

SHIP OPERATIONS COOPERATIVE PROGRAM

*“ECA Compliance - Operational
Equivalencies as an Effective Solution”*

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CLIA at 35: Steering a Sustainable Course



CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)

When you think of a cruise, don't clear blue, pristine oceans come to mind? We at the Cruise Lines International Association are doing all we can and more to ensure this picture does not change. 2010 marks the 35th anniversary of CLIA, and we are celebrating thirty-five years of progress toward innovating new technologies and operating our ships in ways that minimize the impact on the environment. Our industry has a vested interest in protecting the environment, because it is upon our beautiful oceans that we sail.

Ocean liners have always had a simple appeal: enjoy the clean open air and sea breeze while traveling to a special destination. This was true for the first

ahead to our next 35 years and beyond. For example, we are proud that our advanced wastewater systems produce water cleaner than what is discharged from most municipalities, our efficient engine technologies conserve fuel and minimize air emissions, and our many energy conservation programs, including LED light bulbs and extensive recycling procedures reduce energy and allow for reutilization of resources.

Our story is all about growth and the evolution of the modern cruise industry. Along with our impressive growth - 118 new ships since 2000, and average annual growth in passengers of 7.4 percent since 1980 - comes with it an impressive responsibility to protect the fragile natural

CHAPTER 3 WASTEWATER MANAGEMENT

Wastewater management is a complex and vitally important element of cruise ship operations. On a cruise ship, blackwater (water from toilets, blackwater (water drains) and graywater (water from cabin sinks and showers, laundry, galley and spa) discharge is regulated to a higher standard than any other vessel and most land-based facilities. In many areas of the world, the treated wastewater discharged from a cruise ship is cleaner than that discharged from municipal utilities.

At the international level, MARPOL (International Convention for the Prevention of Pollution from Ships) sets the standards of compliance but the many layers of regulation make this issue complex. For instance, as our ships visit more levels of different countries, these regulations evolve and

To illustrate the extent to which these requirements affect a ship and its crew, a piece of equipment that was developed to fulfill a requirement in one region may not be sufficient elsewhere. Imagine lights on your car than another.

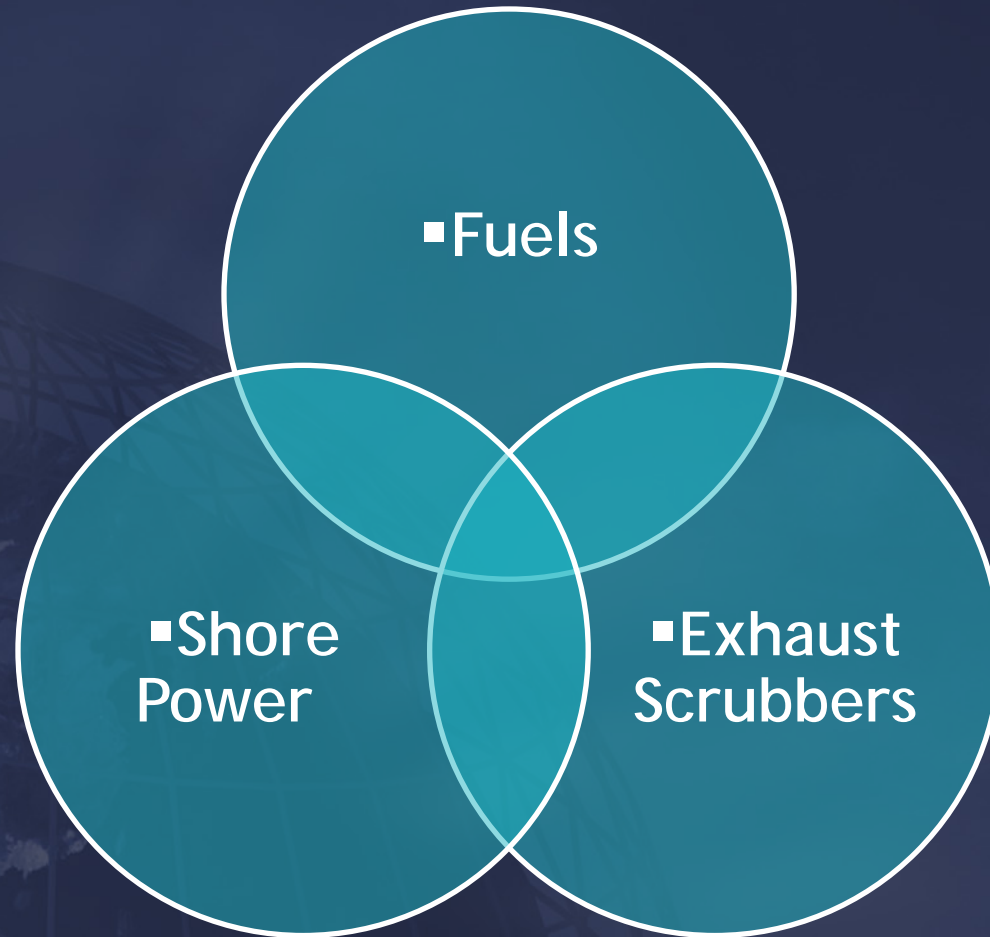
While it is possible to conform to different speed limits with the same vehicle, it would be quite challenging and burdensome to stop at each border to change the tail lights. Remarkably, however, our member cruise lines comply with all applicable regulations.

