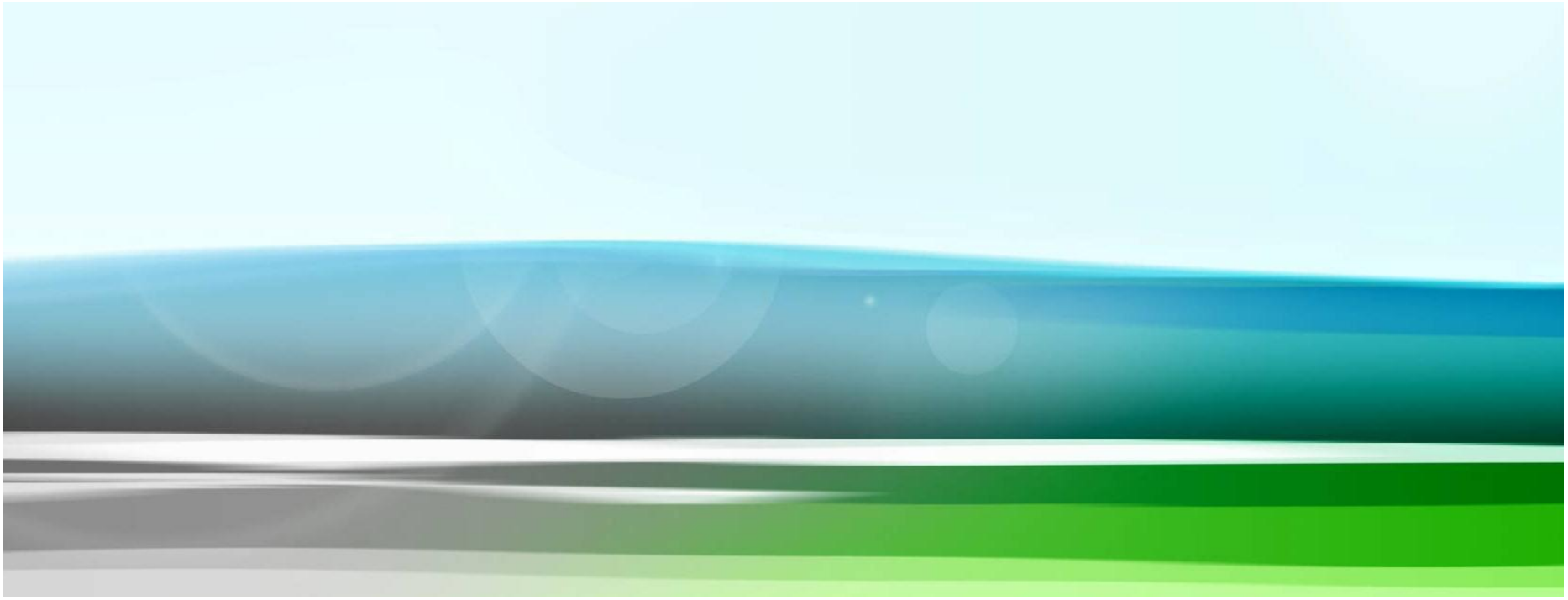


Shipping and the environment

Key regulations this decade, and some likely consequences

Eirik Nyhus – Director, Environment

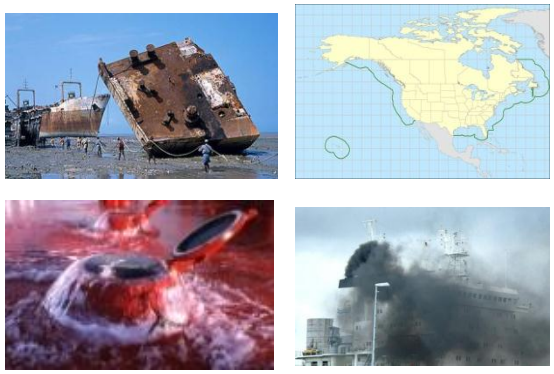
MANAGING RISK

Agenda

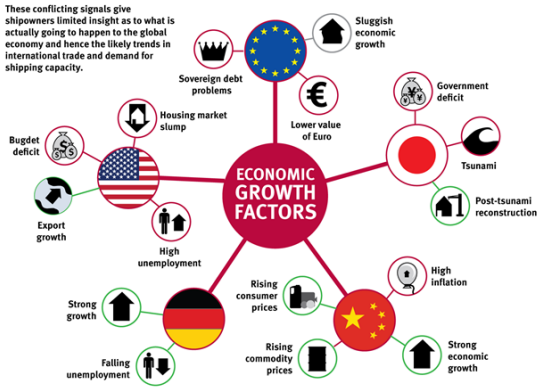
1. The big picture
2. Ballast water
3. Sulphur issues
4. CO_2

