Developments and visions of enviromental friendly ship

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Developments and visions of enviromental friendly ship

- About us
- Environmental drivers
- LNG
- Biofuels
- Fuel Cells
- Wind and Solar Power

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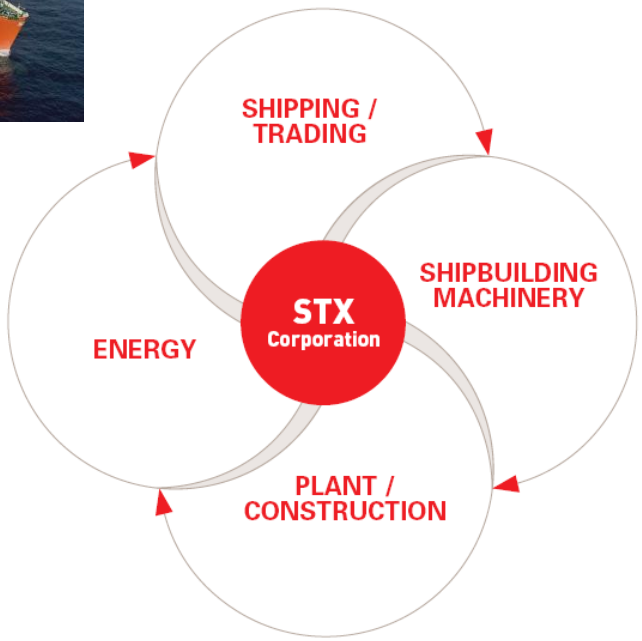
STX Business Group
A Korean conglomerate



