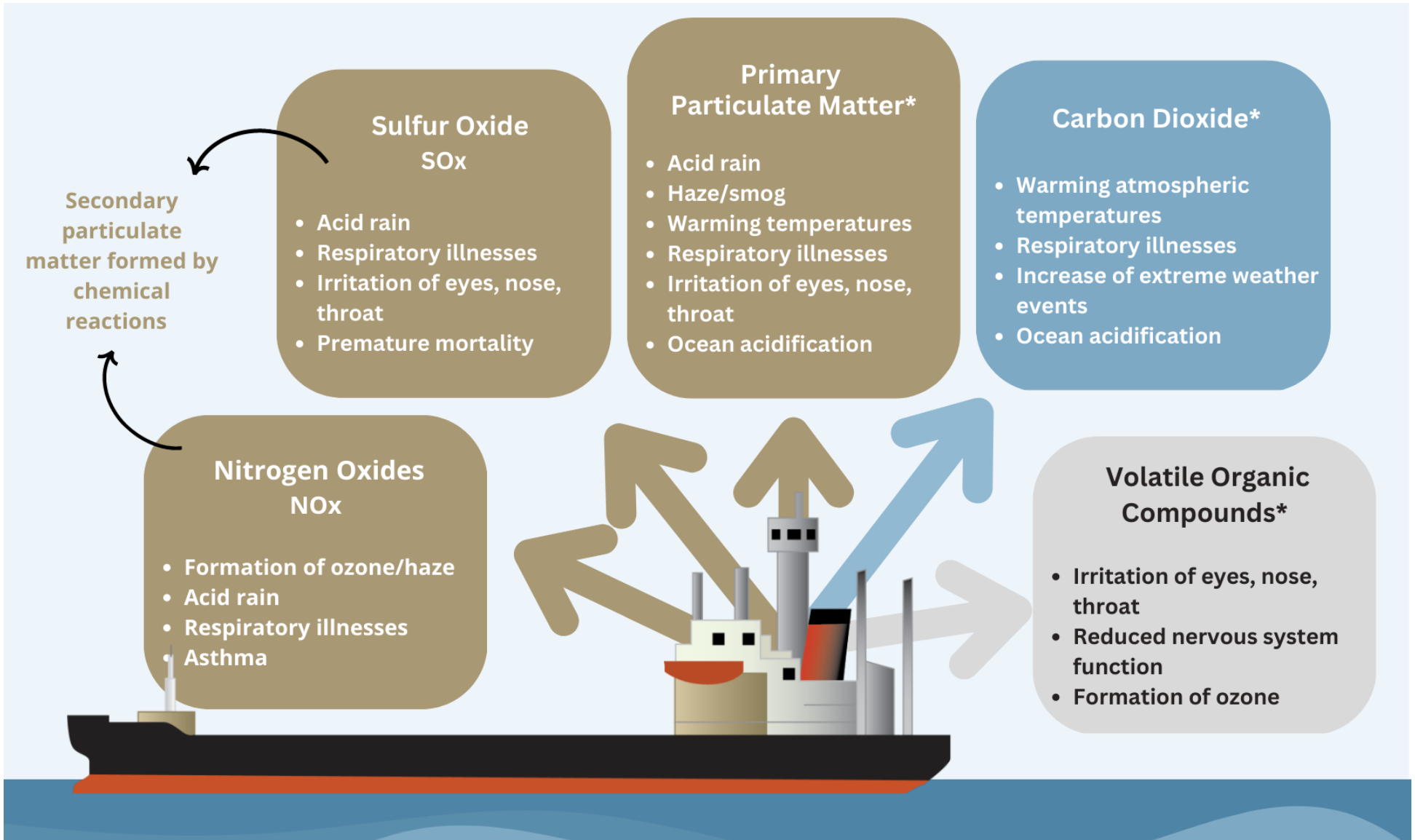
(Apr – May)

