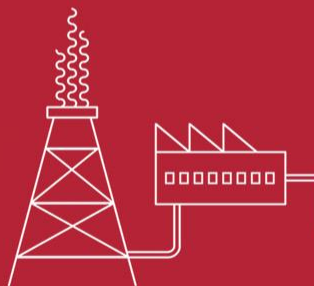




Prelegent: Krzysztof Czernski
Seatech Engineering
BUNKIERKI LNG – specyfika jednostek



[Warszawa - 28 listopada 2019 r.]

Polska Platforma LNG 2019



[Warsaw - 28 November 2019]

Polish LNG Conference 2019

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CONTENT:

1. Gas as fuel– market overview
2. LNG– Bunkering methods
3. LNG BV– Cargo Containment System
4. LNG BV– Cargo handling equipment
5. LNG BV– maneuvering
6. LNGBV– existing fleet

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GAS AS FUEL – MARKET OVERVIEW

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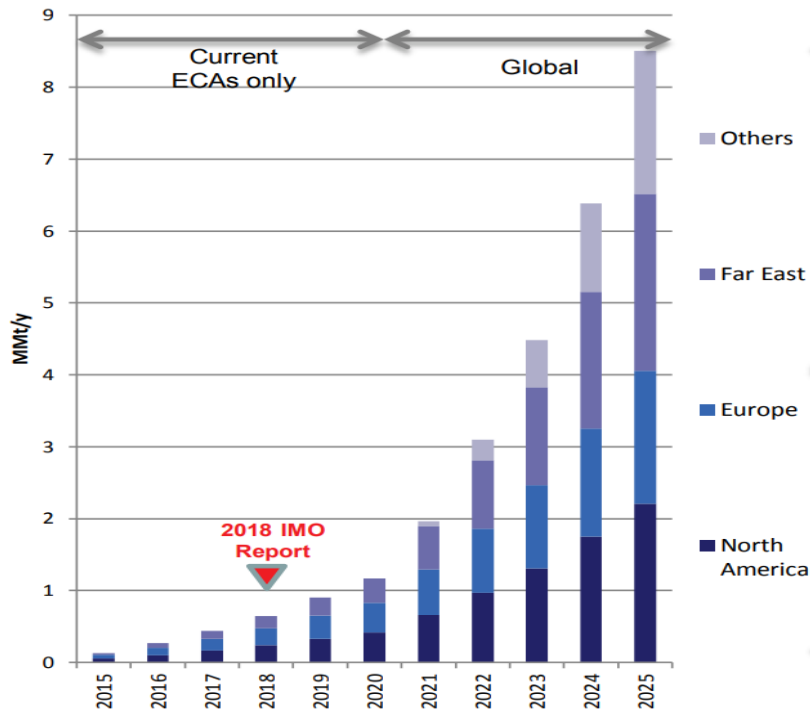
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NATURAL GAS AS MARINE FUEL OF THE FUTURE



LNG Marine Fuel Consumption by Location

source:: Poten & Partners

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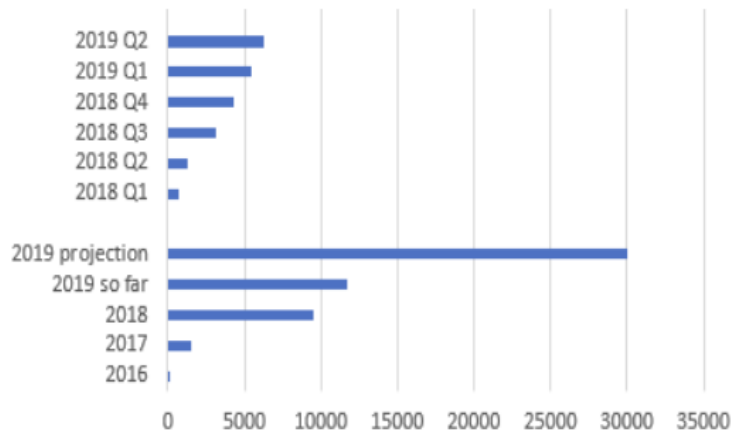
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NATURAL GAS AS MARINE FUEL OF THE FUTURE



