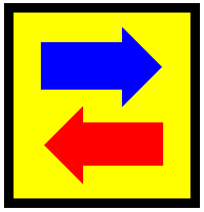
Slow steaming vs. speed limits



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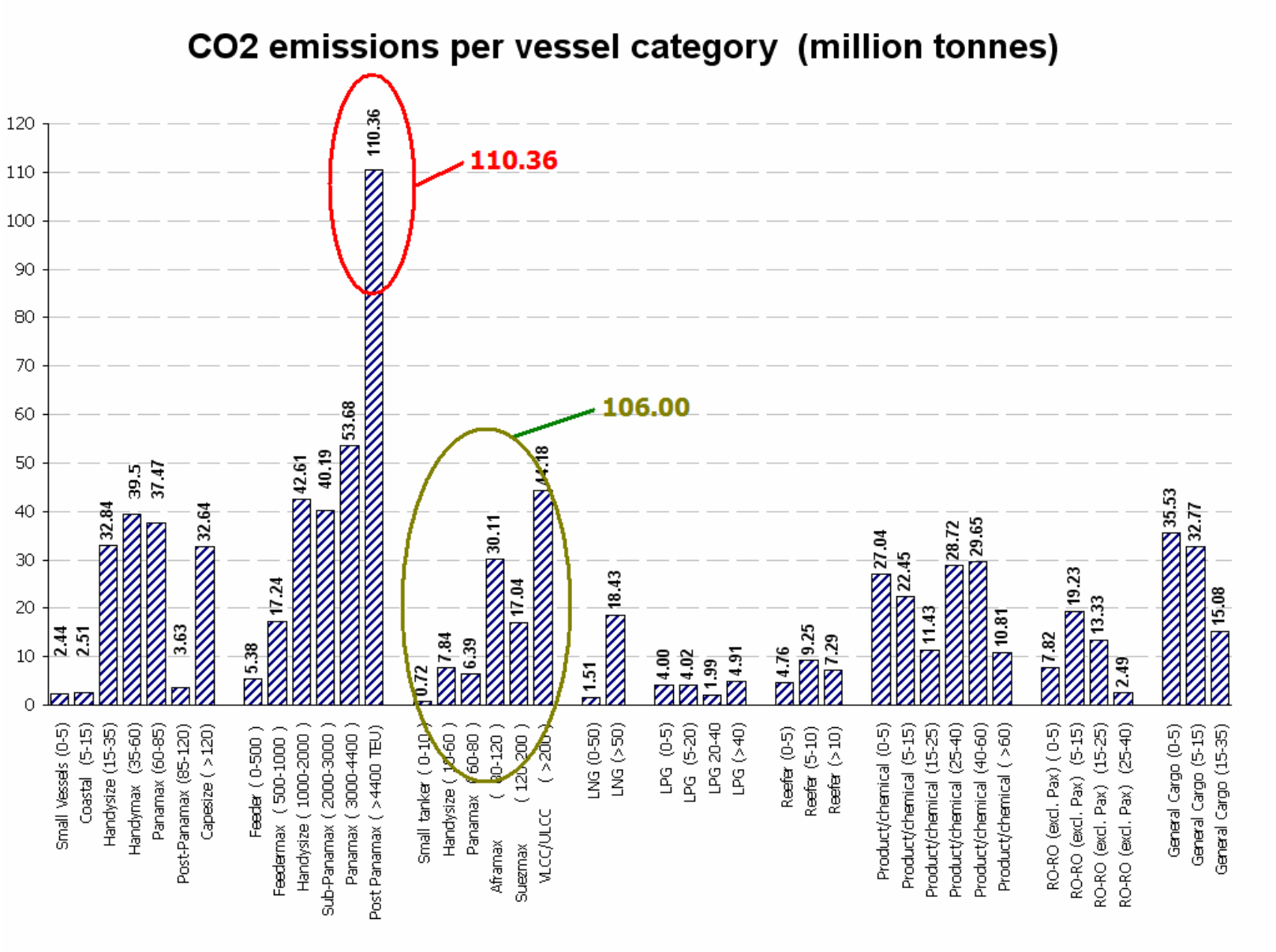


*Psaraftis, H.N. and C.A. Kontovas (2009), "CO2 Emissions Statistics for the World Commercial Fleet", WMU Journal of Maritime Affairs, 8:1, pp. 1-25.