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Shipbuilding

Norway – OSVs
Specialized Vessel

Finland – Cruise & Ferries
LNGC
Ice Breaker

China – Bulkers
PCTC
Drillship
FSO
Pipelayer

France – Cruise & Ferries
Naval Vessels

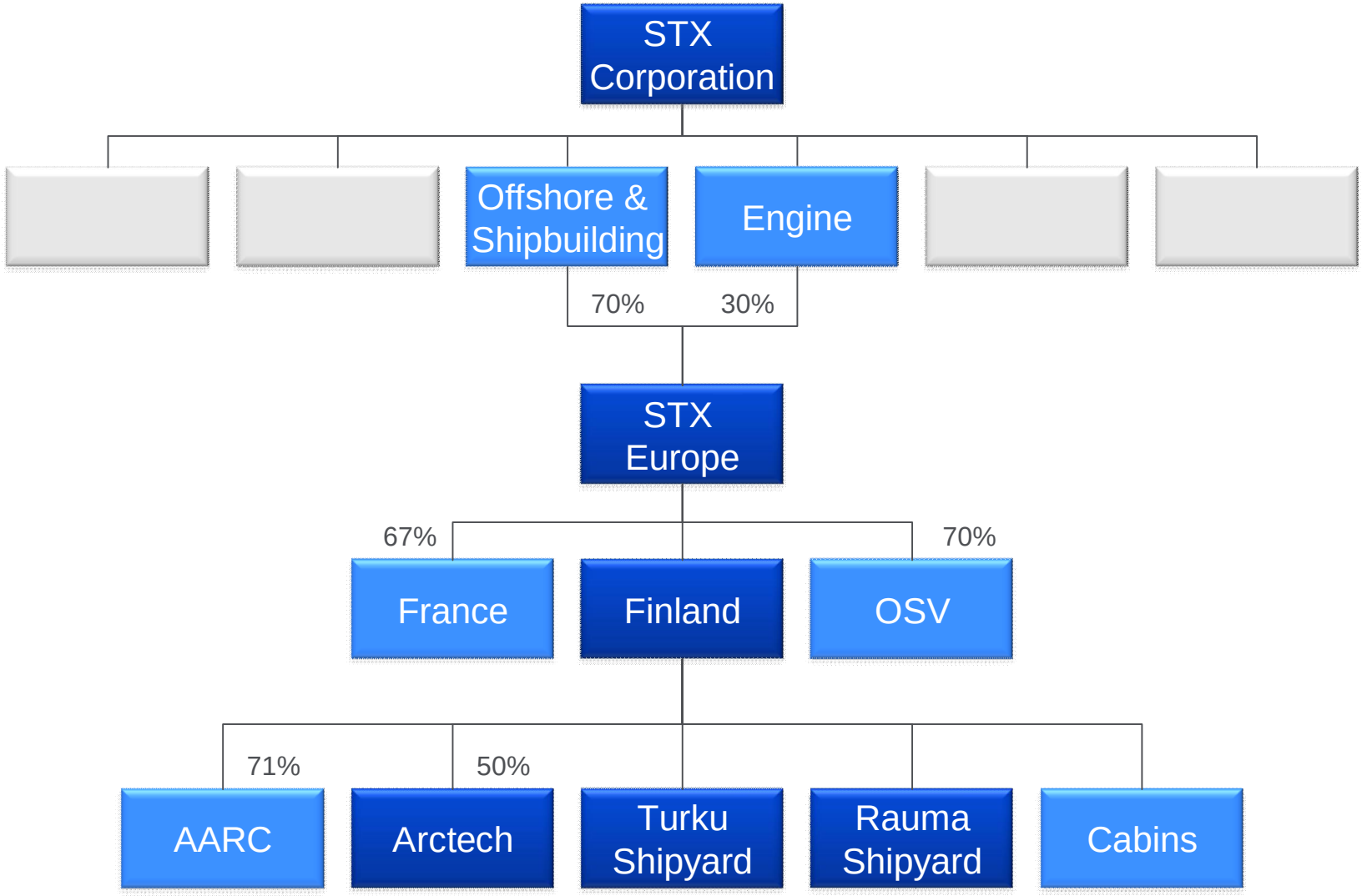
Romania – Bulkers
OSVs

Vietnam - OSVs

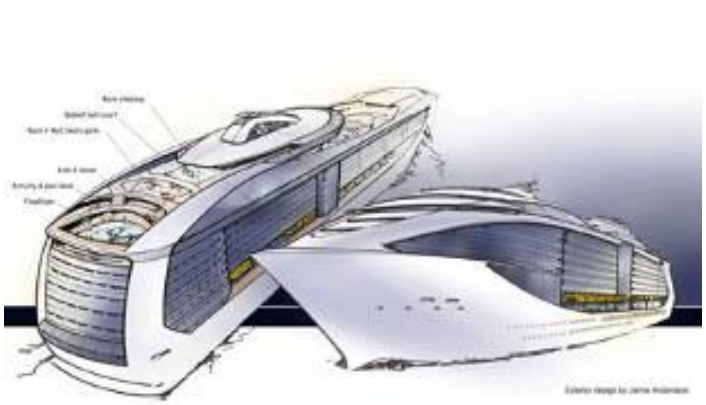
Korea – LNGC
FPSO
VLCC
Mega Container

Brazil – OSVs

Corporate Structure



Key characteristics



Leading cruise vessel builder - 20% market share

Leading cruise ferry builder - 40% market share

Leading icebreaker builder - 60% market share

Strong focus on research, development and innovation,

Concept design to Customer's needs

Developing and supporting the vast sub-supplier network

Focus on the Customers' needs throughout the whole lifecycle

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STX Finland orderbook

	Name	Delivery	Owner	Yard
	Spirit of Britain, Spirit of France (1367, 1368)	III / 2011	P&O Ferries	Rauma
	Polar Supply and Research Vessel (1369)	II / 2012	DEA	Rauma
	Cruise Ferry (1376)	II / 2013	Viking Line	Turku
	Icebreaking Supply Vessels	III / 2013	Sovcomflot	Helsinki
	Fisheries Reseach Vessel	II / 2012	MFMR of the Republic of Namibia	Rauma
	Multipurpose Deck Cargo Cargo Vessel (1379)	II / 2012	Gaiamare Ltd	Turku

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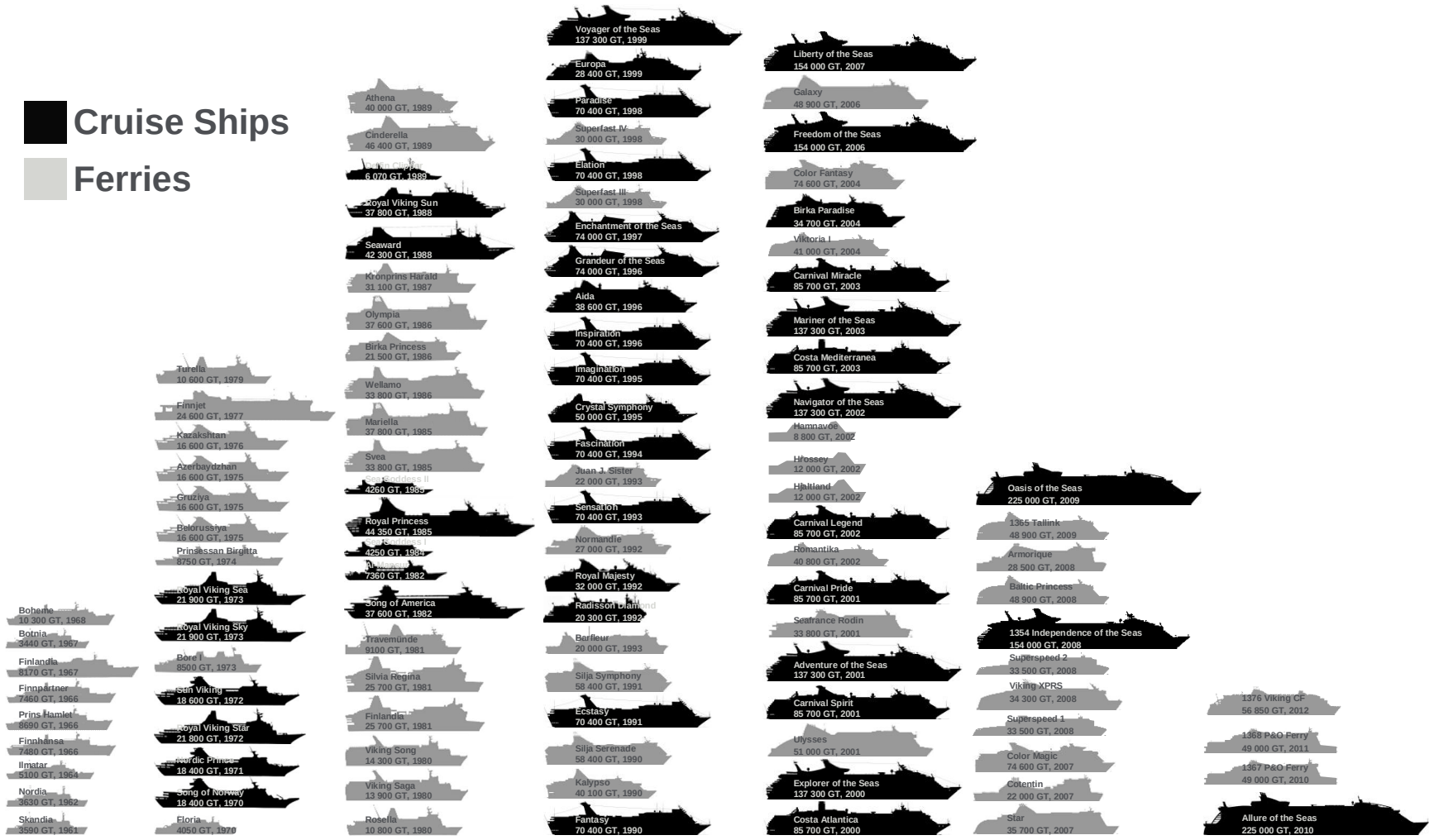
Passenger Ships Built or On Order in Finnish Yards (after 1960)



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Environmental drivers

Cruise Ships Emissions

Environmental drivers

The International Maritime Organization (IMO), as the main regulatory body for shipping, has in recent years devoted significant time and effort to the issue of regulating shipping energy efficiency in order to control marine greenhouse gas (GHG) emissions.

The IMO has developed a number of technical measures that include:

- the Energy Efficiency Design Index (EEDI)
  - limits allowable CO2 emissions per ton or passenger mileage
- the Energy Efficiency Operational Indicator (EEOI)
- the Ship Energy Efficiency Management Plan (SEEMP)
- IMO: revised MARPOL Annex VI
  - Global sulphur limit of 3,5% from 1.1.2012 and 0,5% from 1.1.2020
  - Sulphur Emission Control Areas: from 1,5% 2006 to 0,1% 2015
  - NOx limits Tier III in emission control areas (1.1.2016) and outside Tier II (1.1.2011)
  - Includes also regulations for ozone-depleting substances, volatile organic compounds, shipboard incineration, fuel oil availability and quality

European Union (EU)

- 20 % cut to overall CO_2 emissions from year 1990 levels to year 2020
- Applies to all CO_2 producing activities (international traffic excluded in Kyoto Protocol)
- 0,1% sulphur content limit for EU ports 1.1.2010

Regional regulations

- Emission control areas
- Port dues depending on amount of emissions, etc.