Rotterdam LNG Bunker sales (t)

source: Port of Rotterdam

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LNG BUNKERING - METHODS

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LNG BUNKERING - METHODS

1. Truck to ship <400m3
2. Replacing LNG (ISO) containers <10x40m3
3. Shore to ship <1,000m3 depends on terminal
4. Ship to ship <18,500m3 for time being....

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LNG BUNKERING – TRUCK TO SHIP



LNG Bunkering truck to ship in Port of Gdynia

source: Port of Gdynia



LNG Bunkering multiple truck to ship

source: Applied Cryogenics Technologies

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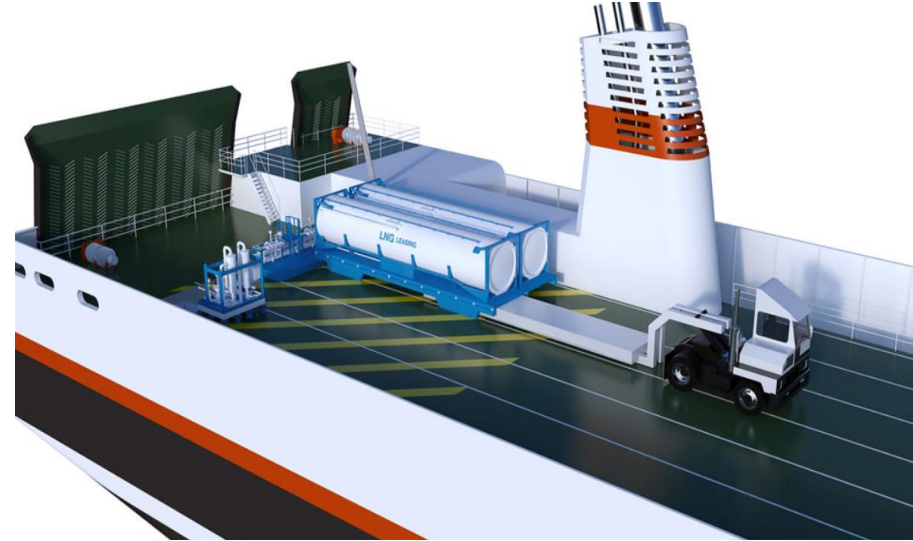


LNG BUNKERING – REPLACING LNG CONTAINERS



LNG ISO Container

source: Fuelgarden LNG



LNG ISO Container on rolltrailer

source: Wartsila

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LNG BUNKERING – SHORE TO SHIP



Shore to Ship bunkering

source: PitPoint LNG

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LNG BUNKERING – SHIP TO SHIP



Ship to Ship bunkering

source: Nauticor (top)/AGA(left)

Ship to Ship bunkering

source: Seatech

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LNGBV – CARGO CONTAINMENT SYSTEM

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LNG BUNKERING VESSELS - CONTAINMENT SYSTEM – IMO Type „A”



1. Independent tanks
2. Prismatic shape
3. Max pressure 0.75barg
4. Design temperature -163C
5. Full secondary barrier

IMO Type A LNG Tank

source: LNT Marine

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LNG BUNKERING VESSELS - CONTAINMENT SYSTEM – IMO Type „B”



1. Independent tanks
2. Prismatic or spherical shape
3. Max pressure 0.75barg
4. Design temperature -163C
5. Partial secondary barrier

IMO Type B LNG Tanks

source: Moss Maritime (left), Exmar (right)

