



TARGETS
SCPO-GA-2010-266008

EU's Energy Efficiency TARGETS

J. Marzi, HSVA

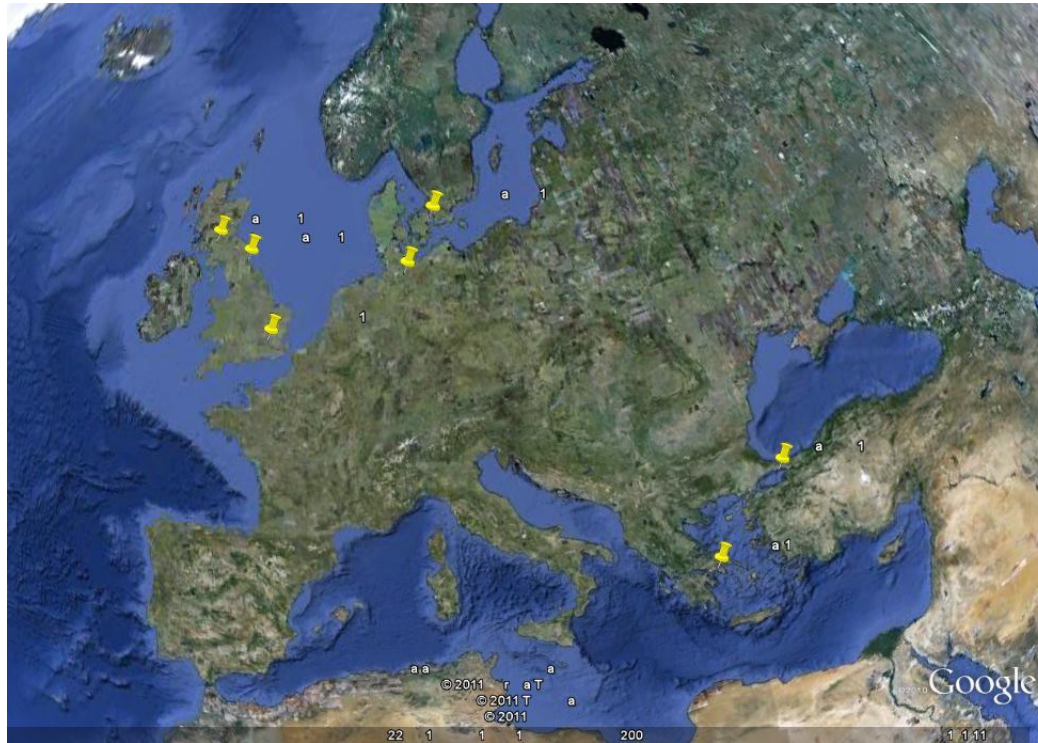
FP 7 Maritime Transport Brokerage Event
London, 7 September 2011

Introduction

- Targeted Advanced Research for Global Efficiency of Transportation Shipping
- New project co-funded by the European Commission in the 7th Framework Surface Transport Programme and started in Dec. 2010
- Develop a holistic simulation and optimisation concept to improve energy efficiency of transport shipping.
- Based on a Dynamic Energy Model the most relevant energy consumers on board and the use of new, alternative energy sources shall be analysed and subsequently improved.



Partnership 11 (+3) Partners from 5 EU countries



OSG Ship Management (GR) Ltd.



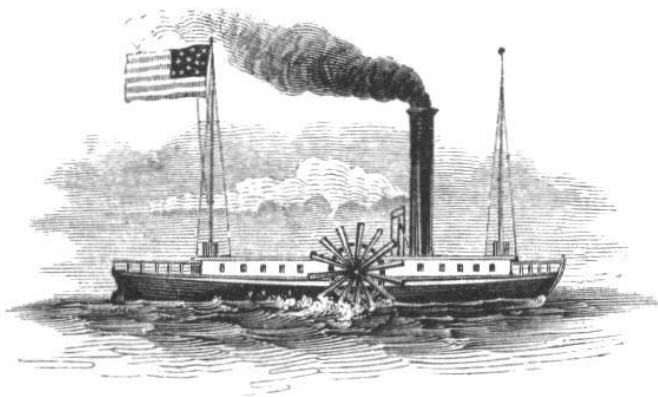
Tsakos Columbia Shipmanagement ("TCM") SA

Alpha Marine Services Ltd.

Background

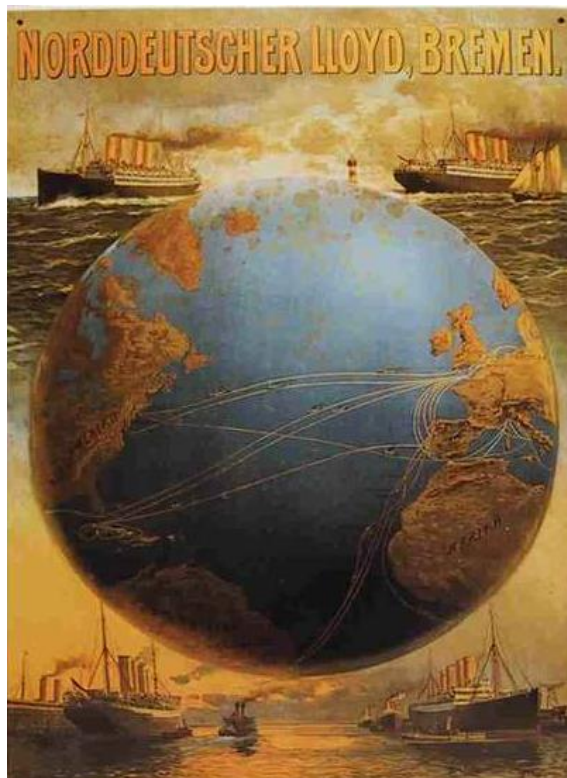
Targeted Advanced Research for Global Efficiency of Transportation Shipping

1807



Fulton's Clermont

1900 +



Steam – shipping becomes the backbone of the world economy

Background



8.6 > Die Hauptrou-
ten des weltweiten
Containerverkehrs
über die Meere. Die
Zahlen geben die
Menge der 2007
transportierten TEUs
in Millionen Stück an.

Improved Efficiency shall help to
resolve the conflict between the
two objectives: -> **TARGETS**

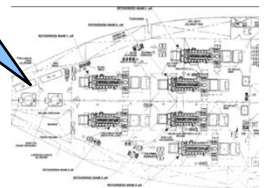
... but international economy hinges largely on seaborne transportation

TARGETS Concept

Modules

Energy audits

Engine Room and prime driver



Auxiliary energy

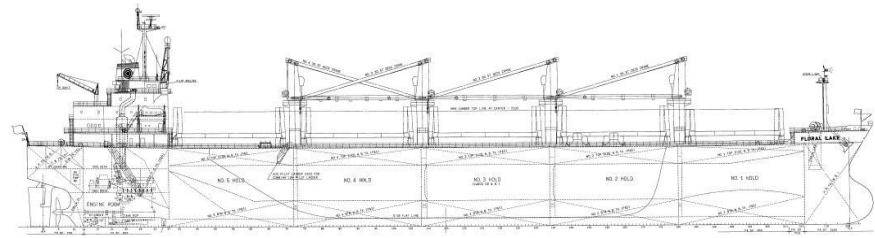
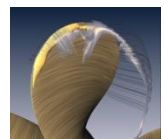
Auxiliary Energy



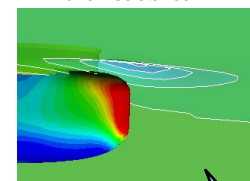
Added Resistance



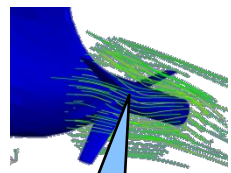
Propeller



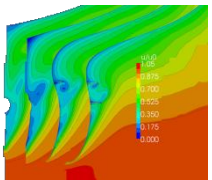
Wave Resistance



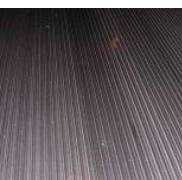
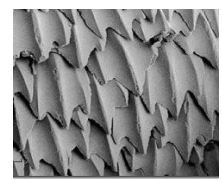
Modules



Propulsion Improvement Devices



Advanced Surface technology



Frictional resistance/ Hull coatings



Hydrodynamic efficiency

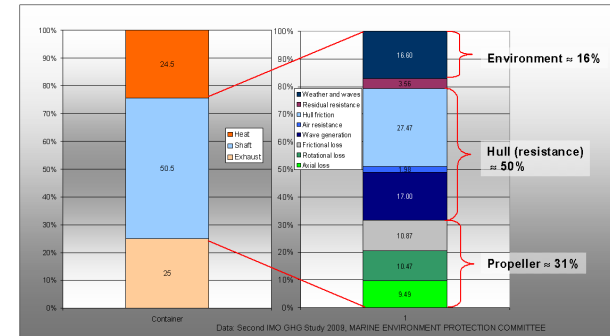
Ship propulsion

Simulation

Optimisation

Integration and simulation

- WP 1 – Resistance Characteristics and ways to influence / optimise ship resistance.
- Ship resistance is a prime cause of energy consumption.
- Form/wave resistance, viscous resistance and environmental contributions account for up to 70% of the energy consumption on board a cargo vessel.
- What can be done to improve this?



Form Resistance

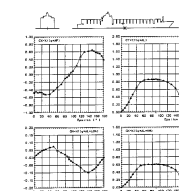
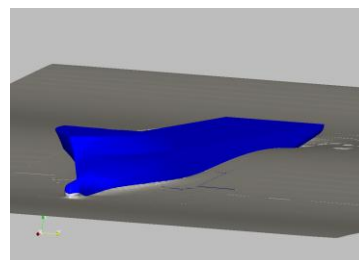
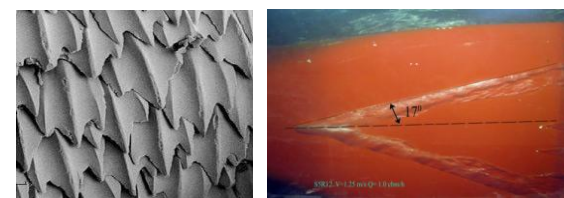
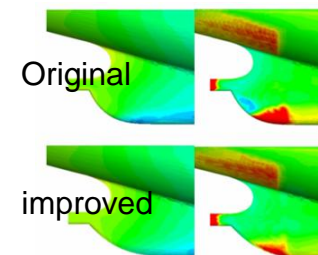
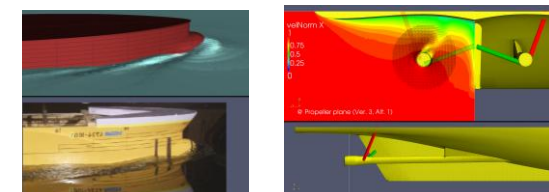
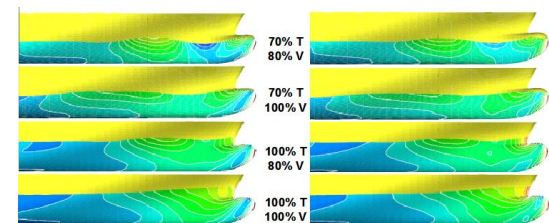
- CFD based Hullform optimisation
 - Panel Codes
 - RANS
- CFD code improvements for RANS free surface predictions.
- Optimisation of appendages.
- New Tools for optimisation / adjoint solver.

Viscous Resistance

- Roughness effects
- Coatings and patterned surfaces.
- Air lubrication
- Assessment, Data (base) and (CFD) tools

Environmental Resistance

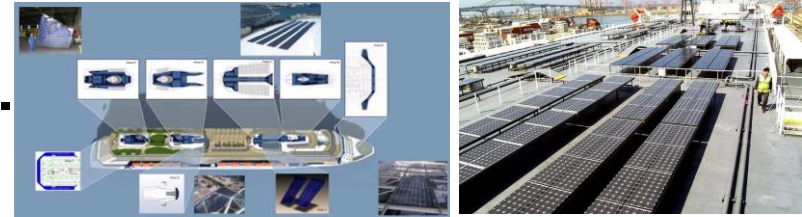
- Added Resistance in Seaways
 - Potential Flow
 - Coupled RANS – BEM tool
- Data and tools
- Aerodynamic Drag (Data)



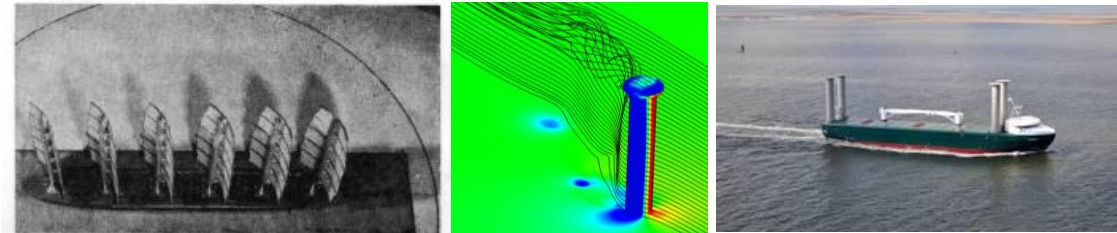
Improved auxiliary on-board energy generation

- Evaluation of environmental friendly fuels and alternative energy sources.

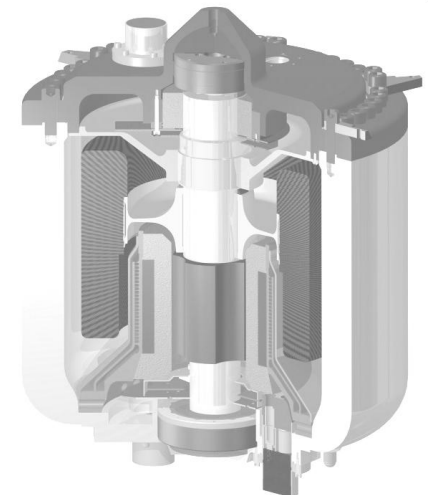
- Photovoltaic installations
- Wind energy



- Fuel Cells



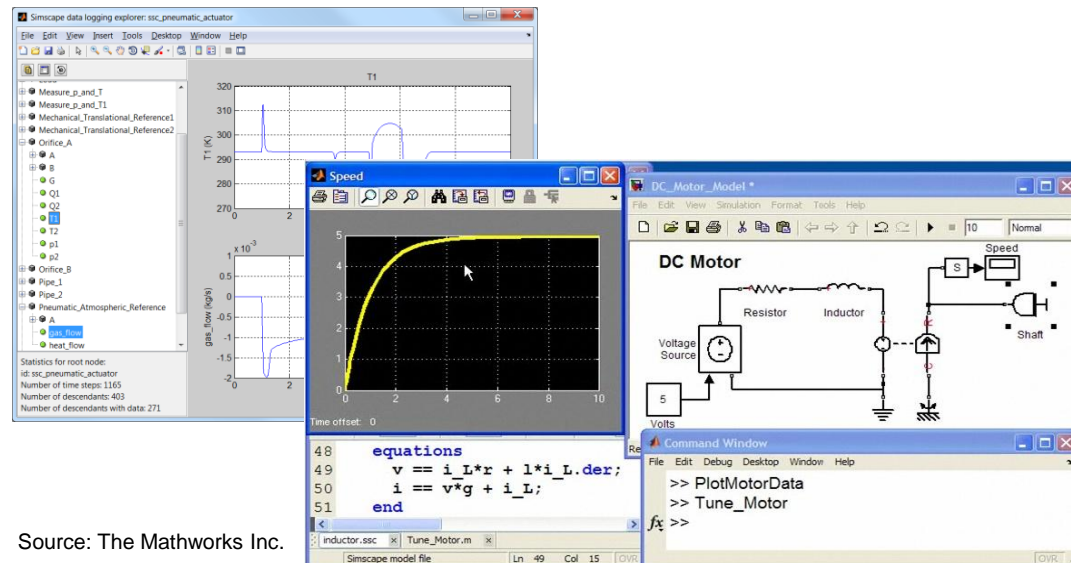
- Establishing concepts, perform simulations and Assessment of potentials for on-board use.
- Integration of energy storage in an efficient and flexible way:
 - Mechanical
 - Electro-chemical
 - Thermal



2 application cases will be developed:

- model of an auxiliary fuel cell supply system for a Ro-Ro-carrier
- *and* for a container vessel

Simulation will be done in Matlab/Simulink and additional Tool boxes



Advanced propulsors

- High performance standard propeller series
- Focused, unconventional propulsor series
- Propeller coating
- Propulsor optimisation

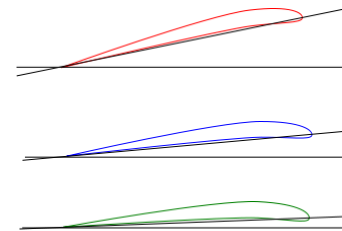
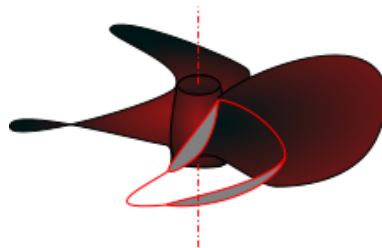
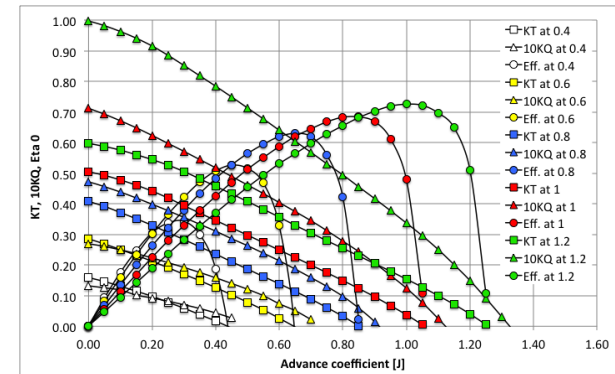
Standard propellers for improved Open Water Efficiency

- An extended Series of high performance standard propellers will be generated.

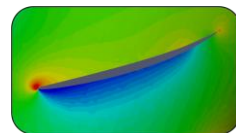
- Increased parameter variation in terms of:

Advance, J

- Blade number [$3 \leq Z \leq 6$]
- Aspect ratios [0.45 ; 1.05]
- Pitch ratio [0.4 ; 1.2]
- New blade outline (skew)
- New blade sections



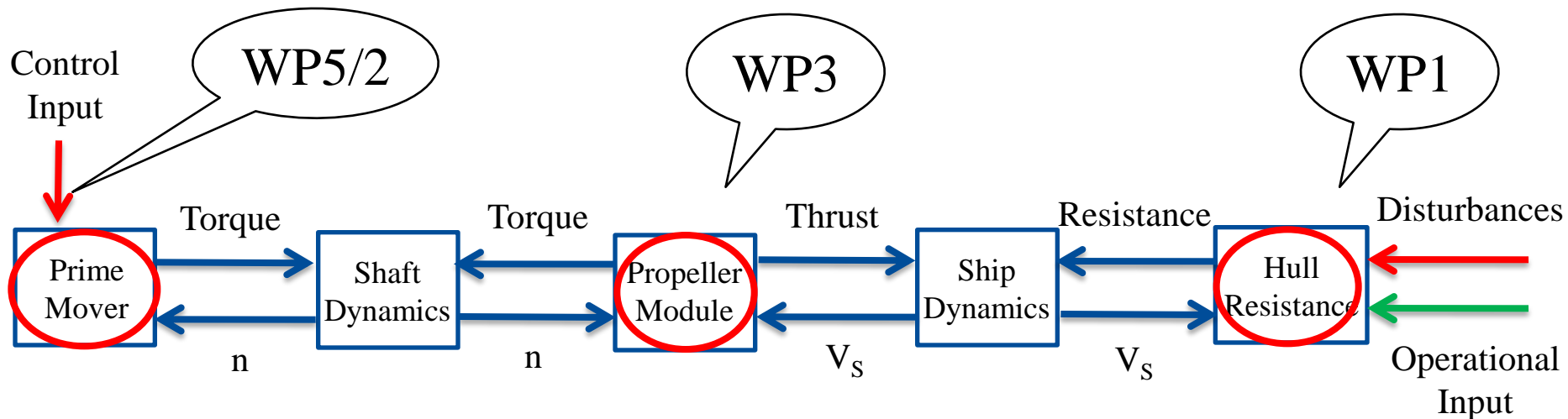
Pitch at Section 0.7 r/R



- TARGETS will perform Energy Audits on cargo ships such as:
 - 1 small container ship;
 - 1 large container ship;
 - 3 bulk carriers (Handymax, Panamax, Capesize);
 - 3 tankers (Suezmax, Aframax, VLCC);
 - 1 RoRo vessel
- Energy Saving Potentials (ESPs) that will be investigated include:
 1. Minimization of speed overrun in ballast;
 2. Minimization of speed overrun in laden;
 3. Minimization of the time that the vessel spends in anchorage;
 4. Analysis of M/E performance;
 5. Analysis of D/G performance; and several others
 6. Optimisation in the context of DEM.



- DEM integrates knowledge from component-level to ship-system level.
- Interactions between energy systems and between energy systems and the environment are fully respected.
- The performance of ship energy systems are assessed by time-domain simulations

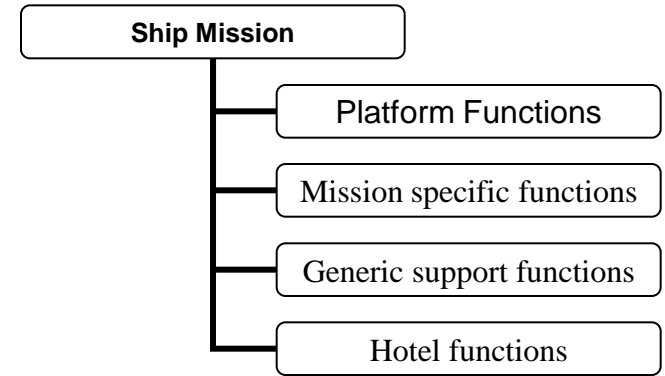


Simulation Specification

- Functional decomposition of Ship's Mission
- Operational Profile and Energy systems

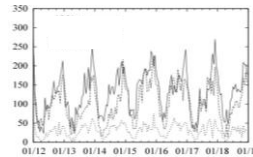
Dynamic Energy Model

- ... for each selected "target" vessel a global energy model will be developed,
- and benchmarked at components level against the results of the energy audits (from WP 4).



Global Energy Models

Hull module,
Propeller
module,
Accommodat
ion module,
Cooling
water



The integrative nature of DEM allows any combination of systems / subsystems configurations and components characteristics to be incorporated and assessed:

- **Configuration optimisation:** assessment of different combinations of component types, rated power, etc., subjected to topological constraints
- **Parameter optimisation:** e.g. minimisation of fuel consumption
- **Operational optimisation** will comprise:
 - Fine-tuning of the control parameters, given the operational circumstances, and
 - An intelligent system that will allow the crew to assess the energy efficiency of the ship during its day-to-day operation.

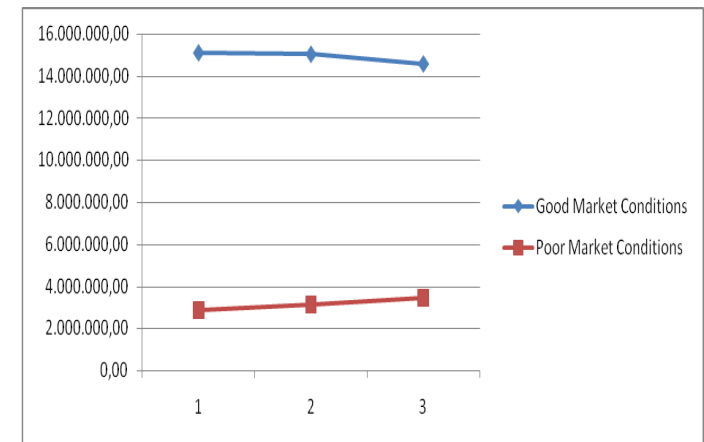
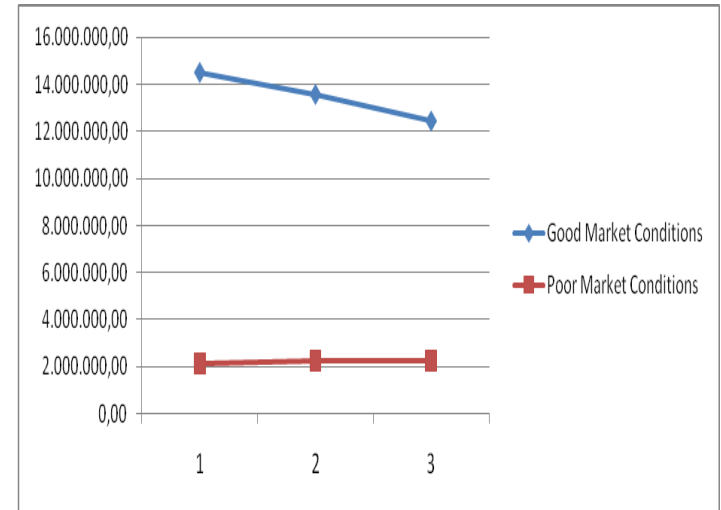
Design

Operation

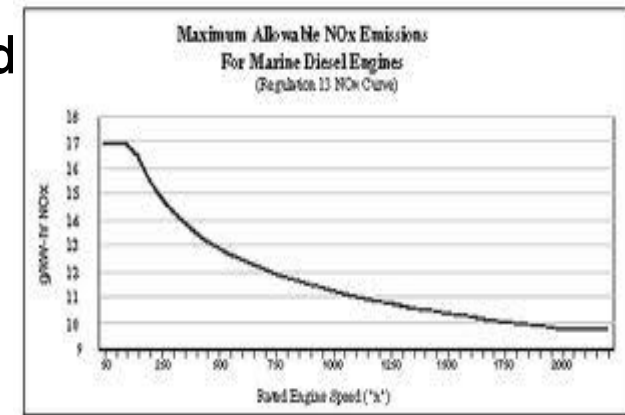
Benchmarking

Establish Key Performance Indicators - KPIs

- Carry out Energy performance benchmarks and compare performance of selected ships against industry standards.
- Establish energy consumption KPIs with the following characteristics:
 - indicative of ship's performance;
 - show appropriate and consistent variations with ship size and type;
 - take into account the operational pattern of the vessel;
 - be unambiguous & calculated.



- **Participating operators shall provide data such as:**
 - **ship plans;**
 - **performance parameters of each system on each ship;**
 - **information regarding operational measurements;**
 - **environmental data collected by the bridge's logging equipment;**
 - **ship's technical specifications & speed trial reports;**
 - **engine's NOx Technical File;**
 - **operational data logs & data from dedicated trials;**
 - **input from WP1 to WP4.**

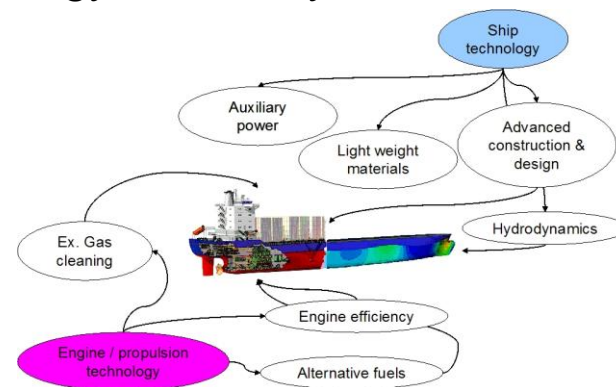


Benchmarking of "target" vessels with statistical and numerical data



Summary and Future Prospects

- TARGETS started at the end of the last year and will run until 2013.
- The project develops advanced simulation tools to assess key elements determining the use of energy on board ships (resistance, propulsion, aux. engines) and presents solutions to reduce energy consumption.
- TARGETS assesses the feasibility of using alternative/renewable energy sources.
- All elements come together in a Dynamic Energy Model to constitute the basis for a holistic simulation of design and operational alternatives and the optimisation of the vessel concept.
- With these elements in place TARGETS together with a group of ECMAR members is at the core of a new initiative to form a network of {projects / actions / interest groups} to jointly address Energy Efficiency of maritime Transportation in a wider context.
- The aim is to establish a technical network of experts (=excellence) and provide a platform for exchange and future planning.



Thank you

www.targets-project.eu