CLIA's Waste Management Practices and Procedures add even another level of detail. The cruise industry has gone beyond the rules and regulations in its discharge procedures by adopting its own set of stringent wastewater practices.

For example, while international regulations permit the discharge of untreated blackwater 12 nautical miles from shore, as a policy CLIA members have committed to treat all blackwater prior to discharge. All blackwater is treated using equipment certified to meet



Emissions



EMISSION CONTROL AREAS

The U.S./Canadian petition for an ECA was adopted by the IMO and it will become enforceable in August 2012, absent any unforeseeable action by the member States. U.S. obtained approval to exempt most steamships from the requirements of the original ECA.

EPA published its related final rulemaking in April 2010.

MARPOL Annex VI provides for emissions control areas (ECA) that restrict sulfur content in fuel:

- 1.5% originally
- 1.0% in July 2010 (August 2012 for North America)
- 0.1% in 2015
- Worldwide sulfur fuel cap of 0.5% in 2020
- Provisions for equivalence through technical solutions
 - Exhaust Gas Scrubbers (EGS)



MARPOL ANNEX VI

- ▶ Annex VI, Regulation 4 provides for broad equivalencies. Specifically, the existing text provides that the requirements can be met by “any fitting, material, appliance, or apparatus to be fitted in a ship *or other procedures, alternative fuel oils, or compliance methods used as an alternative*” if they are “*at least as effective in terms of emission reductions.*”



MARPOL ANNEX VI EQUIVALENCY PROCESS

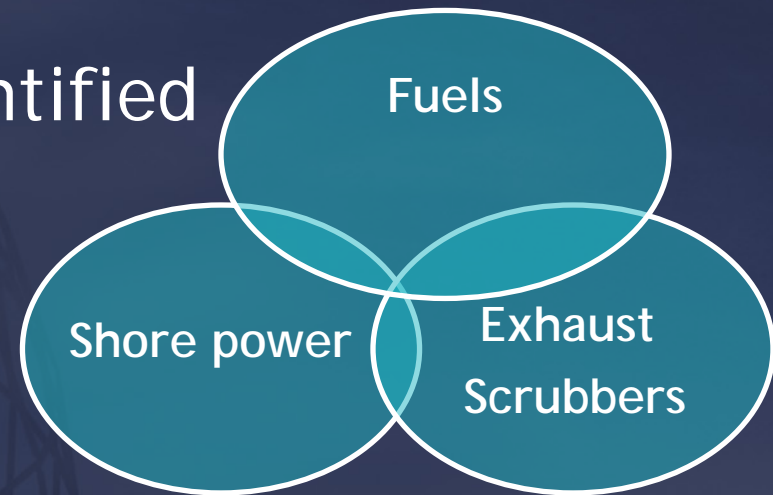
- The Administration (flag State) evaluates the equivalency
- The equivalency may be allowed by the Administration
- The ship's IAPP certificate is annotated
- The Administration notifies the IMO Secretariat
- IMO Member States are notified by the Secretariat
- Flag State verifies, and Port States may verify, compliance with the equivalency

Demonstrating Equivalence: Development and Application of Emissions Calculator



ALTERNATIVES & EQUIVALENCIES

- ▶ Potential alternatives or equivalencies include:
 - Mechanical removal (scrubbers)
 - Alternative fuels or non conventional propulsion
 - Averaging or other operational means
 - Other means not yet identified



GOAL REGARDING OPERATIONAL EQUIVALENCIES

- Work within the existing MARPOL Annex VI framework to provide equal or greater public health and welfare benefit in a more economically efficient manner by:
- Focusing sulfur emission reductions where they provide the greatest benefit
- Ensuring that air quality is not degraded for any persons affected by a cruise ship's sulfur emissions



BENEFITS OF THIS APPROACH

- A more cost effective and equally or more effective method;
- Lower exposures in heavily populated coastal areas with high environmental loadings compared with ECA compliance without averaging;
- Potential to reduce total human health impact below what would be achieved without averaging;
- Uses best available science to achieve equivalent benefits;
- Reduces potential impact to ports and states from itinerary changes that reduce economic benefits and jobs; and
- Reduces potential concerns regarding availability of fuel and encourages innovation and investment for longer term abatement technology solutions.