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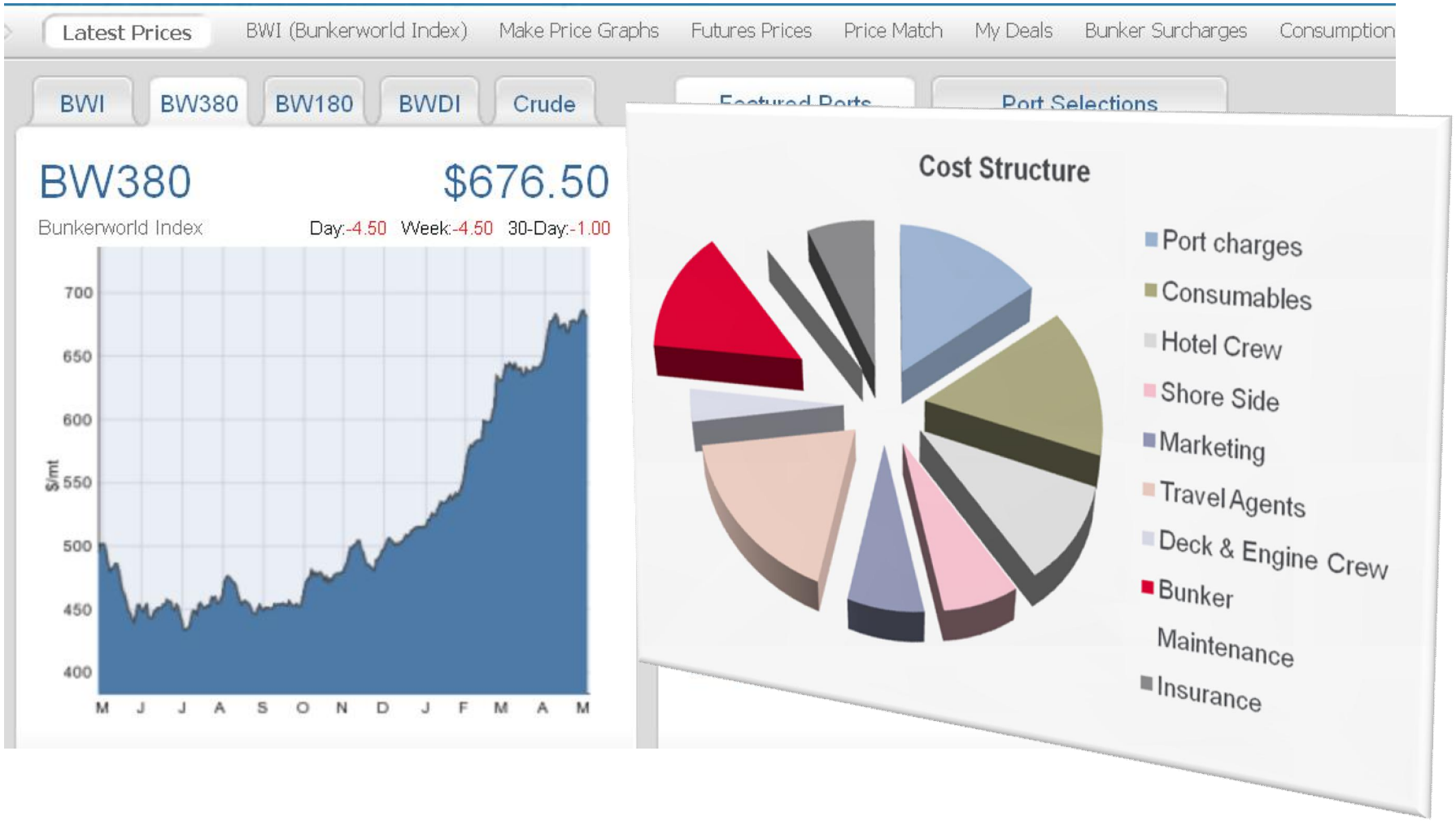
Fuel Price