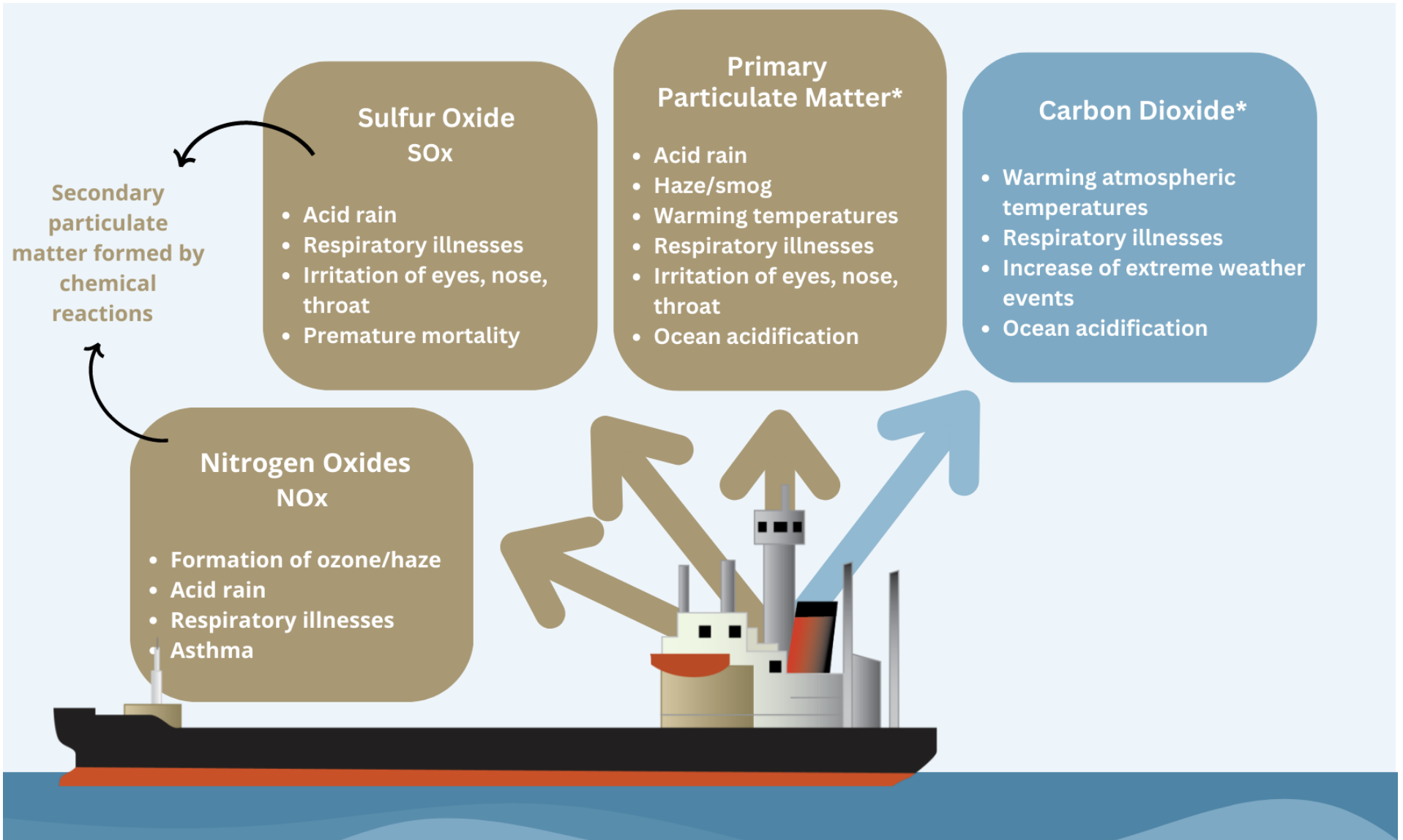
- Presentation
- Report  
(draft and final)



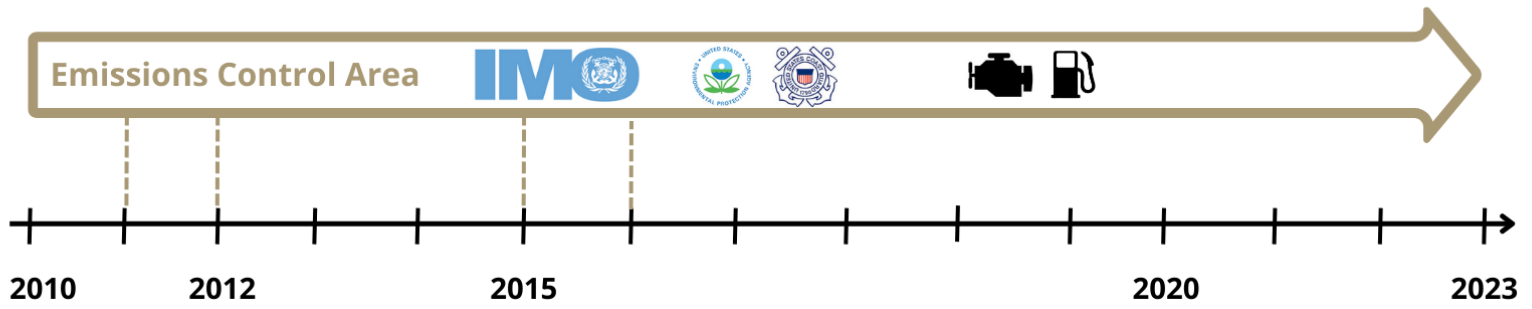
# Regulators







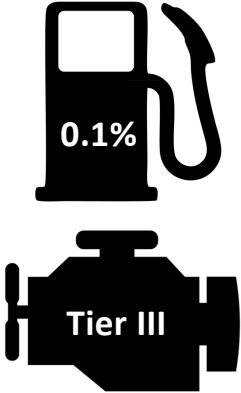
SOx, NOx, PM CO2 emissions intensity





# ECA

Emissions  
Control  
Area



# Compliance options

Distillate  
(gas/diesel)