A complicated decade

New and stricter environmental regulations entering into force

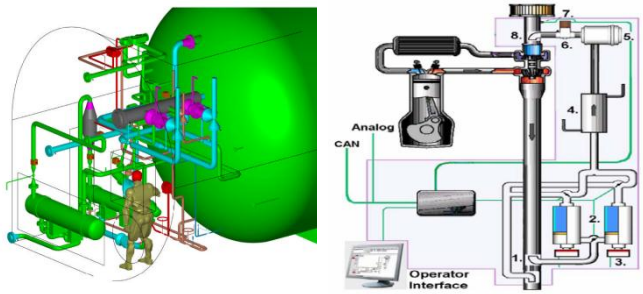


The global economy and oil prices will help steer the course



Increasing stakeholder pressure and transparency requirements

Technical solutions are appearing - but what to choose, and when to do it?



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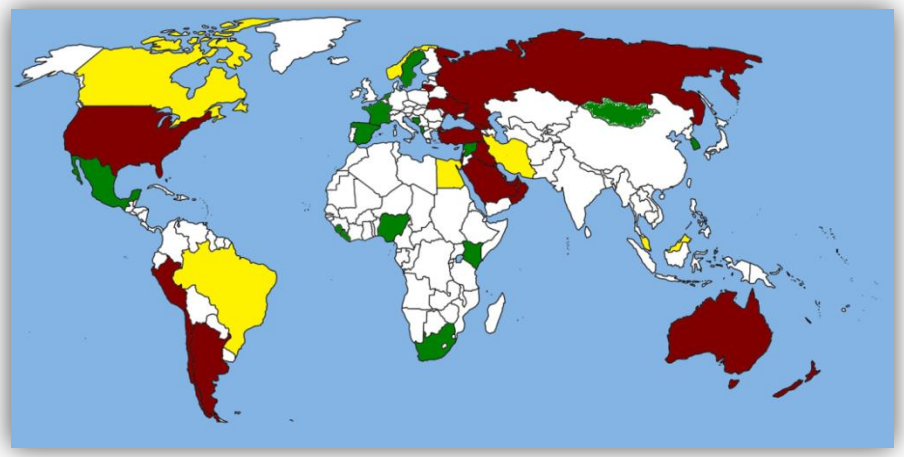
The IMO Ballast Water Management Convention

- Aims to minimize
  - transfer of invasive aquatic species between ecosystems
  - transfer of bacteria harmful to human health
- Invasive species do real damage;
  - Great lakes, Canada
    - Zebra Mussels
  - Argentina & Brazil
    - Golden mussels
  - Pandemic outbreak, South America
    - Cholera
- Requires all ships to treat ballast water by end of 2020, retroactive validity
- Approaching ratification (2013?)

