MSTRS
May 4, 2010

Lee Kindberg
Director, Environment

Ocean-going Vessel Standards – The Carrier's Perspective

MAERSK LINE

The A.P. Moller–Maersk Group

A.P. Moller-Maersk Group
HQ: Copenhagen, Denmark

- **2009 Revenue: USD $48.5 b**
  in Shipping, Energy, Retail
  and Banking.
- 115,000 employees, 130 countries.

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A.P. Moller-Maersk transportation businesses in North America

- Maersk Line Limited – US-flagged vessels
- Maersk Line North America – Sales, operations & inland transportation contracting (rail & trucking)
- APM Terminals Americas – Marine terminals
- Maersk Equipment Services – Equipment and maintenance
- Direct ChassisLink – NEW Neutral chassis leasing business
- Bridge Terminal Transport – Truck
- Maersk Distribution Services Inc. –
- Gilbert -- Warehousing & logistics
- Damco – Third-party logistics

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Maersk Line – the container shipping arm

- Operations
  - Operates more than 470 vessels
  - Moves approx 1.8 million containers
- 90% of all goods transported globally is done by ship
- Maersk Line represents approx. 4% of worldwide shipping activities
- 16% of the container segment
- Consumes over 10 M tonnes of heavy fuel oil annually

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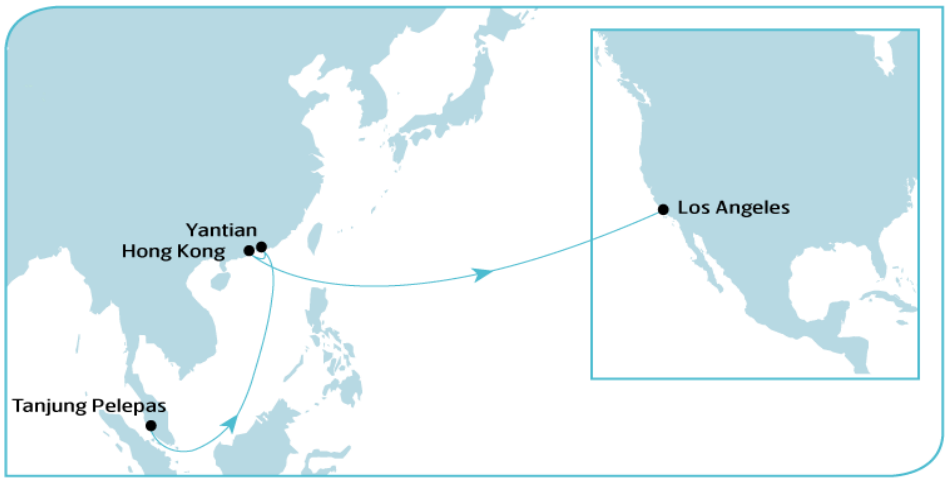
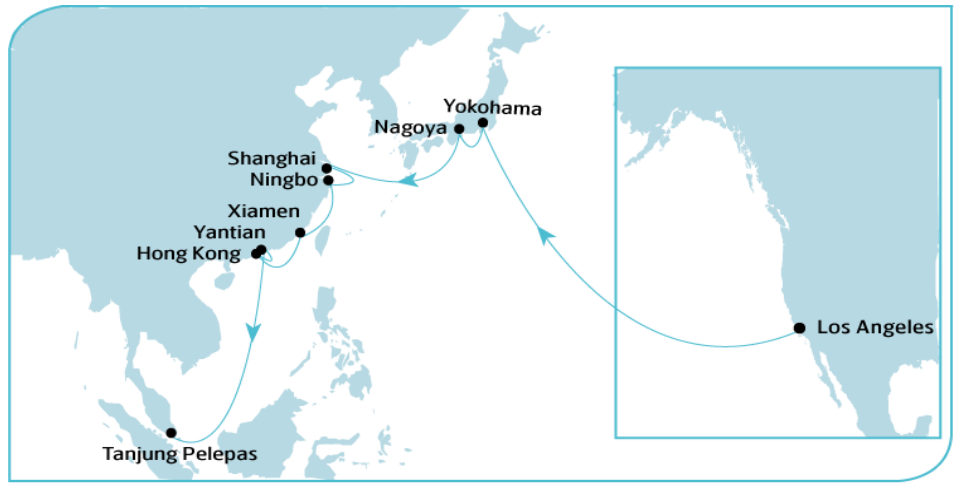
Multiple vessels are scheduled on each route to provide regular (weekly) service.



Transpacific 6 (TP6) – Eastbound

PORT	ARRIVES	DEPARTS	TRANSIT
Tanjung Pelepas, Malaysia	MON 1900	WED 0300	--
Yantian, Mainland China	FRI 2100	SAT 2200	2
Hong Kong, Mainland China	SUN 0400	MON 0400	4
Los Angeles, CA, USA	FRI 1800	TUE 0200	16

Note: Weekly Service



Transpacific 6 (TP6) – Westbound

PORT	ARRIVES	DEPARTS	TRANSIT
Los Angeles, CA, USA	FRI 1800	MON 1700	--
Yokohama, Japan	THU 0100	THU 1600	17
Nagoya, Japan	FRI 0800	FRI 1800	18
Shanghai (YS), Mainland China	SUN 1700	MON 0700	20
Ningbo, Mainland China	MON 1900	TUE 0600	21
Xiamen, Mainland China	WED 1300	THU 0001	23
Hong Kong, Mainland China	THU 2000	FRI 0700	24
Yantian, Mainland China	FRI 1200	SAT 0200	25
Tanjung Pelepas, Malaysia	MON 2100	WED 0400	28

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Vessel schedule:
Georg Maersk on TP-6

Port Name	Arrival Date		Departure Date	
Hong Kong	18 Apr 2010	04:00	19 Apr 2010	04:00
Los Angeles	30 Apr 2010	18:00	03May 2010	17:00
Yokohama	20 May 2010	01:00	20 May 2010	16:00
Nagoya	21 May 2010	08:00	21May 2010	18:00
Shanghai	23 May 2010	17:00	24 May 2010	07:00
Ningbo	24 May 2010	19:00	25 May 2010	06:00
Xiamen	26 May 2010	13:00	27 May 2010	00:01
Hong Kong	27 May 2010	18:00	28 May 2010	11:00
Yantian	28 May 2010	17:00	29 May 2010	07:00
Tanjung Pelepas	01 Jun 2010	09:00	02 Jun 2010	16:00
Jeddah	11 Jun 2010	23:00	12 Jun 2010	23:00
Suez Canal	15 Jun 2010	01:00	15 Jun 2010	17:00
Barcelona	19 Jun 2010	08:00	20 Jun 2010	08:00
Valencia	21 Jun 2010	02:00	22 Jun 2010	08:00
Algeciras	23 Jun 2010	08:00	24 Jun 2010	14:00
Port Tangier Mediterranee	25 Jun 2010	00:01	26 Jun 2010	02:00
Suez Canal	01 Jul 2010	19:00	02 Jul 2010	17:00
Tanjung Pelepas	17 Jul 2010	02:30	18 Jul 2010	10:30
Vung Tau	20 Jul 2010	08:00	21 Jul 2010	08:00
Yantian	23 Jul 2010	15:00	24 Jul 2010	22:00
Hong Kong	25 Jul 2010	04:00	26 Jul 2010	04:00
Los Angeles	08 Aug 2010	18:00	12 Aug 2010	03:00

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Maersk Alabama

- US flagged ship
- Operates near Africa delivering US food aid.

