



Technical
Conference

The evolution of designs: SHEAR-WATER a ballast-water-free LNG Bunker & Feeder vessel



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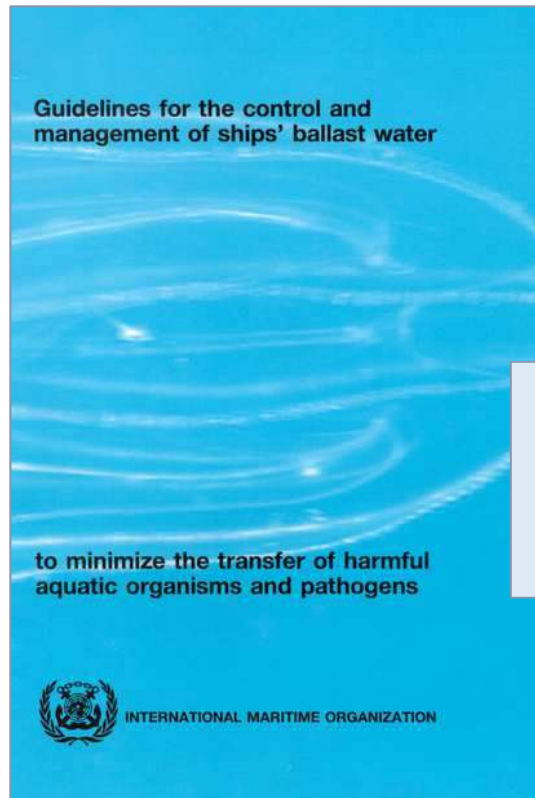


« Shear-Water »

Ballast-Water-Free
LNG Feeder & Bunker Vessel



Ballast-Water

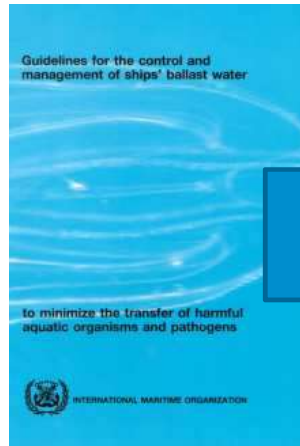


*A major issue
World-wide*

*Capex & Opex :
By systems, maintenance, consumption
+ Risk of transfer of organisms,
+ Time & Paperwork...*



... going Ballast-Water-Free :



