

Dealing with Environmental Challenges in Shipping

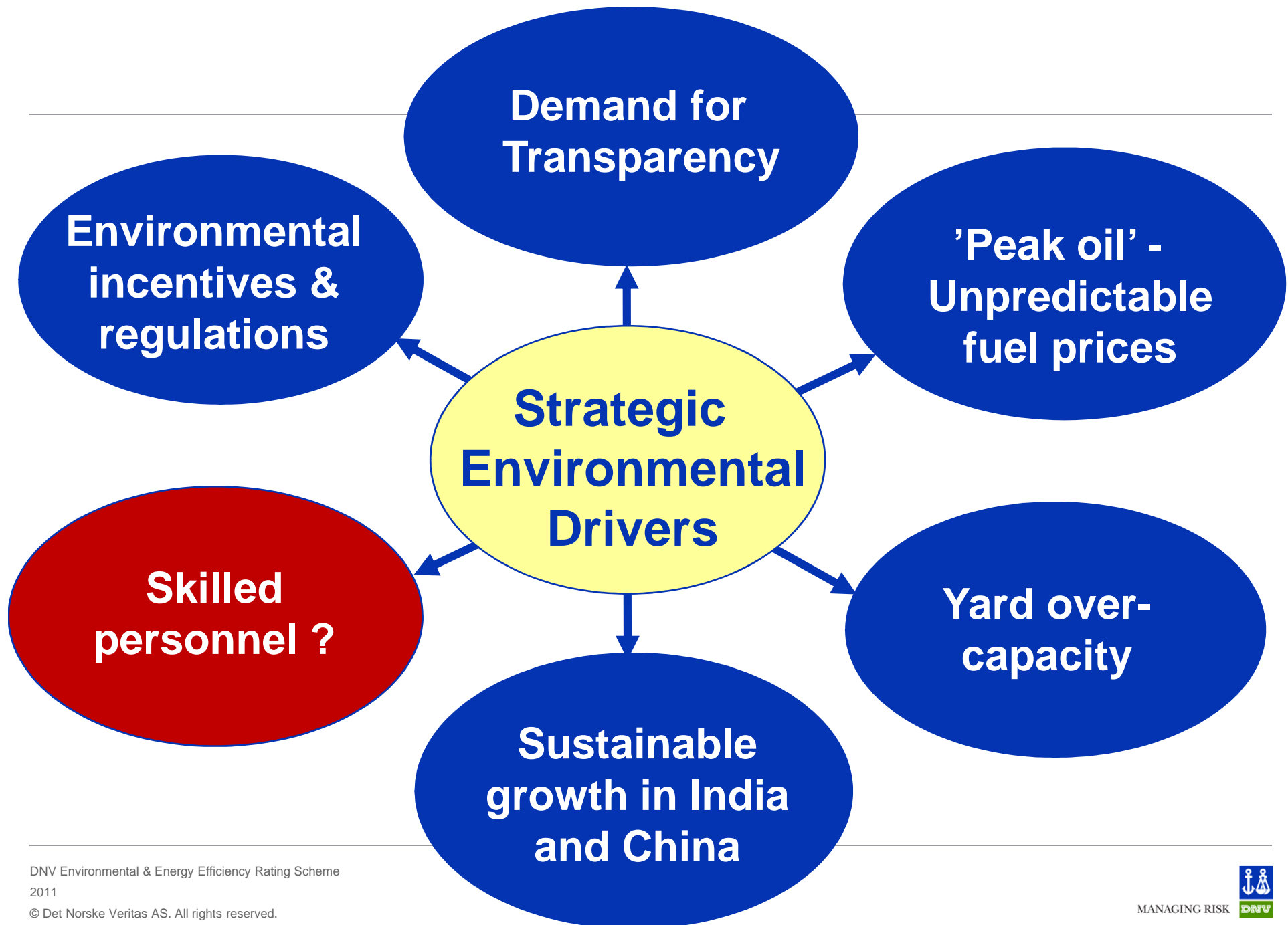
Shippingforum, Rederiforbundet
25-April 2012

Per Holmvang

DNV Environmental Program Director



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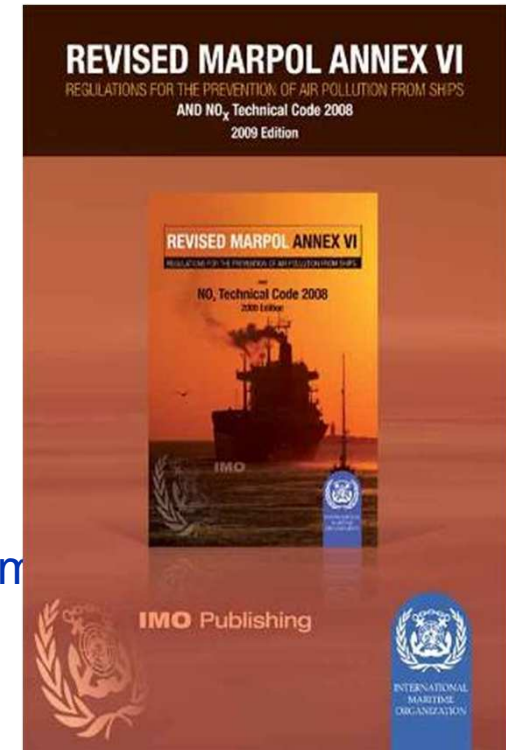