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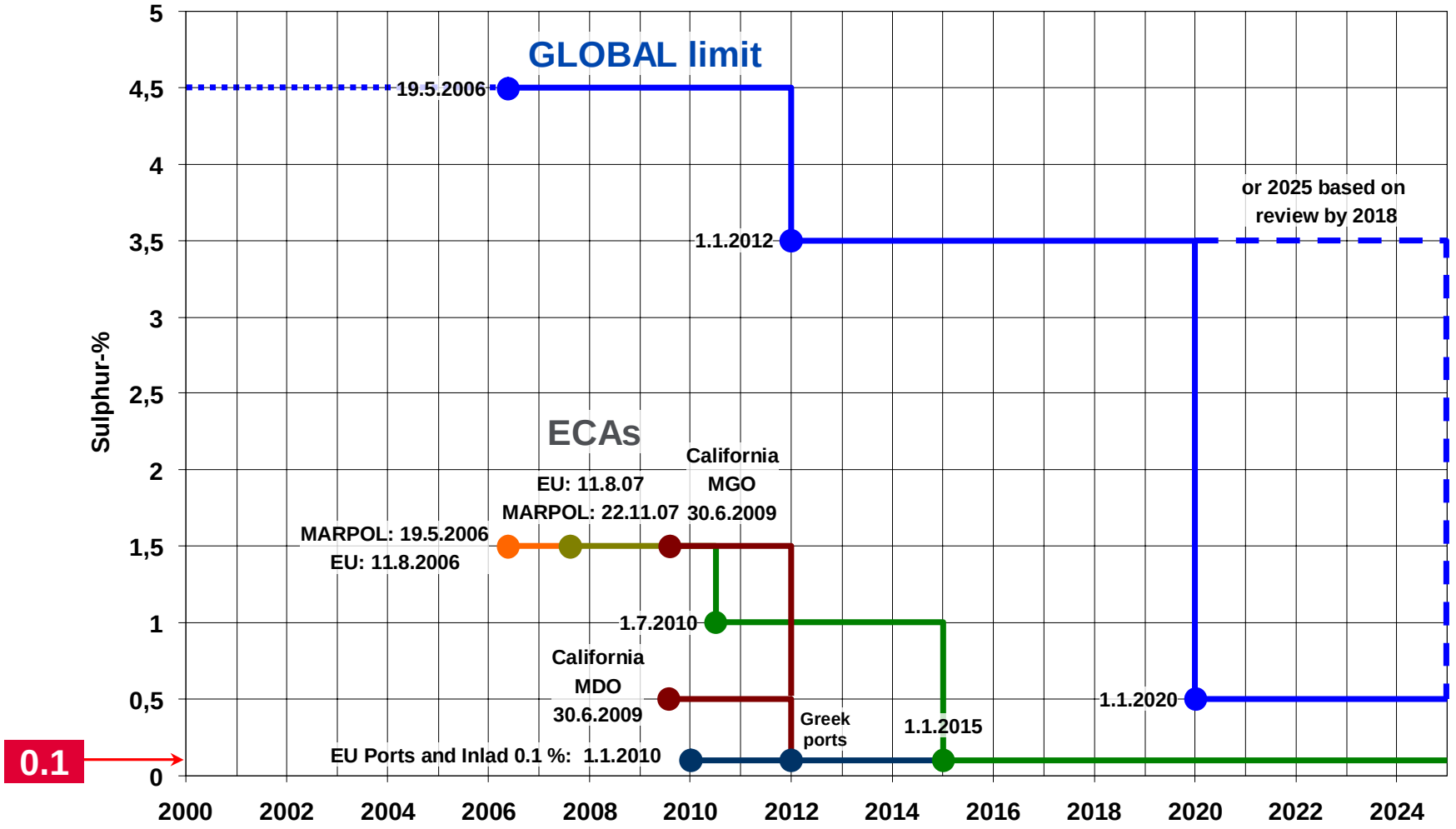
SOx - Fuel Oils (emission) Sulphur Content Limits for ALL SHIPS



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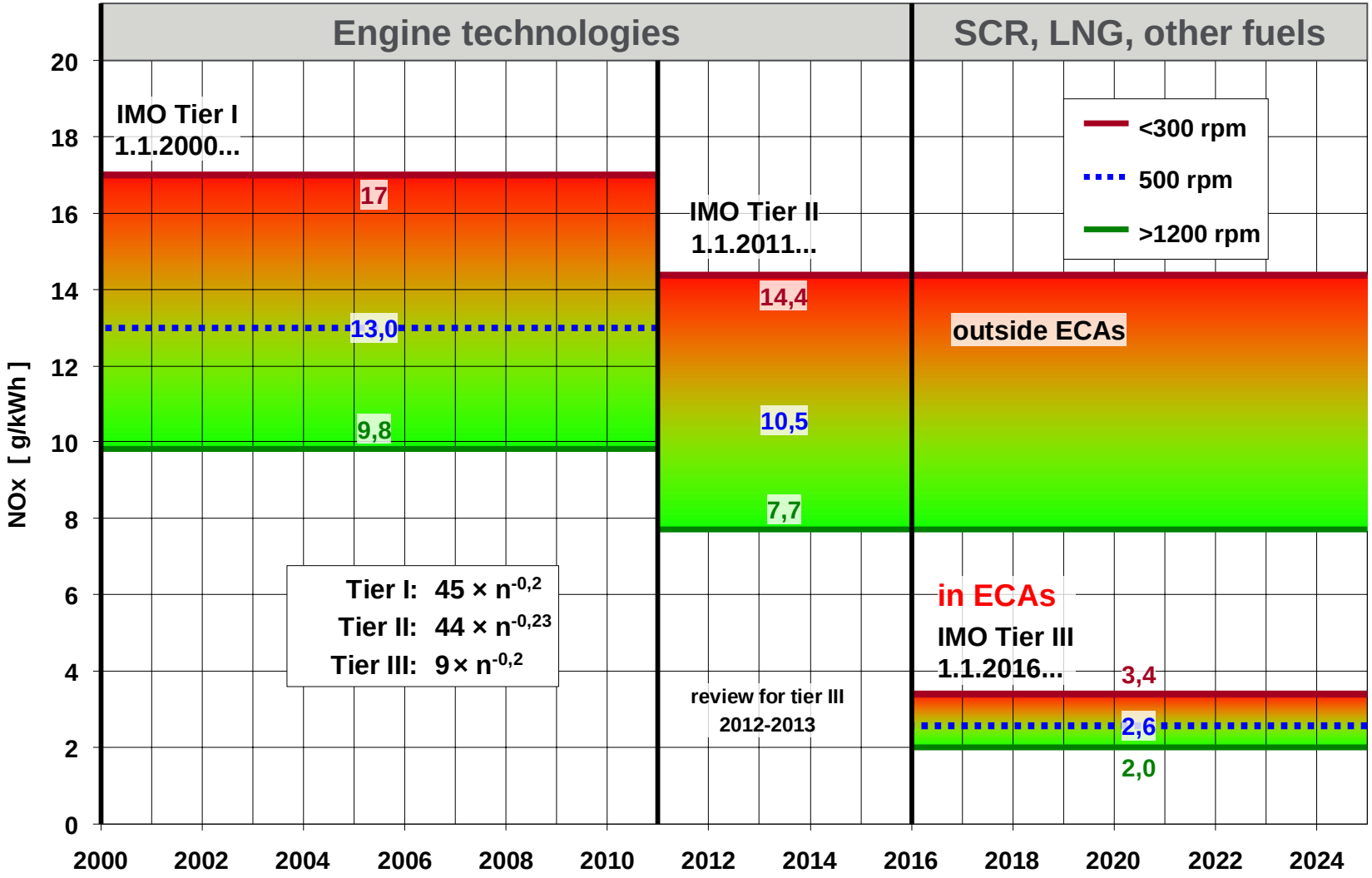
NOx Limits for NEW Marine Engines > 130 kW



