SHIP OPERATIONS COOPERATIVE PROGRAM

"ECA Compliance – Operational Equivalencies as an Effective Solution"

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CRUISE LINES INTERNATIONAL ASSOCIATION

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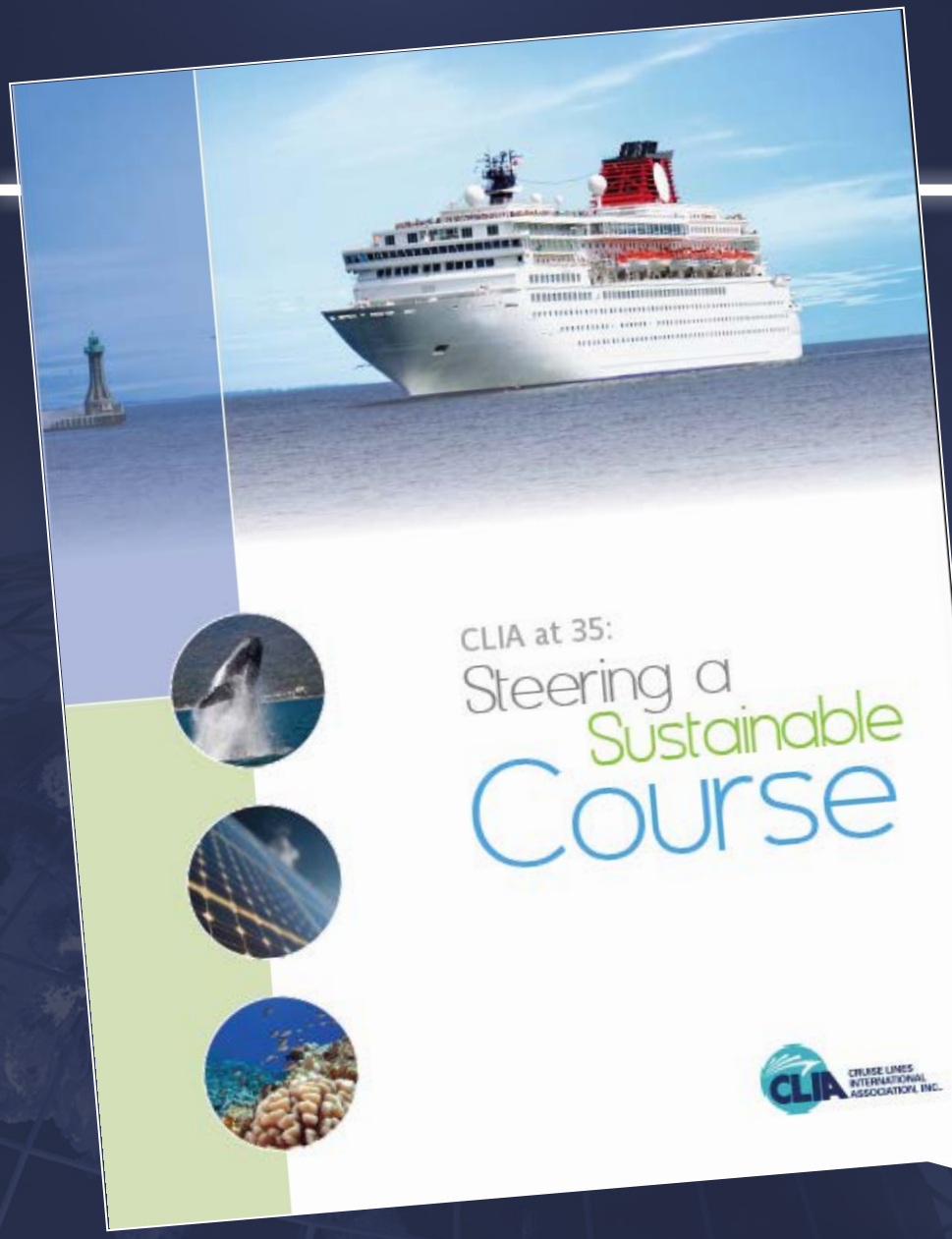
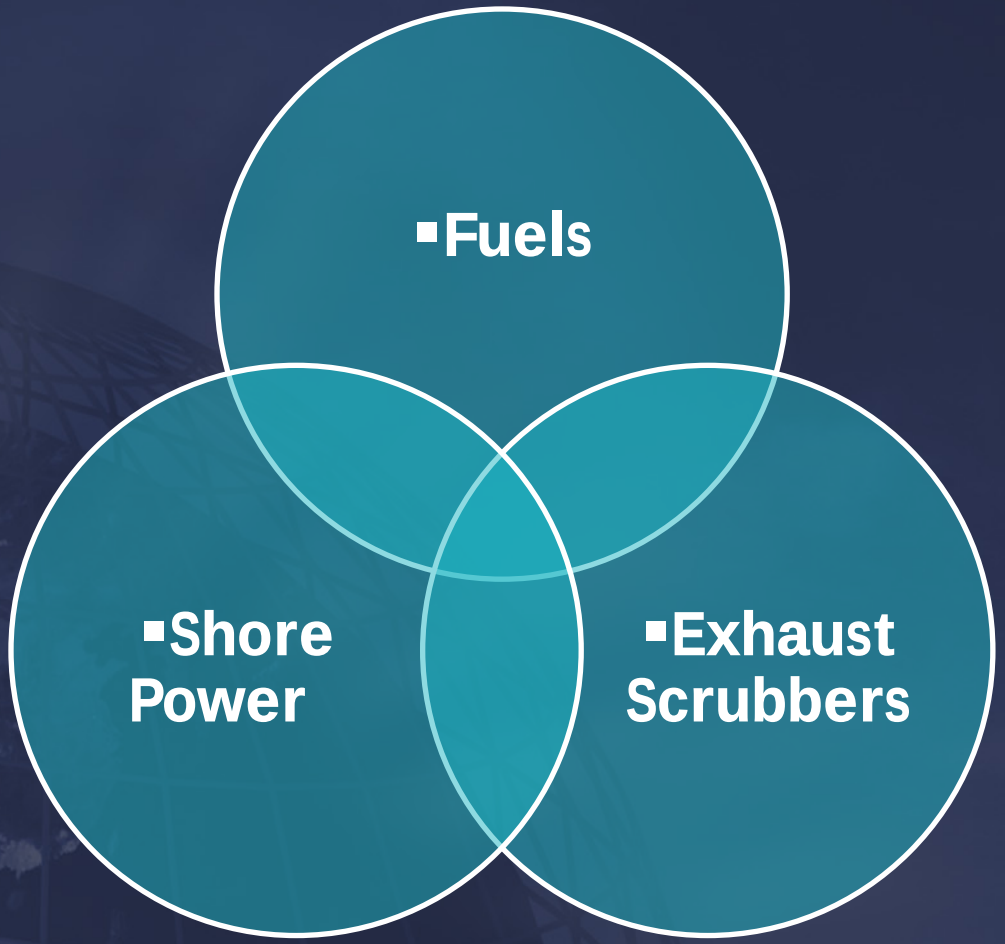