Emissions to Air - General

IMO – Marine Environmental Protection Committee (MEPC)

MARPOL 73/78: International convention for the prevention of pollution at sea, adopted by IMO 1973 and updated 1978:

- Annex I Prevention of Pollution by Oil
- Annex II Noxious Liquid Substances in Bulk
- Annex III Harmful Substances Carried by Sea in Packaged Form
- Annex IV Pollution by Sewage from Ships
- Annex V Pollution by Garbage from Ships
- Annex VI Prevention of Air Pollution from Ships (in force May-05)



IMO Emission Control Areas (ECA)

Existing:

The Baltic Sea and North Sea

Coming:

North American & Canada –
probably in force Aug 2012



2011

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Emissions to Air - NO_x



MARPOL Annex VI - NO_x

NO _x emission limit	Requirement	Enforcement
Tier I	17.0 g/kWh	Ships built 1-Jan-00 to 1-Jan-11
Tier II	14.4 g/kWh	Ships built after 1-Jan-11
Tier III	3.4 g/kWh	Ships built after 1-Jan-16 and operating in ECAs

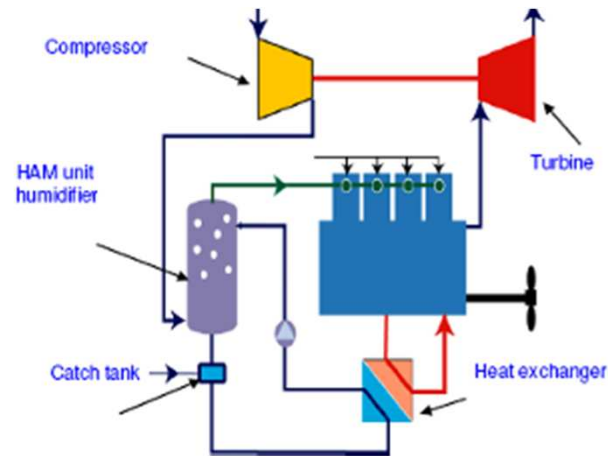
NO_x to be handled on board !

- General fuel reduction measures
- Transition to distillates or gas (Duration of combustion)
- Machinery modifications (HAM, SAM, EGR, DWI, FWE)
- Abatement technologies (SCR)

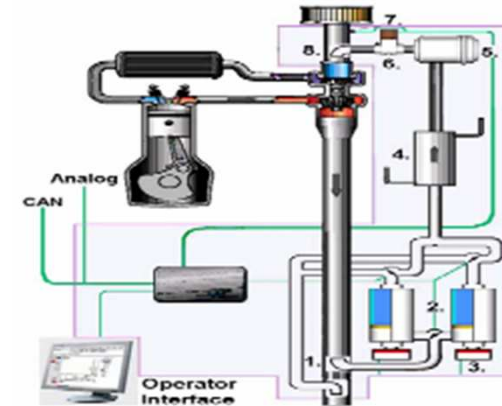
NO_x abatement

- Removal efficiency ?
- Space ?
- Chemicals ?
- Energy ?
- Documentation ?
- Crew ?