Rules
compliance

Improved
Operations



*Key
targets*

Competitive
CAPEX

Reduced
OPEX



3TT

UNIQUE COST SAVING DESIGN

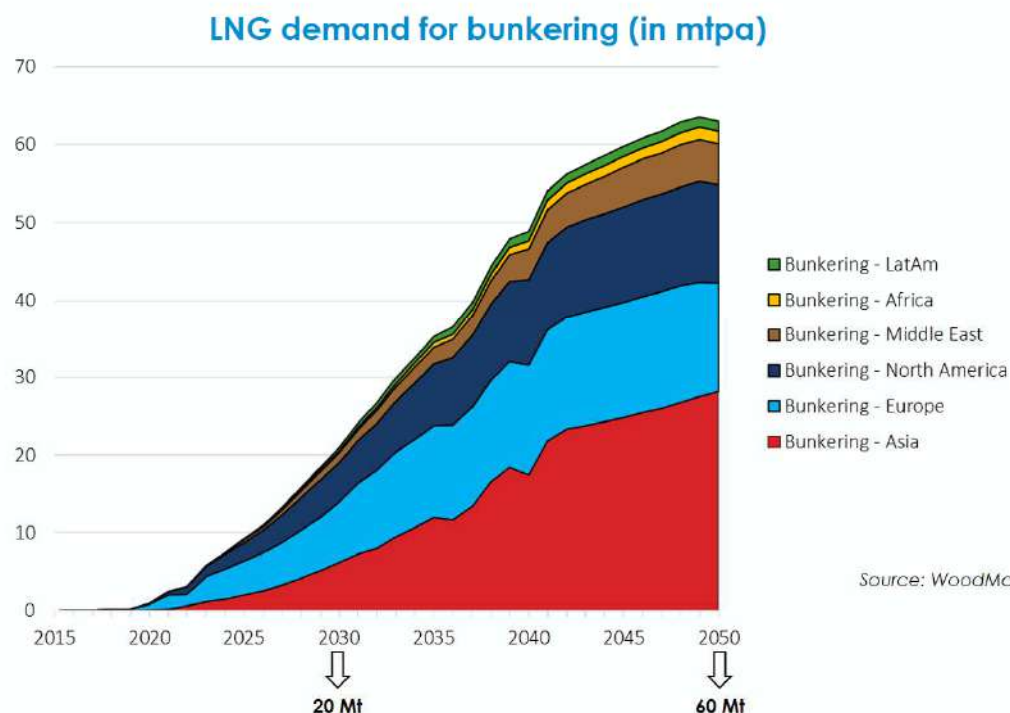


LBV WORLD FLEET (May 2022):

- 38 vessels in service
- 15 on order



LNG bunker market expected to reach ~20 mtpa in 2030



- LNG demand for bunkering is expected to grow annually at a rate of **27% between 2022 and 2030**
- An additional **4 million LNG** will be required between 2022 & 2025

Source: WoodMackenzie, Q1-2022



Existing Membrane type LBVs (Mark III)



LBV "Gas Agility" Delivery April 2020

LNG Capacity: 18,600 m³
Loa 135.5 m
Beam 24.5 m
Draft 6.5 m
Speed 12.0 kn
Power 4 x 1,480 kW
BOR 0.180% V/day
Class : BV

Construction at Hudong-Zhonghua, China
Mark III Flex 170 kg/m³
No filling restriction: worldwide
2 identical cargo tanks
1 GCU, 1 Subcooler ALAT TBF-700
Bunkering rate: 1,600 m³/h

The vessel is performing routine Gassing-Up and Cooling-Down operations, Pre- & post-commissioning operations and emergency assistance.



LBV (18.6k) Sistership "Gas Vitality" Delivery October 2021

The specification of this LBV is the same as "Gas Agility" except for:

- Bunkering rate: 2,000 m³/h
- Pressure Reduction device.



Existing Membrane type LBVs (Mark III)



Sembcorp Marine Bunker Vessel : **"Brassavola"**
In construction

LNG Capacity: 12,000 m³
Loa 113.0 m
Beam 22.0 m
Draft 7.0 m
Speed 11.5 kn
Power 3 x 1,600 kW
BOR 0.185% V/day
Class : BV

Mark III Flex 170 kg/m³
No filling restriction the in operation area
2 identical cargo tanks
1 GCU, 1 Subcooler ALAT TBF-700
Bunkering rate: 2000 m³/h



Image courtesy of Conrad Industries

"Clean Jacksonville" Bunker barge 2,200 m³ – Conrad Shipyard, USA
Delivered 8-2018

Loa 64.62 m
Beam 14.79 m
Draft 2.60 m
BOR 0.38%V/day
Non propelled
Class : ABS



Ballast-Water-Free into the Future

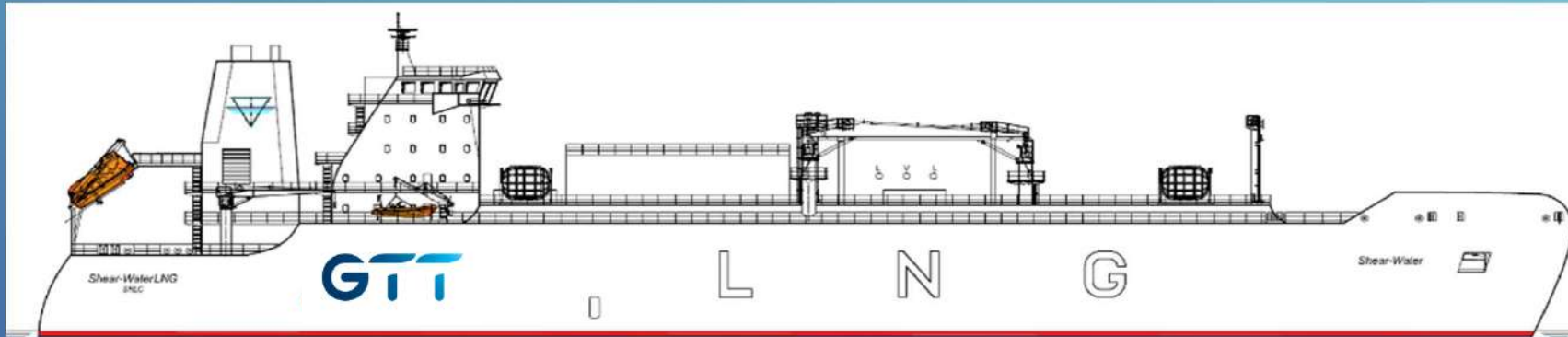
« Shear-Water »