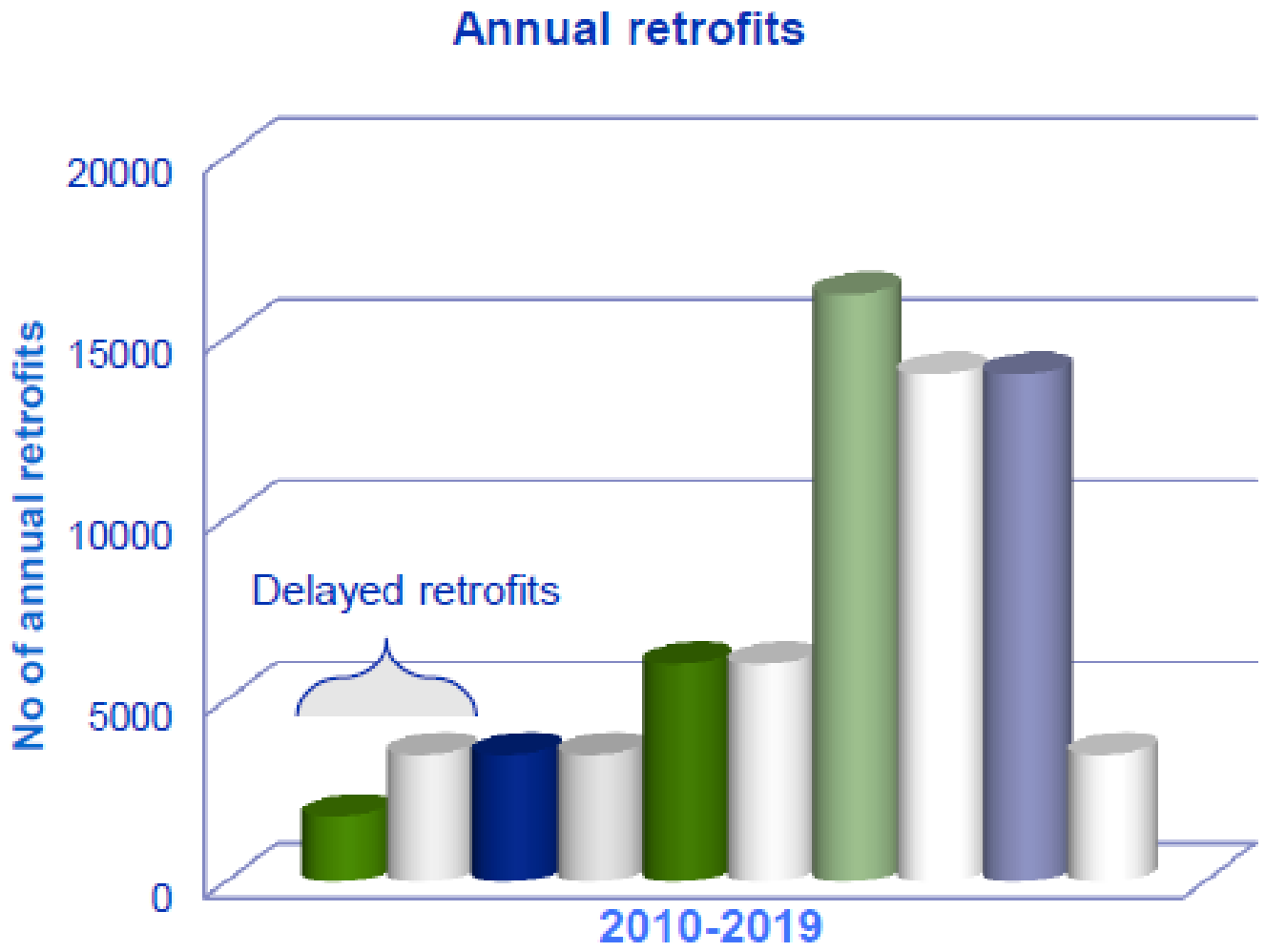


In addition, new US ballast water regulations

- New USCG regulations released, effective 1 Dec 2013. Applies IMO standard, similar timeline.
- Technology availability and type approval issues?
- Enforcement mechanisms and non-compliance consequences?
- Harmonisation with forthcoming EPA requirements?
- States can – and some may – impose additional requirements; above and beyond IMO requirements

	Ballast water capacity	Construction date	Compliance date
New ships	All	On or after 2013-12-01	On delivery
Existing ships	Less than 1500 m^3	Before 2013-12-01	First scheduled drydocking after 2016-01-01
	1500 m^3 to 5000 m^3	Before 2013-12-01	First scheduled drydocking after 2014-01-01
	Greater than 5000 m^3	Before 2013-12-01	First scheduled drydocking after 2016-01-01

Treatment systems – looming bottlenecks?



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The details

ECA Emissions requirements for all ships	
Requirement	Compliance option
2010: SOx < 1,00% 2015: SOx < 0,10%	• HFO + scrubber • Distillate fuels • LNG

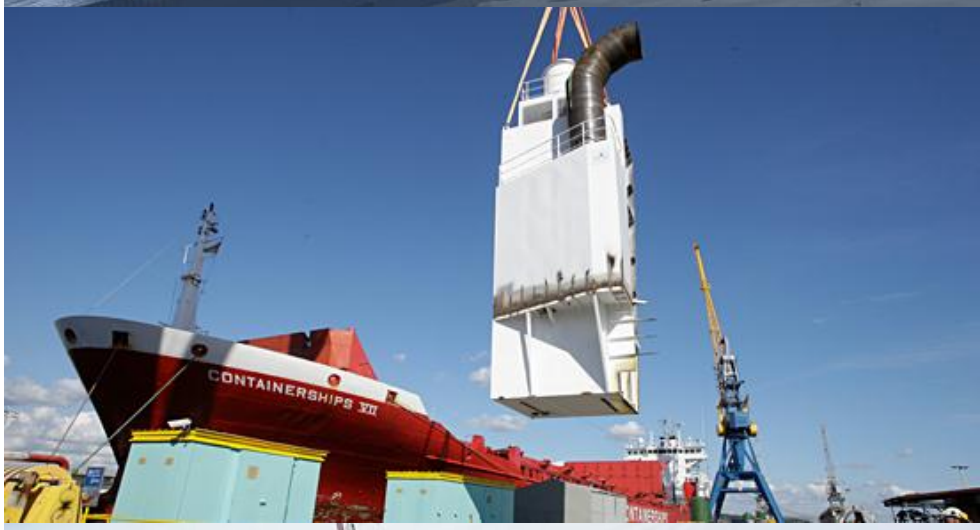
ECA Emissions requirements for newbuilds	
Requirement	Compliance option
2011: NOx Tier 2 2016: NOx Tier 3	• Scrubber + SCR • LNG