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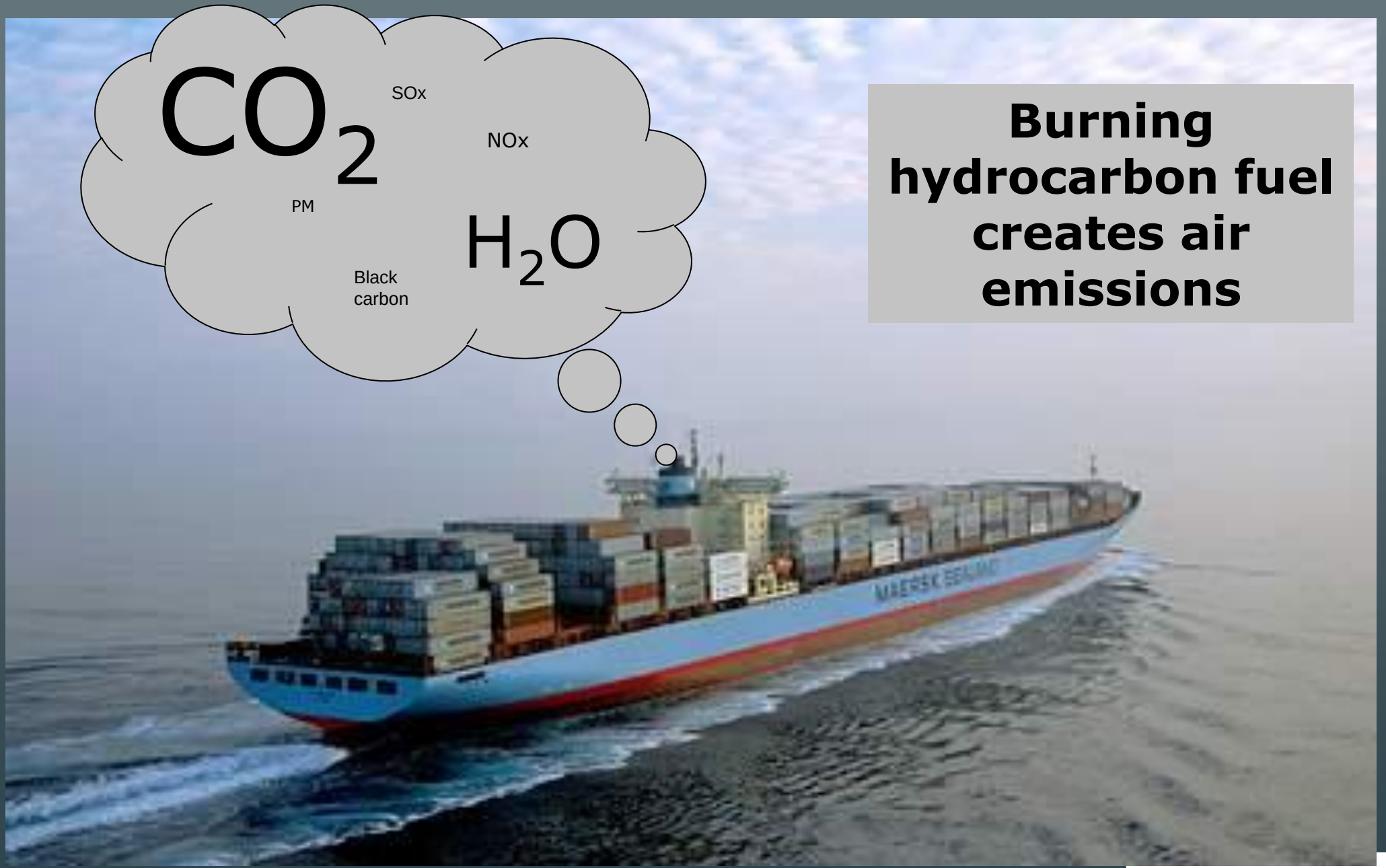

Burning hydrocarbon fuel creates air emissions

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Transportation does have a significant impact on the environment, but

We are actually doing something about it.

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Fuel switching provides immediate air quality improvement.

Vessels change fuels:

From Bunker avg. 2.7% sulfur

To Distillate avg. 0.12% sulfur

Emissions reduction:

SOx: 95%

PM: 86%

NOx: 6 to 12%

Locations:

California – from 24nm

(1.5/0.5% required since 7/2009)

WA & BC – at dock

Houston – demo 11/09, DERA grant

Mærsk Mc-Kinney Møller stands on the dock at Pier 400 in Los Angeles with the Sine Maersk at berth behind him. The vessel was the first to perform a fuel switch as part of a Maersk Line pilot environmental initiative in California.

-- March 21, 2006

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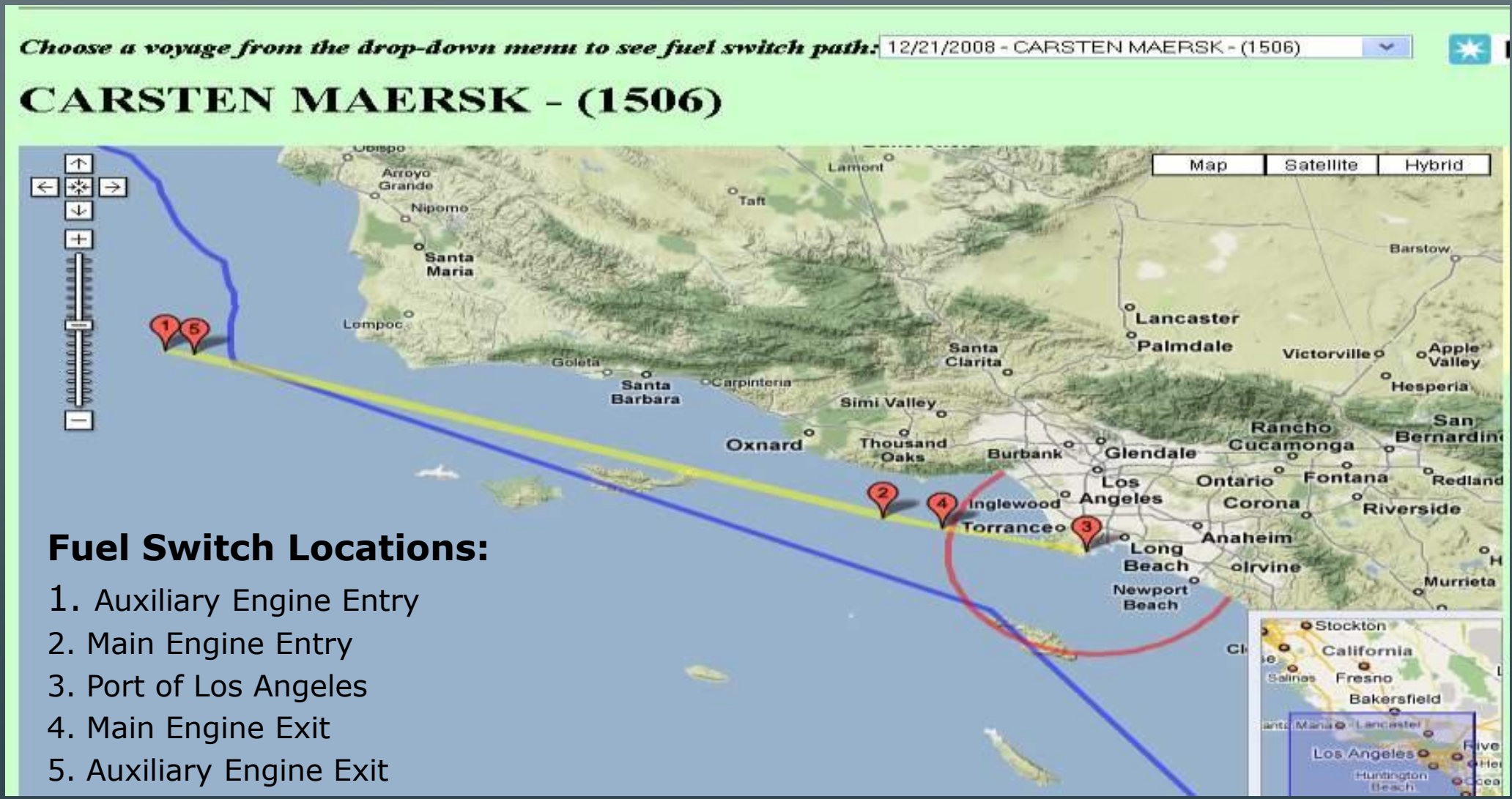
Typical Fuel Switch Map