Humid inlet air



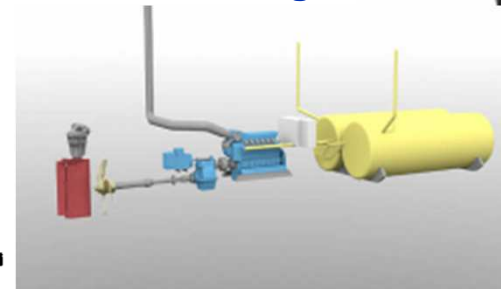
Exhaust Gas Recirculation



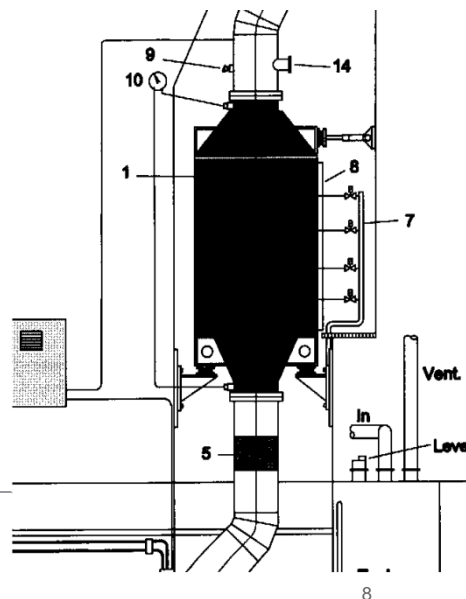
Low-NO_x engine



LNG engine

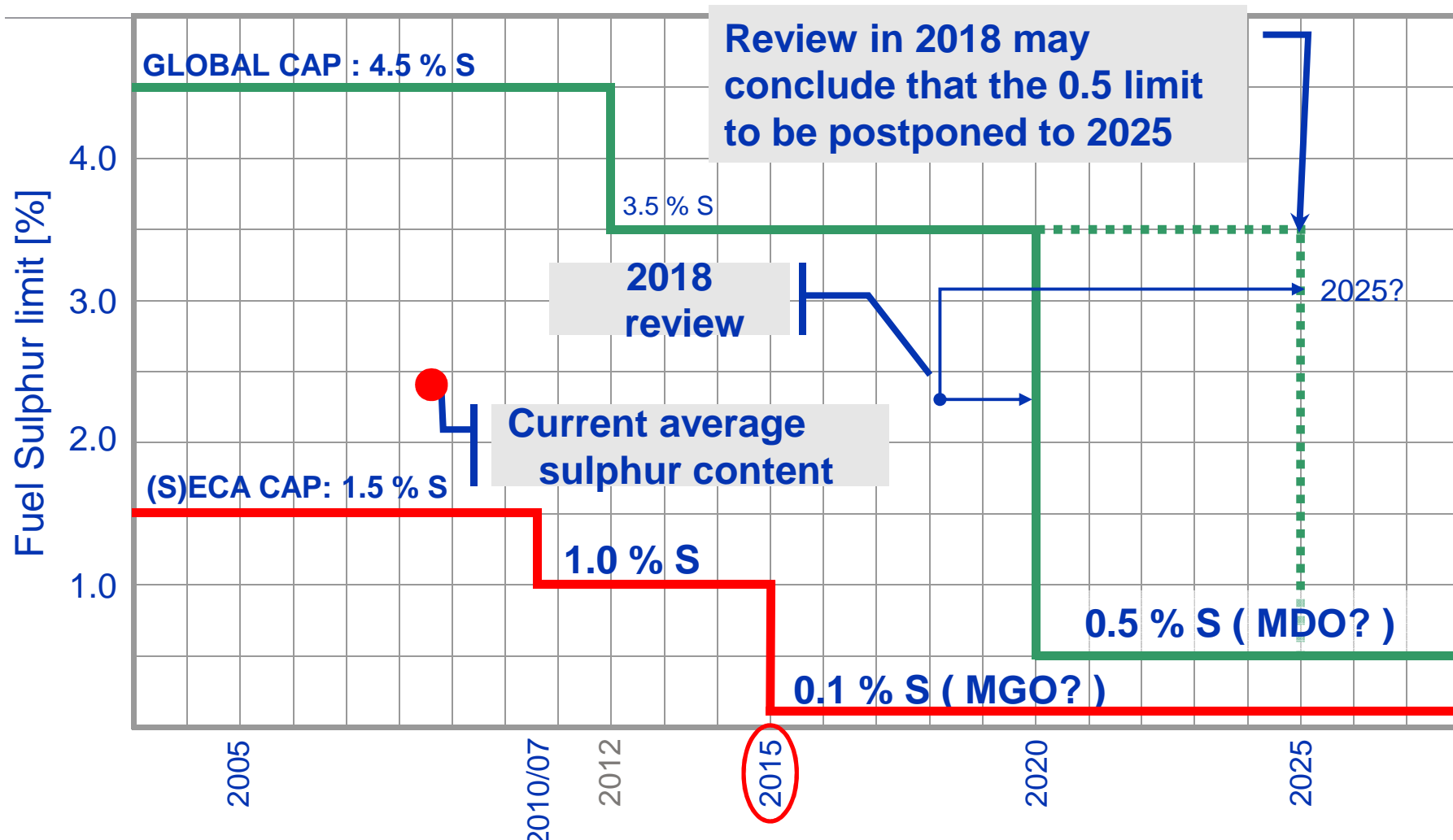


Selective Catalytic Reduction, SCR



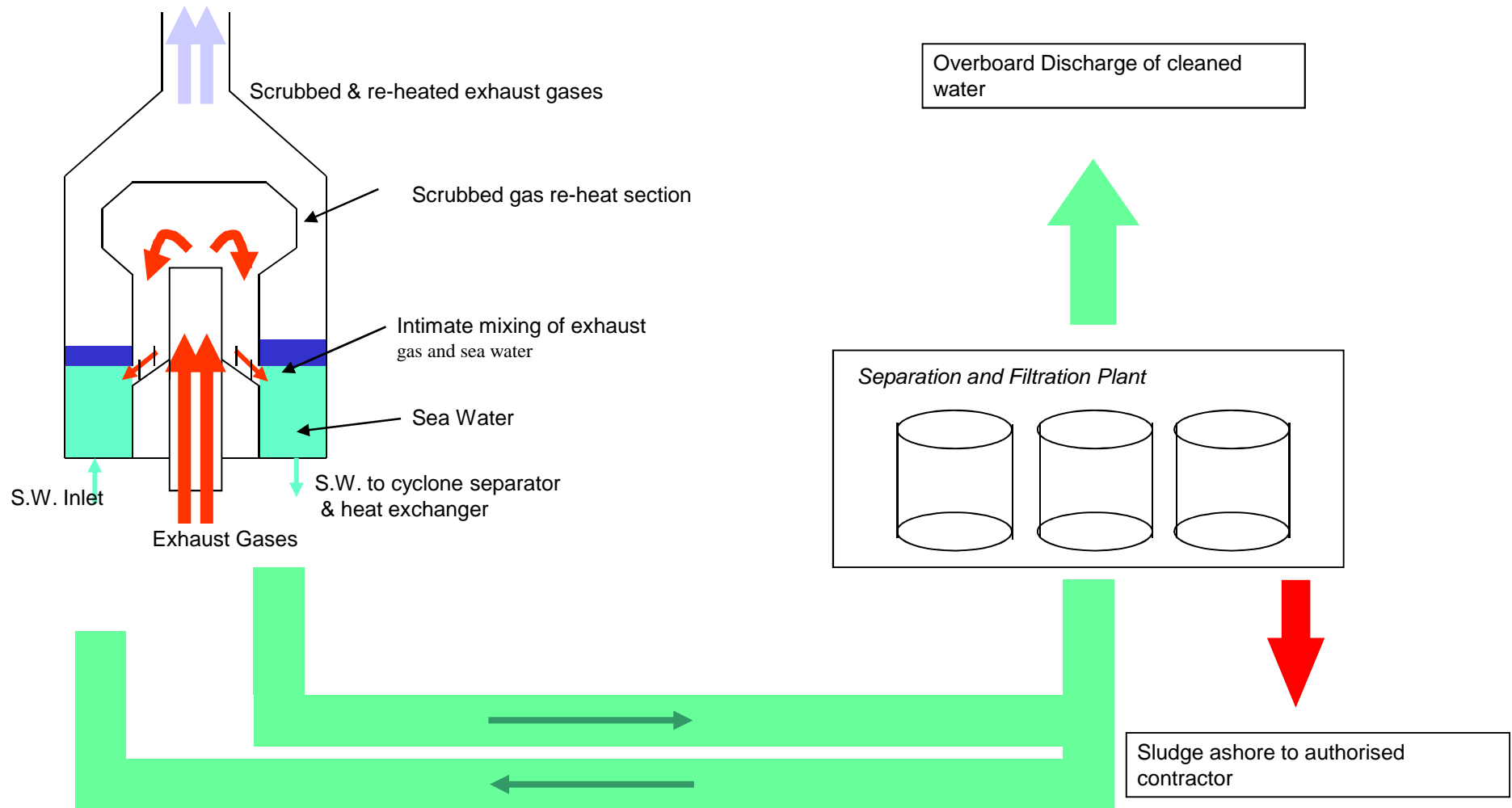
Emissions to Air - SO_x

IMO/MARPOL Annex VI SO_x Emission Limits



Abatement technology (eg Scrubbers) regarded "equivalent measure"

SO_x Abatement Systems (Scrubbing)