Low Sulfur  
Heavy Fuel Oil

Heavy Fuel  
Oil

Marine Scrubbers

Closed-loop

Disposed on  
shore

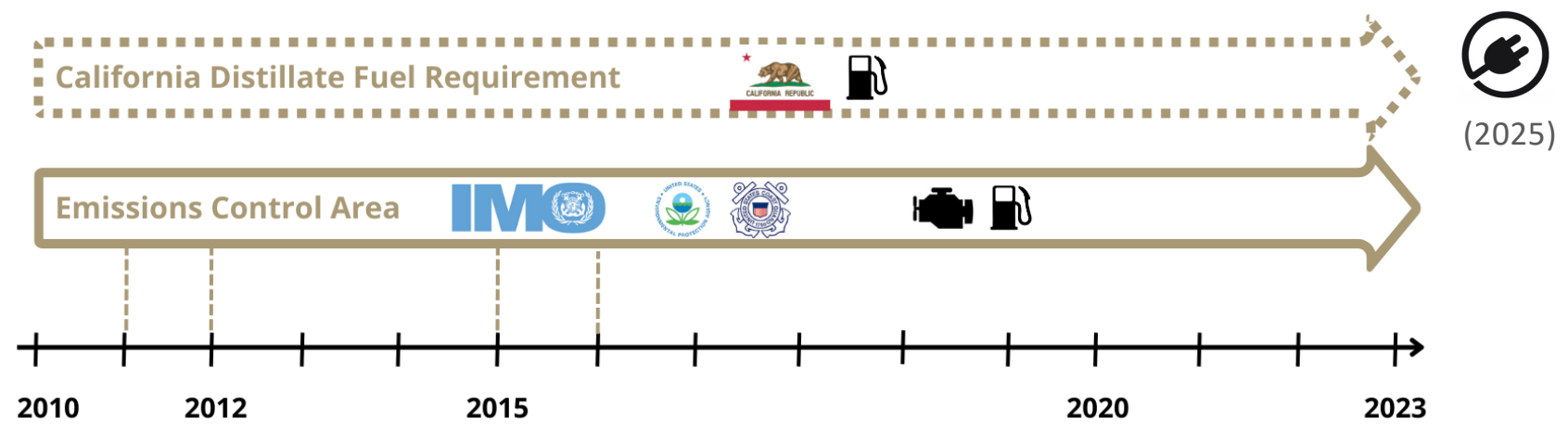
Hybrid

Open-loop

Wastewater  
disposed in water

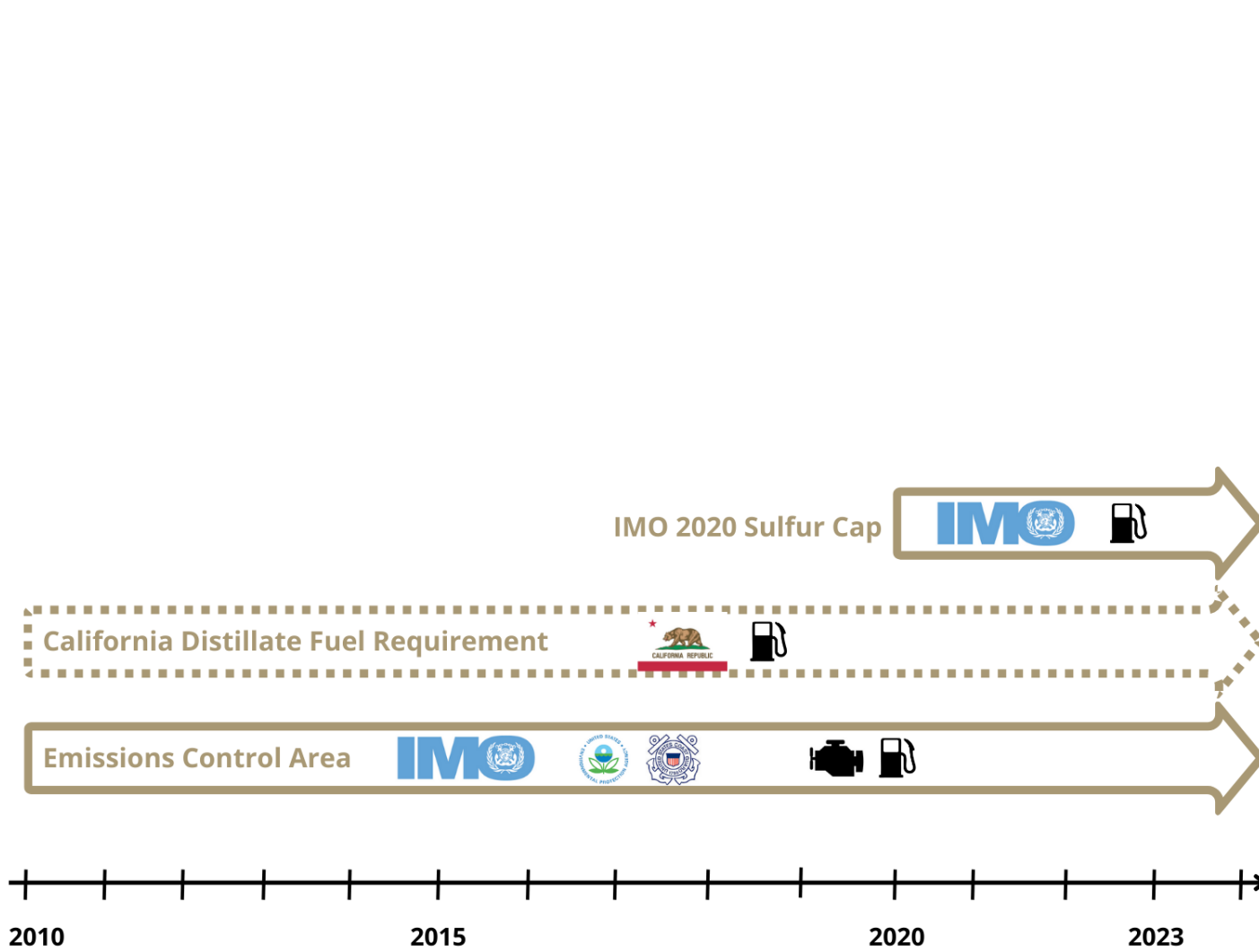
CO2 emissions intensity

SOx, NOx, PM



CO2 emissions intensity

SOx, NOx, PM



# “IMO 2020”



International  
Chamber of Shipping

Shaping the Future of Shipping

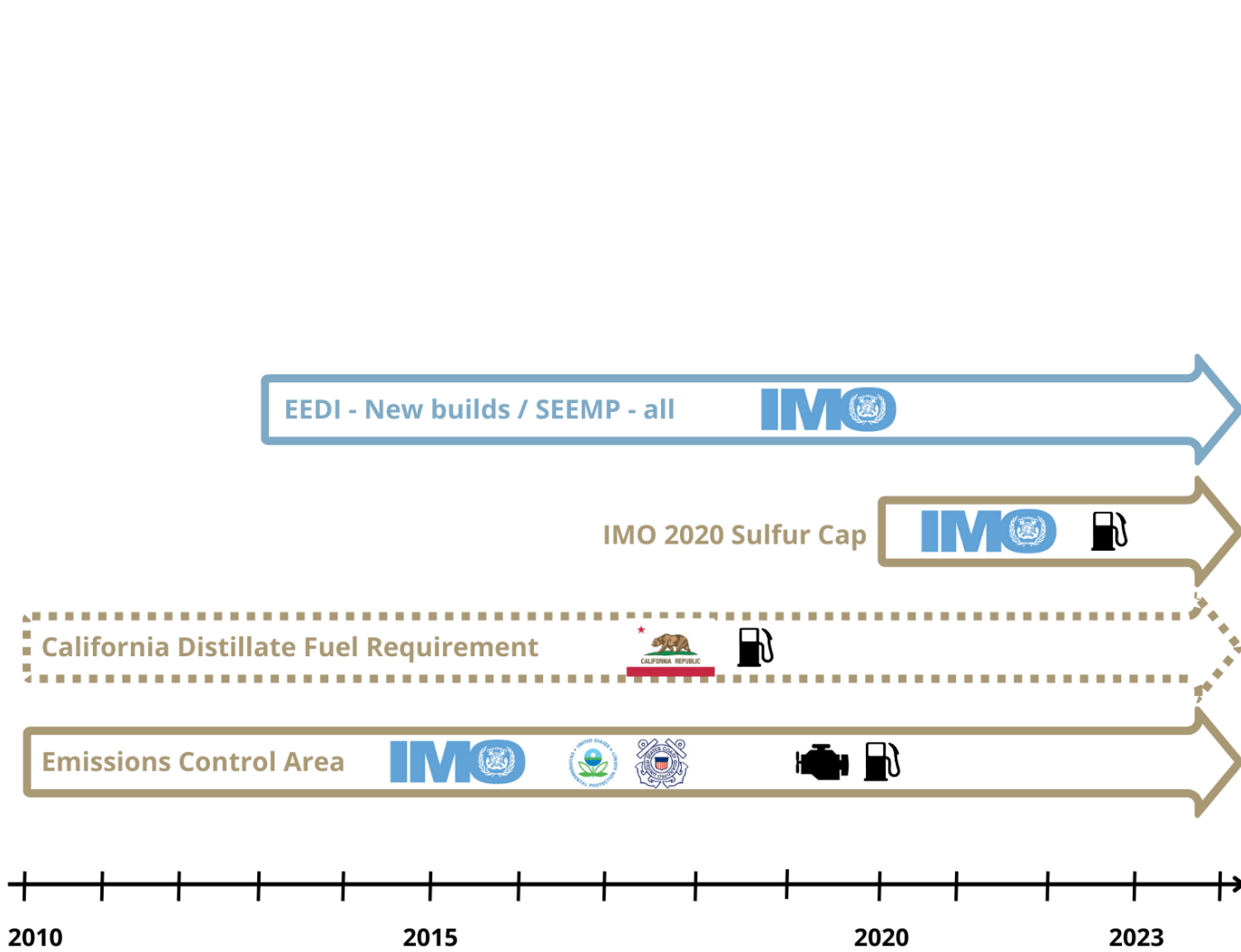