Fuel Switch Locations:

1. Auxiliary Engine Entry
2. Main Engine Entry
3. Port of Los Angeles
4. Main Engine Exit
5. Auxiliary Engine Exit

Data by ENVIRON

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Fuel switch costs and implementation

- Little or no capital investment required – vessel or port
- Mobile solution – travels with the vessel
- Rapid implementation (weeks vs. years)
- Does not shift emissions to other power sources or locations
- Minimal personnel safety or training issue

BUT:

- Fuel cost differential is substantial
- Cost of Program to Maersk to date is over USD 20 million
- Some care needed in switching

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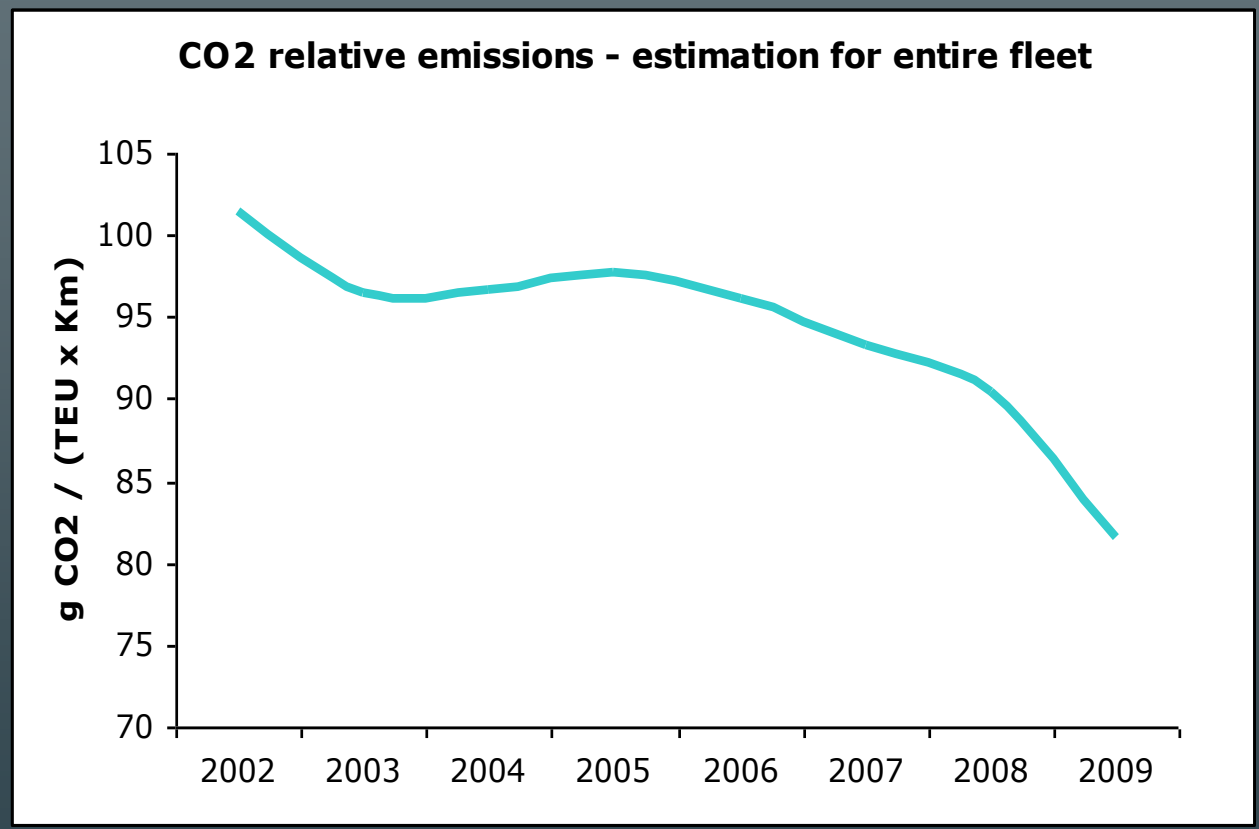
Vessels are becoming more energy efficient, so are reducing emissions

Due to

- Technologies
- Operations
- Speeds
- Vessel size



- Reduced over two million tonnes CO_2 plus other emissions
- Reduction target for 2017 is 20% below 2007 levels

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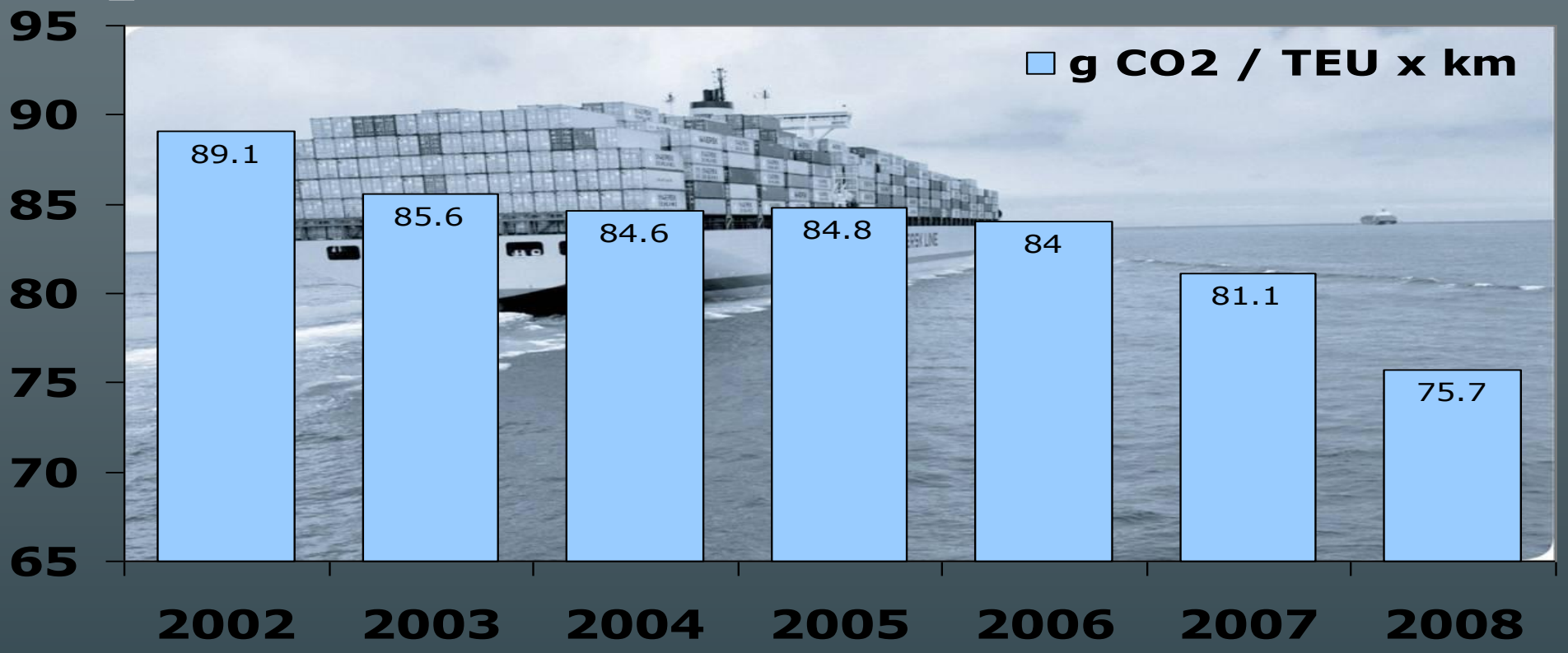
Maersk-owned container vessels – CO_2 emissions