UNIQUE COST SAVING DESIGN
BALLAST-FREE 7,500 M³ LNG CARRIER



The « Shear-Water » approach



- Full Rules Compliance
- No sediments, no aquatic pollutions
- Simple & economic operations
- Capex & Opex savings
- “Green Ship” with lower CO2 emissions

KEEP THE OCEAN IN THE OCEAN !



The « Shear-Water » approach

18,700 m³ - 14.0 kn

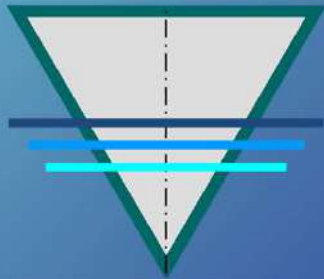
L x B x draft : 141 x 25 x 7.25 m

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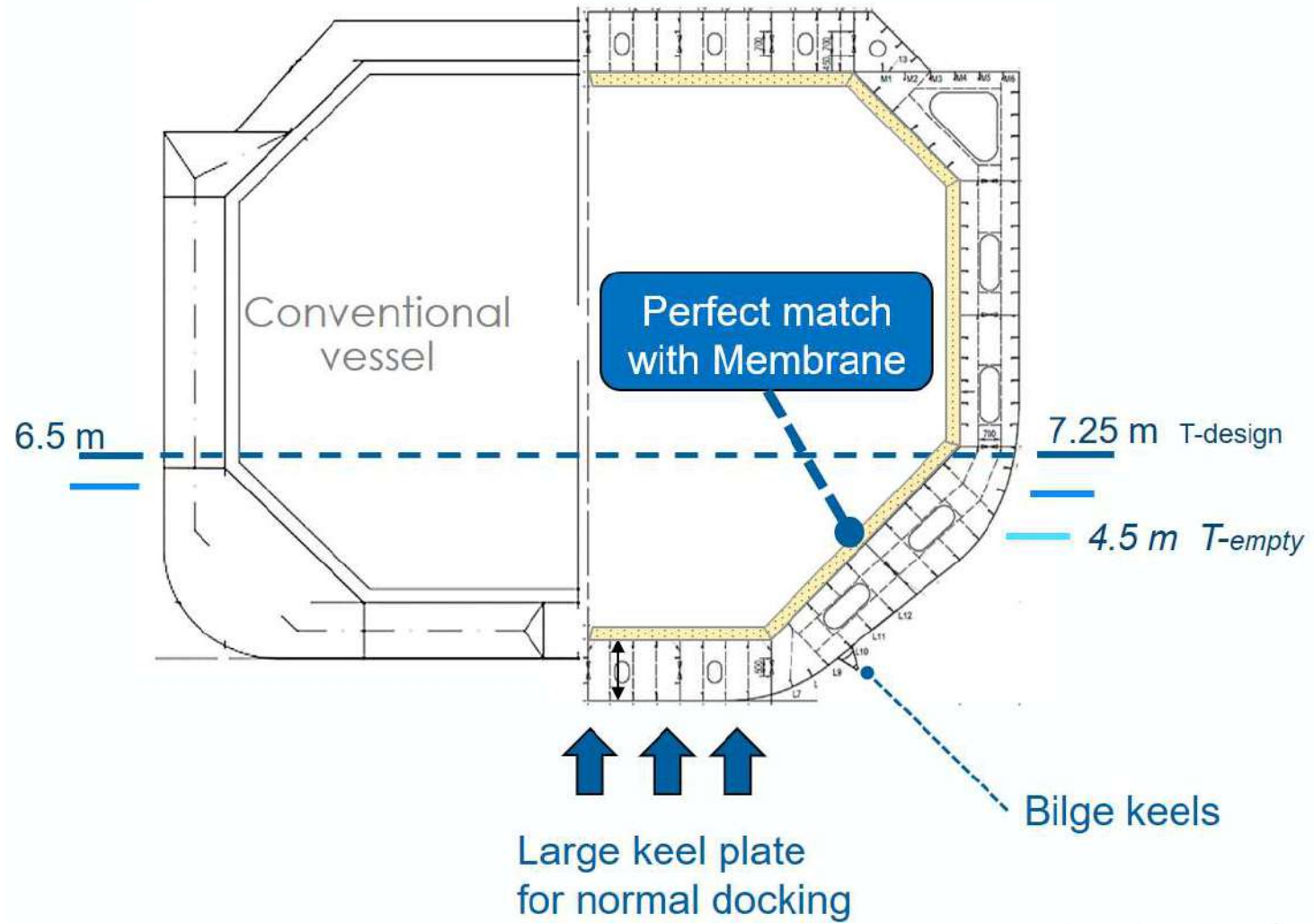