## 2020 Global Sulphur Cap



The introduction of a global sulphur cap has brought radical change to the industry, raising questions about fuel availability, safety and compatibility.

CO2 emissions intensity

SOx, NOx, PM



2010

2015

2020

2023

# EEDI – new builds

## Energy Efficiency Design Index

CO<sub>2</sub> emissions

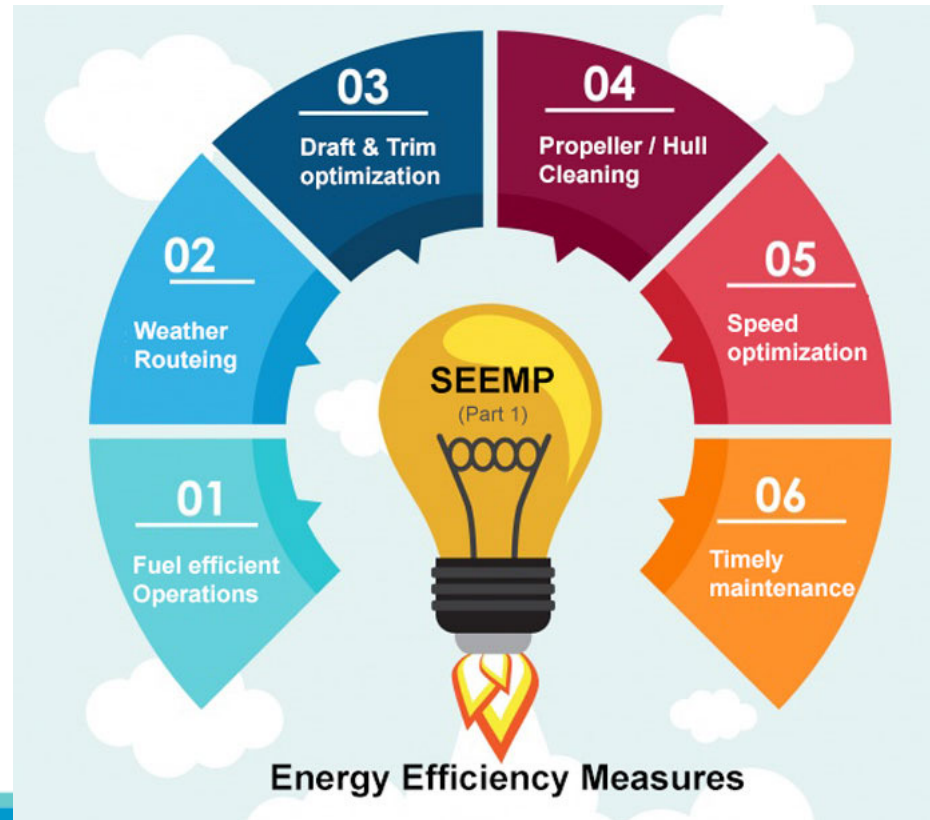
transport work

$$\frac{\left( \prod_{j=1}^M f_j \right) \left( \sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + (P_{AE} \cdot C_{FAE} \cdot SFC_{AE}^*) + \left( \left( \prod_{j=1}^M f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AE_{eff}(i)} \right) C_{FAE} \cdot SFC_{AE} \right) - \left( \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME} \right)}{f_i \cdot Capacity \cdot V_{ref} \cdot f_w}$$

auxiliary engine power   fuel consumed   type of fuel   speed  
 main engine power/capacity   correction for weather   energy efficiency technologies