- 15% decrease in fuel consumption and CO_2 emissions (per TEU x km)
- Reduced over two million tonnes CO_2
- Reduction target for 2007 – 2017 is 20%

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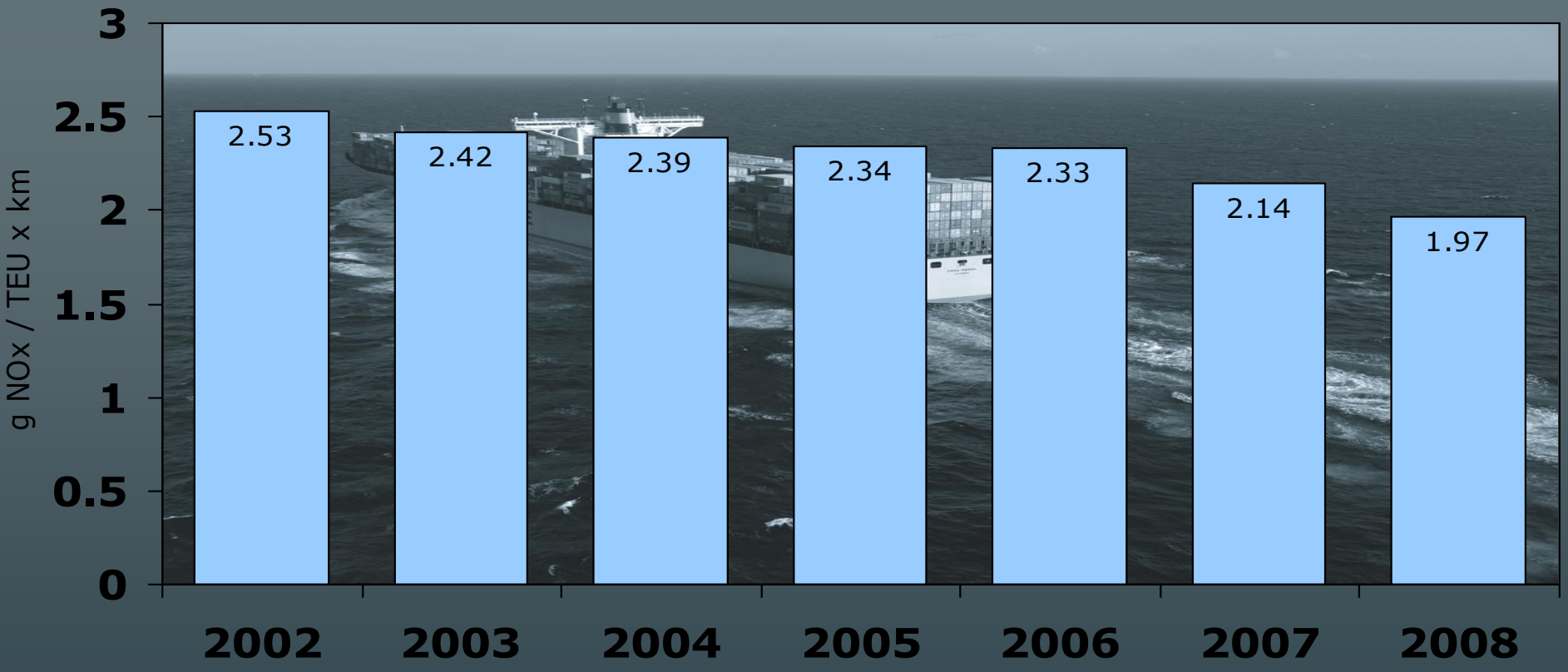
Maersk Container Vessels -- NOx Emissions



- Decrease in NOx largely due to reduced fuel consumption
- Large and increasing number of vessels built after 2000, so NOx certified

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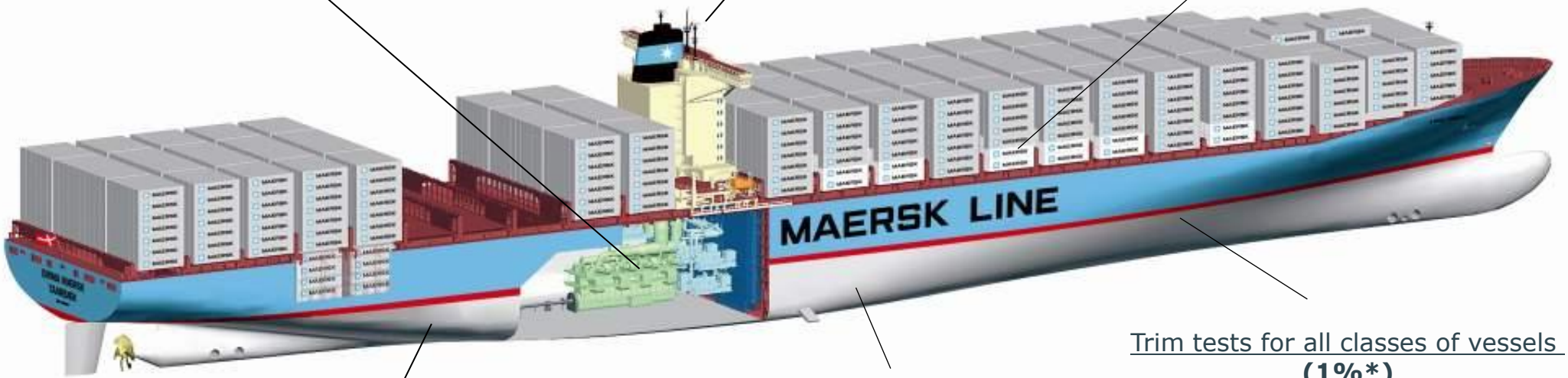
Technical innovation is essential for sustainability