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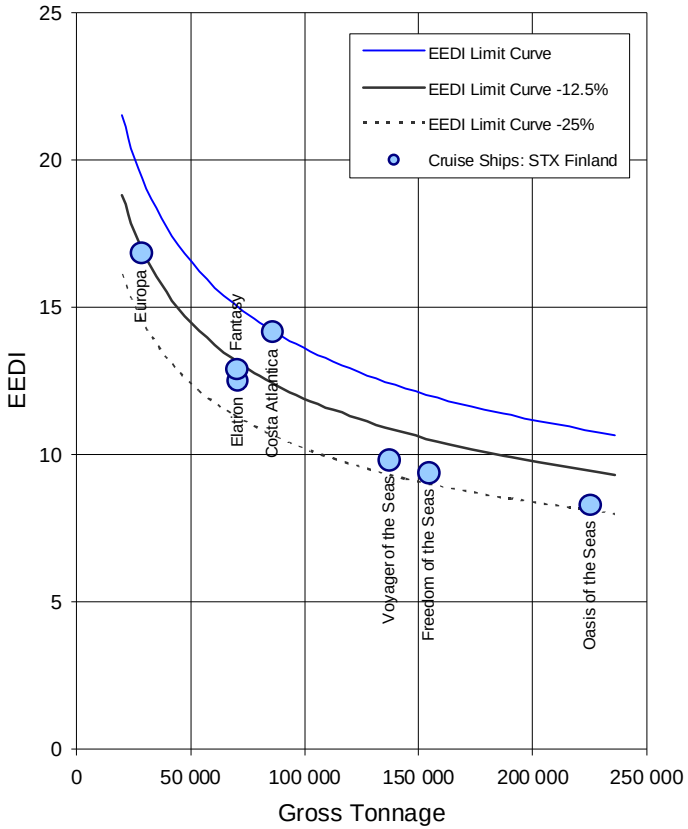
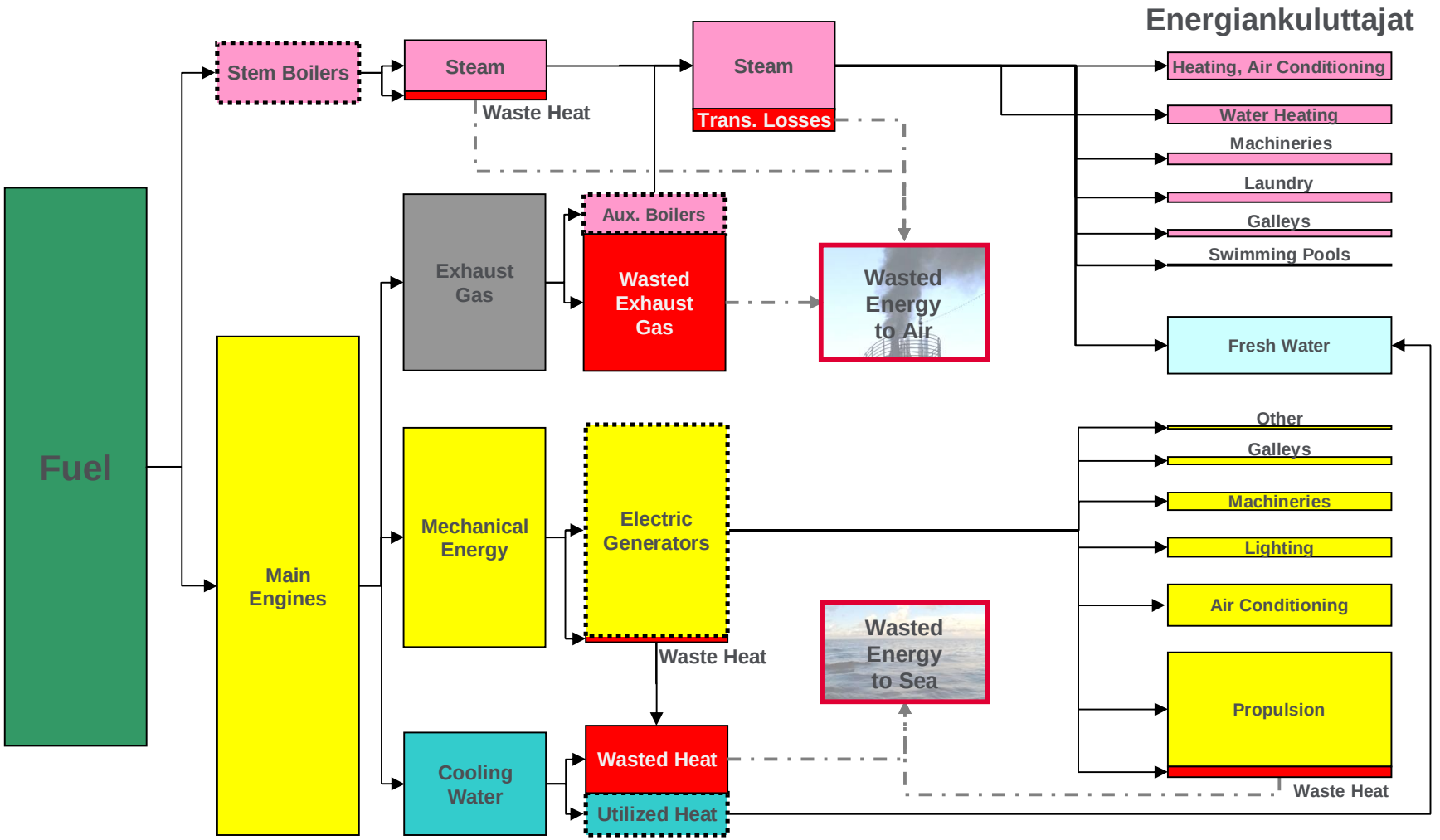
EEDI - Energy Efficiency Design Index for New Ships

- EEDI is currently under development by IMO Marine Environment Protection Committee
- Coverage in first phase: oil and gas tankers, bulk carriers, general cargo and container ships, ro-ro carriers and passenger ships
- EEDI value reprecents the production of CO2 in relation to the "benefit for the society"
- For the moment EEDI is voluntary design criteria
- Preliminary limiting curves presented here are calculated from the data of 71 modern cruise vessels built 1999 – 2009.