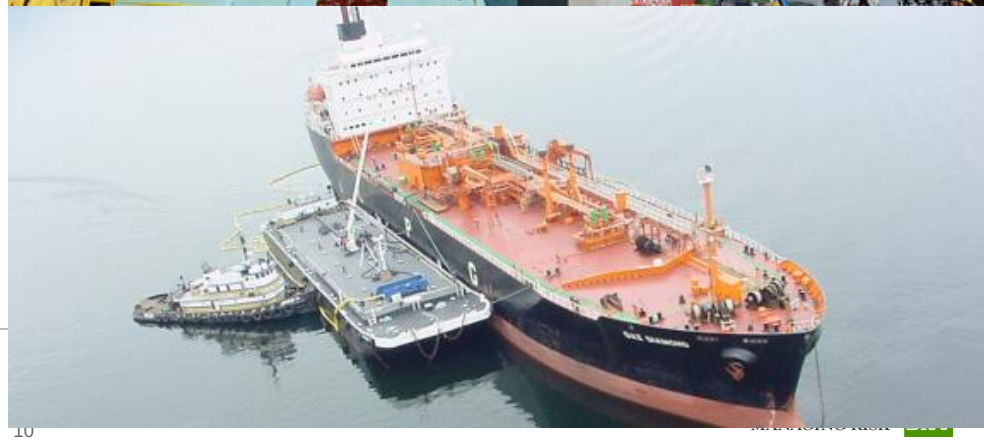
3 options on the table

1 LNG as fuel

2 HFO + Scrubbers for exhaust gas cleaning

3 HFO + change over to low-sulphur fuel in ECA



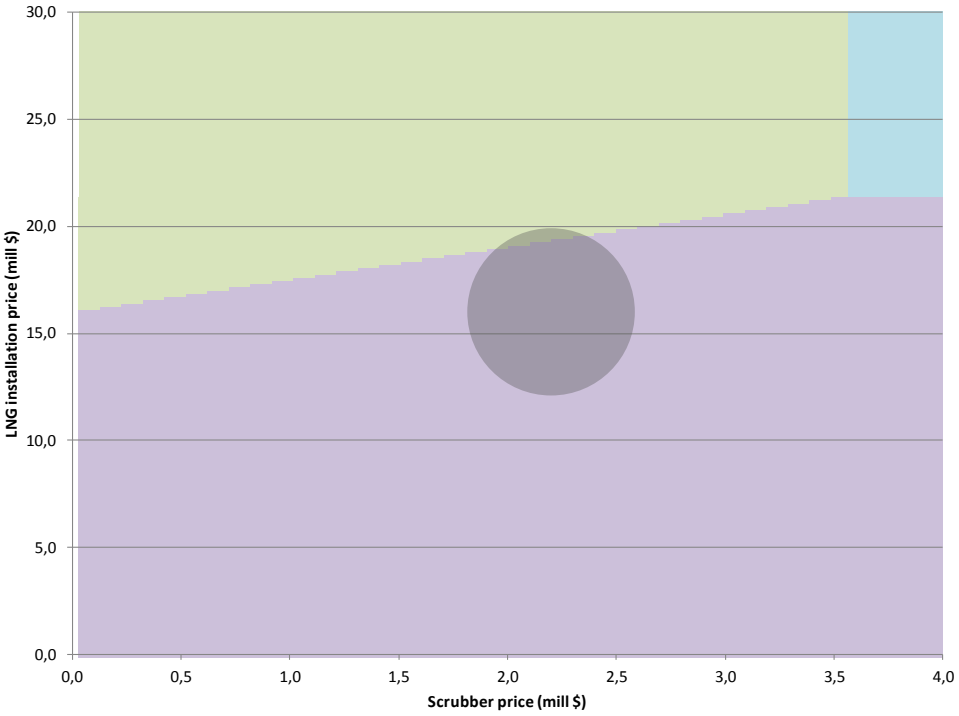


May 2012

Example: Panamax bulk (60000 dwt)