Voyage Efficient System (VES) **(1%*)**

Waste Heat Recovery System **(10%*)**
Electronically controlled engine **(0,5%*)**
Adjusting main engines **(1%*)**

QUEST: Low energy reefer containers **(0,5%*)**



Trim tests for all classes of vessels **(1%*)**

Ballast water optimisation

Antifouling paint and maintenance of hull and propeller **(1.5%*)**

*CO_2 emission saving potential

Source: Maersk Line Sustainability Department

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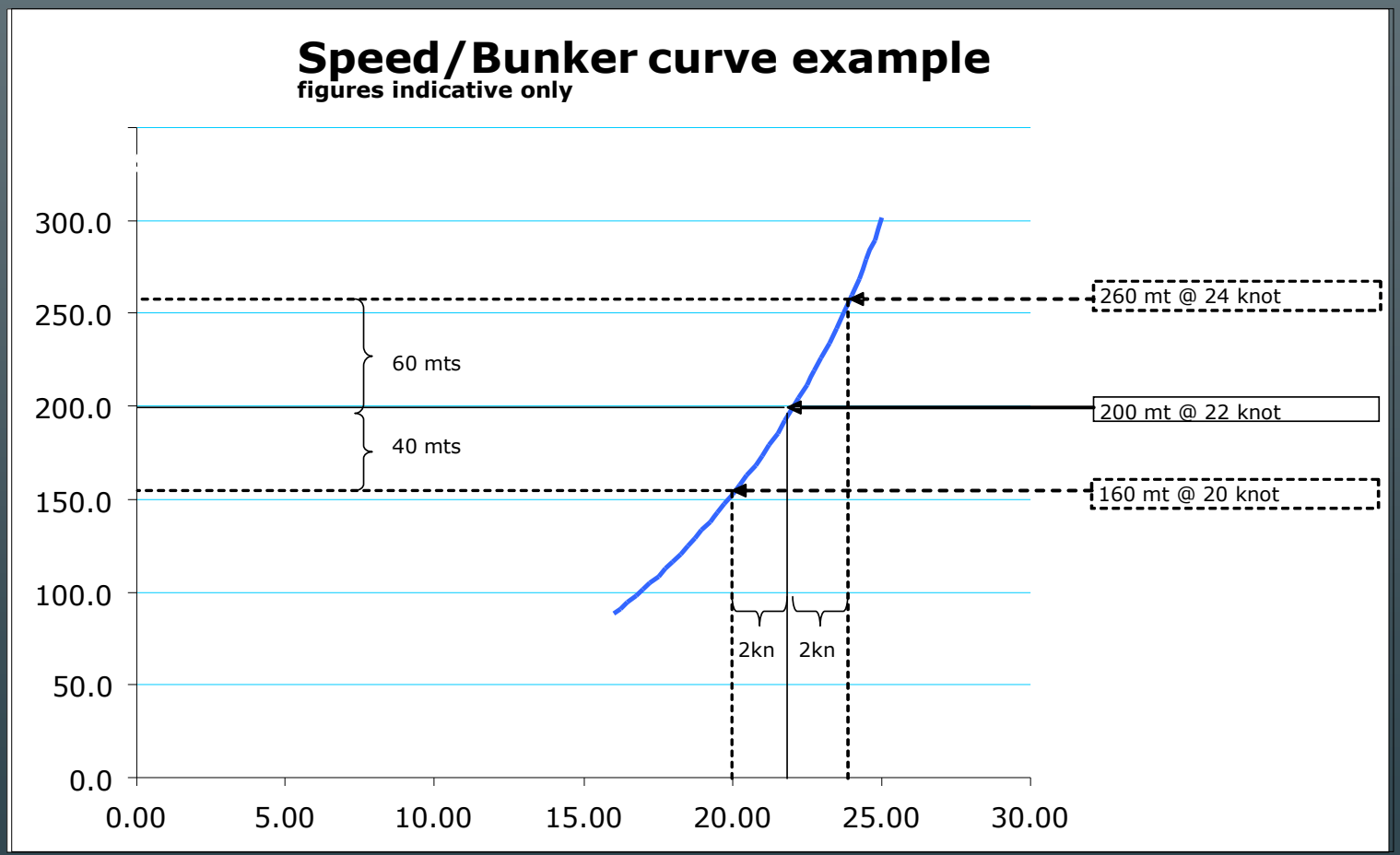
Fuel use and costs increase exponentially at higher speeds



- The speed/ fuel use curve is exponential.
- Speeding up will cost more fuel than what we save by slowing down
- Lowest constant speed is best

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Designing schedules to reduce consumption

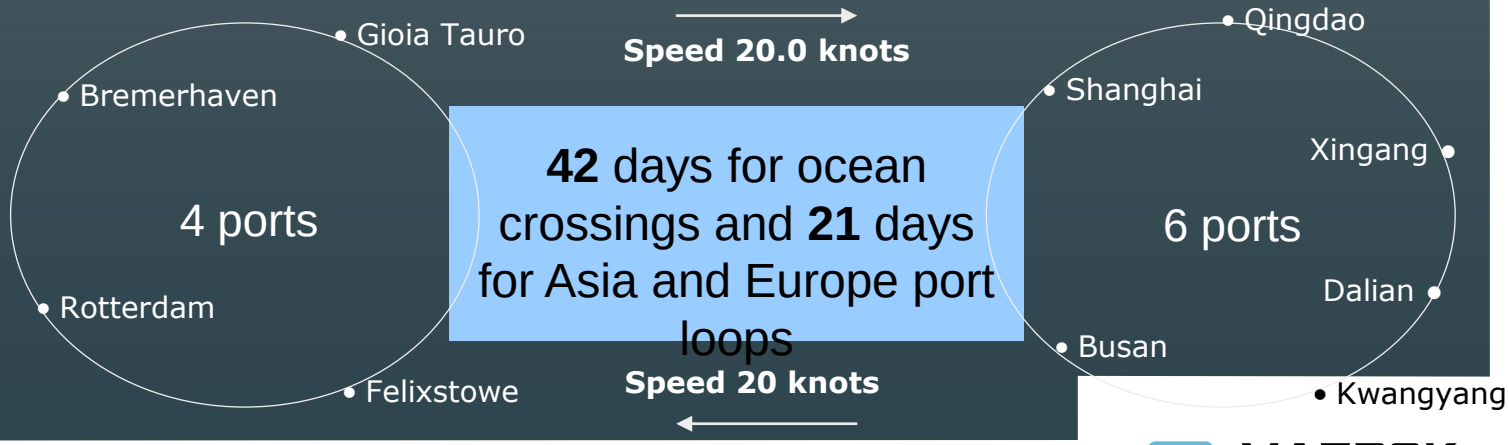
8 x 6,000 TEU vessel
Weekly capacity: 6000 TEU

- To create a weekly schedule:
- **8** vessels means a full rotation time of **56** days

Asia-Europe example

9 x 6,000 TEU vessels
Weekly capacity: 6000 TEU

- To create a weekly schedule:
- **9** vessels means a full rotation time of **63** days



