‘Innovation in Shipping - Green Vessel of the Future’

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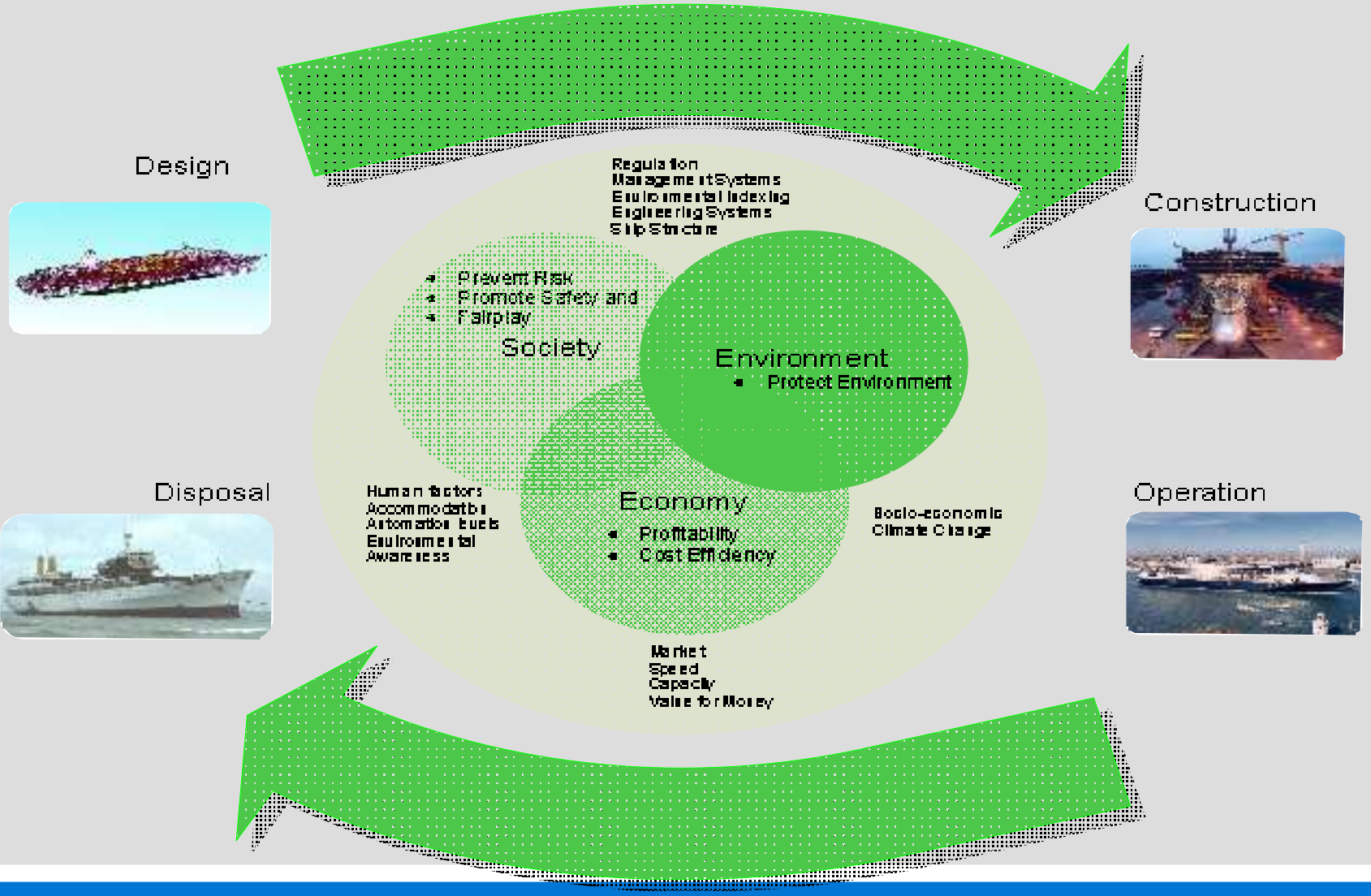
Lloyd's Register

250 YEARS OF SERVICE

Innovation in Shipping ??