# SEEMP

## Ship Energy Efficiency Management Plan



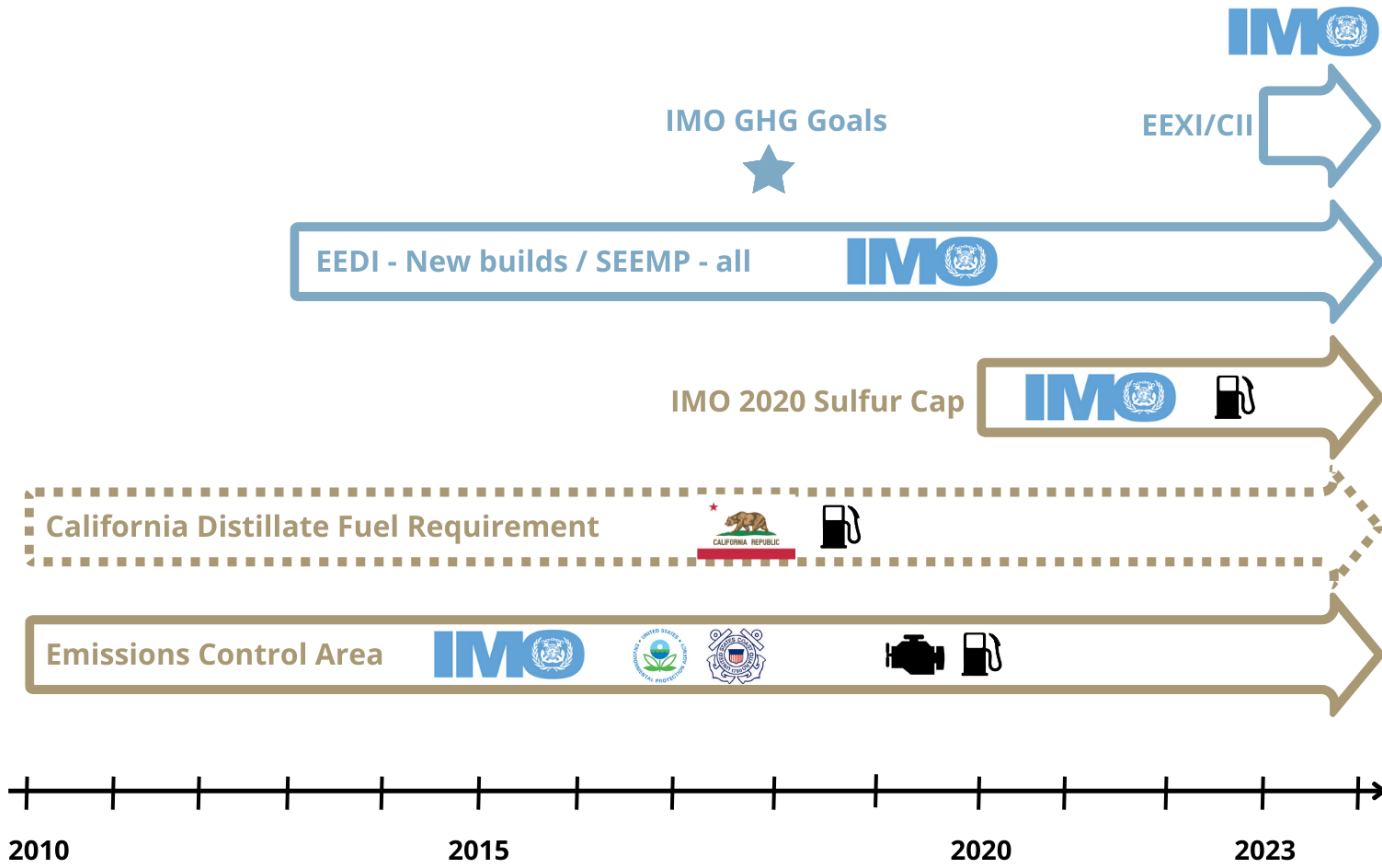


# EEDI / SEEMP

	EEDI	SEEMP
New builds	✓	✓
Existing vessels		✓
Progressive improvements	✓	

CO2 emissions intensity

SOx, NOx, PM



2010

2015

2020

2023



# IMO GHG Reduction Goals (2018)

## Intensity

**2030:**

Reduce by 30%

**2050:**

Reduce by 70%

## Total

**2050:**

Reduce by 50% (compared to 2008), then phase out completely

## Ways to get there – near-term

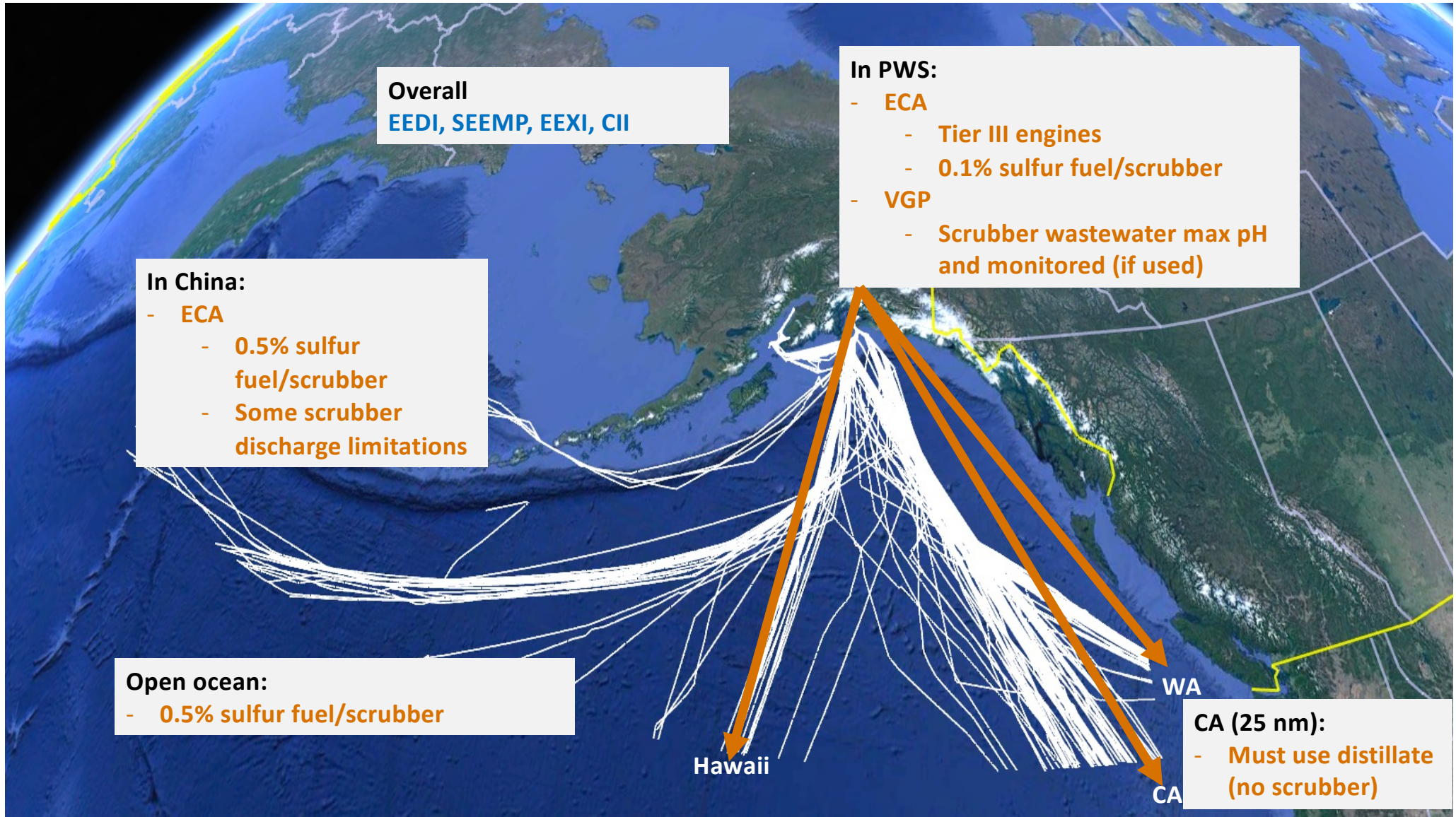
	EEDI	SEEMP	EEXI	CII
New builds	✓			
Existing vessels		✓	✓	✓
Progressive improvements	✓			✓
			<i>Will be revisited in 2026.</i>	

# CII

## Carbon intensity indicator

- ✓ Reported to IMO
- ✓ Must report on corrective actions if "E" ever or "D" for 3 years straight
- ✓ Information is not public, but can be accessed by gov't, operators, ports





**Overall**  
EEDI, SEEMP, EEXI, CII

**In PWS:**

- ECA
  - Tier III engines
  - 0.1% sulfur fuel/scrubber
- VGP
  - Scrubber wastewater max pH and monitored (if used)