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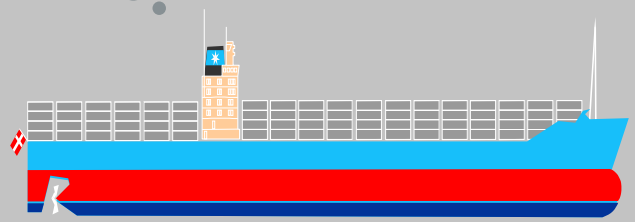
Minor change – great impact

- **Before sailing at economical speed:**
- **12 vessels**
- **Fuel consumption: 12,000 MT**

37,000 MT CO_2

20.5 Knots

- **12 ×**



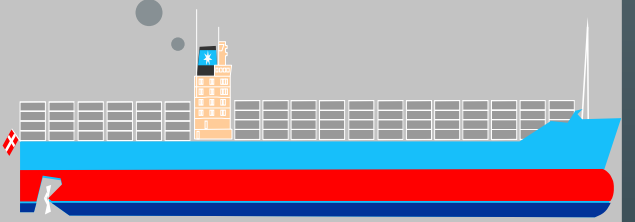
Barcelona ⇄ Hong Kong ⇄ Long Beach (CA)

- **With economical speed**
- **13 vessels**
- **Fuel consumption: 10,000 MT**

31,000 MT CO_2

19 Knots

- **13 ×**



Barcelona ⇄ Hong Kong ⇄ Long Beach (CA)

- 16% Savings on fuel reduces costs, criteria pollutant emissions and CO_2

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Super Slow Speed Steaming

Optimal Speed

Optimal Load

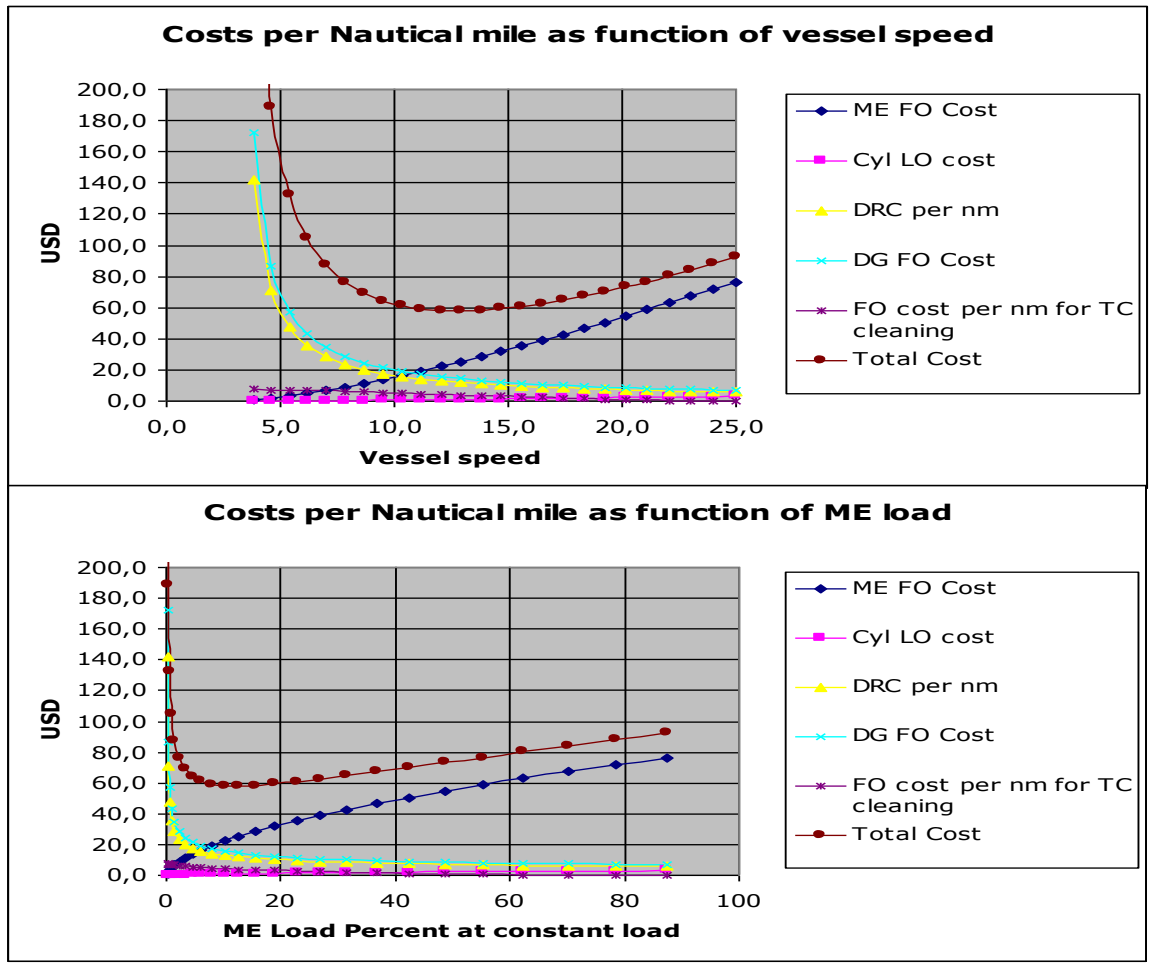

Figure 1; Cost per Nautical mile
Vessel: 3030TEU, ME: 7RTA96C, 200 Reefers; FO Cost 300$/mt

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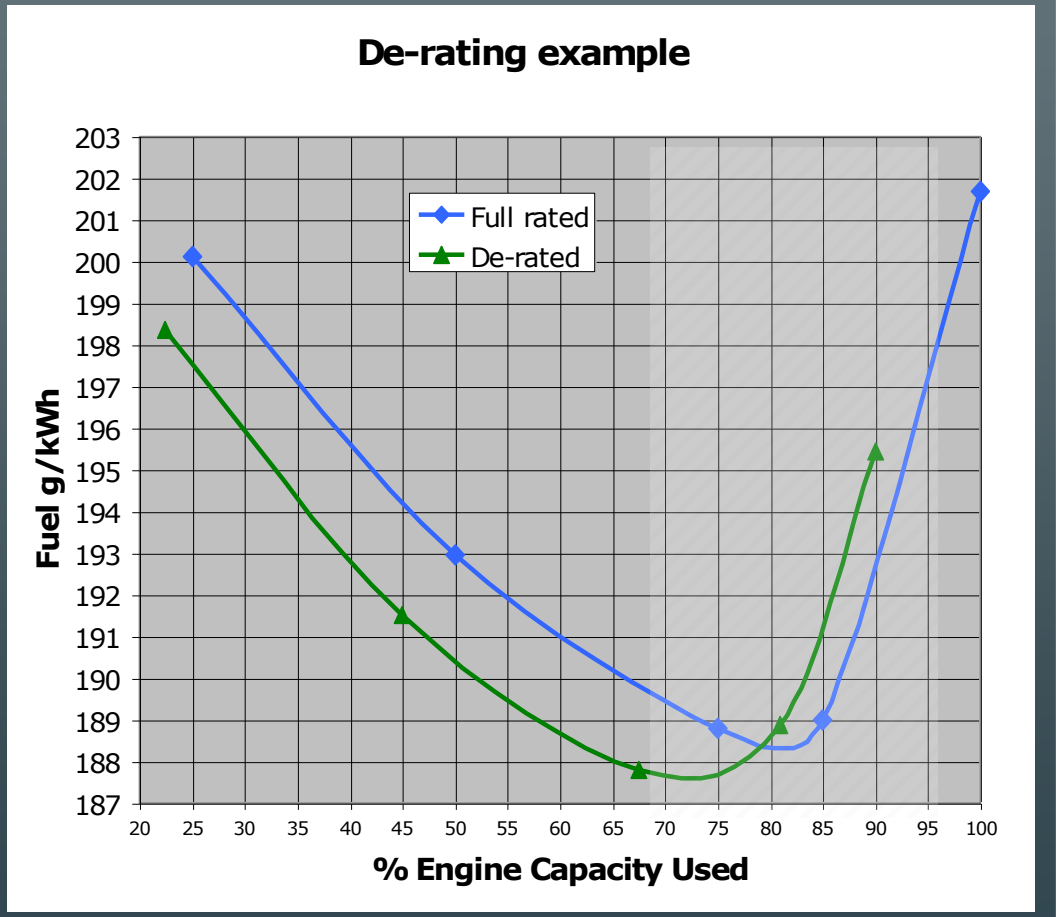
Adjusting main engines to economical speed