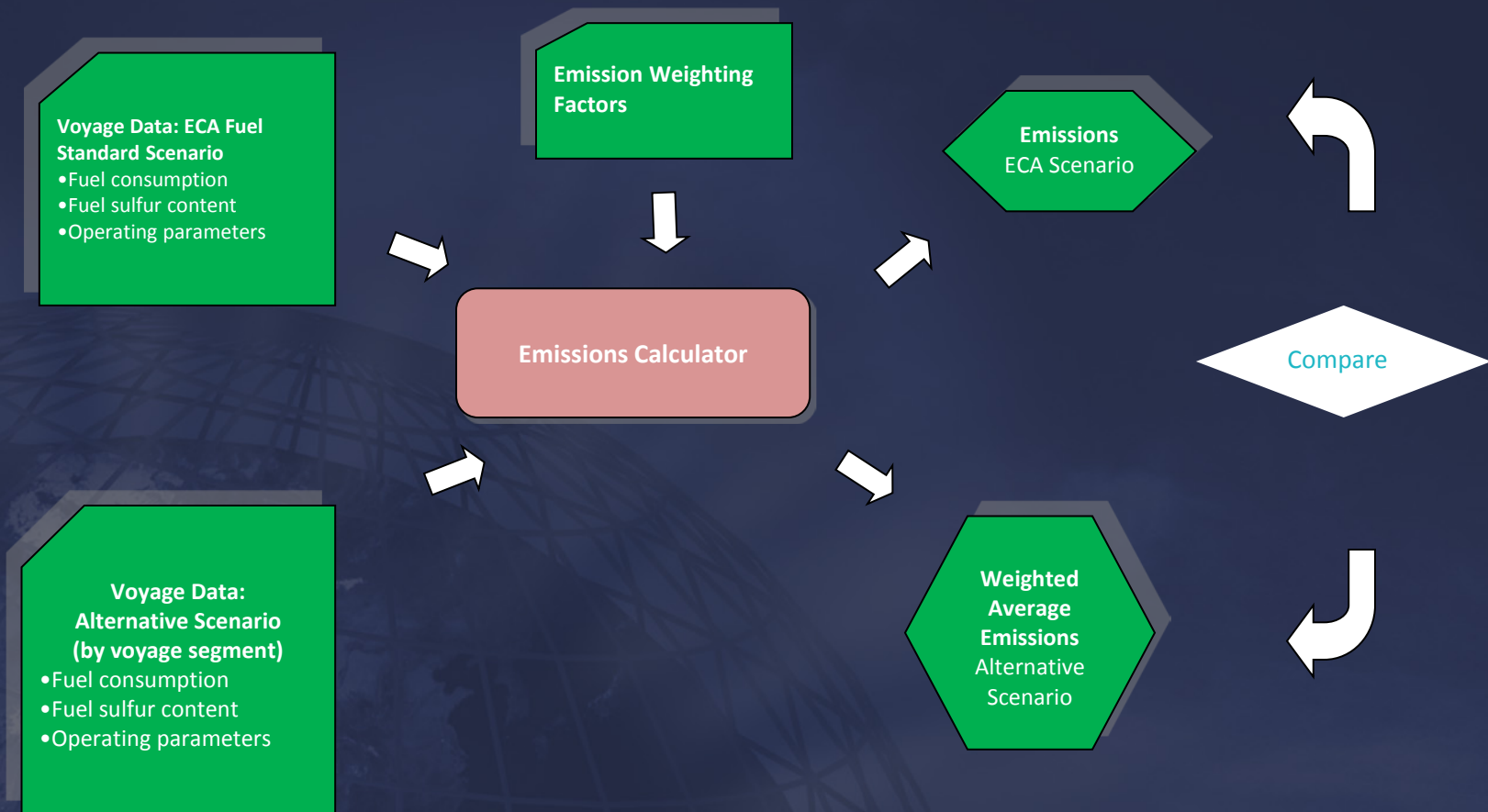
MULTIPLE VESSEL AVERAGING

- Average total emissions and emission impacts over vessels or fleets of vessels

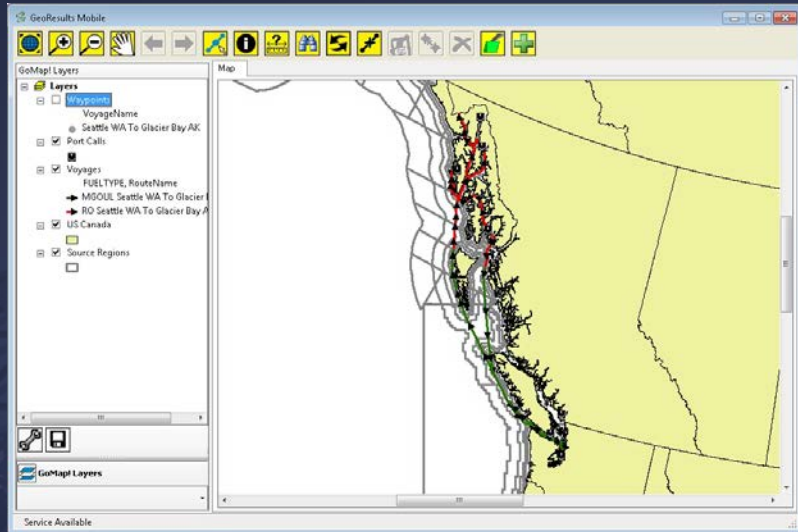
- Emission calculations for each vessel
 - By mode (berthing, maneuvering, transiting)
 - By vessel: total fuel consumed
 - Most cruise vessels use a diesel-electric design thus allowing emissions to be estimated directly from fuel consumption (no low load adjustment factors)
 - Activity:
 - Time and load (# engines on) in each mode, or
 - Fuel consumption (which can be accurately measured and verified through accounting documentation)



EMISSIONS CALCULATOR: HOW IT WORKS



CLIA Emissions Calculator (CLEcalc)



The screenshot shows the Emissions Calculator application window. It has a 'Summary' tab selected, displaying a table with the following data:

	ECA 2015 (0.1% MGO)	ECA 2015 (0.1% MGO) (Modified)	Equivalency Scenario	Equivalency (Revised)
IPM	247.5	247.5	208.55	208.55
SOx	117.62	117.62	27.12	27.12
SUM	365.12	365.12	235.67	235.67
Cost	\$951,446.00	\$951,446.00	\$816,749.00	\$816,749.00
Distance	2554.55	2554.55	2554.55	2554.55
Hours	181.8	181.8	181.8	181.8
RO Cost	\$694,828.00			

Below the table is a 'Scrubber Values' section with a table:

Emission Type	Reduction
Sulphur Dioxide	0.037
Particulate Matter	0.13

An 'Update' button is located below the scrubber values table. At the bottom of the window are 'Save' and 'Close' buttons.

- ▶ Software tool for exploring alternative “equivalence” compliance options
- ▶ View and manipulate voyages on a map
- ▶ Change fuel types, cost and sulfur content interactively
