Overview on actions to reduce shipping emissions

2012 U.S.-Taiwan Sustainability Symposium:
Creating Sustainable Cities and Promoting Sustainable Ports in the Asia Pacific Region

Nic Lutsey, Ph.D.

Kaohsiung, Taiwan

December 10-11, 2012

icct

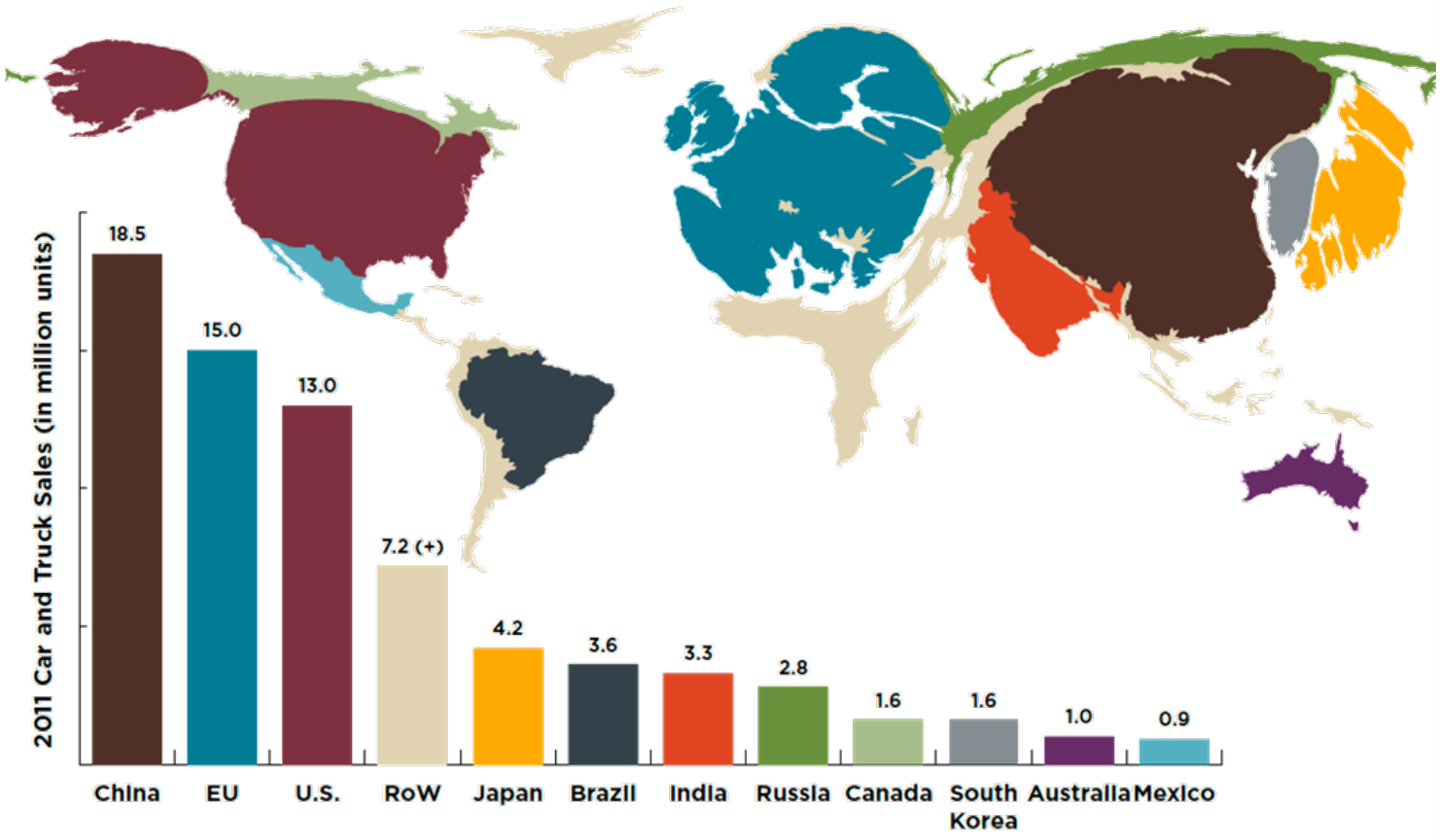
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Outline