CO₂ Footprint



Shipping Fuel Consumption & CO₂ emissions

- > 350 million MT of heavy fuel per year
- > 200 billion USD fuel cost per year (USD 550/MT)
- > 1 billion ton CO₂ emissions per year



IMO - Energy Efficiency Design Index – EEDI

MEPC.1/Circ.681

“Interim Guidelines on the Method of Calculation of the Energy Efficiency Design Index for New Ships”

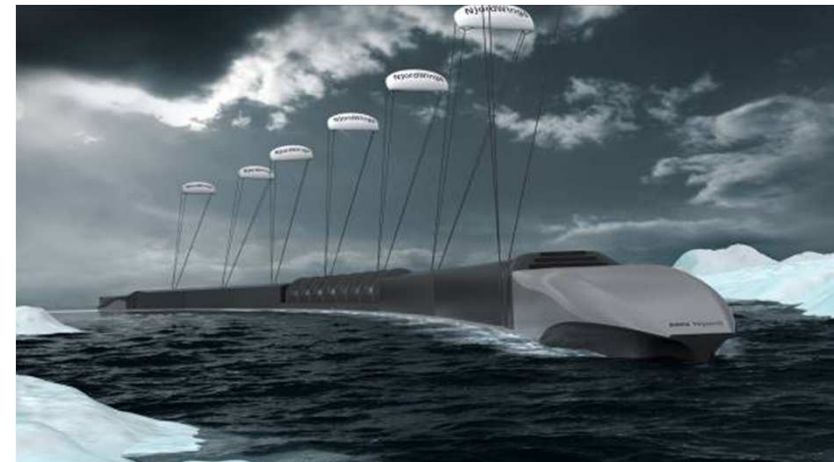
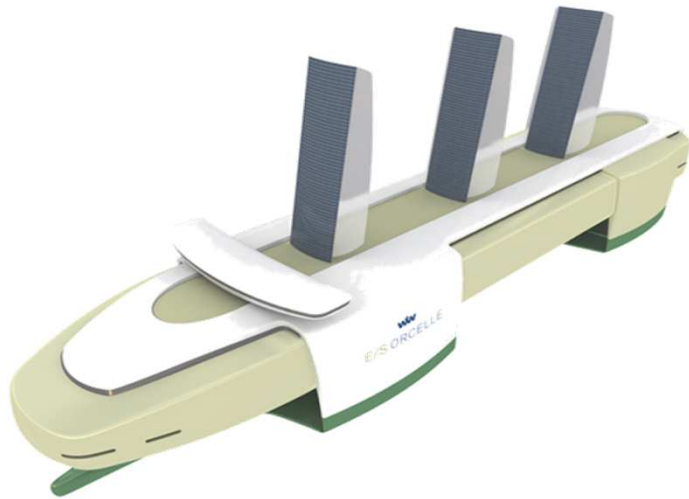
MEPC.1/Circ.682