- New products: novel ship designs
- New technology: renewable energy, fuels, materials, automation, recycling,
- New tools: comms software, risk-based maintenance systems
- New systems: integrated management systems
- New operating models: virtual teams, joint ventures etc
- New business mix: routes, cargoes (CO_2 etc), diversification, public/private

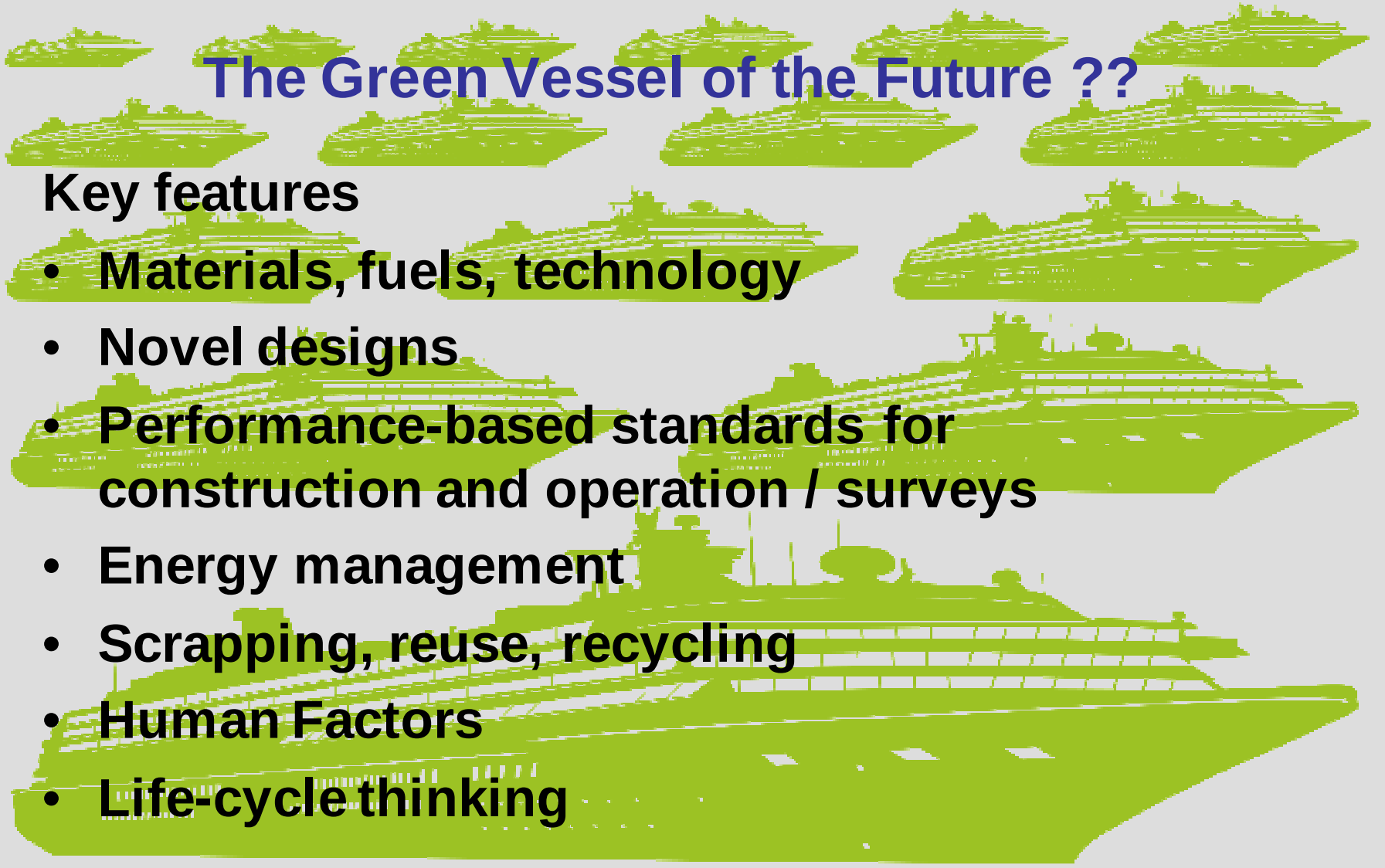
Why Green Ship Innovation?