$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE}*\right) + \left(\left(\prod_{j=1}^{M} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE}\right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}\right)}{f_i \cdot Capacity_{ref} \cdot f_w}$$

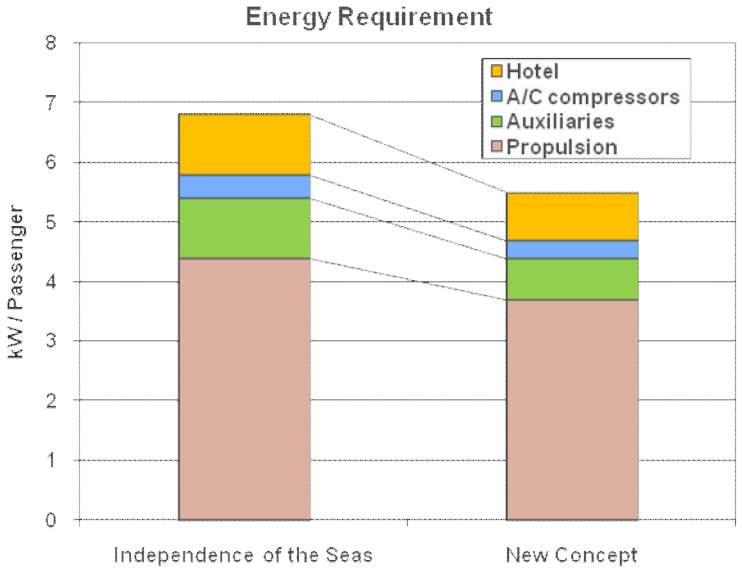
Cruise Ship Energy Flow

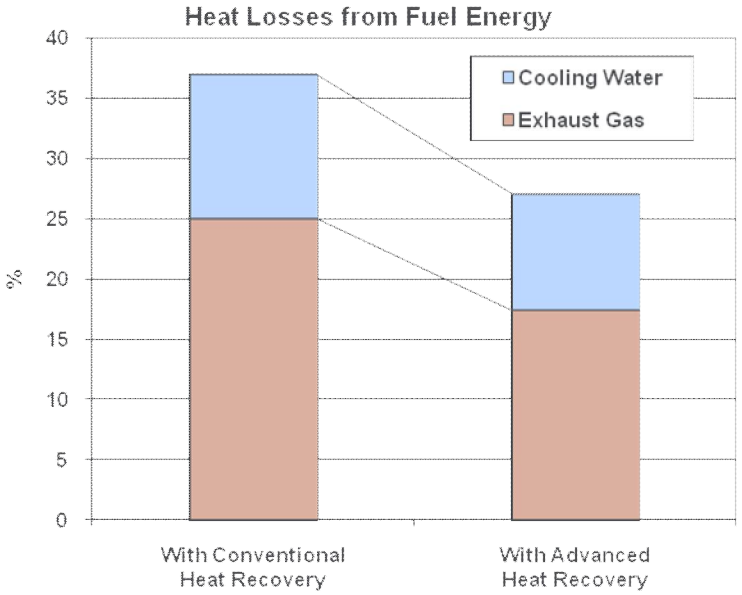


New Energy Efficient Cruise Ship Concepts

Independence of the Seas (2008) is currently the most energy efficient ship in her size category. With new and improved technology - of which some introduced in Oasis class - significantly better energy efficiency level is feasible.

By reducing the energy requirements together with improved waste heat recovery and optimized total energy flow, 20% to 30% better energy efficiency is achievable compared to Independency of the Seas and even over 40% if compared to other large cruise ships.





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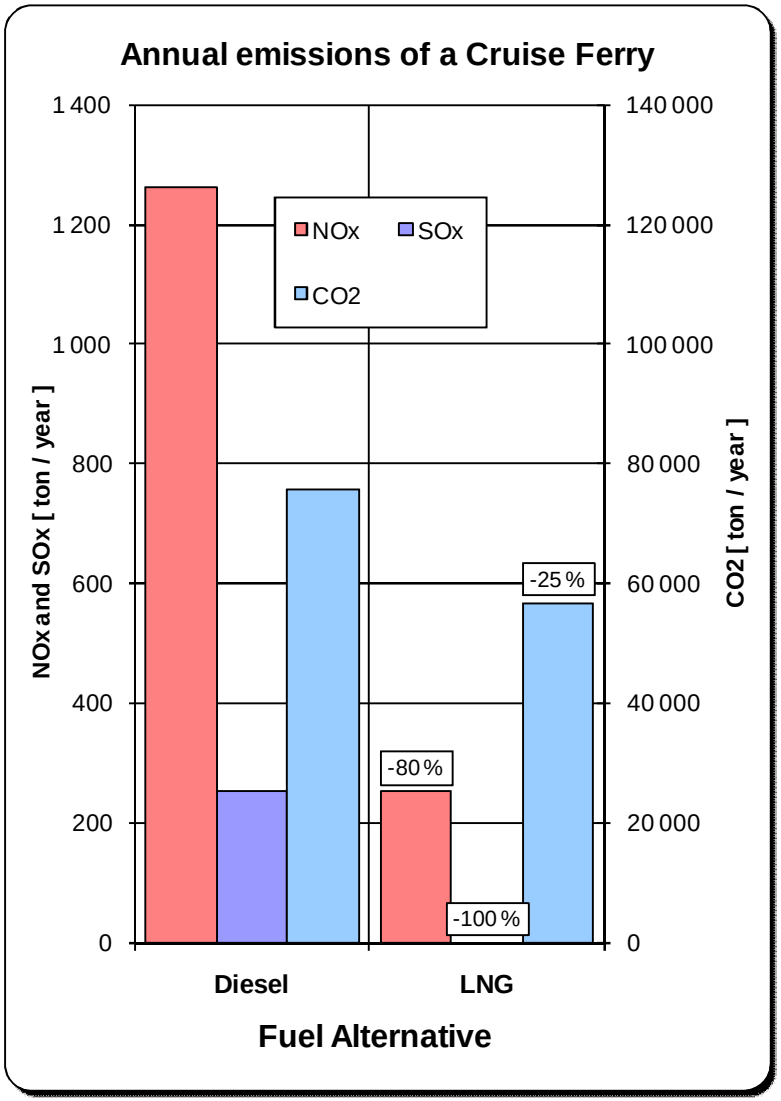
LNG

LNG

Natural gas has become a popular fuel option for shipowners trying to meet legislative emissions requirements as well as to gain benefit from emission based route and port fees.