Available to download at www.CruiseIndustryFacts.com

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*."

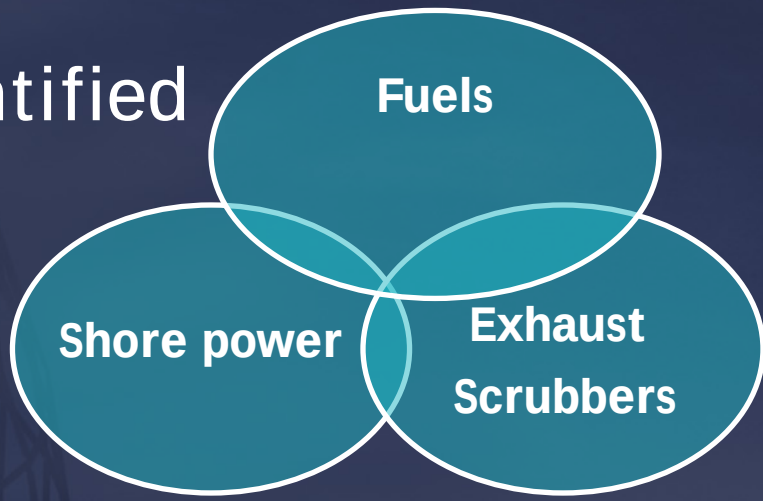
MARPOL ANNEX VI EQUIVALENCY PROCESS

- 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

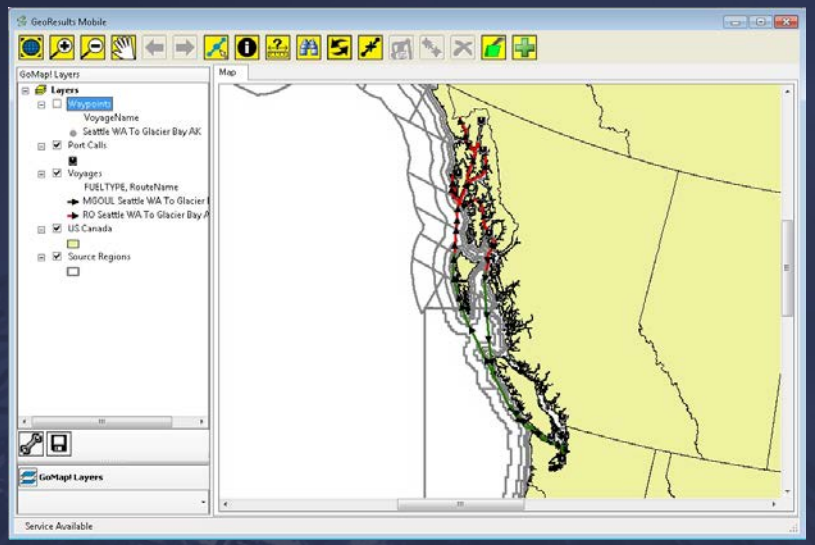
- **Average total emissions and emission impacts over vessels or fleets of vessels**

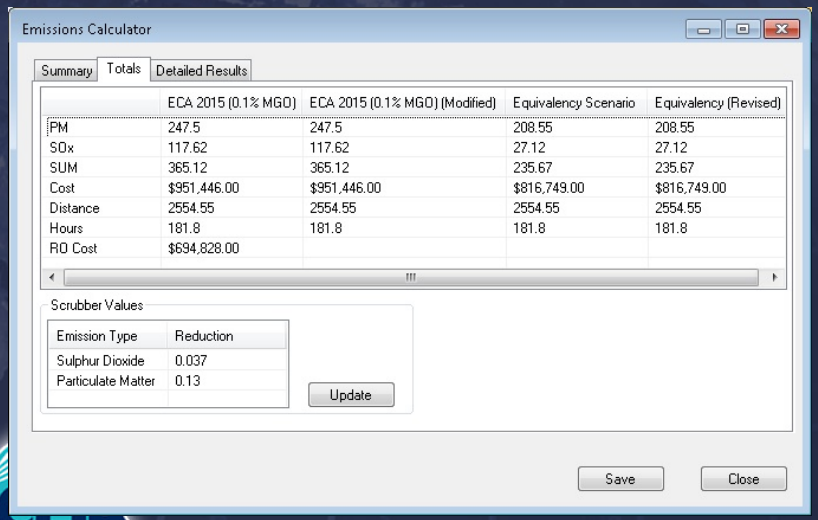
- **Emission calculations for each vessel**
  - By mode (berthing, maneuvering, transiting)
  - By vessel: total fuel consumed
  - Most cruise vessels use a diesel-electric design thus allowing emissions to be estimated directly from fuel consumption (no low load adjustment factors)