- Engine and operation
  - 20 % of time in ECA
  - 11 MW engine
  - 250 days per year in cruise at 80%
  - 10000 tonnes fuel per year
- Fuel prices
  - HFO: 750 $/tonne
  - MGO: 1000 $/tonne
  - LNG: 12 $/MMBtu
- CapEx
  - LNG: $ 16 000 000
  - Scrubber: $ 2 200 000
- Financial
  - Discount rate: 15%
  - **Investment horizon: 10 years**
- Other
  - 3% increase in fuel consumption with scrubber
  - From 2020 low sulphur requirement globally

Net present value		
Scrubber	Fuel Switch	LNG
-$3 837 888	-$5 899 869	-$467 739



The circle shows the assumed price, while the colour shows the preferred choice given different prices on LNG and scrubber

But what if the investment horizon is only 5 years?

- Engine and operation
  - 20 % of time in ECA
  - 11 MW engine
  - 250 days per year in cruise at 80%
  - 10000 tonnes fuel per year
- Fuel prices
  - HFO: 750 $/tonne
  - MGO: 1000 $/tonne
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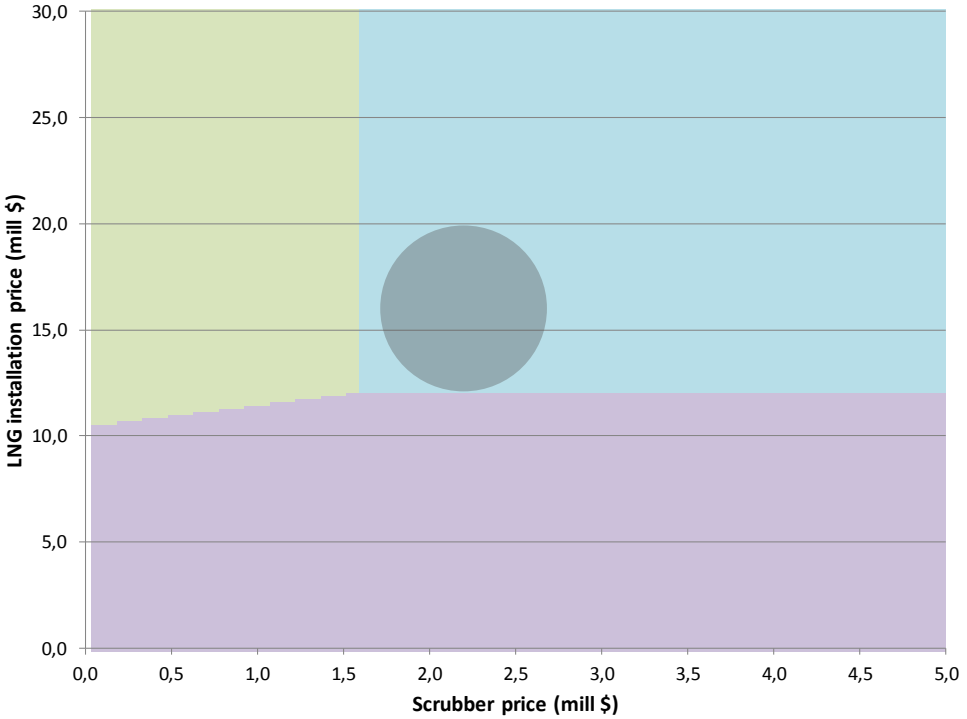
- Financial
  - Discount rate: 15%
  - **Investment horizon: 5 years**
- Other
  - 3% increase in fuel consumption with scrubber
  - From 2020 low sulphur requirement globally