Pros and cons:

++ emissions	-- bunkering
+ gas reserves	- storage
	- methane slip
	- spillage
	- combustion process



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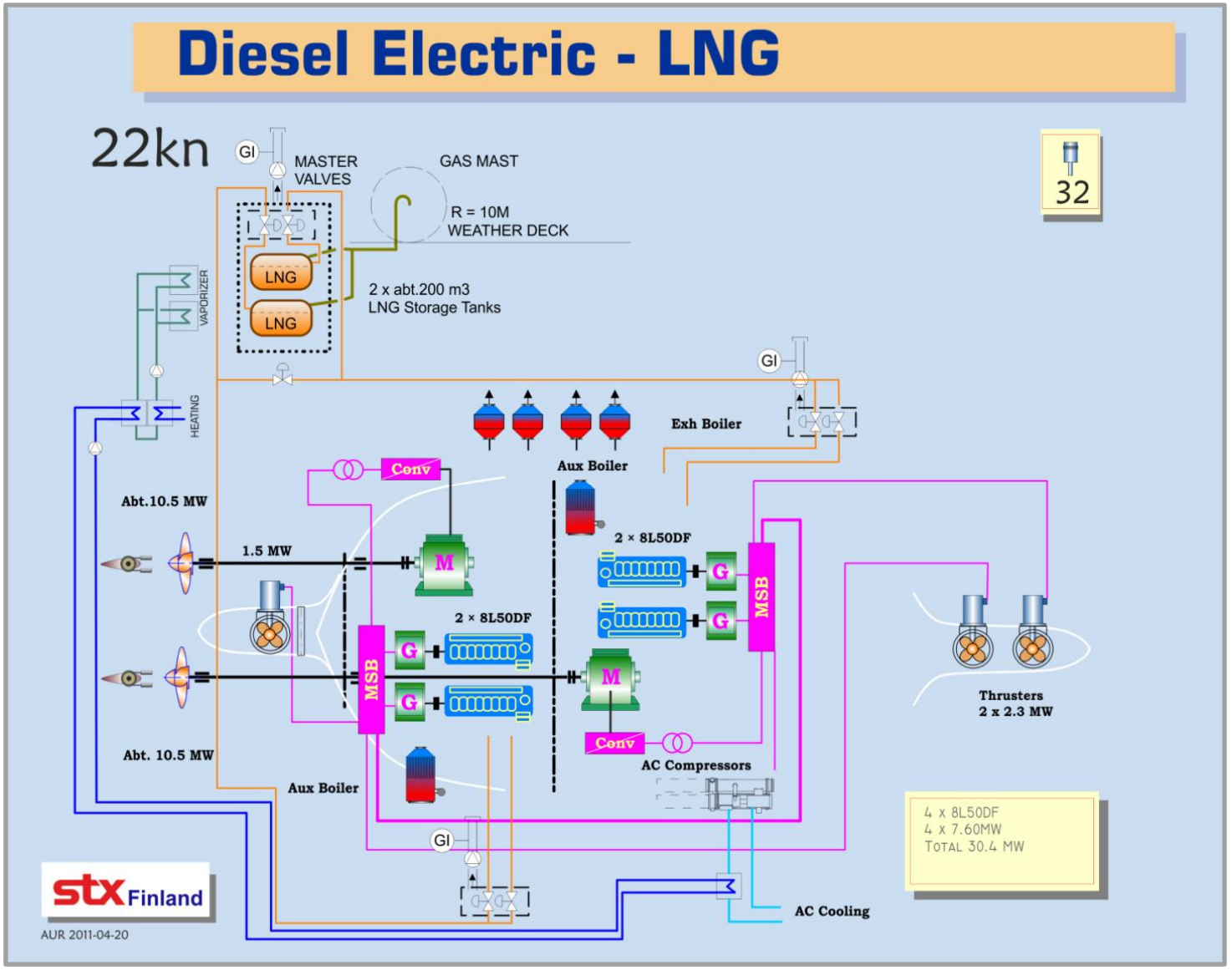
LNG Machinery Principle



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Biofuel

Aura 2 - Biofuel powered multipurpose deck cargo vessel

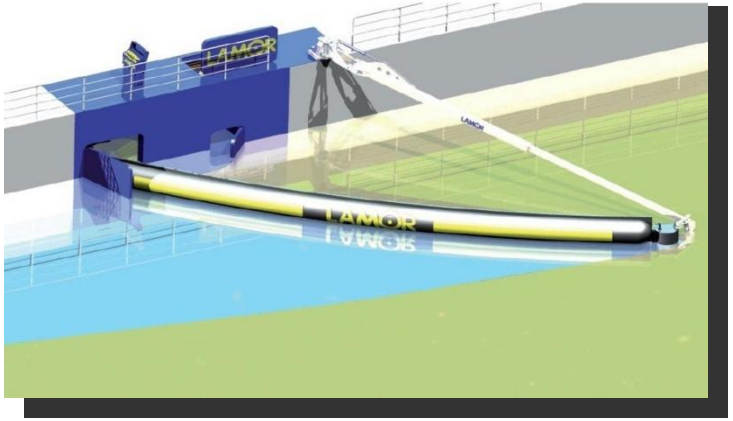
Double Acting Ship (DASTM) – concept

- Good stern first operation capability in brushed ice conditions
- Dynamic position system (DP)
- Azimuthing thruster propulsion
- Ice class 1 A
- Length 105,4 m
- Breadth 18,8 m
- Draught 3,5 – 4,9 m

Oil Recovery readiness

- 2700 m³ oil recovery storage
- year around oil recovery capability
- high manouvrability in oil recovery operations
- high transportation capacity for mobile oil recovery equipment

Safe transportation of special project cargos, like structures for offshore windmills



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Aura 2

Ship's machinery and fuel systems are designed to use LBF (Liquid Bio Fuel) as an alternative to non renewable fuels

