



Developments towards regulating greenhouse gases from shipping



Canada

Overview

International Context

- International Maritime Organization
- UN Framework Convention

Domestic Context

- Canada-US



Background

Greenhouse gases are different from air pollutants

- Effect whole atmosphere not regions
- Change the thermal properties of the atmosphere to retain more heat energy
- Cause changes planet wide, over oceans
 - El Nino, La Nina, Sea level rise



Marine mode is efficient, BUT...

- IMO estimates ships emit 3.3% of all GHGs
 - If world shipping was a country, it would be in the top 20 major GHG emitters
 - This is expected to grow with trade
 - Doing nothing means by 2050 ships would be 12-18% of all CO₂ emissions, as other sectors are controlled under ambitious plan
- Future fuel prices could drive change
- IMO estimates efficiency can improve by 25% to 75%



Focus is carbon dioxide

- Combustion from main propulsion is the key source of GHGs from shipping
- Other sources negligible



Reducing CO₂ from shipping

Where do the reductions come from?

DESIGN (New ships)	Saving of CO ₂ /tonne-mile	Combined	Combined
Concept, speed & capability	2% to 50%+	10% to 50%+	25% to 75%+
Hull and superstructure	2% to 20%		
Power and propulsion systems	5% to 15%		
Low-carbon fuels	5% to 15%*		
Renewable energy	1% to 10%		
Exhaust gas CO ₂ reduction	0%		
OPERATION (All ships)		10% to 50%+	
Fleet management, logistics & incentives	5% to 50%+		
Voyage optimization	1% to 10%		
Energy management	1% to 10%		

- from the *Second IMO GHG study 2009*



IMO Framework being developed

- Energy Efficiency Design Index
- Energy Efficiency Operating Index
- Shipboard Energy Management Plan
- Proposed Market Based Measures
 - Cap and trade
 - Global levy on marine fuel to buy offsets



Energy Efficiency Design Index

EEDI index =

$$\frac{\left(f_1 \cdot \prod_{j=2}^M f_j \right) \left(\sum_{i=1}^{nME} C_{FMEi} SFC_{MEi} P_{MEi} \right) + C_{FAE} SFC_{AE} P_{AE} + \left(\sum_{i=1}^{nPTh} P_{PTh} - \sum_{i=1}^{nWHR} P_{WHRi} \right) - \left(\sum_{i=1}^{neff} f_{eff} P_{eff} C_{F_{eff}} SFC_{MEi} \right)}{(f_1 \cdot Capacity) \cdot V_{ref} \cdot f_W}$$

OR

CO₂ emitted by main engines – CO₂ saved by technology

Transport work to be done
(cargo capacity and reference speed)



Energy Efficiency Operating Index

$$\frac{\sum_i \sum_j (FC_{ij} \times C_{Fj})}{\sum_i (m_{cargo,i} \times D_i)}$$

- j is the fuel type;
- i is the voyage number;
- FC_{ij} is the mass of consumed fuel j at voyage i ;
- C_{Fj} is the fuel mass to CO₂ mass conversion factor for fuel j
- m_{cargo} is cargo carried (tonnes) or work done (number of TEU or passengers) or gross tonnes for passenger ships; and
- D is the distance in nautical miles corresponding to the cargo carries or work done.



Proposed market – based measures

1. Cap and trade mechanism

- Set upper limit on CO₂ emissions (the Cap)
- Allocate average limit per ship over world fleet
- Ships under limit trade with ships over limit

2. Global levy on marine fuel purchases

- IMO may fund offsets for marine industry
 - Technical Cooperation Committee
 - Clean Development Mechanism
 - Carbon credits on open markets



Alternative (US proposal)

Mandatory efficiency rules

- Specify Energy Efficiency Design Index of *all* ships
- Specified indices set by type of ship
- Specified indices would be tightened overtime
- Trading possible for ships that do not meet specified design efficiency



The UN debate

UN Framework Convention on Climate Change, 1992

- advanced “*common but differentiated responsibilities*”
- developed countries take lead for addressing climate change

Kyoto Protocol to UNFCCC, 1997

- established carbon markets

New Framework, for post 2012, being negotiated



IMO is caught in the UN debate

- IMO has global rules for shipping
- Developing countries pushing IMO for a differentiated approach
 - Response to pressure at UN debate
 - China, India, Brazil, South Africa, Saudi Arabia lead the G77
 - out vote developed countries and major flag States by 2 to 1 margin



Canada's view at IMO

- Global rules on ships' GHGs are needed
 - Differentiated approach will not work for a globalized industry
- Tactically, being out-voted, proposed global rules must be acceptable to China and G77
- One option:
 - Develop energy efficiency rules under MARPOL, Annex VI, as prelude to shift to distillate fuels at 0.5% sulphur
 - Co-develop optional carbon efficiency rules



Domestic measures

- Canadian measures under development
 - Draw from IMO Framework
- Canada – US measures possible, but not known
 - Depends on discussions led by Environment Canada
- Marine Safety will be preparing regulations under the Canada Shipping Act, 2001
- Commercial measures???
 - Unknown at this time



Questions?

Paul Topping

Manager, Environmental Protection
Transport Canada, Marine Safety

paul.topping@tc.gc.ca

613-991-3168