Speed reduction

- An obvious way to reduce emissions

- Killing 3 birds with one stone?

- Pay less for fuel
- Reduce CO2 (and other) emissions
- Help sustain a volatile market

Dual targetting

- OPERATIONAL

- Operate existing ships at reduced speed (derate engines)
- Slow steaming kits

- STRATEGIC (DESIGN)

- Design new ships that cannot go very fast (have smaller engines)

How much slower?

- From 20-25 knots, go down to 14-18

- New Maersk 18,000 TEU ships: 19 knots

- Project ULYSSES:

  Go 5-6 knots!

Some basics

- Ships do not trade at predetermined speeds.
- Those who pay for the fuel, that is, the ship owner if the ship is in the spot market on voyage charter, or the charterer if the ship is on time or bareboat charter, will **choose an optimal speed** as a function of
  - (a) bunker price, and
  - (b) the state of the market and specifically the spot rate

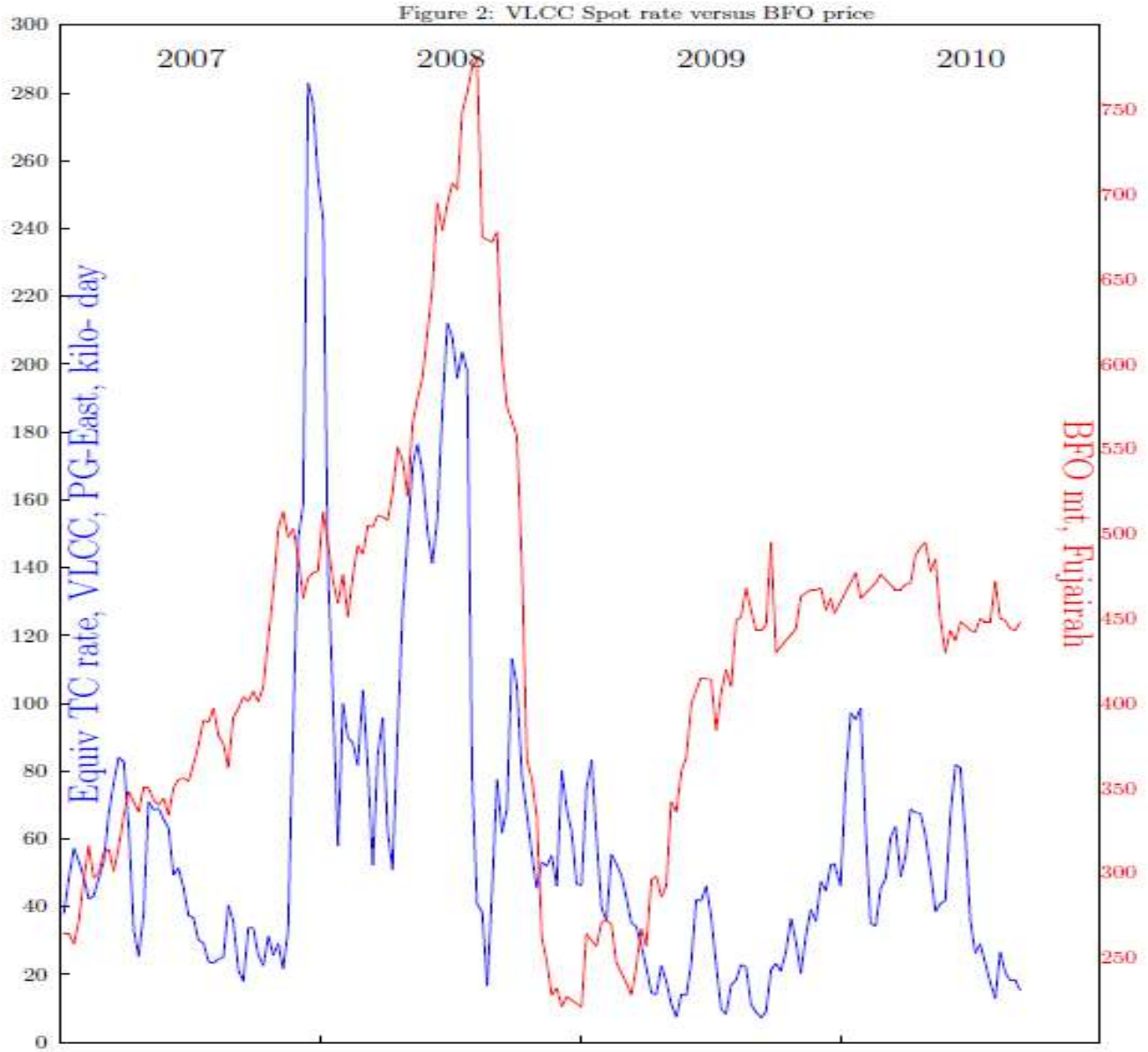


Figure 2: VLCC Spot rate versus BFO price
2007
2008
2009
2010
Equiv TC rate, VLCC, PG-East, kilo- day
BFO mt, Fujairah
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
750
700
650
600
550
500
450
400
350
300
250

Basics ii

- Even though the owner's and time charterer's speed optimization problems may seem at first glance different, for a given ship the optimal speed (and hence fuel consumption) is in both cases the same.
- In that sense, from an emissions standpoint, it makes no difference who is paying for the fuel, the owner, the time charterer, or the bareboat charterer.

Owner in spot market

- OBJECTIVE: Maximize average per day profits
- s: spot rate ($/tonne)
- C: payload (tonnes)
- p: fuel price
- F(v): fuel consumption at speed v
- D: route r-trip distance
- E: OPEX ($/day)