Drivers for Innovation

- Social/political/environment/regulatory issues
- Quality, safety, security, human factor challenges
- Cost reduction, driven by financial crisis to increase efficiencies.
- Creation of new markets
- Gain competitive advantage
- Profit, creating value for shareholders "Sell more valued products to appreciative customers in a responsible way" Paul Polman, Chief Exec Unilever.
- Sustainability drive in general

The Green Vessel of the Future ??



Key features

- **Materials, fuels, technology**
- **Novel designs**
- **Performance-based standards for construction and operation / surveys**
- **Energy management**
- **Scrapping, reuse, recycling**
- **Human Factors**
- **Life-cycle thinking**

Current Technology Measures – Potential Efficiency Gains

Technology	Potential efficiency gains
Optimal hull maintenance	4%-8%
Propeller maintenance	1%-3%
Fuel injection	1%-2%
Fuel switch from HFO to MDO	4%-5%
Efficiency rating	3%-5%
Turbocharger upgrades	5%-7%
Engine tuning	1%-2%
Waste heat recovery	5%-10%

Efficiency gains
Up to 40%

Efficiency gains
Up to 20%

Operational measures	Potential efficiency gains
Transport management	5%- 40%
Weather routing	2%- 4%
Just in time strategy	1%- 5%
Increase vessel size	1%-10%
Constant RPM	1%- 2%

Hull and material challenges

Hull design

- reduction in fuel usage
- increase strength to manage risk of accidental pollution

Needs:

- performance based regulatory framework
- ship design procedures to deal with extreme conditions;
- software tools for load predictions

Technology Outlook : Emerging Technologies

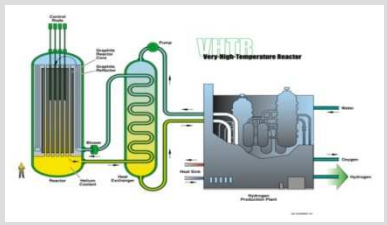
- **Waves and Climate**
- **Alternative sources of energy : Biomass, Fuels Cells, Nuclear, Solar**
- **Concept ship designs and technology demonstrators**

Wind

Bio Mass

Solar power

Nuclear



Concept Demonstrators

Propulsion and new fuels

Fuels

Existing fuels and challenges

LNG fuel as alternative to “cold-ironing”. Bunkering of LNG

Storage of LNG under pressure for use as a fuel. Influence on positioning of tanks within hull

Bio-diesel – work in progress on compatibility with existing fuels, combustion characteristics, long-term stability

Nuclear: technology developed but expensive, wet steam, scrapping costs.

Other : Wind, Solar, Hydrogen, Fuel cells ??

IT to improve performance and control

‘Dynamic’ Routing

- Driver - Fuel cost savings
- Possible because:
  - Availability of data
  - Improvement of models
  - Increase in computer power
- Why do it?
  - Prediction of time to destination
  - Management of scarce resources
  - Management of risks

IT to improve performance and control

Continuous Monitoring - where

- Equipment remote and online
- Hull monitoring and cleaning
- Ballast water control
- Performance monitoring
- Management System data