“Interim Guidelines for Voluntary Verification of the Energy Efficiency Design Index”

MARPOL Annex VI requirement for new ships > 400 GT from 1-Jan-13

Fuel Efficient Design & Alternative Fuels

Novel designs...with visions and technologies



Liquid Natural Gas (LNG) as Fuel

LNG has potential to reduce CO₂ by 20-25% compared to HFO !!

GLUTRA: First LNG fuelled ferry built to DNV Class.

Several more in operation and coming:

- Coast Guard**
- Off-shore**
- Ferries.**

- As HFO increases in price, LNG becomes more attractive. Likely to increase.**
- Supply infrastructure is a concern.**



Energy Efficiency

SEEMP - Ship Energy Efficiency Management Plan

IMO measure to ensure energy efficient ship operation:

MEPC.1/Circ.683

“Guidance for the Development of a Ship Energy Efficiency Management Plan”

Includes:

- Impact assessment of measures to improve energy efficiency
- Performance monitoring to document efficiency gains (EEOI)

MARPOL Annex VI requirement for all ships from 1-Jan-13

EEOI - Energy Efficiency Operational Indicator

IMO initiative for monitoring of fuel consumption and CO₂ emissions (CO₂-Index)

MEPC.1/Circ.684

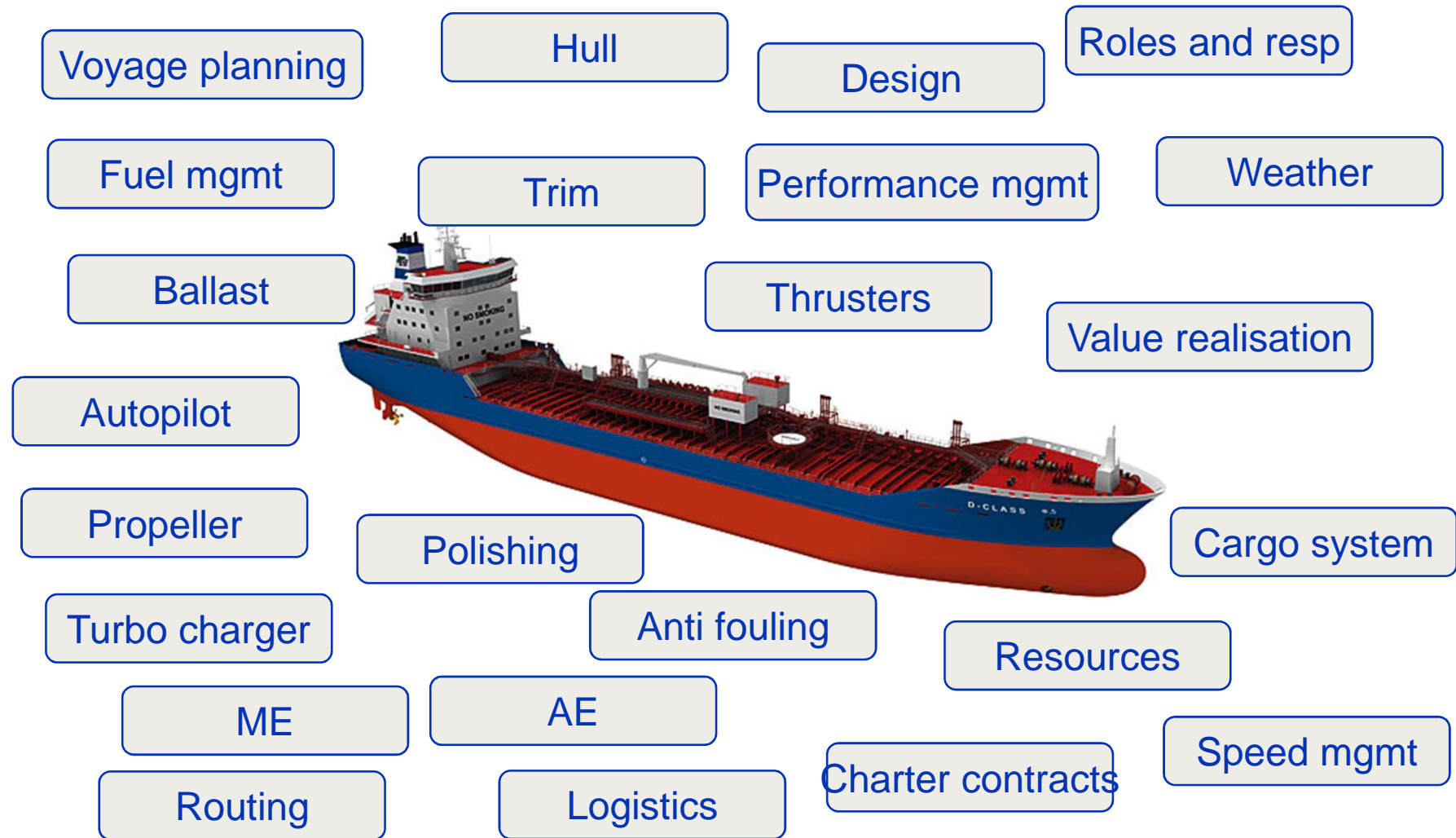
“Guidance for Voluntary Use of the Ship Energy Efficiency Operational Indicator (EEOI)”