- Background
- Examples of actions to reduce shipping emissions
- Conclusion

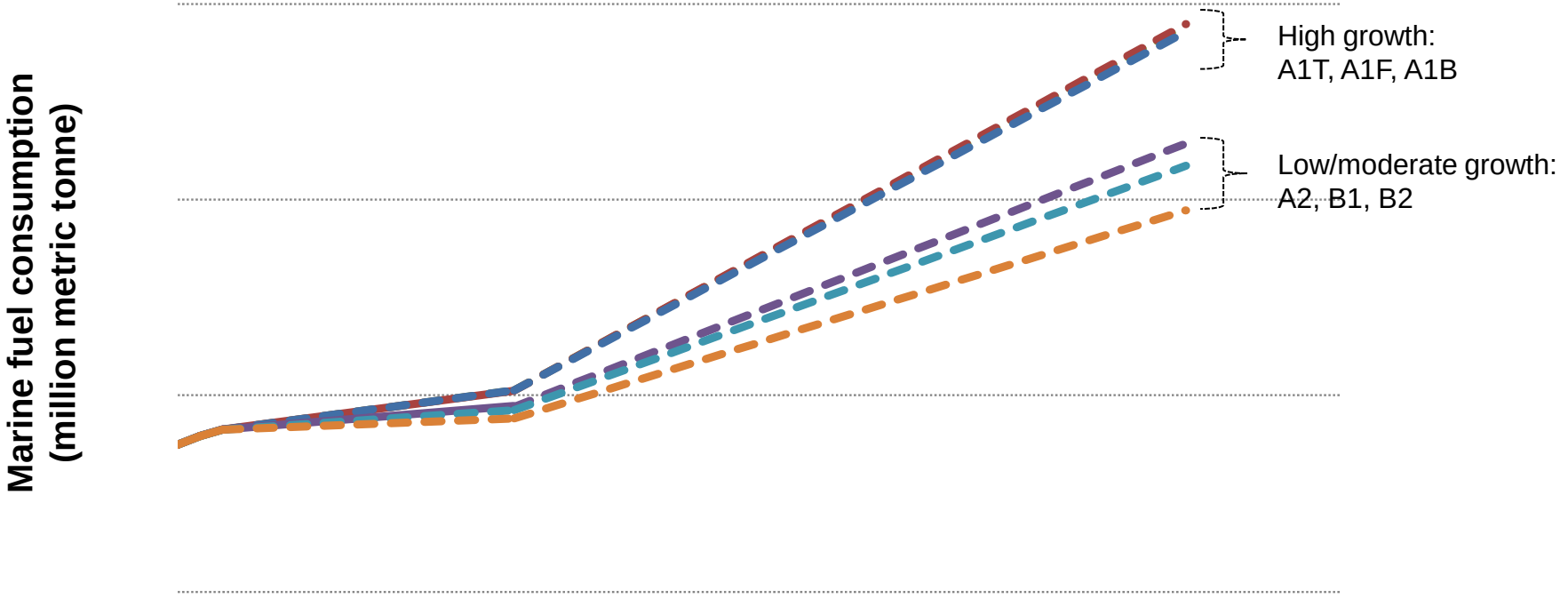
Background

- Most global vehicle markets now have emissions/efficiency standards
  - The marine sector becomes one of the foremost transport emission sources



Marine emissions: Future growth

- The marine sector represents about 11% of transport fuel use, CO_2
  - Marine sector fuel use/CO_2 to double-triple; percent contribution increases
  - Marine sector NO_x, SO_x, $PM_{2.5}$ emissions can be 10-40% of mobile source emissions