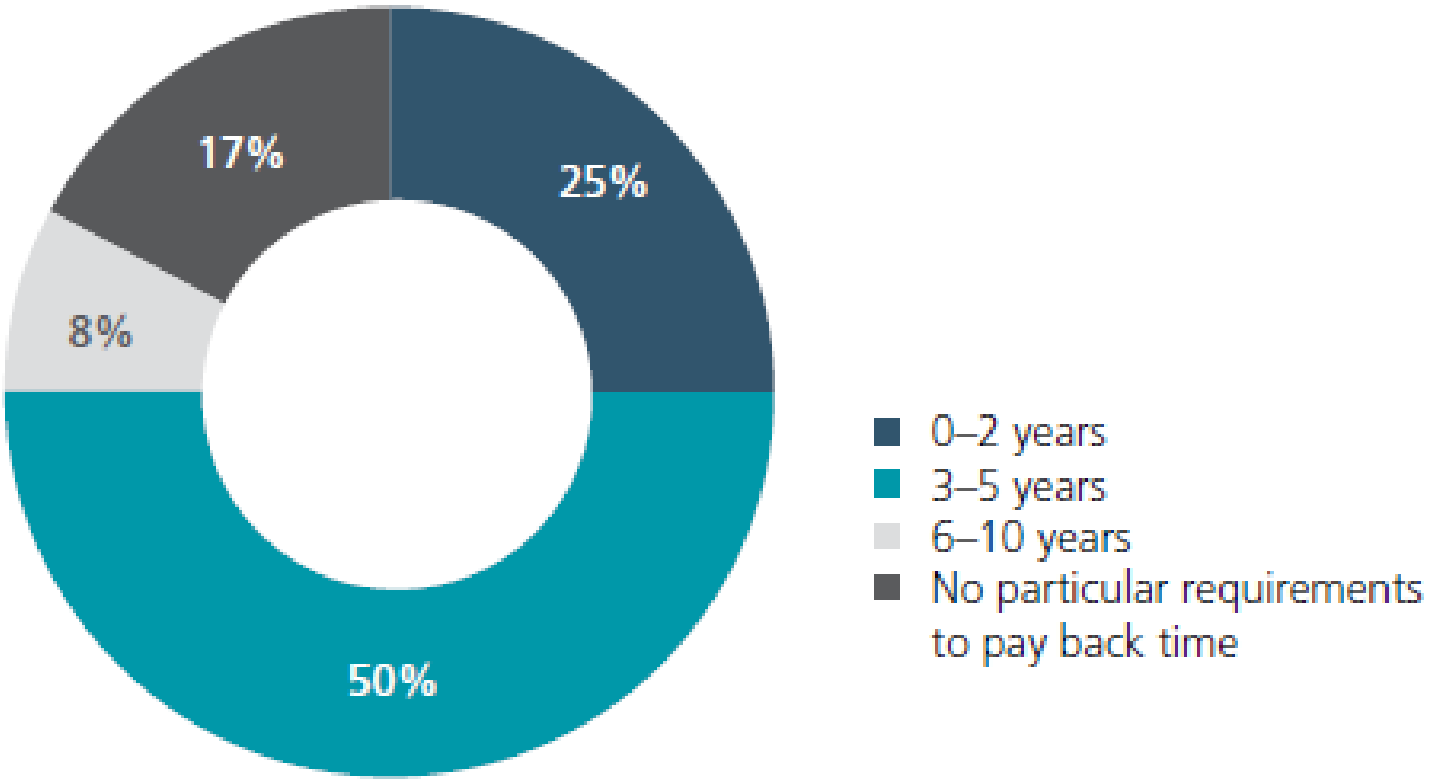
Net present value		
Scrubber	Fuel Switch	LNG
-$2 330 699	-$1 692 503	-$5 625 633



The circle shows the assumed price, while the colour shows the preferred choice given different prices on LNG and scrubber