- ▶ Compare voyage fuel costs and weighted average emissions with standard ECA compliance approach



GIS-Based Emissions Calculator

NorthwestVoyages.mxd - ArcMap - ArcEditor

File Edit View Bookmarks Insert Selection Tools Window Help

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Editor Task: Create New Feature Target: Voyages

Layers

- Waypoints
- VoyageName
 - Seattle WA To Glacier Bay AK
- Port Calls
- Voyages
 - FUELTYPE, RouteName
 - MGOU Seattle WA To Glacier Bay AK
 - RO Seattle WA To Glacier Bay AK
- US Canada
- Source Regions
 - INUSE
 - 0

Voyage Results

Summary Totals Detailed Results

ECA Scenario: ECA 2015 (0.1% MGO)

Route: Seattle WA To Glacier Bay AK

Vessel Name: M/S

Engine Type: MSD

Fuel Type	% Sulphur	Cost Per Ton
RO	1.96%	\$696.00
MGOU	0.1%	\$1,000.00
MGOL	0.001%	\$1,200.00
MDO	1%	\$805.00

	ECA 2015 (0.1% MGO)
Emissions Ratio (Equivalency / ECA)	0.65
% Cost of ECA Saved	20

Update Fuel Value

Calculate

Save Close

Display Source Selection

Drawing

Arial 10 B I U

-2807617.577 1489314.987 Meters

RegulationCalculato... NorthwestVoyages... Voyage Results

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EMISSIONS CALCULATOR: CURRENT STATUS

- Initial development completed
 - Multiple vessel averaging
 - Distance weighted and population weighted averaging (based on initial modeling)
 - Initially three demonstration itineraries
 - Seattle to Alaska
 - Hawaii
 - New York to Quebec
- Preliminary results very encouraging: additional testing and quality assurance done; evaluating results; ensuring methods quantifiable and verifiable; enhancing user interface; and documentation.



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