Sources: Buhaug et al (2009) Updated 2009 IMO GHG Report;
International Transport Forum (2010) Transport Greenhouse Gas Emissions: Country Data.
Hong Kong EPD, 2012. http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html,

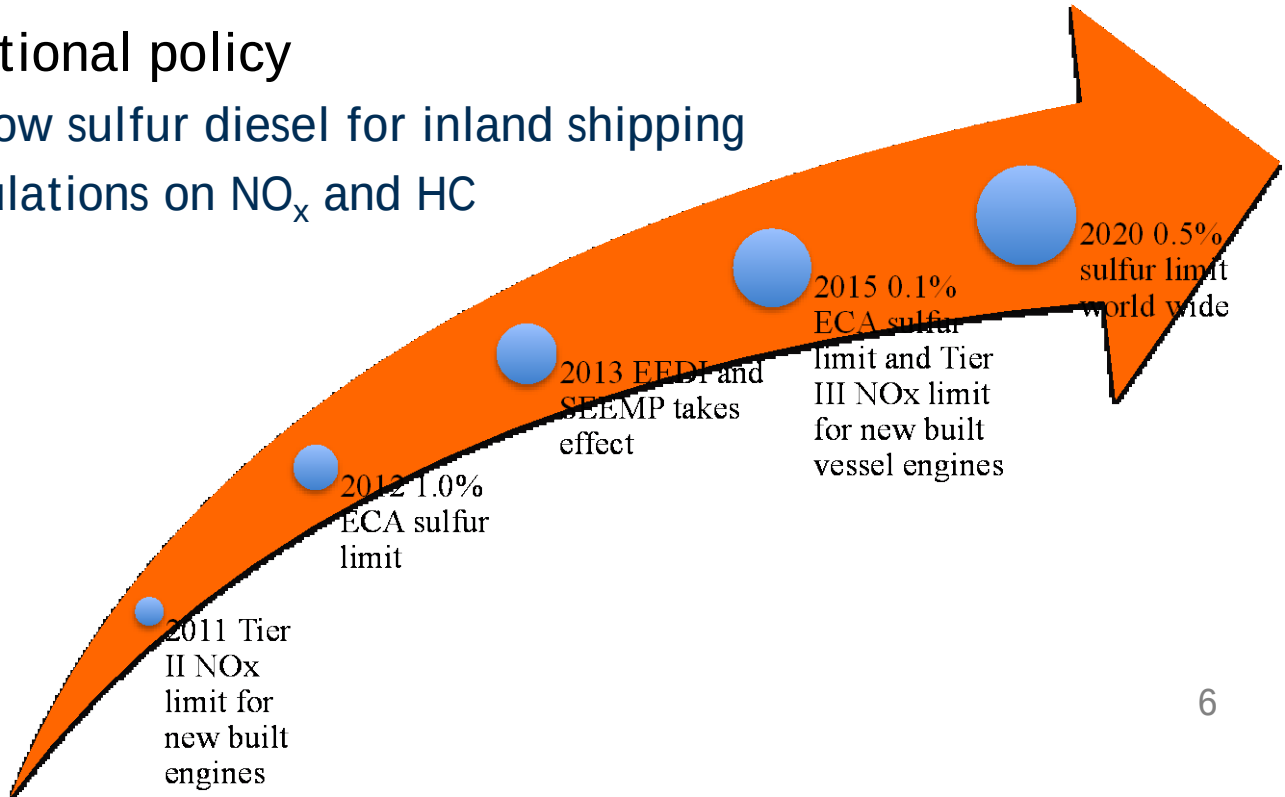
Cleaner ports, ships: Many approaches

- Different approaches make sense – are not mutually exclusive

	Voluntary	Regulatory
General relative advantages	Quicker action	Increased certainty (actions, emission reduction, timing)
	Local actions to suit local needs, complexity	More uniform approach for competitive global market
	Provide ground work, data, and experience for later policy	Larger emission reduction potential
Examples	EEDI efficiency before 2013	Vessel efficiency, CO_2 standards
	Fuel switching (e.g., Fair Wind Charter)	Low fuel sulfur requirements
	Port technology incentives (e.g., from “Incentive Tool”)	Tier I-III NO_x, SO_x, PM standards
	Operational port improvements (e.g., from “Air Quality Toolbox”)	