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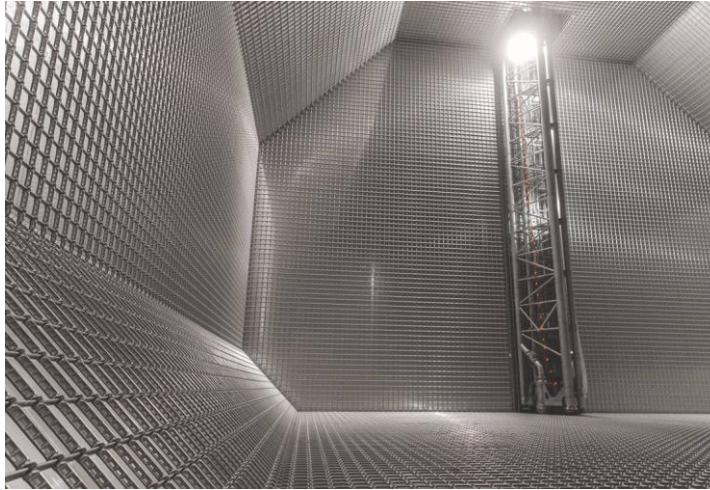
Tłumaczenie zapewnia
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LNG BUNKERING VESSELS - CONTAINMENT SYSTEM – IMO membrane Type



1. Built-in tanks
2. Prismatic shape
3. Max pressure 0.25barg
4. Design temperature -163C
5. Full secondary barrier integrated with hull
6. Patented design and application(GTT)

IMO Membrane LNG Tanks

source: Gaz Transport Technigaz (GTT)

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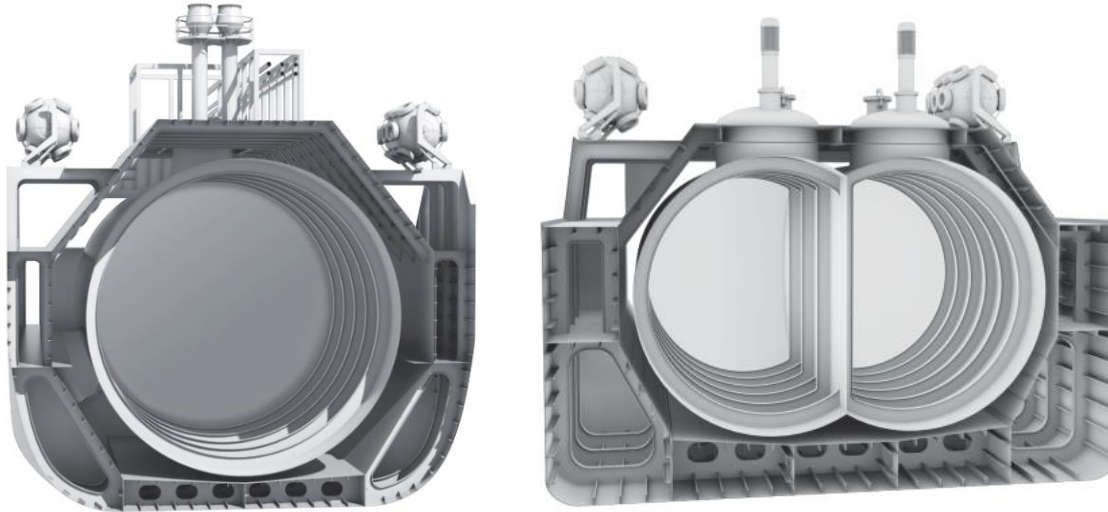
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LNG BUNKERING VESSELS - CONTAINMENT SYSTEM – IMO Type „C”



1. Independent tanks
2. Cylindrical shape
3. Max pressure above 2 barg
4. Design temperature -163C
5. No secondary barrier

IMO Type „C” LNG Tanks

source: Seatech (cylindrical - left, bilobe – right)

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LNGBV - CARGO HANDLING EQUIPMENT

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LNG BUNKERING VESSELS – CARGO HANDLING EQUIPMENT (almost the same as for LNGC)



