

U.S. Approaches to Address International Ships' GHGs

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Outline



- **U.N., Legislative, and Regulatory Overviews**
- **U.S. activity at IMO regarding GHGs**
 - Measures for new ships
 - Opportunities to improve existing ships



UNFCCC at Copenhagen: COP/15

- Marine bunkers was one of many areas where negotiators could not make progress
- General agreement that the international maritime discussion should take place in IMO
- Disagreement on what IMO should do and what principles it should use
 - UNFCCC's CBDR versus IMO's non-discrimination
- Despite significant pressure, no levy was adopted

U.S. Climate Legislation



- House Passed Waxman-Markey Bill
 - Economy Wide Cap---80% reduction 2050
 - Complementary efficiency measures
- Senate Climate Debate Stalled
 - Similar to House Bill
 - New Bi-Partisan measures under discussion

Recent EPA Actions on Climate



- Made Endangerment Finding
- Issued Mandatory Greenhouse Gas Reporting Rule
- Proposed National Vehicle Standards
- Proposed Requirements for Large Industrial Sources (“Tailoring Rule”)
- Engagement at IMO and ICAO

International Maritime Sector & Greenhouse Gas Emissions



- International shipping estimated to contribute 2.7% of anthropogenic CO₂ emissions in 2007
- Projections are for continued growth in emissions
- Sector emissions must be addressed to avoid >2 degree Celsius temperature increase
- Improving energy efficiency of the world's fleet will help
- Should growth projections be realized, efficiency improvements will not offset growth in GHGs

Changing Policy Paradigm



- New emphasis on regulatory strategies
 - IMO
- Market based measures effective as well
 - Growing number of partnerships and incentive schemes
 - New interest in carbon accounting mechanisms
 - IMO is engaged as well
- New business opportunities for carriers who:
 - Reduce costs through fuel savings
 - Reduce the client's carbon footprint
 - Quantify and disclose carbon emissions

Developing Solutions at IMO



- U.S. supports IMO work on efficiency standards for new ships
- A similar approach for existing vessels may have advantages (U.S. market-based measures proposal)
 - Leverages good work already completed at IMO
 - Could be implemented quickly under Annex VI
 - Not mutually exclusive of other measures
- A market-based instrument would provide critical impetus for energy efficiency improvements

EEDI Background (for new ships)



- EEDI is a “snapshot” of the ship efficiency at a design point
- Contains more than engine efficiency
 - Includes all systems working together
- Ship efficiency can and will change over time
 - Addition or deletion of installed equipment
 - Maintenance of engine, hull, propeller
 - Operation of equipment and ship

EEDI Overview



- The EEDI is a balanced approach
 - Simplicity vs Fidelity is important
 - Snapshot of one operating condition
 - Requires fine tuning on individual variables
 - Requires correlation to the baselines
- EEDI allows a common metric to measure new ship efficiency
- It does not account for how a ship may change over time or how operations factor into ship efficiency

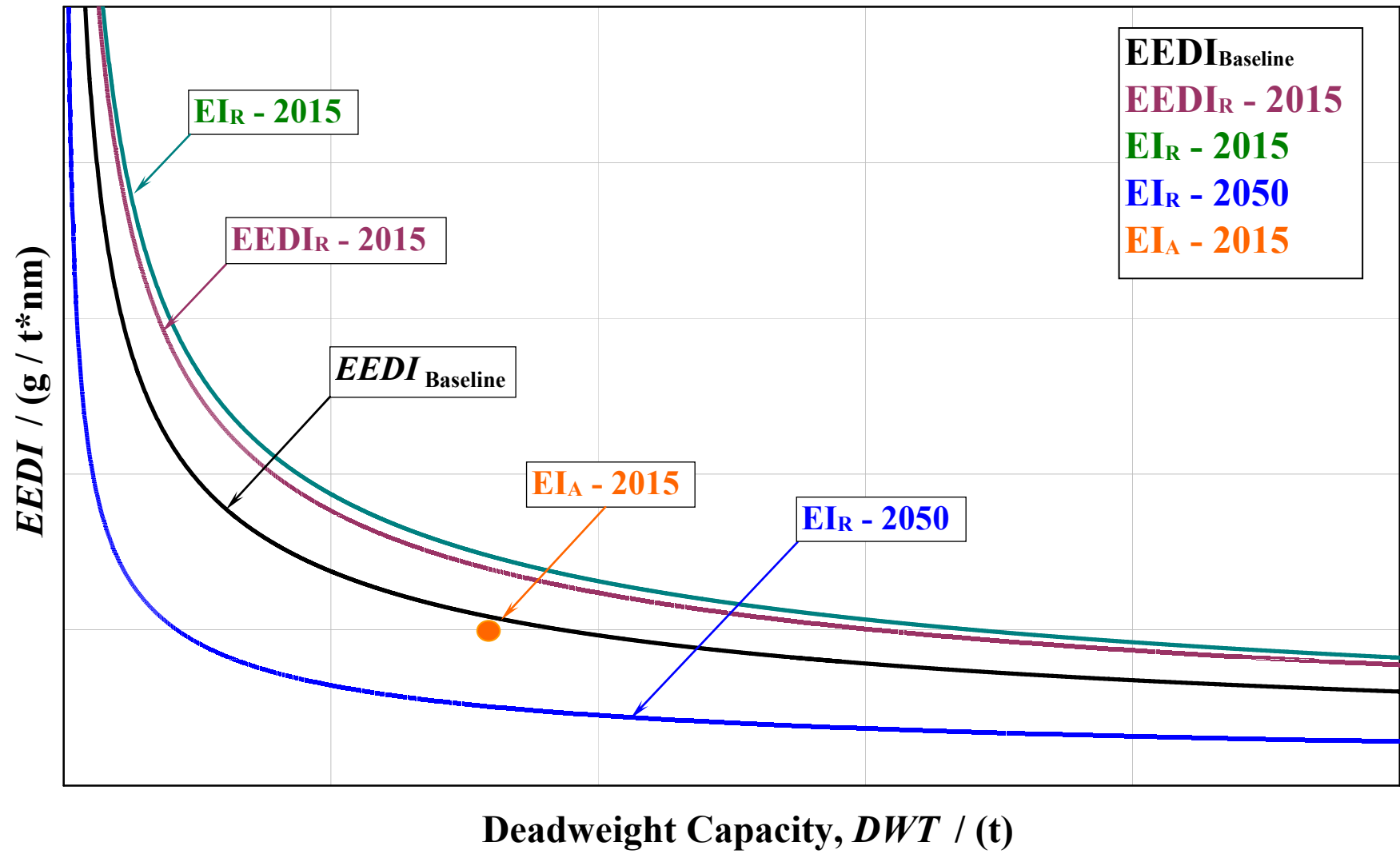
Overview of the US proposal to MEPC for a market-based measure that relies on efficiency requirements for existing ships