Policies for cleaner shipping

- MARPOL Annex VI
  - NO_x: Tier I-III standards
  - SO_x: Cleaner fuel
  - CO_2: Energy efficiency standards (EEDI, SEEMP)
- Regional and national policy
  - EU and U.S: Low sulfur diesel for inland shipping
  - Stringent regulations on NO_x and HC



Emission Control Areas (ECAs)

- ECAs offer dramatic SO_x, NO_x, PM emission benefits from ships
  - Many marine-intensive, heavily polluted areas are yet to have ECA regulations

Graphic: http://www.amnautical.com/blogs/news/5833134-north-american-eca-will-change-shipping-forever

Marine pollution control: Benefits

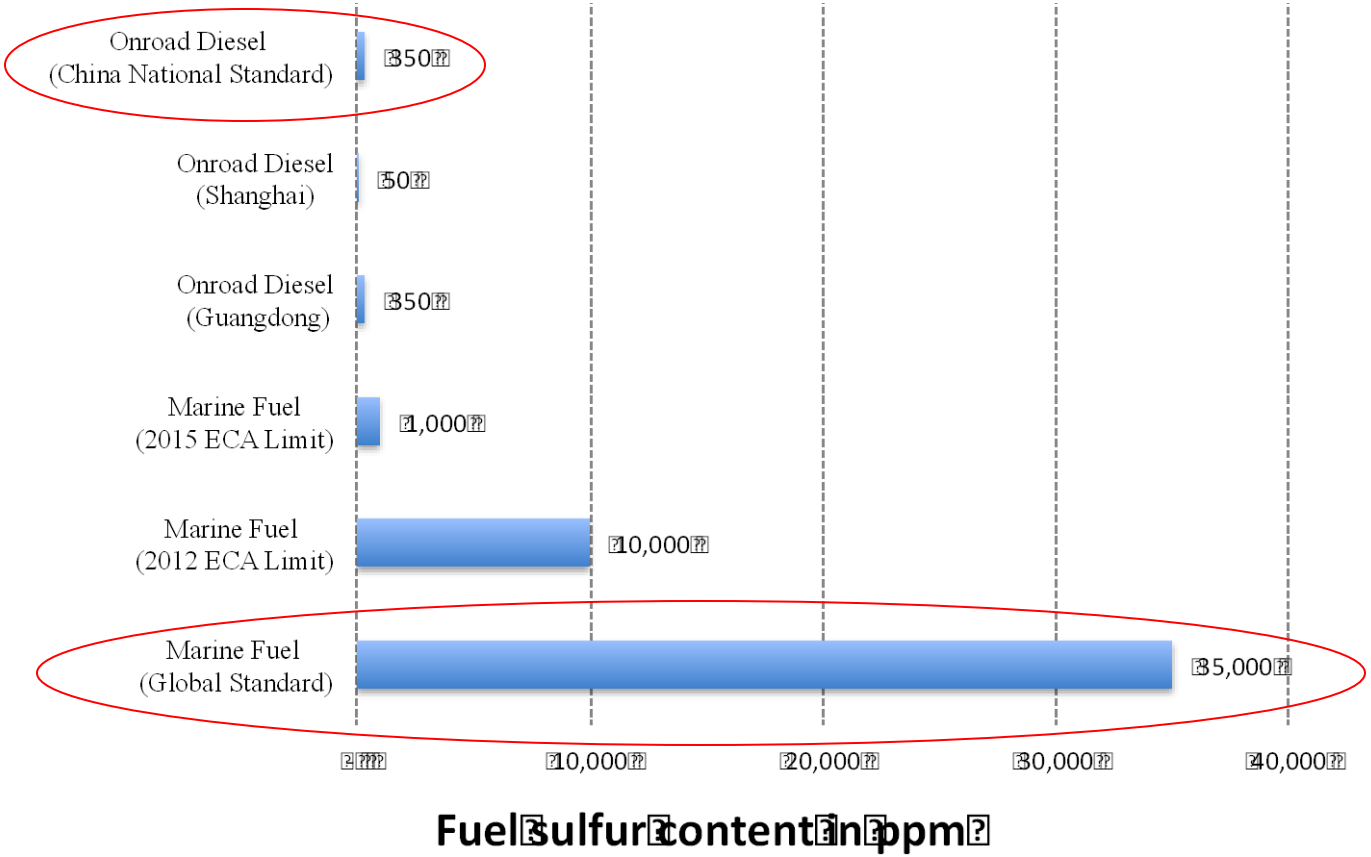
- North America's Emission Control Area ("ECA") benefits are enormous
  - NO_x, SO_x, $PM_{2.5}$ benefits from ship/port emission reductions in the US shown below
  - Annual health benefits from ECA are larger than all other recent US regulations