$$\max_{v} \left\{ \frac{sC}{\frac{D}{24v}} - pF(v) - E \right\}$$

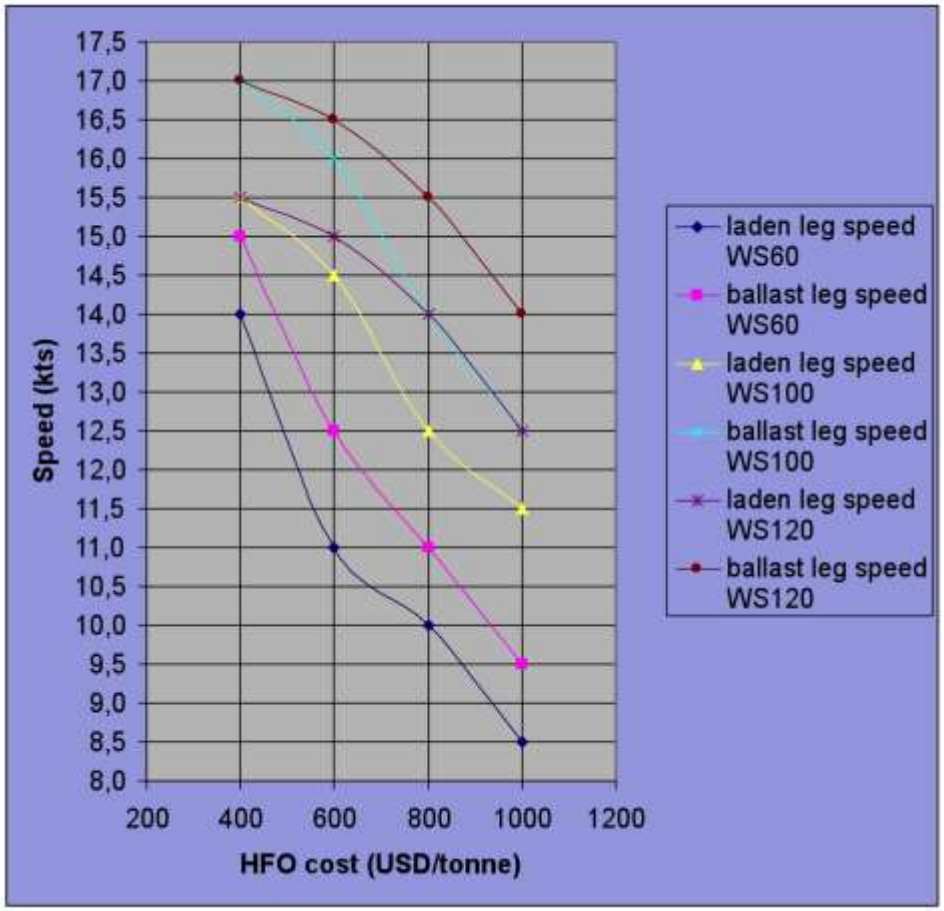
Time charterer

- OBJECTIVE: Minimize average per day costs
- R: demand requirements (tonnes/day)
- T: time charter rate ($/day)