$$\overbrace{\text{Efficiency Credit (EC)}}^{\text{Credits generated (+/-) over a period}} = \left(\overbrace{\sum \text{Activity}_{\text{ship}}}^{\text{Indicator of total ship activity over a period}} \right) \times \left(\underbrace{\overbrace{EI_R}}_{\substack{\text{Efficiency Requirement} \\ \text{based on ship's baseline} \\ \text{Only regulated value} \\ \text{in U.S. approach}}} - \underbrace{\overbrace{EI_A}}_{\substack{\text{Attained Efficiency for} \\ \text{ship from testing} \\ \text{Periodically updated} \\ \text{by each ship to reflect} \\ \text{current efficiency}}} \right)$$

Efficiency Requirement - EI_R

- The efficiency standards would be based on the EEDI baselined but are *not* the baselines.
- The US proposes the concept of a +/-% change versus the EEDI baselines
- The % change would become more stringent over time to maintain incentives in the midst of continued improvements in feasible technology and operational methods.

Hypothetical Baseline, EEDI and EI



US proposal – Existing Ship Efficiency: Use the EEDI equation already developed

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

$$EI_A \approx \frac{P_{ME(i)} + P_{AE(i)}}{Capacity \times V_{ref}}$$

- EI_A can be reduced using same methods as $EEDI_A$
- Unique to EI_A
 - Higher usage of innovative technologies (feff)
 - “Operational” speed reduction (Increased power safety margin)

Alternative Calculation of Ship Efficiency (EI_A)

$$EI_A = \frac{\sum \text{Tonnes Fuel Used} * CO_2 \text{ Conversion factor}}{\sum \text{Activity (tonne} \cdot \text{mile)}}$$

- Does not use EEDI equation
- Considers ship operational history
 - Optimal route planning
 - Part time speed reductions
 - Optimal capacity
- Still needs work but should be considered



Measurement of $EEDI_A$ and EI_A

- EEDI requires formal sea trial
 - Uses predicted factors for efficiency
 - Waste heat or power saving devices (solar, sails)
- EI_A could be completed during at-sea voyages
 - Requires robust procedure
 - Historical performance instead of predicted factors (f_{eff})
 - Factors in ship maintenance
 - Calculates real time efficiency, useful for ship owners and operators
 - Periodic recalculation

Activity

- The new ship EEDI does not require activity
 - As it is only a requirement for entry into the fleet
- Because EI_R and EI_A are both rates, a ship's activity (in cargo tonne-miles) is needed in order to accurately calculate efficiency credits of an existing ship
- The difference between EI_R and EI_A determines if a ship generates or consumes EC's
 - This promotes preferential usage of efficient ships

Activity – Measurement Possibilities



We are considering three possibilities for determining a ship's activity:

1. A ship could report actual cargo tonne-miles based upon cargo logs and navigational logs

2. IMO could publish default average percent capacity values for various ship types and sizes
 - Then ships would only be required to report annual nautical miles traveled
 - This would simplify the reporting requirement

3. IMO could publish default cargo tonne-mile values for various ship types and sizes
 - This would further simplify the reporting requirements such that no activity data would have to be reported

Market-based aspects

- Efficiency credits would be traded exclusively within the maritime sector
- Flag states and port states would establish and enforce compliance
- Currently considering a number of implementation options for trading credits
- Looking for feedback on ideas in U.S. paper to MEPC/60

Conclusion

- Consider our market based proposal

$$\pm EC = (EI_R - EI_A) \times Activity_{ship}$$

- Major points
 - Improvement exclusively within the maritime sector is possible and desirable
 - EPA supports IMO efficiency standards for new ships (EEDI)
 - Similar approach for existing vessels may have considerable advantages (EI)
 - Develop required efficiency index standards for new and existing ships (EEDI_r & EI_r) from baselines
 - Include activity in Efficiency Credit calculation



Next steps for MEPC 60

- Work toward finalization of EEDI
- Consider a number of potential market based measures and work toward consensus on developing one or more for application to international ships



Thank you

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