- Based on ‘noon report’ data:
 - Total fuel consumption (FOC)
 - Actual distance traveled (D)
 - Cargo mass or cargo unit (m, TEU)
 - Fuel Carbon Content (C_F)

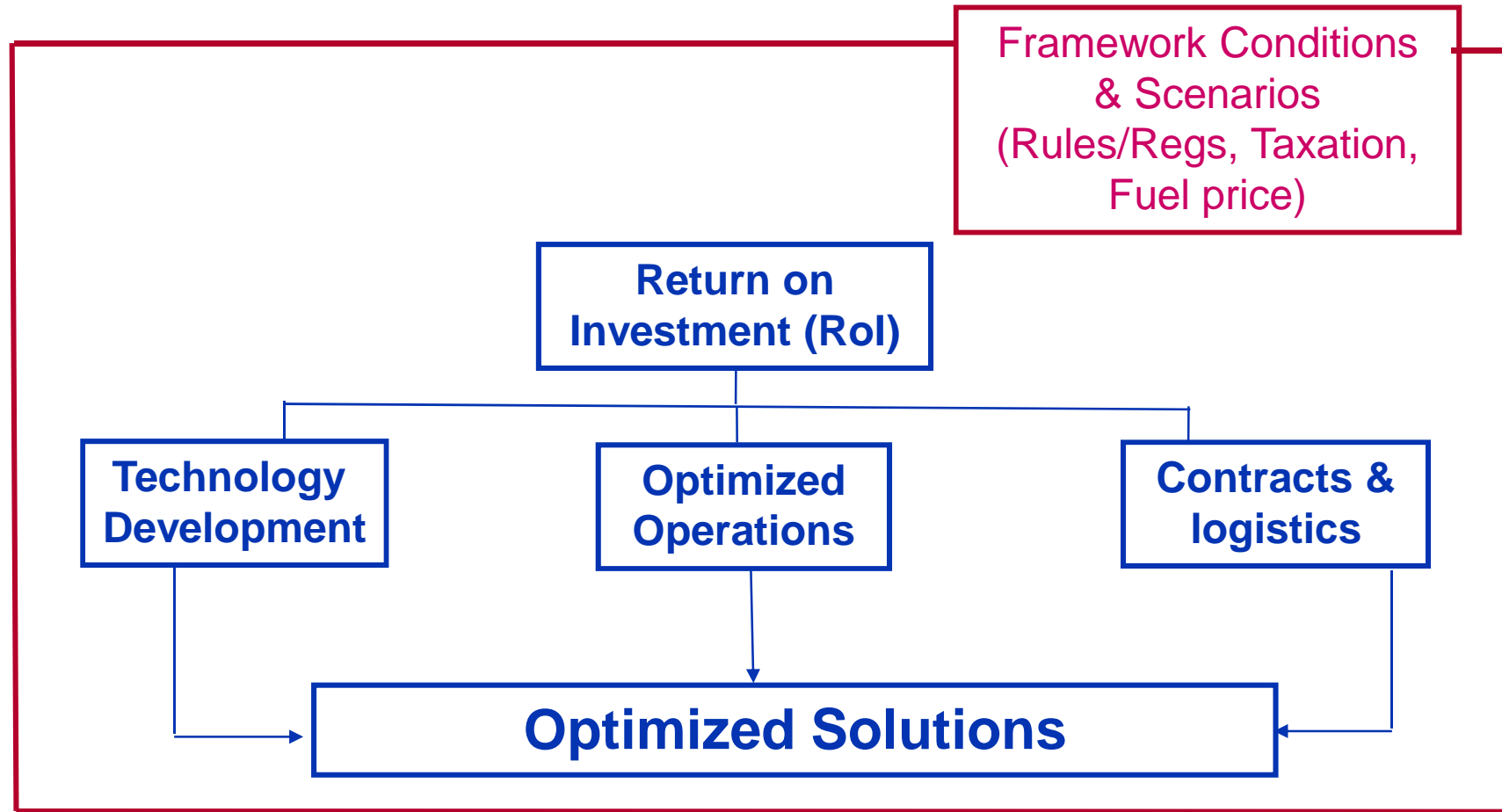
$$\frac{\text{FOC} * C_F}{M_{\text{cargo}} * D} = \text{g CO}_2/\text{ton,mile}$$