$$\min_{v} \left\{ s \left(R - \frac{C24v}{D} \right) + T + pF(v) \right\}$$

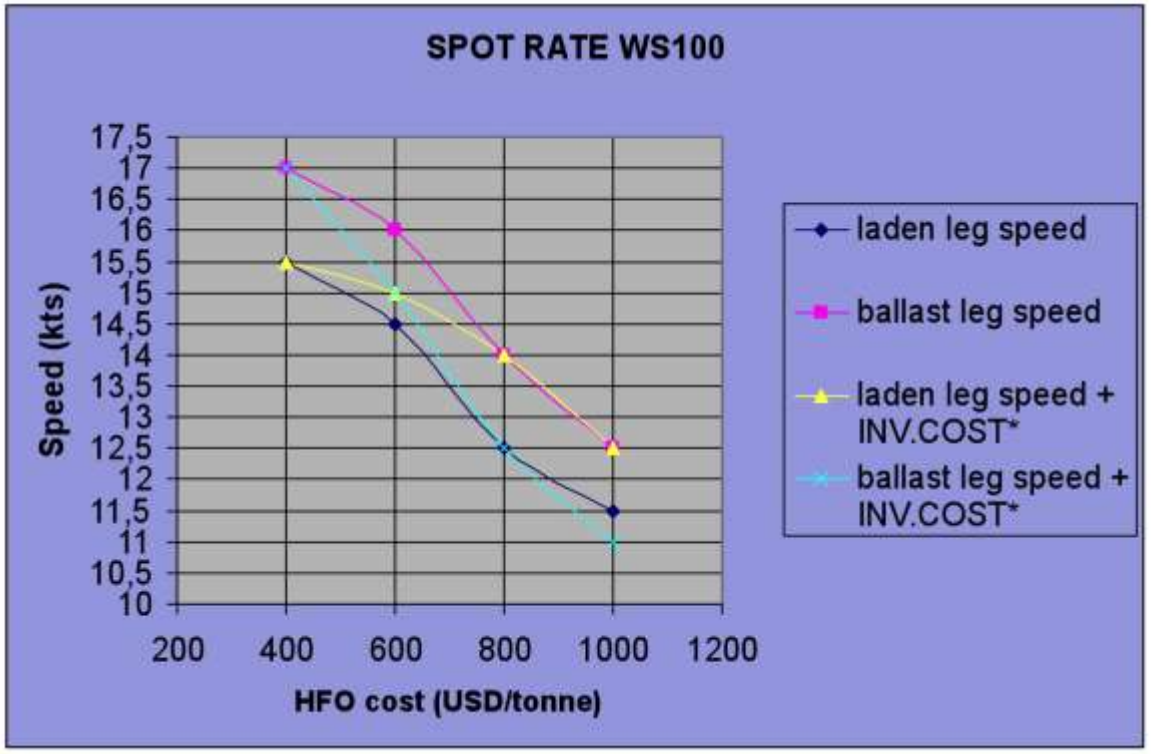
VLCC results

- Route: Gulf-Japan
- Optimize both laden and ballast speeds

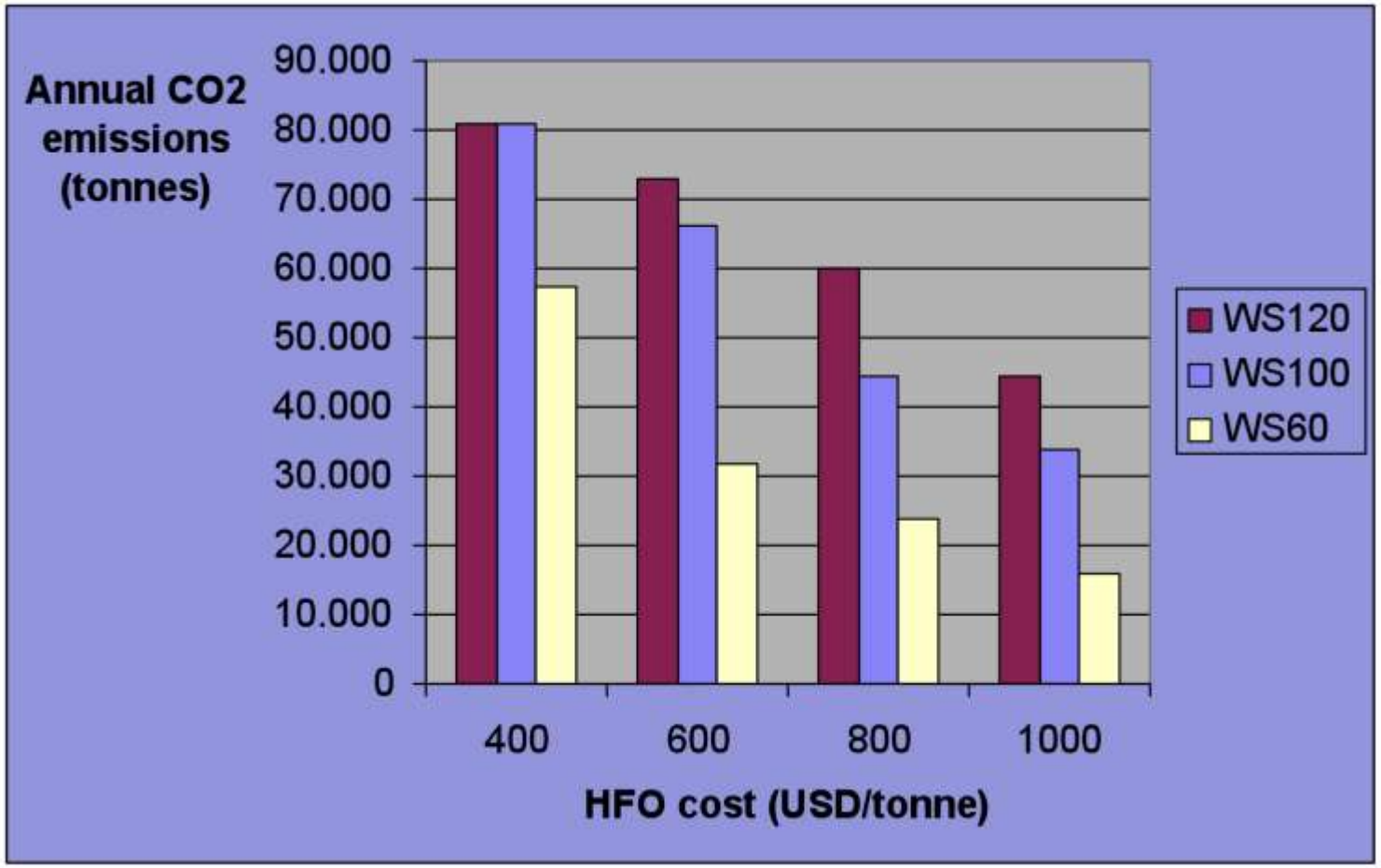


VLCC cont'd

- Include cargo inventory costs



Effect of fuel price on emissions

- 

parenthesis

- A Levy on fuel will take care of slow steaming **automatically**- this will not happen with any of the other proposed market based measures (ETS, hybrid MBMs, etc)

- At the STRATEGIC level, this will also push to improve ship design (better hulls, engines, propellers, etc)