- Traditionally, vessels are optimized for high speed
- Lower economical speed allows for de-rating of the main engine
- Maximum engine power is restricted
- Significantly lower fuel consumption at medium power



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Super Slow Steaming Initiative

- Study started in 2007, covered 110 vessels
  - Maersk collaborated with engine manufacturers
- Results:
  - OK to operate as low as 10% engine load
  - Traditional range is 40 – 60%
  - Manufacturers have changed recommendations
- Over 100 vessels used since 2007, resulting in
  - More flexible voyage & schedule planning
  - 10 – 30% fuel savings and reduced CO_2
  - Significant savings:
    - Post panamax: 3500 MT fuel, 10,000 MT CO2
    - $1 million
- Sustainable Shipping Operator of The Year - 2009

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Cold ironing (shore power)

- Emissions reductions can be achieved when:
  - Both vessel and berth are equipped and hooked-up
  - Clean power is available - otherwise transfer emissions to shore generation
  - Benefits are reduced during connect and disconnect/engine restart
- High capital requirements
  - Vessel installation cost all inclusive – Est. today approx. $1.2M / vessel
  - Marne Terminal -- all inclusive (vault, trenching, equipment, transformer, conduit and cables, switchgear) for one berth (1000 ft of wharf length) to dock one ship is approximately $4-5 M. per berth
  - Off terminal infrastructure may also require upgrades
- Impact must consider hook-up/disconnect and engine restart
- Other implementation concerns for cargo vessels include very small crew, required skills, weather, location variations, high dock activity (safety)
- In contrast, fuel switch and slow steaming are quickly implemented, low capital investment, and mobile.
- Mobile solutions travel with the vessel → benefits everywhere the vessel travels.

How do we meet environmental goals while maximizing operational flexibility?

- **Our vessels travel the world**
  - **International standards are essential for a level playing field**
  - **US state fragmentation is detrimental to progress**
- **Carriers and shippers are working to measure and reduce impacts**
  - **Harmonized tools are needed**
- **New sources of fuels: oil sands, assorted bio-based, blends**
  - What must be measured or controlled to control environmental performance?
  - What new pollutants result ??
  - Are CEMs necessary in a more diverse fuel future?
- **Reduced sulfur – implementation considerations**
  - Sulfur content may be more variable

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Working with the industry and customers to reduce impacts

- Clean Cargo Working Group is a business-to-business forum with the goal “to promote more sustainable product transportation”
- Members are shippers and ocean liner companies including:
  - American Eagle Outfitters, Chiquita, Coca-Cola, IKEA, Johnson & Johnson, John Wiley & Sons, NIKE, Nordstrom, Phillips-Van Heusen, Polo Ralph Lauren, Starbucks, Wal-Mart
  - APL, CMA CGM, COSCON, Hamburg Sud, Hanjin, Hapag Lloyd, Hyundai, K Line, Li & Fung, Maersk Line, NYK Line, OOCL, Safmarine, Shell Marine, UPS, Yang Ming

http://www.bsr.org/consulting/working-groups/clean-cargo.cfm

Clean Cargo Working Group
Environmental Performance Scorecard

Carrier Name:

TABLE 1 - OVERALL PERFORMANCE

	% of Fleet Reported On		Max Score Possible	Carrier Score	Carrier Score as % of Max
	Owned	Time-Chartered			
CO2 Emissions (across all trade lanes)	--	--	50	N/A	N/A
SOx Emissions	--	--	15	--	--
NOx Emissions	--	--	15	--	--
Environmental management systems	--	--	10	--	--
Transparency	--	--	10	--	--
Overall Performance			100	N/A	N/A

***Score not available until "CCW(**

TABLE 2 - DETAILED CO2 PERFORMANCE

				DRY CONTAINERS		REEFERS	
CO2 Emissions - by trade Lane	**% of Fleet Reported On**		**TEU-km**	**grams CO2/ TEU-km**	**Score**	**grams CO2/ TEU-km**	**Score**
	Owned	**Time-Chartered**					
Asia--Africa	--	--	-	-	N/A	-	N/A
Asia--South America (EC/WC)	--	--	-	-	N/A	-	N/A
Asia--Oceania	--	--	-	-	N/A	-	N/A
Asia--North Europe	--	--	-	-	N/A	-	N/A
Asia--Mediterranean	--	--	-	-	N/A	-	N/A
Asia--North America EC	--	--	-	-	N/A	-	N/A
Asia--North America WC	--	--	-	-	N/A	-	N/A