**In China:**

- ECA
  - 0.5% sulfur fuel/scrubber
  - Some scrubber discharge limitations

**Open ocean:**

- 0.5% sulfur fuel/scrubber

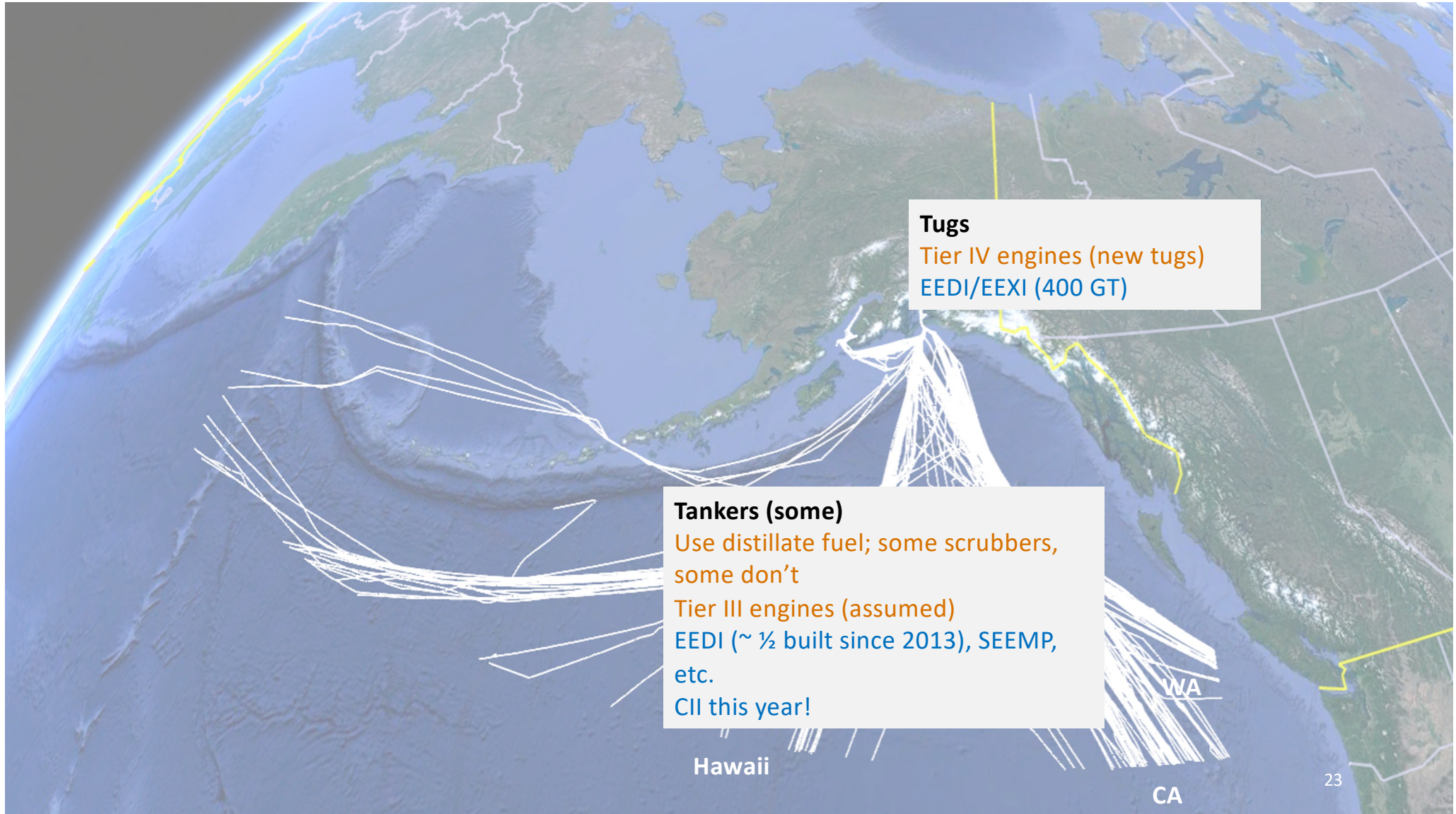
Hawaii

WA

CA

**CA (25 nm):**

- Must use distillate (no scrubber)



**Tugs**  
Tier IV engines (new tugs)  
EEDI/EEI (400 GT)

**Tankers (some)**  
Use distillate fuel; some scrubbers,  
some don't  
Tier III engines (assumed)  
EEDI (~ ½ built since 2013), SEEMP,  
etc.  
CII this year!

Hawaii

WA

CA

# Things to watch for

- Maybe new IMO goals
- Expecting IMO adopted long-term measures
- Updated U.S. regulations (USCG, EPA)
- Ongoing developments with other states, local measures
  - Alternative fuel
  - Scrubber discharge bans
  - Shoreside power
  - Electric tugs

## Next up:

- *Questions, corrections, input*
- *Draft report (next week?)*
- *Final report*