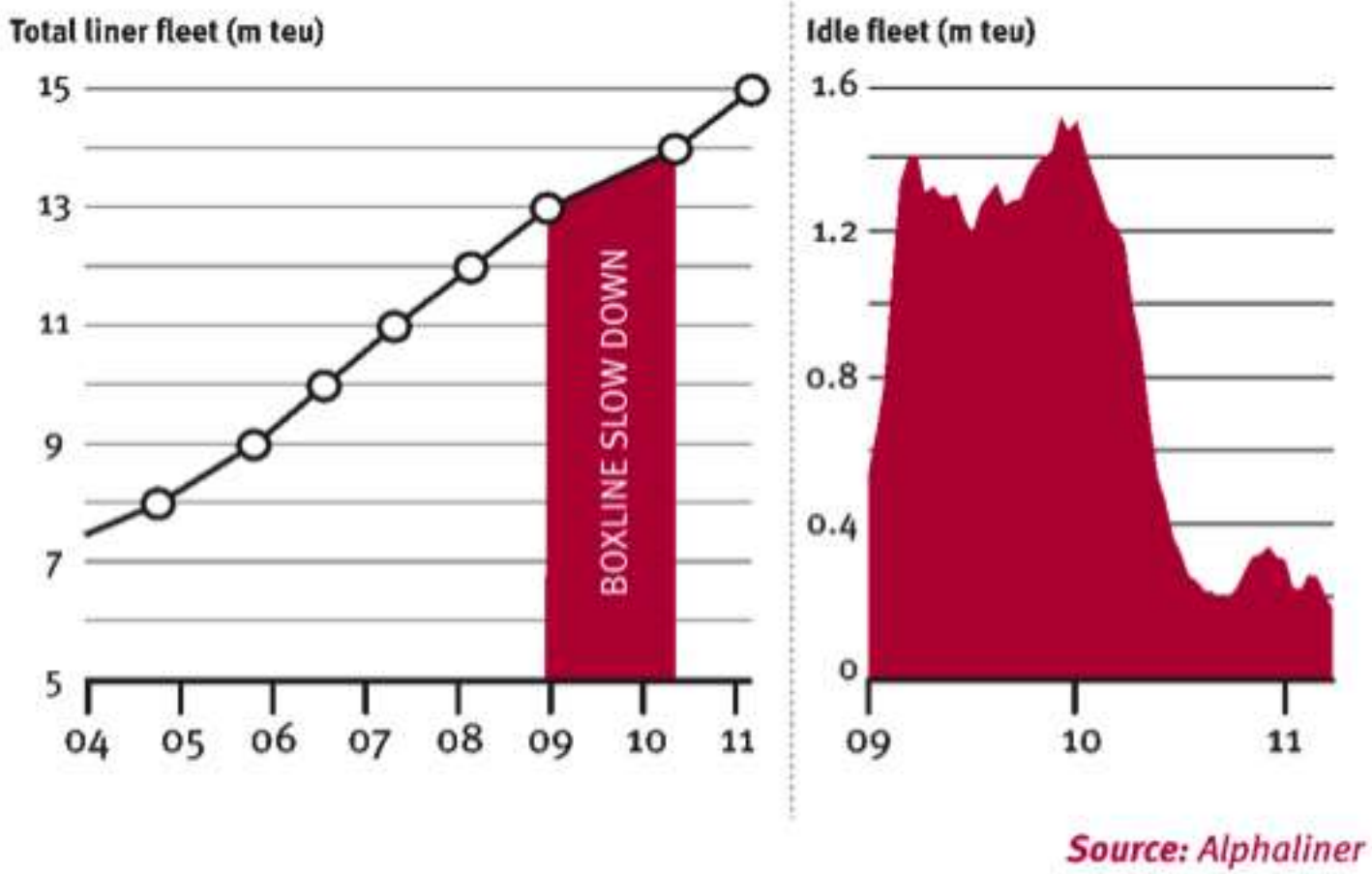
Is slow steaming being practised today?

OF COURSE!