  – 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

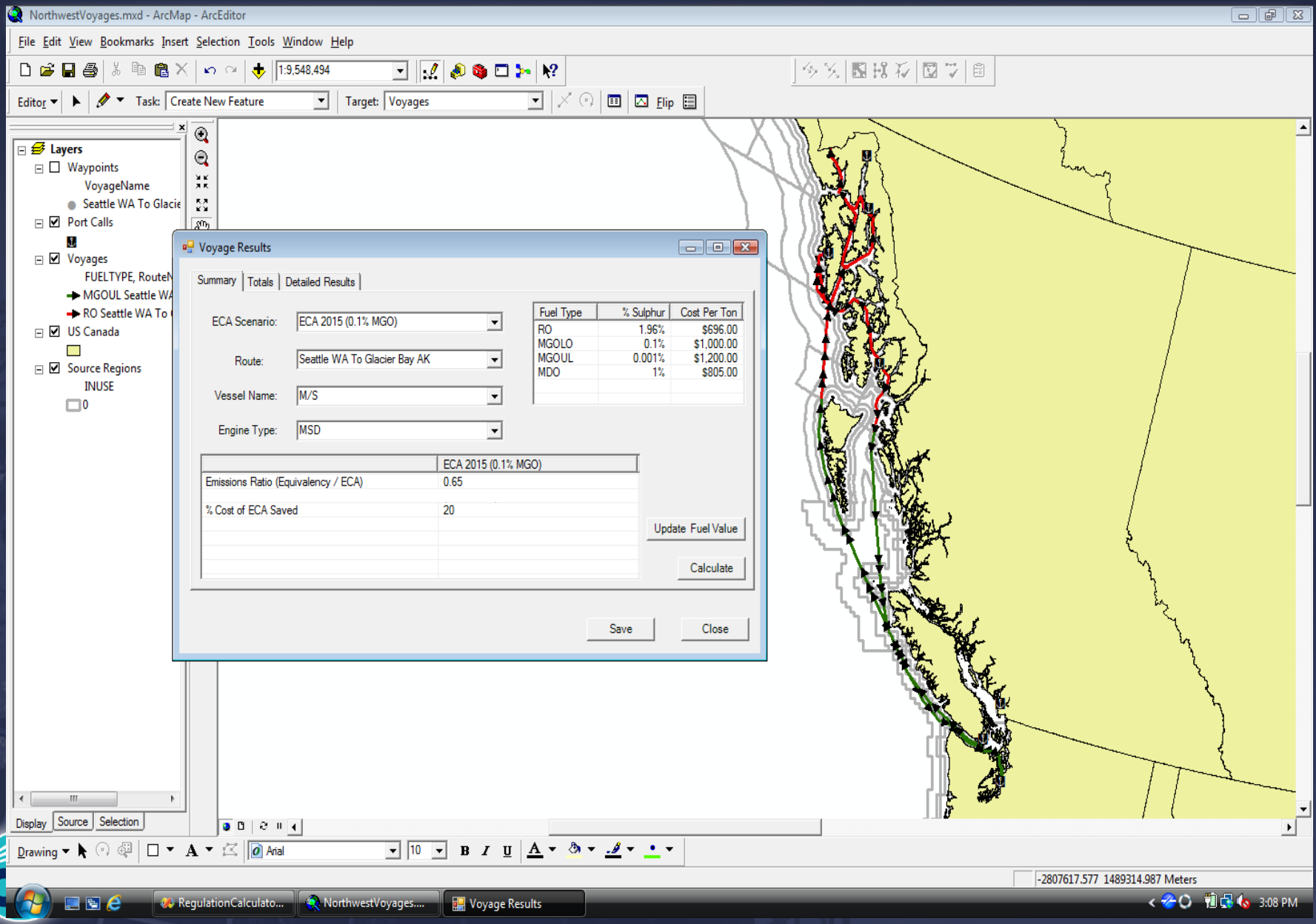
CLIA Emissions Calculator (CLEcalc)





- 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



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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