	Light Duty "Tier 2"	Heavy Duty 2007-2010+	Nonroad Diesel Tier 4	Locomotive & Marine Diesel	Marine ECA	Totals
NOx (short tons)	2,800,000	2,600,000	738,000	795,000	**1,200,000**	8,133,000
PM2.5 (short tons)	36,000	109,000	129,000	27,000	**143,000**	444,000
VOC (short tons)	401,000	115,000	34,000	43,000	**0**	593,000
SOx (short tons)	281,000	142,000	376,000	0	**1,300,000**	2,099,000
Total Cost (billion)	$5.3	$4.2	$1.7	$0.7	**$3.1**	$15
Total Monetized Benefits (billion)	$25	$70	$80	$11	**$110**	$296
Avoided Premature Mortality	4,300	8,300	12,000	1,400	**13,000**	39,000
Avoided Hospital Admissions	3,000	7,100	8,900	870	**12,400**	32,270
Avoided Lost Work Days	700,000	1,500,000	1,000,000	120,000	**1,400,000**	4,720,000

Source: US EPA

Marine fuels: Relatively uncontrolled

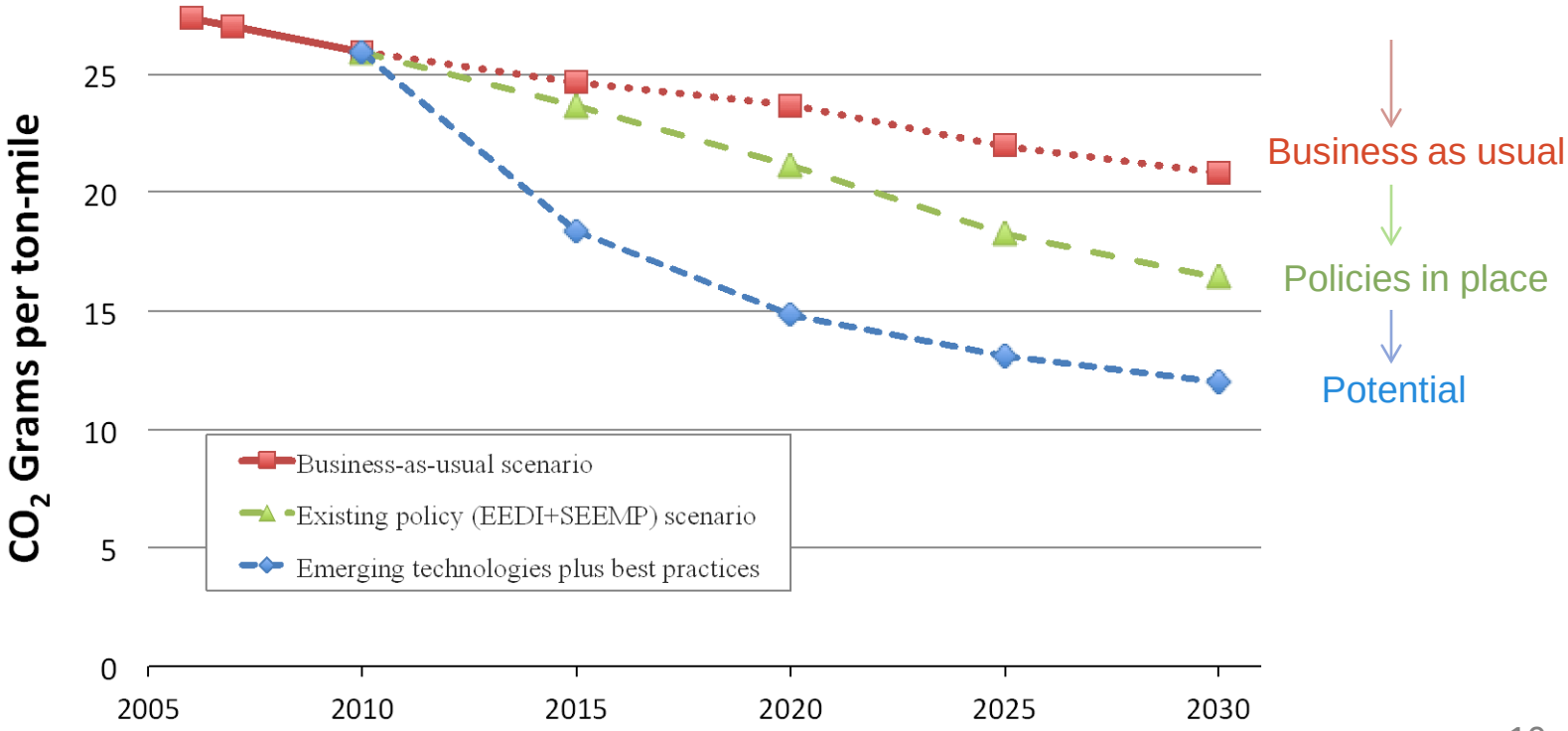
- Low sulfur fuels directly reduce emissions *and* enable lower-emission technology on ships and at-port vehicles, equipment
  - 50-90% of NO_x; >90% of SO_x; 75-90% of PM from ports is from ocean-going vessels



Ho, B.Q, Yosthana, S., Taylor, C., 2012. Emission Inventory Approaches and Application for ASEAN Ports.