- Practically 0 tanker and bulk carrier lay up
- 0.2 mm tons of bulkers laid up out of 564.1 mm afloat*
- 2.6 mm tons of tankers out of 440.1 mm tons afloat*

*Clarksons Shipping Intelligence Weekly, 2011-06-03,

GLOBAL CONTAINERSHIP CAPACITY



Container sector

- “For Maersk Line slow steaming is here to stay because it remains a win-win-win situation. It is better for our customers, better for the environment, and better for our business,” (Eivind Kolding, Maersk Line CEO).

Technological advances

- Modern ships consume significantly less fuel for same speed than ships 10 years ago
- Electronically controlled engines can make these ships go slower than their older counterparts
- What has changed in 10 years? Fuel price.

Possible barrier to slow steaming

- Some spot charter agreements force ships to sail a specific speed (which may be higher than the optimal one)
- Result: ships go faster in laden leg and slower in ballast leg (whereas the reverse is typically the case if speeds are chosen freely) → MORE CO2!
- Market imperfection: Possible issue for regulatory action?

Regulating speed

- 2 ways to regulate speed:

- (A) Indirect way: Via EEDI
- (B) Direct way: Mandate it (set a speed limit)

Regulating speed

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(B) Setting a speed limit

- If speed limit is ABOVE optimal slow steaming speed, superfluous
- If speed limit is BELOW optimal slow steaming speed, distortions may occur

- SHORT TERM: higher freight rates
- LONG TERM: build more ships than you need

Parenthesis:
direct speed limits at IMO

- Proposal by Clean Ship Coalition at MEPC 61: *"Speed reduction should be pursued as a regulatory option in its own right and not only as possible consequences of market-based instruments or the EEDI."*

- The proposal was NOT supported: *"The Committee agreed that speed considerations would be addressed indirectly through the EEDI, the SEEMP and by a possible market-based mechanism and, therefore, decided that no further investigation of speed reductions as a separate regulatory path was needed."*

Speed limits distortions

- Building more ships to match demand throughput
- Increasing cargo inventory costs due to delayed delivery
- Increasing freight rates due to a reduction in ton-mile capacity
- Inducing reverse modal shifts to land-based modes (mainly road)
- Implications on **SAFETY**.

More ships to match demand throughput

- Total fuel cost is still lower, BUT:
- More ships means more CO2 due to shipbuilding and scrapping (life cycle analysis)
- It also means more maritime traffic, with negative implications on safety
- More crews to fly around (more aviation CO2)
- Etc etc

Possible modal shifts: Tran-siberian railway example

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- Psaraftis, H.N., Kontovas, C.A. (2010) “Balancing the Economic and Environmental Performance of Maritime Transportation”, Transportation Research D 15, 458-462

TRANS EURASIA EXPRESS

Trans-siberian railway

Far East to Europe by boat

- 43,000 km
- 7.8 gr CO2/tkm at full speed
- **Reduce speed by 40%**
- **2.8 gr CO2/tkm at reduced speed**
- 150,000 tons of cargo produce **18,000 tons of CO2**

Far East to Europe by rail

- 12,000 km
- Cargo arrives 26 days earlier
- Lower inventory costs
- **18 gr CO2/tkm**
- 150,000 tons of cargo produce **32,000 tons of CO2**

Net result

- TOTAL ΔCO2 may be >0 or <0, depending on scenario
- Result unclear for more complex network scenarios
- Reducing CO2 in one mode may result in more CO2 overall
- **NOTE: SHORT SEA SHIPPING MAY ALSO SUFFER FROM SPEED REDUCTION, AS CARGOES MAY SHIFT TO ROAD (RESULT: MORE CO2)- EU TRANSPORT POLICY IS JUST THE OPPOSITE**

Last but not least: safety

- Setting speed limits will reduce installed engine power
- But a ship needs to have adequate power to maintain speed in bad weather, manoeuvering, etc
- IACS et al submission at MEPC 62 (minimum power requirements)
- ICS submission at MEPC 62 (minimum safe speed of 14 knots)

Main conclusion

- Slow steaming and speed limits are 2 different things
- If you want to reduce speed (as a means to reduce emissions):

- Do NOT put a speed limit.
- Increase the price of fuel.

Thank you very much!

- www.martrans.org