SHEAR-WATER



Midship-section



Test campaigns

at HSVA



HSVA

The Hamburg Ship Model Basin
Driving excellence for the maritime future



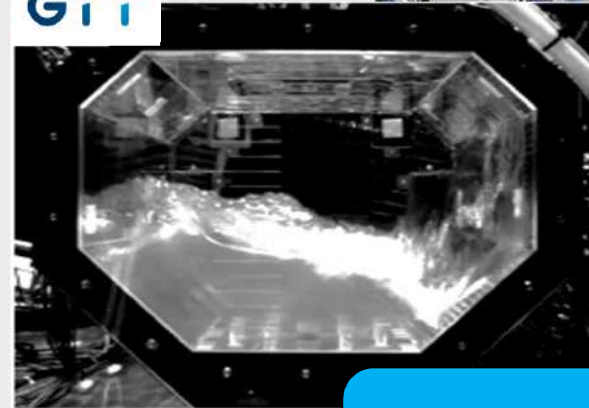
Good to excellent results

at GTT

Liquid
Motions

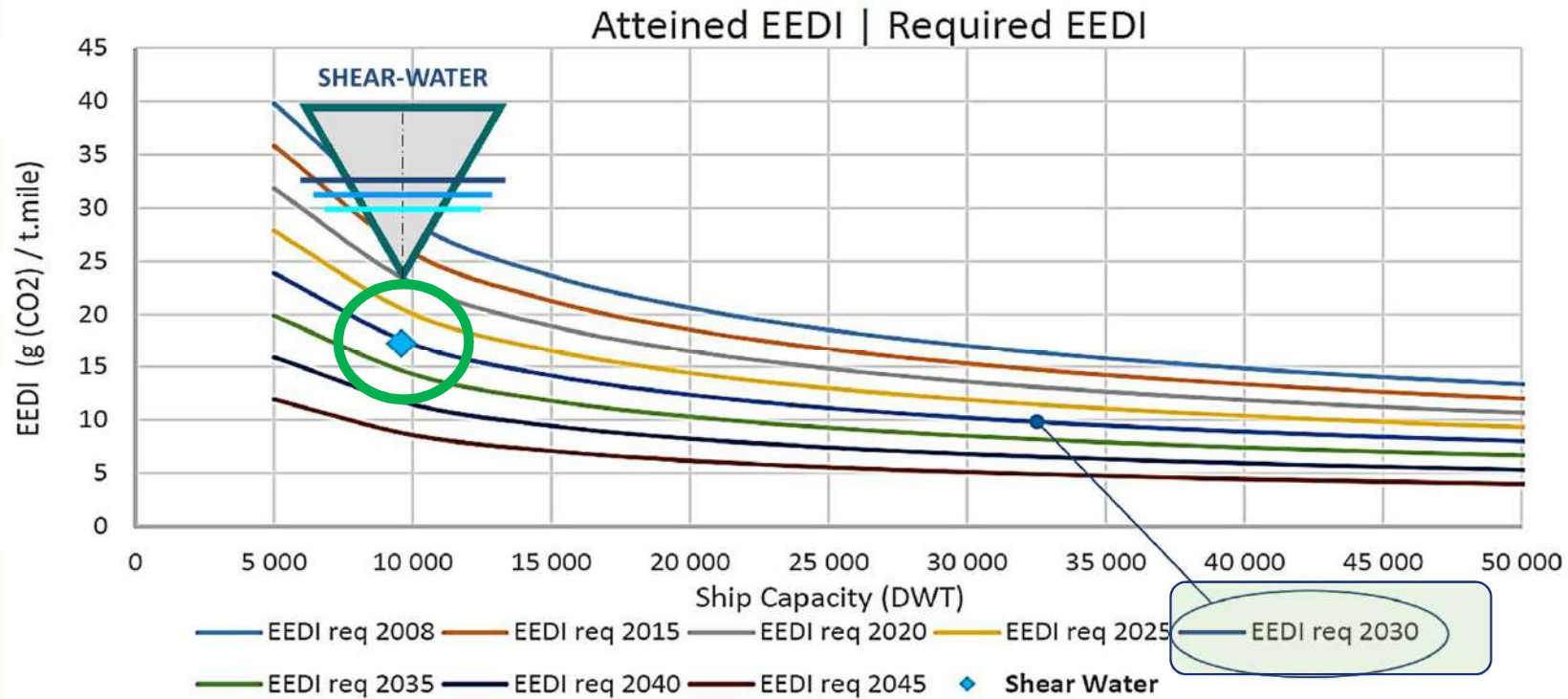


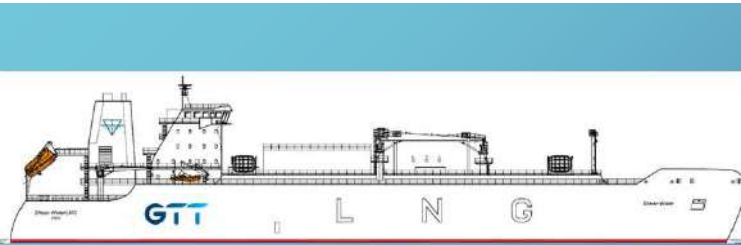
GTT



Low BOR
No Filling restrictions

EEDI compliance





Cost Savings

CAPEX optimization

- No ballast-water-system (pumps, valves, pipes, sea-chests)
- No Ballast water treatment system (BWTS)
- Reduction of air vents & sounding pipes, control