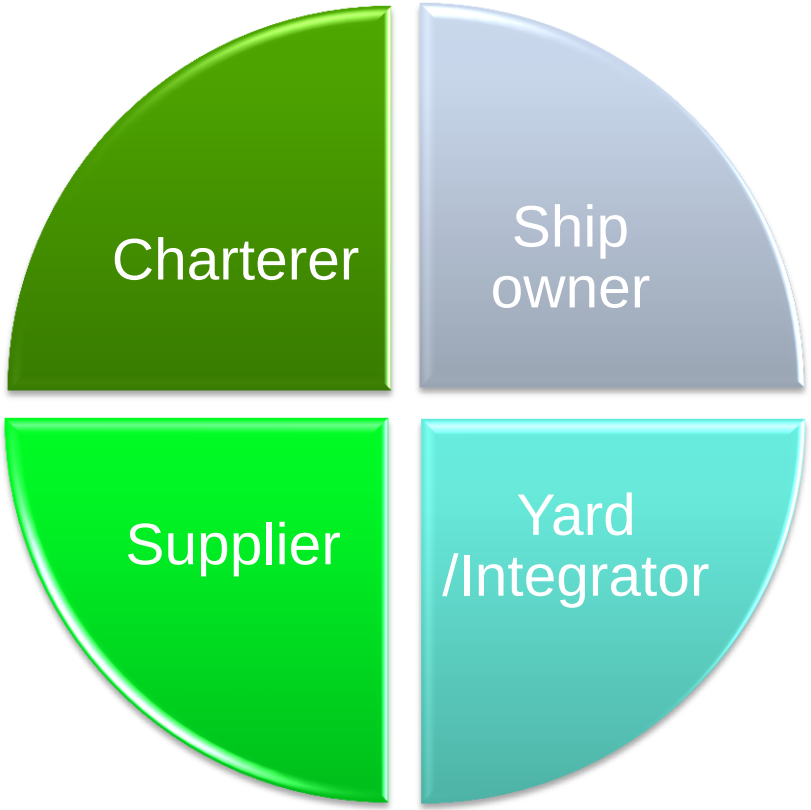
Investment horizons in shipping

- Questionnaire based survey, 2012;
  "What's your company's requirement to pay-back time?"



Not all issues equally important – but the decision space is complex, and cost implications significant

- There is a lot of money at stake
  - Major investments or increased operating costs
  - Vessel second-hand value?
  - Non-compliance consequences?
  - Contractual framework?
  - Business strategy and capital requirements?
- Different trading patterns requires different solutions
  - Time in ECA
  - Fleet redeployment / segmenting?
- Fleet characteristics/age profiles will impact decisions & solutions
  - Is selling or scrapping a viable option?



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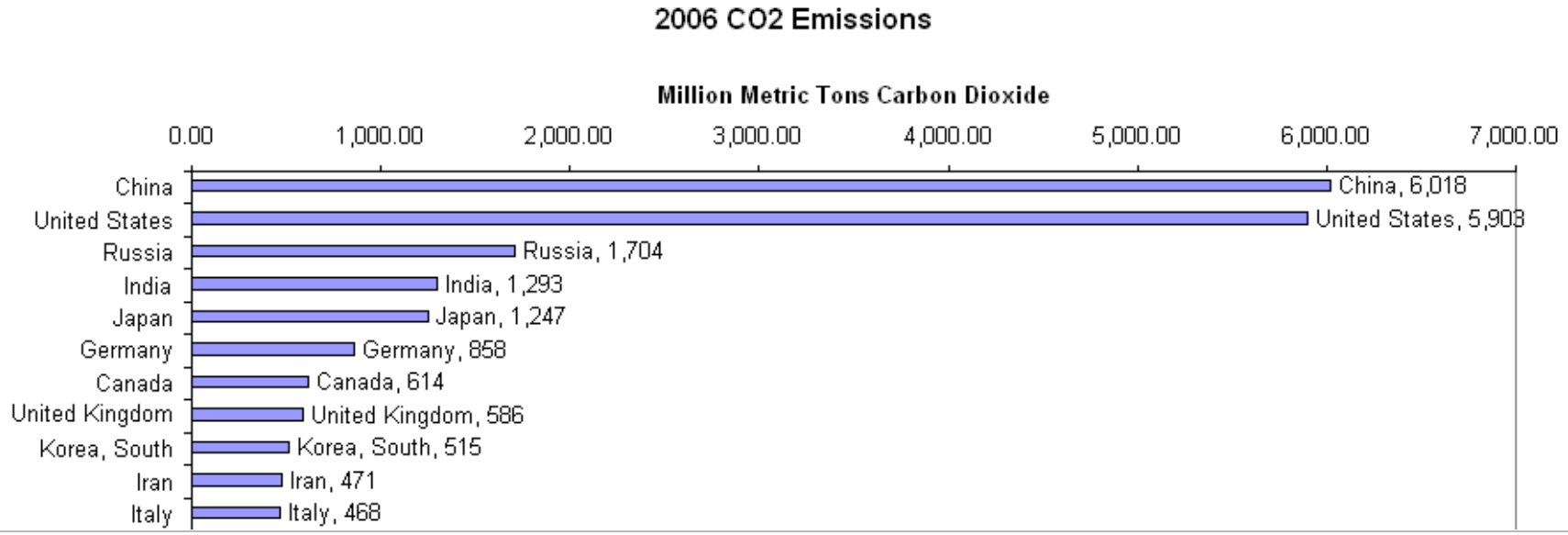
Shipping CO_2 emissions – why the world cares

- Shipping burns approx. **335 million tonnes fuel** per year… while transporting 85% of the worlds goods
- The associated emission of CO_2 is around **1 billion tonnes of CO_2** per year