1. LNG manifold
2. LNG pumps
3. Hose handling crane
4. Fenders
5. Fuel gas compressors and vaporizers
6. LNG custody transfer measurement
7. Relieve valves/masts
8. Special LNG bunkering equipment – see next slide

Typical Cargo Handling Equipment for LNGBV

source: Seatech

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LNG BUNKERING VESSELS – CARGO HANDLING EQUIPMENT



- 6.1. LNG Emergency Release Couplings
- 6.2. LNG loading boom

Emergency Release Couplings and LNG Loading Booms

source: Kanon Loading Equipment

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LNGBV - MANEUVERING

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LNG BUNKERING SHIPS - MANEUVERING



1. High maneuverability
2. Bow thruster
3. Operation without tug assistance
4. Redundancy
5. No DP needed (but sometime requested)

Typical propulsion arrangement for LNCBV

source: Seatech

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LNGBV – EXISTING FLEET

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SEAGAS – WORLD'S FIRST LNG BUNKERING VESSEL - 2015 (170m3)



source: AGA



source: FleetMon

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CORAL METHANE – MULTIGAS CARRIER BUILT IN 2007 AT REMONTOWA SHIPBUILDING AND REBUILT TO LNGV IN 2018 (7500m3)



source: Anthony Veder



source: Port of Barcelona/Shell (bottom)

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CARDISSA – 2017 (6500m3)



source: Shipspotting

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ENGIE ZEEBRUGGE – 2017 (6500m3)



©Scheepvaartwest

source: Scheepvaartwest

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COREALIUS – 2017 (5800m3)



source: Anthony Veder

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KAIROS – 2018 (7500m3)



source: Nauticor

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LNG London – 2019 (3000m3)



source: FleetMon

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TITAN LNG – FlexFueller001 – 2019 (3000m3)



source: Titan LNG

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UNDER CONSTRUCTION -2019-2020



source: MES/Stolt LNG



source: FuelNG/Keppel



source: LMG Marine/MOL



source: Keppel/Gazprom



source: Avenir LNG



source: Avenir LNG

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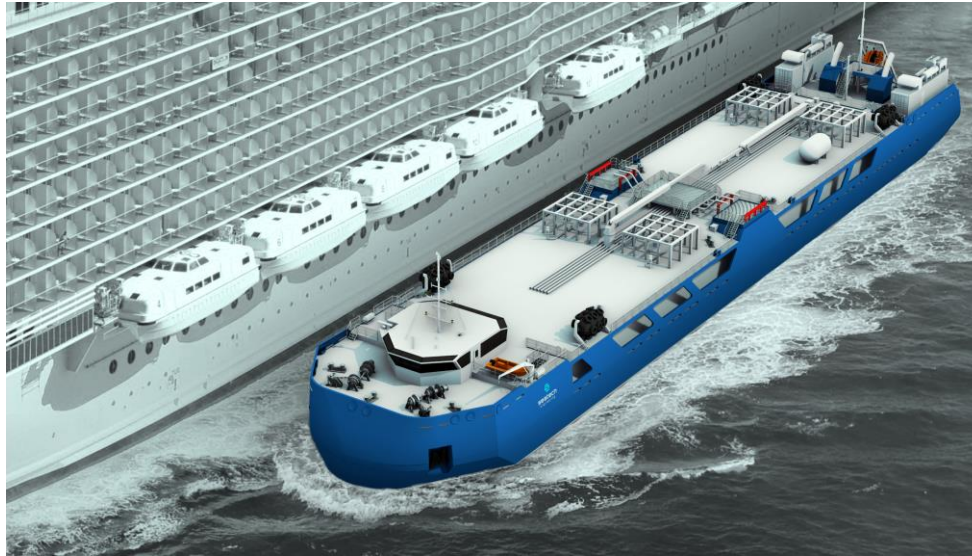
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TENDER FOR BUNKERING LNG FUELLED CRUISE VESSELS – 2022 (5000m3)



source: Seatech

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DZIĘKUJĘ/THANK YOU!

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