- Reduction of Hull Scantlings

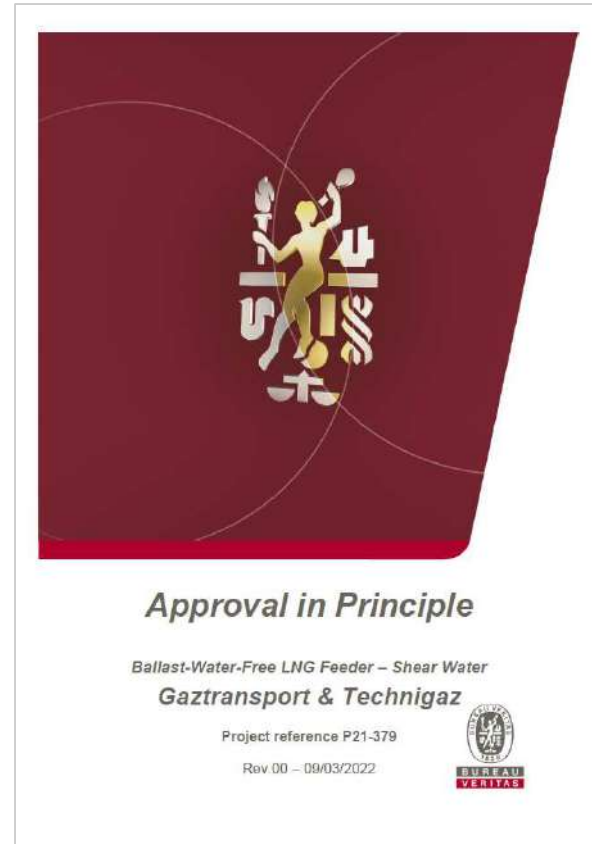
OPEX reduction

- 10-15% Fuel savings
- No BWTS
 - energy consumption
 - consumables, spares & maintenance
- No Ballast pump power consumption
- Less Ballast-tank corrosion / longer hull life
- No Ballast tank anodes & paint maintenance
- No Maintenance due to sediments (pumps & valves)
- Less Cleaning work during dry-dock
 - ➔ Savings in docking time





Involvement of Bureau Veritas



Bureau Veritas extensive experience in LNG Bunkering Vessels (LBV's)