Not an IMO requirement, but cargo owners have started to ask for EEOI

Potential fuel saving initiatives



Cost Effective Measures & Investments



Tool for evaluation of cost effectiveness of scenarios & solutions

Discharge to Sea - Ballast Water

IMO BWM Convention - Adopted 13 Feb 2004

- All ships shall have on board:
 - International BW Management Certificate
 - BW management plan
 - BW record book
- Ballast Water Management
 - BW Exchange (to be phased out)
 - BW Treatment
- Entry into force 12 months after signing by:
 - 30 States
 - 35% of world merchant shipping tonnage
- Will have **retroactive** effect



Ship Re-cycling

Ships Recycling Convention – Hong Kong 2009

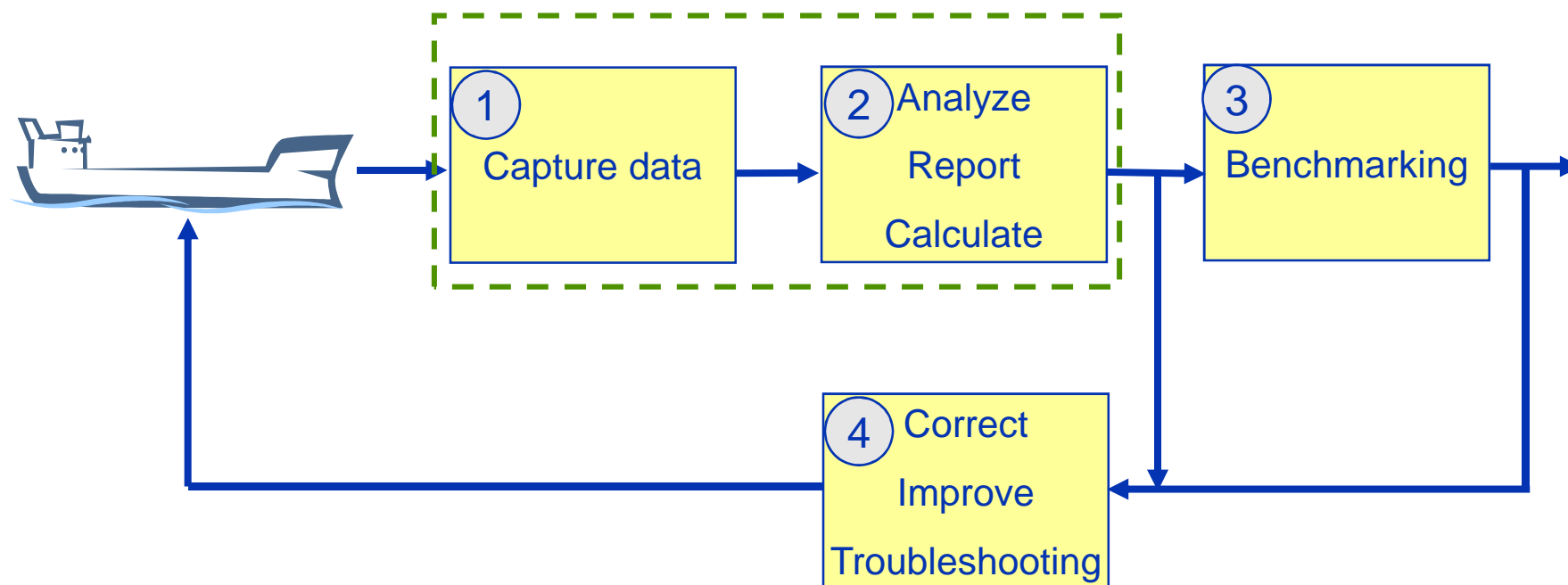
- Design, construction, operation and preparation of ships to facilitate safe and environmentally sound recycling
- Includes **Inventory of Hazardous Materials**
- Safe and environmentally sound operation of ship-recycling facilities
- Places responsibilities on:
 - **Ship owners**
 - **Ship builders**
 - **Recycling facilities**
 - **National authorities**



Environmental Accounting and Monitoring

Environmental performance becomes business critical

Monitoring and reporting



As part of EMS:

Identify env. indicators



Criteria & KPIs



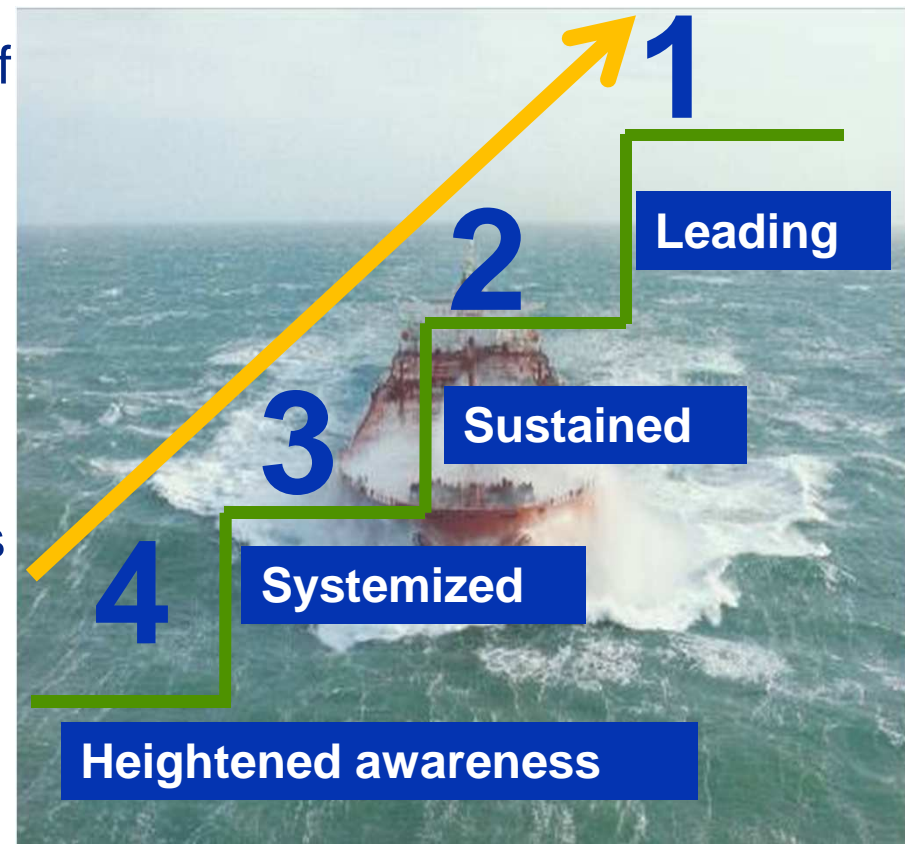
Monitor KPI fulfillment

Triple-E™

DNV Environmental & Energy Efficiency Rating Scheme

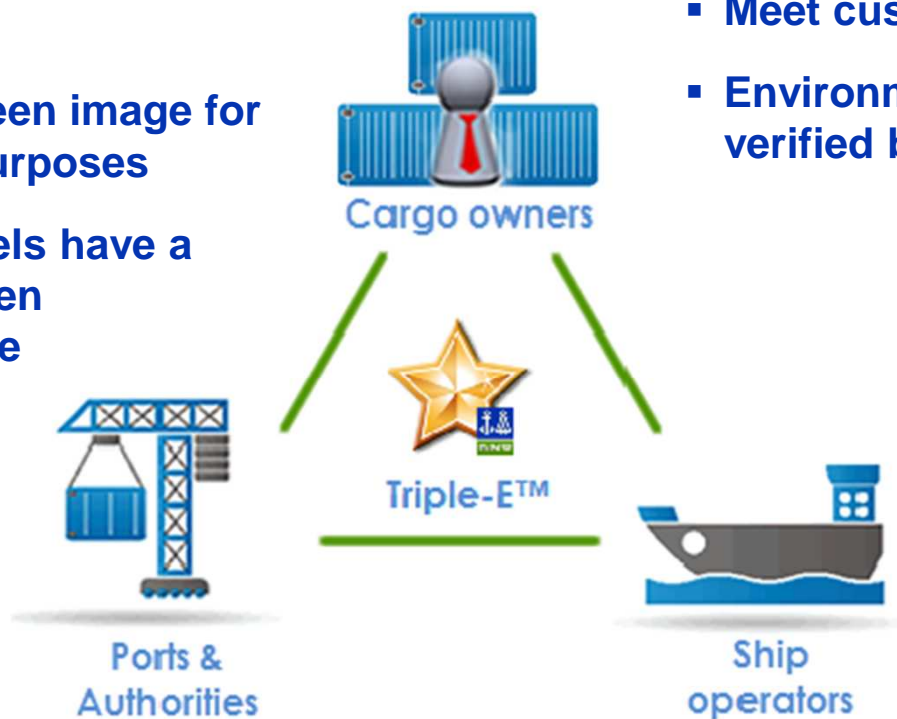
Triple-E™

- Voluntary environmental performance rating scheme for ships, independent of class, age and flag
- Key elements:
 - Environmental management
 - Fuel efficient operation
 - Energy efficient design
 - Verifiable monitoring, measurements and documentation schemes
- Successfully used by tanker, container and ro-ro ship operators
- Applicable for new and existing ships



Value of environmental performance rating

- Basis for green incentive schemes
- Improve green image for branding purposes
- Rated vessels have a verified green performance



- Select the environmental 'best performers' for charter
- Optimal fuel efficiency of chartered in ships
- Meet customers green expectations
- Environmental performance of vessels verified by an independent third party
- Stay in the forefront of green shipping rules and regulations
- Prove environmental responsibility and energy efficient operation
- Branding of ships' environmental performance
- Benchmarking of own fleet

Conclusions

- New regulations
- New technologies
- New requirements for monitoring & documentation



- Will represent a challenge for sea-going personnel
- Proper training including use of simulators is a must to handle these challenges



Safeguarding life, property and the environment

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