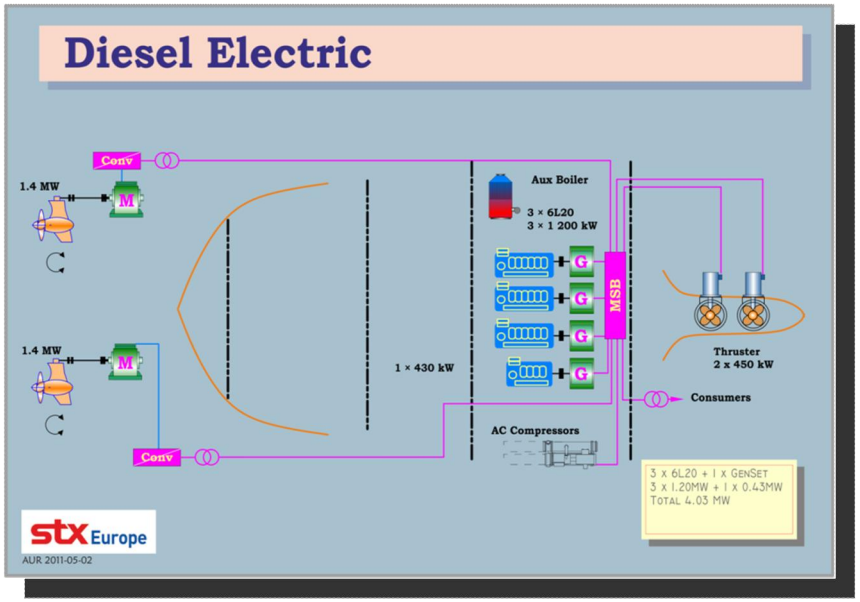
- Wärtsilä 6L20 Genset 3 × 1200 kW
- Azimuthing rudder propellers 2 × 1400 kW
- Bow thrusters 2 × 450 kW

Minimized environmental impact due to

- no sulphur oxide emissions
- reduction of CO2 emissions
- low particulate emissions

Biofuel production

- Sybimar, part of the owner company, is planning to produce the biofuel in their own facilty
- Biofuel is produced from eg. fish industries side streams



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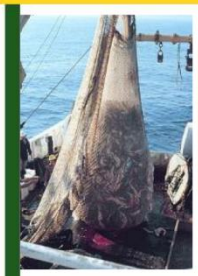
Liquid Biofuels from Residues

Sybimar Oy
Energy Solutions



Food industry
-Slaughterhouse
-Fishery
- Chicken coop

Food

Process Heat

Oily/Fatty residues

Bio Oil

Combined Heat and Power (CHP) => Distributed Energy Solution?

Perkules:
Refining and acidifying unit

SeparUnit:
Bio oil separation unit

Bio Oil

Biodiesel

Biodiesel for needs of sea & road logistics or CHP

Solids for Animal Feed or Biogas production

Bio Oil

Bio oil for needs of sea logistics

Fuel Cells

Fuel cells

General

+ Very low level of harmful emissions
+ High fuel efficiency
+ Low noise and vibration levels
- Unmature technology
- Not suitable for primary power source due to the small unit size, kWs instead of MWs

Concept idea:

- Fuel cells use biogas as fuel
- Biogas is produced by the biological degradation of ships food waste
- Continuous digestion process
- Achievable electric energy production capacity in a cruise ship approximately 20-50 kW

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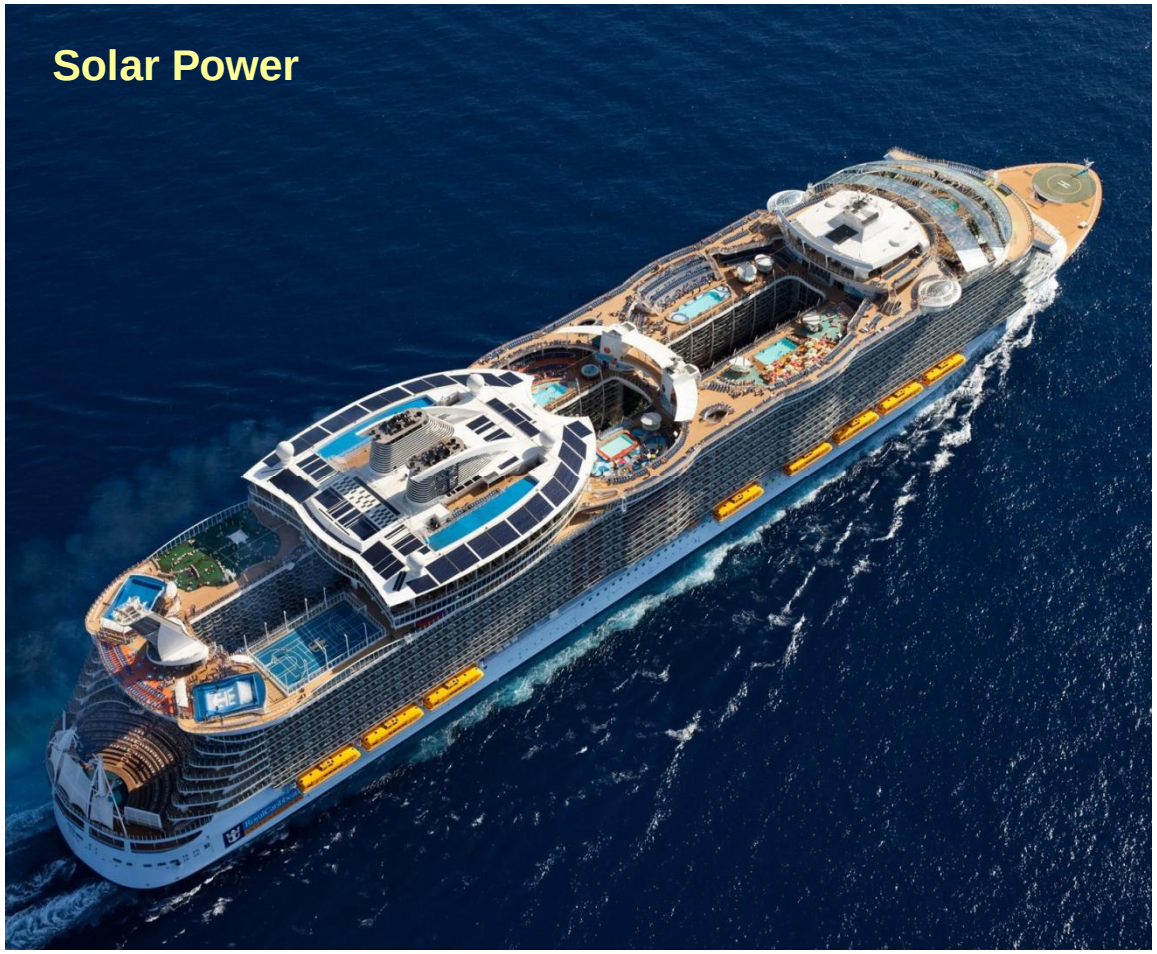
Wind and Solar Power

Wind and Solar Power



- Sails

- Flettner rotors

- Kite (Sky Sail)

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Thank you!