THE M/S MEGASTAR BUNKERING EXPERIENCE

Tallinn

16.05.2018
1. Eesti Gaas in brief.
2. Bunkering of M/S Megastar.
3. Lessons learned.
4. First year bunkering results
5. Conclusion.
6. Development project
EESTI GAAS GROUP

- Natural gas
- Electricity
- CNG
- LNG

- 48,000 customers
- 200 employees
- 123 mlj. EUR turnover
- 495 milj.m³
# Infortar Group of Companies

<table>
<thead>
<tr>
<th>Service Companies</th>
<th>Real Estate Investments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tallink Grupp</td>
<td>Tallink Hotels real estate</td>
</tr>
<tr>
<td>Tallink Takso</td>
<td>Fastinvest</td>
</tr>
<tr>
<td>Gastrolink</td>
<td>Infor Invest</td>
</tr>
<tr>
<td>Sea Images</td>
<td>Tallink City / Inf Maja</td>
</tr>
<tr>
<td>Tallink Tennisekeskus</td>
<td>Lasnamae</td>
</tr>
<tr>
<td>H.T. Valuuta</td>
<td>Hili Terviselinnak</td>
</tr>
<tr>
<td>Eesti Gaas</td>
<td>Vana-Posti Kinnisvara</td>
</tr>
</tbody>
</table>
M/S MEGASTAR BUNKERING
M/S MEGASTAR - THE LATEST LNG FERRY

Built in: Meyer Turku Shipyard, Finland
Gross tonnage: 49 000
Length: 212 meters
Capacity: 2 800 passengers, 800 cars
Engine: dual fuel (LNG/MGO)
Service speed: 27 knots
In operation since 29\textsuperscript{th} of January 2017
The vessel cost is \textasciitilde EUR 230 million

Carried over two million passengers during its first year of service on the Helsinki-Tallinn route
PREPARATION

• Preparation work 2016 - HAZID, HAZOP and QRA (in co-operation with Tallink and Port of Tallinn).
• Procurement of LNG trailers and hiring transport companies.
• Recruiting and training new staff.
LNG SEMI-TRAILERS FLEET

- 8 semi-trailers from GOFA in order to transport and bunker LNG.
- The semi-trailers have Cryostar 1000 l/min cryogenic pumps.
- Full set of PPE is worn by drivers/operators.
TRAINING PROGRAMM

- Bunkering school - multistage training of bunkering drivers/operators

THEORY I
THEORY II
THEORY III
EXAME

LNG-TRAINING
Emergency response

ASSISTED
BUNKERING TRAINING

UNTILL
COMFORT LEVEL
REACHED

Signed logbook

Training certificate

Trained Bunkering Operator
name

Issue date: ...
Valid date: ...
Approved by: ...

EESTI GAAS
SOURCES OF LNG

- LNG import-export terminals/production in the region and on the coast of Baltic Sea.

  ![Map of LNG Sources](image)

  - **in operation**
  - **planned**
LNG SUPPLIES

- Main supply of LNG is from Pskov (Russia) liquefaction plant (350 km).

- Additional supplies has been made from Pori (Finland), Klaipeda (Lithuania) and Świnoujście (Poland).
TTS BUNKERING PROCEDURE

• Safety zones, check-list and etc.
• Duration of bunkering: 4 times a week at night (between 2-6 a.m.).
• 2 - 4 trucks per night (37 - 74 tons).
• Emergency Shut-Down (ESD).
• Break-Away-Couplings (BAC).
• Dry Cryogenic Couplings (DCC).
DCC CONNECTIONS – 0-EMISSION OPERATIONS

• Easy to handle
  Push and turn – free flow
  Turn and pull – closed.

• Safe
  The valve cannot be opened until the unit is coupled and closes automatically when disconnecting.

• Environmentally friendly
  Accidental spillage eliminated

• Reliability
  No loss or spillage of liquids at connection and disconnection
LESSONS LEARNED AND RESULTS
LESSONS LEARNED

1. The importance of safety in using LNG as marine fuel.
2. Preparation and coordination with all parties regarding technical documentation and bunkering procedures.
3. Staff training
4. Logistic and tight bunkering schedule.
5. Crossing the Russia-Estonia border.
6. LNG quality (MN).
Eesti Gaas is the leading LNG bunkering service provider in the Baltic region and has acquired a high level of competence in all sectors of LNG business

- Over 700 TTS bunkering operations have been completed since 30th of January 2017.
- A total of ~13 300 tons of LNG has been bunkered.
- Over 600,000 km has covered in delivering the LNG.
- The bunkering of the Megastar ship has provided us with invaluable experience with various sources of supply, logistics and technological solutions for LNG.
EXPANDING THE SERVICE AREA

• Eesti Gaas will start to offer truck-to-to ship bunkering services in the Ports around the Baltic sea and inland water ways.
  • Estonia
  • Finland
  • Latvia
• First deliveries Q2/2019
DEVELOPING SHIP TO SHIP BUNKERING
Passenger and cargo ship fleet is gradually being turned into LNG fueled. Already LNG fueled ships are using these ports. Port of Tallinn has requested for bunkering services and is prepared to support these efforts.

### MAJOR PORTS IN THE TARGETED REGION

<table>
<thead>
<tr>
<th>Port</th>
<th>Country</th>
<th>Distance from Tallinn, nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ust-Luga</td>
<td>Russia</td>
<td>120</td>
</tr>
<tr>
<td>Vyborg</td>
<td>Russia</td>
<td>142</td>
</tr>
<tr>
<td>Turku</td>
<td>Finland</td>
<td>160</td>
</tr>
<tr>
<td>Helsinki</td>
<td>Finland</td>
<td>40</td>
</tr>
<tr>
<td>Kotka-Hamina</td>
<td>Finland</td>
<td>103</td>
</tr>
<tr>
<td>Mariehamn</td>
<td>Finland</td>
<td>170</td>
</tr>
<tr>
<td>Sillamäe</td>
<td>Estonia</td>
<td>106</td>
</tr>
<tr>
<td>Ventspils</td>
<td>Latvia</td>
<td>213</td>
</tr>
</tbody>
</table>
THANK YOU!

Pasi Moisio
AS Eesti Gaas
sergei.jefimov@gaas.ee
pasi.moisio@gaas.ee