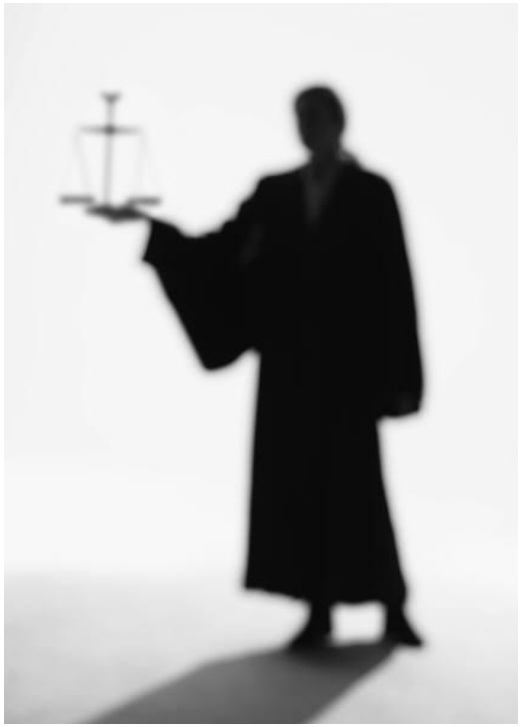
Political bodies shape global efforts to reduce shipping GHG

- **UNFCCC**. Arena for international climate negotiations. Considers shipping key source of climate change mitigation and adaptation **funding**

- **IMO**. Working to reach **industry wide, global agreements** reducing the amount of CO2 emissions from international shipping.

- **EU**. Proposes to cut shipping CO2 by **40% by 2050** when compared with 2005 levels. Working on regional regulations.

Regulatory options for shipping



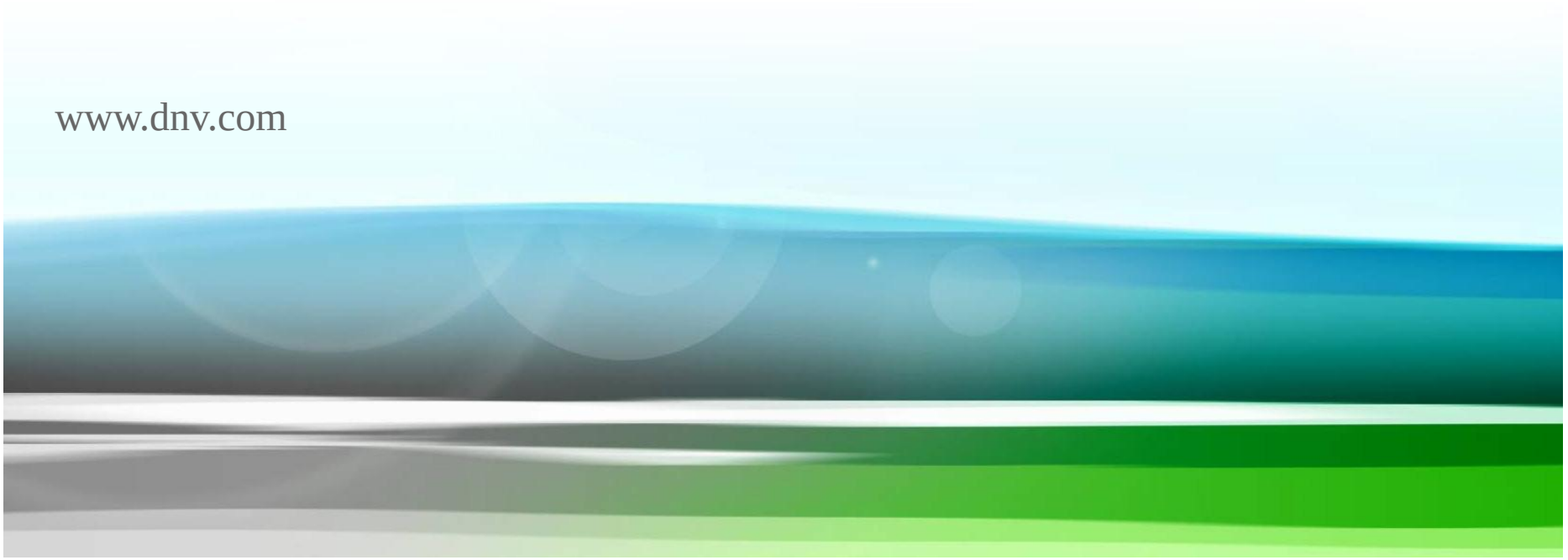
- **Technical / operational measures**
  - EEDI (adopted)
  - SEEMP (adopted)
  - EEOI (voluntary)
- **Market Based Measures (MBM)**
  - cap and trade system
  - levy system
  - other approaches (several on the table)

The outlook for a comprehensive deal on CO_2?

Key words for the decade

Safeguarding life, property and the environment

www.dnv.com



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