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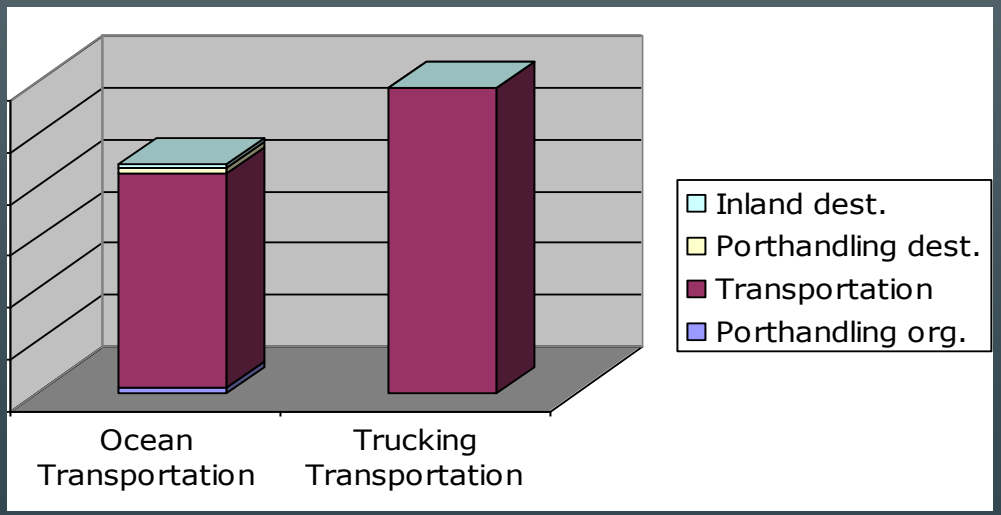
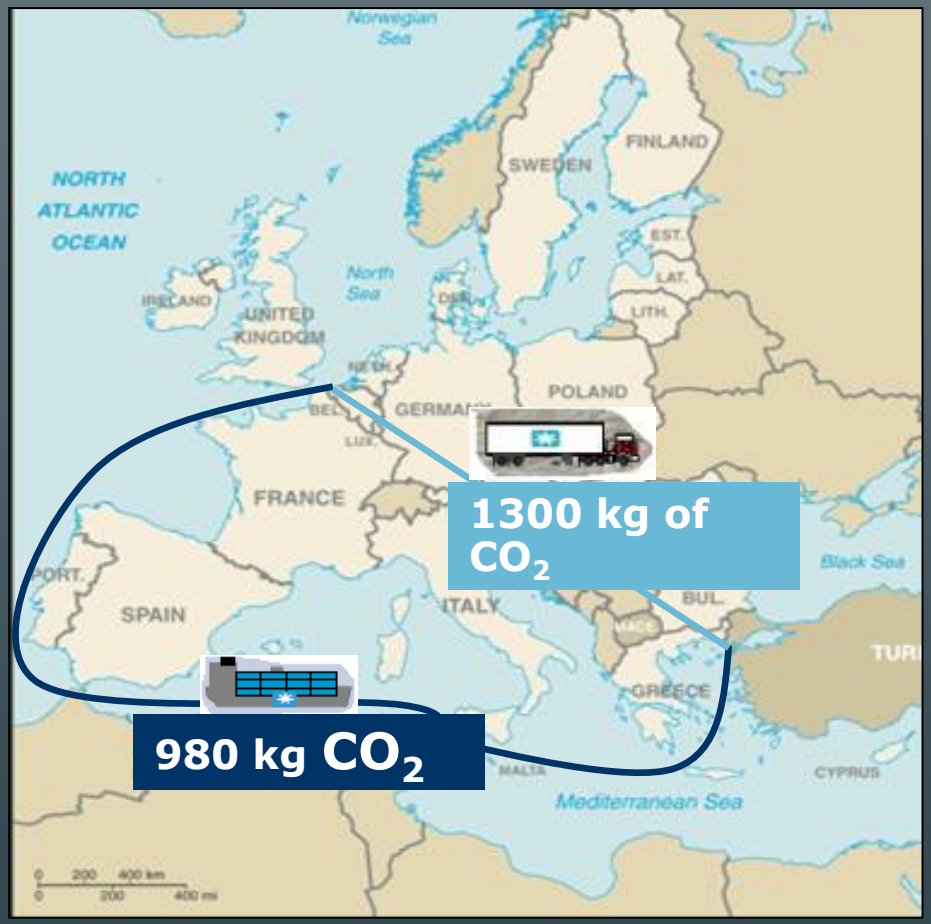
Reducing air emissions by routing

- Istanbul to Belgium
- Compare CO_2 emitted per container
  - all truck
  - sea and truck transportation





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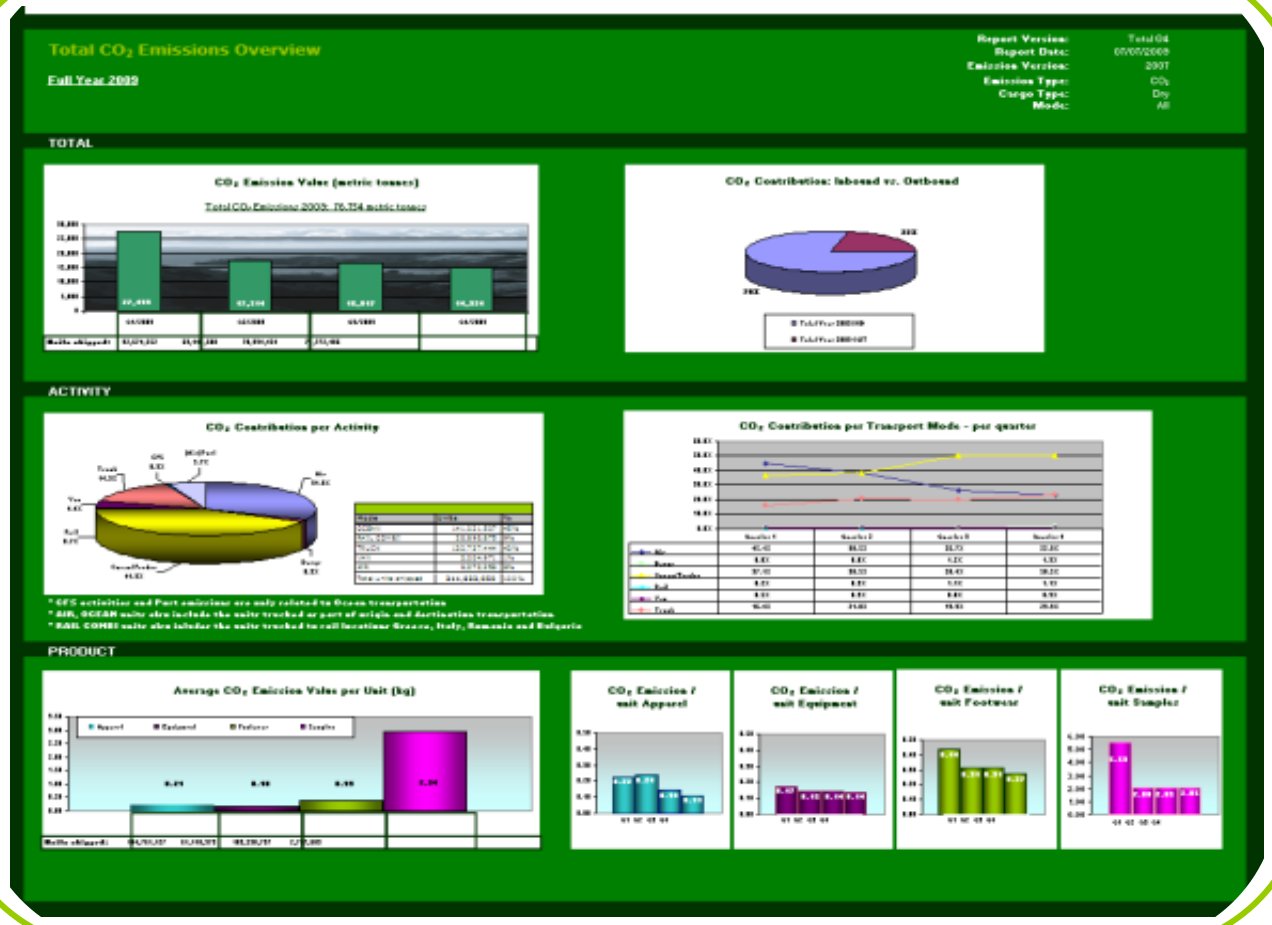
Case study: Nike

Visibility on supply chain carbon emissions to help accomplish 30% reduction target for 2020



Greener can also be cheaper

Case studies at **www.damco.com**

CarbonCheck projects with Boots, a leading international chain of pharmacy and health and beauty stores.

Since 2004, focus on these analyses have enabled Boots to

- **reduce CO2 emissions by 29% and**
- **reduce logistics costs by 21%**

in their inbound supply chain from Asia to their distribution centre in England.

”It goes to show that if you review and optimize your supply chain end-to-end from a green perspective, great savings can be made.”

-- Erling Johns Nielsen
Supply Chain Development Team
Maersk

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Thank you

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