Marine emissions: Technical potential

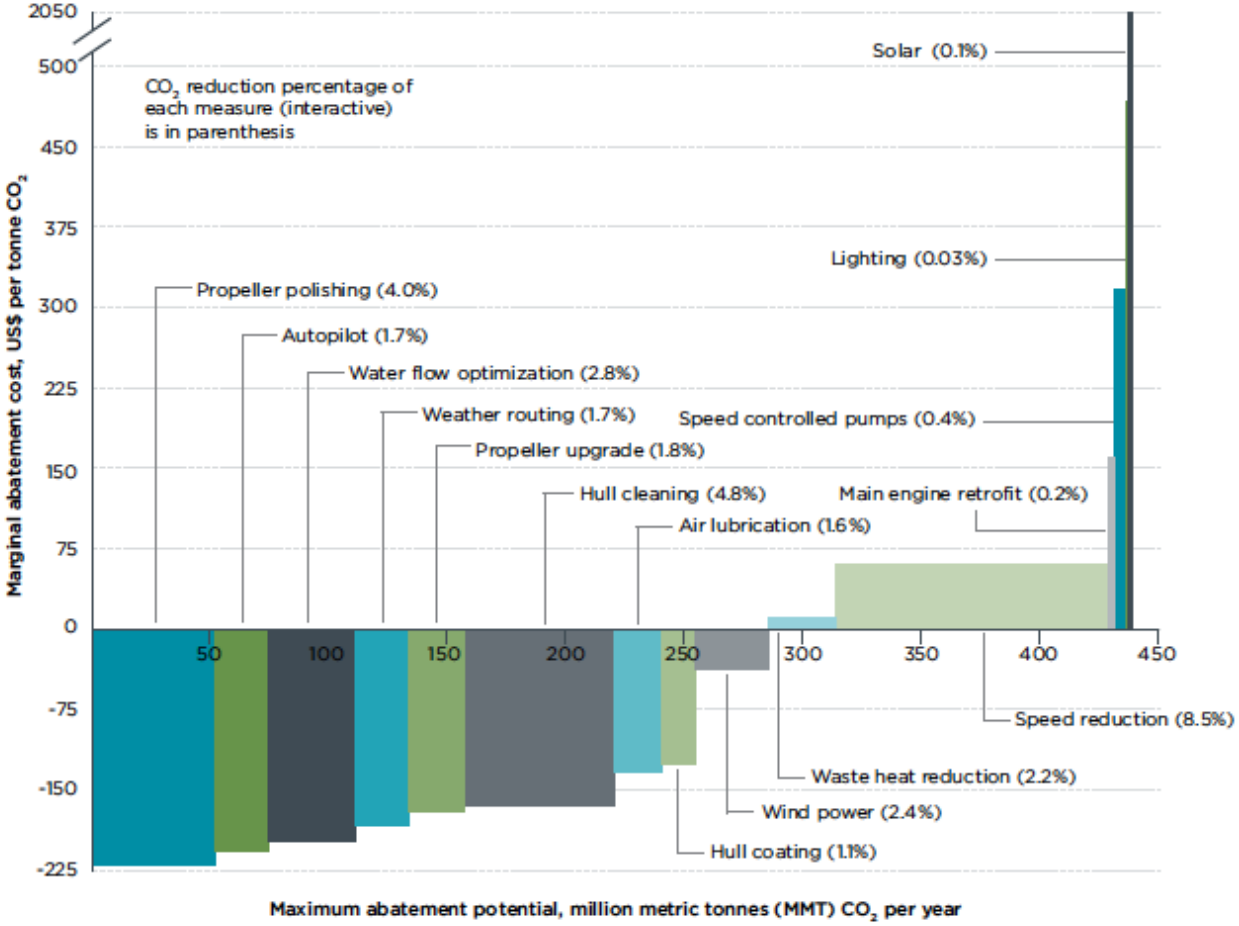
- Known efficiency and in-use operation strategies can reduce shipping CO_2 emission rates by over one-third by the year 2030
  - Aggressive slow-steaming, LNG penetration, black carbon controls would go further



Based on Russell, B, St Amand, D. et al, 2011. "Marginal Abatement Costs and Cost Effectiveness of Energy-Efficiency Measures". http://www.imarest.org/Portals/0/IMarEST/Community/IMO/MEPC62%20INF%207%20Report.pdf
Faber et al, 2012. "Regulated Slow Steaming in Maritime Transport An Assessment of Options, Costs and Benefits

Marine emissions: Technical potential

- Many opportunities to reduce fuel cost, CO_2
  - Many *with net benefits* (fuel savings > costs)



ICCT (2010) "Reducing Greenhouse Gas Emissions from Ships" www.theicct.org/reducing-ghg-emissions-ships

Conclusions

- Shipping and port activities' emission impacts can be reduced with best practices in deployment of available technology, operational strategies, and improved port management practices.
- Data collection and analysis of potential scenarios can offer powerful tools to prioritize port-level decision-making
- Many actions can bring forth major emission reductions at ports
  - International, national, regional, and local policies
  - Voluntary local actions and incentives can be tailored to local needs
  - Collaboration between and within governments, and with industry are crucial

Thank You

www.theicct.org/marine

THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION