



GNL

LA GRANDE OPPORTUNITÀ
LA SCELTA ECOSOSTENIBILE.



Antonio de Feo

**BUREAU
VERITAS**

SOLUTIONS
Marine & Offshore

**190 YEARS
OF
SAFETY AT SEA**

SUPPORTING THE ENVIRONMENT

In order to reduce emissions, Owners are increasingly opting for alternative fuels, including LNG.

Bureau Veritas offers a range of tools and Class notations for alternative fuels and hybrid solutions.

Our experts support Clients throughout vessel design, construction and operation.



7 Alternative Fuels

by

3 Groups

○ Advantages

○ Challenges

CARBON FUELS

Liquefied Natural Gas (LNG)


Established infrastructure


Long-term solution


Global fuel availability


Safe to handle


Increased CAPEX


Clean fuel, rapidly developing infrastructure


Methane slip

Liquefied Petroleum Gas (LPG)


Global fuel availability


Safe to handle

 CO₂ emissions

Methanol / Ethanol


Increased CAPEX


High fuel cost


Easy-to-handle, well developed terminal network


Refueling challenges, flammable

CARBON NEUTRAL

Biofuels / Biomethane


Safe to handle


High fuel cost


Increasingly used as marine fuel, can be used as drop-in fuel


Sustainable scaling up needed

Synthetic methane / SNG


Safe to handle


High fuel cost


Easily adapted to LNG infrastructure, can be used as drop-in fuel


Large-scale production challenges, requires renewable energy source

ZERO CARBON

Hydrogen


Long-term solution


Increased CAPEX


High fuel cost


Low energy density per volume and favorable specific density by mass


Storage challenges, flammable

Ammonia


Long-term solution


Increased CAPEX


High fuel cost


Solution for internal combustion engines and fuel cells


Limited bunkering, toxic effects on human health





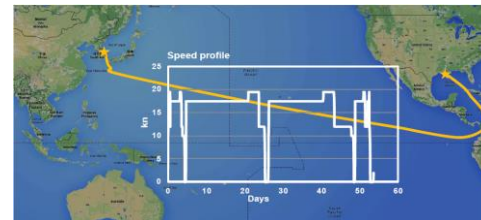
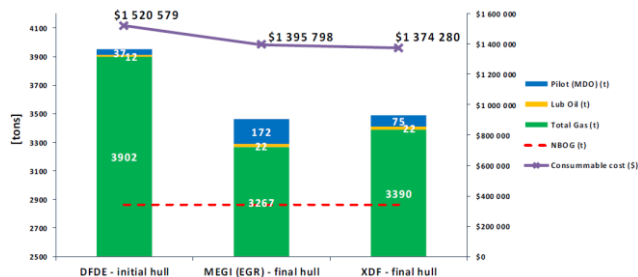
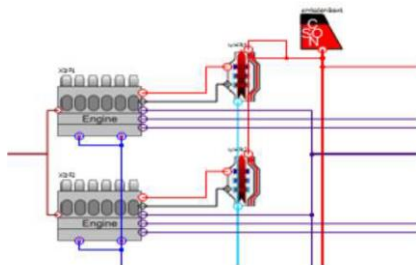
seeocat

Development started in 2011

A tool to simulate complex ship energy systems



SHIP ENERGY EFFICIENCY CALCULATION AND ANALYSIS TOOL



Designs comparison

■ Engine & Propulsion

- Engine A vs B
- Fuel oil vs Gas
- ...

■ Machinery

- Variable speed pumps
- WHR systems
- PTO / PTI
- PTO vs Diesel Generators ...

KPI assessment

■ Energy flow

- Fuel, Gaz
- Electricity
- Steam
- Cooling water
- Lub oil ...

■ Emissions

- CO₂, Sox, Nox
- PM ...

Operations comparison

■ Operational profiles

- Speed optimisation (Slow steaming ...)
- Weather routing
- Loading / unloading scenarios

MSC CRUISES – GIANT CRUISE VESSEL LNG POWERD



VERISTAR **MAG**



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A GIANT IN GREEN SHIPPING FOR THE CRUISE INDUSTRY



CMA CGM – MEGA – CONTAINERSHIP LNG POWERED

CMA CGM

JACQUES SAADE

LNG-POWERED

MEGA-CONTAINER SHIP





SMALL SCALE & LNG BUNKERING VESSELS



BUREAU
VERITAS

ENVIRONMENTAL

OUTFITTING THE WORLD WITH SMALL-SCALE LNG AND BUNKERING VESSELS



NATURAL GAS VALUE CHAIN



BUREAU
VERITAS

ENVIRONMENTAL

OPTIMIZING THE NATURAL GAS VALUE CHAIN TO ADVANCE DECARBONIZATION



**BUREAU
VERITAS**

190 YEARS
OF SAFETY AT SEA
AND STILL INNOVATING

THANK YOU

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