Why

- To improve risk management
- To manage consequences better
- Reduce costs

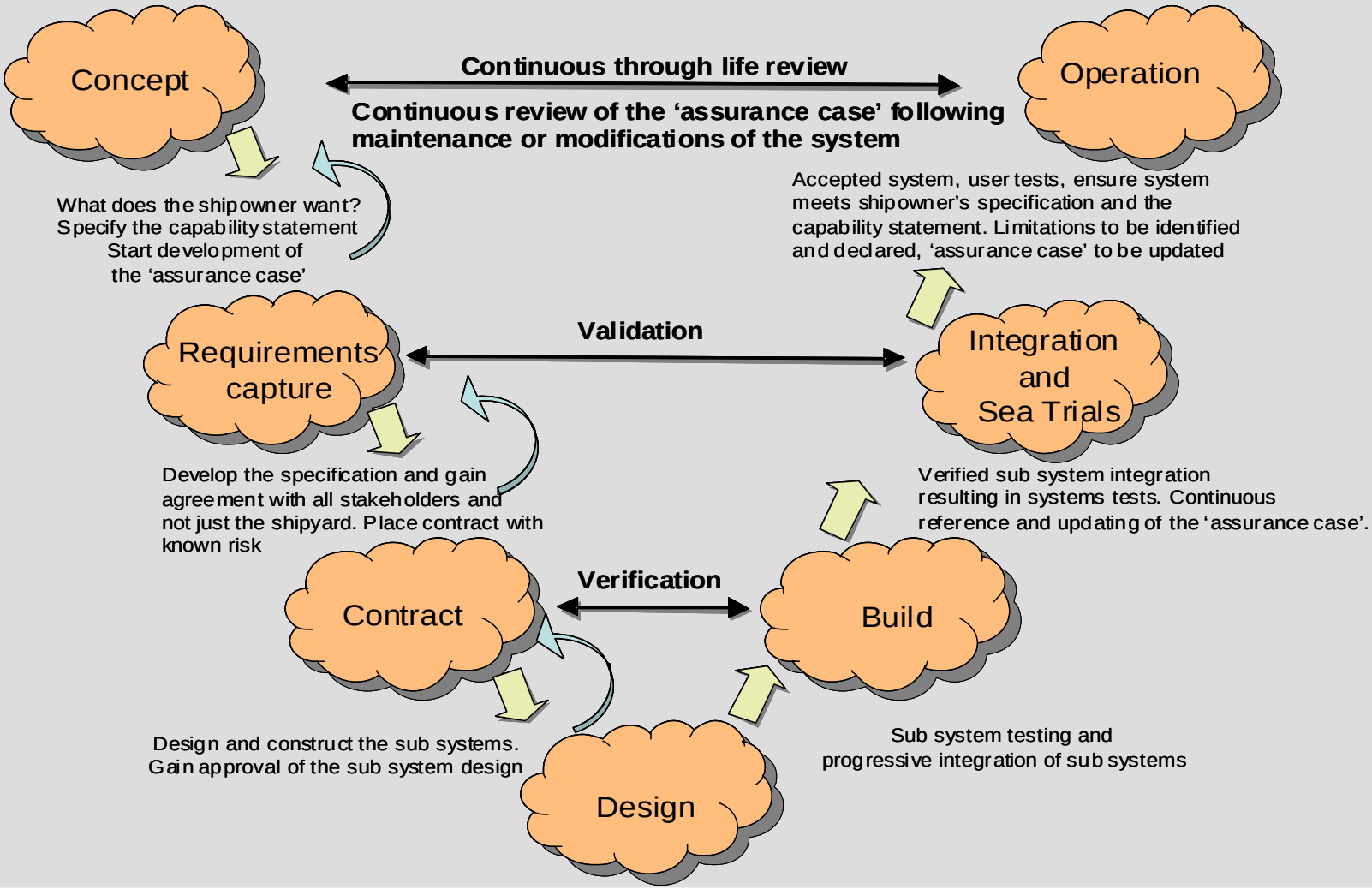
Dis-mantability, reuse and recycling

Think beyond recycling conventions

Design challenges:

- Hazardous materials which can be minimised or excluded
- Easier to dismantle –modularity, not mixing dangerous and benign systems etc
- Clarity on through life benefits – increased value of the ship due to easier dismantling, maintenance and enhanced design.

Through Life-cycle : A systematic approach



Conclusions

- Shipping is key to international trade - aim to make it even more environmentally friendly, through innovative thinking and political will.
- Social and economic feasibility of any technology onboard a ship needs to be acceptable from a holistic perspective in order to deliver value.
- Current and future marine environmental protection through innovation will require:
  - ❖ Efficient energy systems for production, storage, energy conversion
  - ❖ Knowledge about cost- and energy-optimal ship design, construction and recycling, including life cycle costs and associated environmental impacts
  - ❖ Solutions for optimal operation and control of the ship and engineering systems
- Operational effects - new trading routes, speeds, sizes, short sea, new players/collaborations, owner/operators, human element
- Future Asset values - determined by market forces and compliance with regulations, “energy efficiency rating”
- Life-cycle thinking is necessary
- Innovation is a key element of sustainability

Remember this - Plato ?

"Necessity is the mother of invention."

Thank you

For more information, please contact:

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