Green Zeebrugge 5,100 m³ LBV in 2017

Active in newbuilding and conversions

Any containment system and size

- Membrane and type C
- From 660 m³ to 18,600 m³

Sloshing assessment expertise

- Specific guidelines

Experts in risk assessment

Active in SGMF and other associations

The largest membrane LBV in operation

Approximately 40% of the LBV market share



BV & LBV's – Regulatory framework

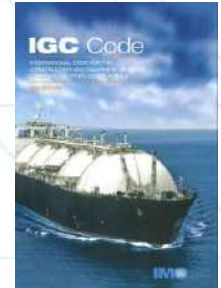
IGC Code & other international regulations

The first ever specific rule to cover LBV's

- Bureau Veritas NR620 – LNG Bunkering Ship notation
 - First version issued in 2015
 - Revision issued in July 2022
 - Covers in particular the LNG transfer system
 - Specific risk assessment
 - Industry standard are considered

Guidelines commonly used

- Bunkering guidelines (for instance SGMF)
- ISO standards



Bureau Veritas Involvement

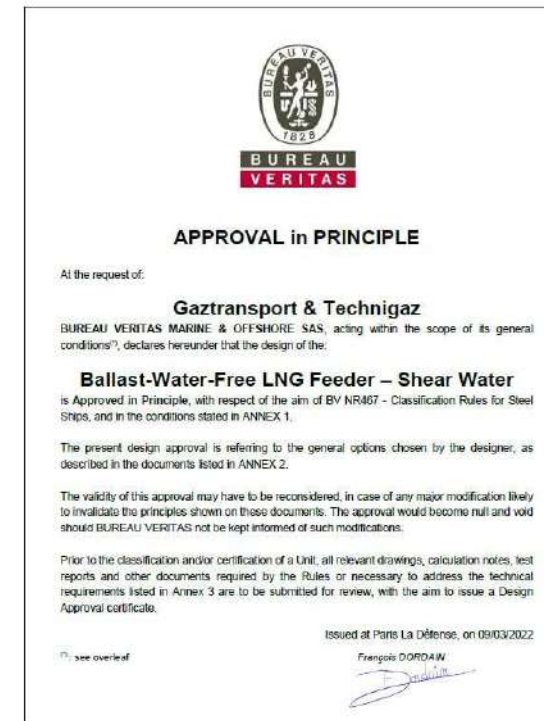
Shear-Water LNG bunker & Feeder vessel design

An approval in principle (AIP) to give client necessary confidence on future project developments

Based on the latest regulations

- The latest edition of Bureau Veritas NR467 - Classification Rules for Steel Ships,
- The latest edition of Bureau Veritas NR620 – LNG Bunkering Ship notation,
- The IMO IGC Code 2016,
- Bureau Veritas NI 554 – Design Sloshing Loads for LNG Membrane Tanks, and
- Bureau Veritas NI 564 – Strength Assessment of LNG Membrane Tanks under sloshing

AIP issued in March 2022



Bureau Veritas Involvement

Shear-Water LNG bunker & Feeder vessel design

Exhaustive list of documents reviewed

Design found in compliance with the regulatory framework

Set of technical valuable comments

Detailed assessment on the transfer system and sloshing to be carried out at a later stage

- 3D views
- Datasheet 18k Shear-Water
- Outline Specification
- General Arrangement
- Accommodation arrangement
- Machinery arrangement
- Midship Section
- Mars Midship Section Scantling
- Lines Plan HSVA
- Trim & Stability booklet
- Hydrostatic Table
- Damage Stability
- Electric load analysis
- Hydrodynamic studies and testing (HSVA) campaign) - Executive summary
- Maneuvering and course keeping performance test (HSVA campaign) - Executive summary
- Summary Report on Liquid Movements
- BOR calculation
- PFD Diagram CHS
- Equipment List CHS
- EL Diagram
- Trim-water schematic
- Docking-water schematic
- EEDI report



CONCLUSION

- A validated design concept
 - Proven for safe navigation
 - A major environmental step forward
 - Lower cost & longer lifetime
 - A scalable concept
-
- Key operational questions are solved
 - Bureau Veritas Approval in Principle is obtained

... ready to order ...



Thank you !

Shear-Water Movie



<https://youtu.be/5Jf2tOyo5fl>

