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KLAIPĖDA SCIENCE AND TECHNOLOGY PARK

TRANSFER/BUNKERING OPERATION OF LNG

Habil. Dr., prof. Vytautas Paulauskas

KSRC

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LNG TRANSFER FROM LNG IMPORT TERMINAL TO SHIPS AND BUNKERING STATIONS

- LNG transfer by small LNG tankers
- LNG transfer by trucks
- LNG transfer by rail tanks
- LNG transfer by LNG tank-containers

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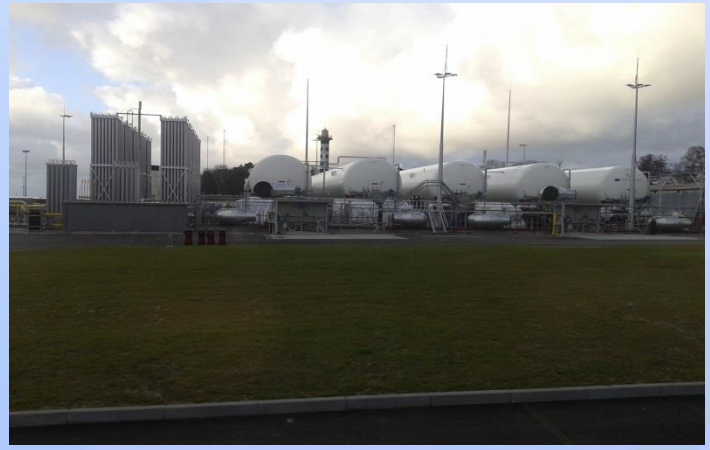
SMALL SCALE LNG TERMINALS



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SAFETY DURING LNG TRANSFER AND BUNKERING

- **Legal basis of the safety during LNG transfer (Countries Administrations Regulations)**
- **Safety zones (Countries Administrations regulations)**
- **Actions in emergency situation (Must be prepared in advance)**

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LNG DANGEROUS OR NOT FOR PEOPLE HEALTH ???

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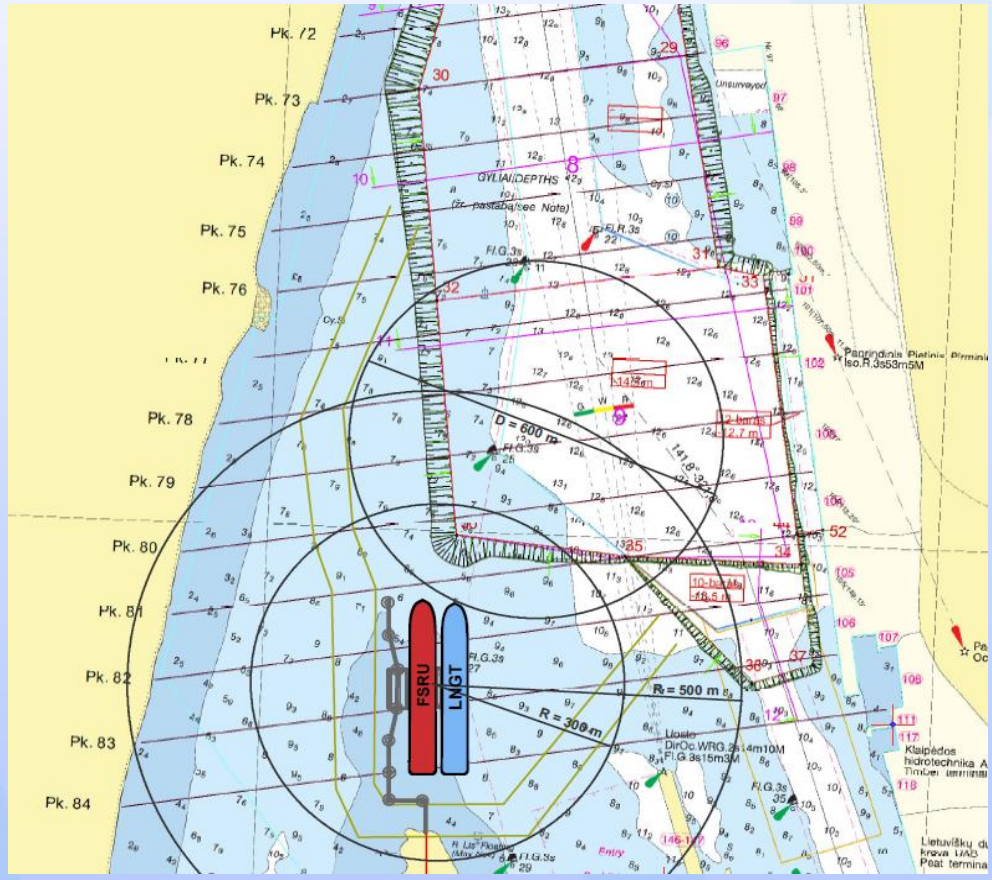
KLAIPEDA LNG IMPORT TERMINAL SAFETY ZONES



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LNG SMALL SUPPLY AND BUNKERING SHIPS

- **LNG small supply Sea ships (capacity from 4000 m³ up to 15000 m³ of LNG)**
- **LNG small supply IWW ships (capacity from 400 m³ up to 2000 m³ of LNG)**
- **Port LNG supply ships (capacity from 200 m³ up to 1000 m³ of LNG)**

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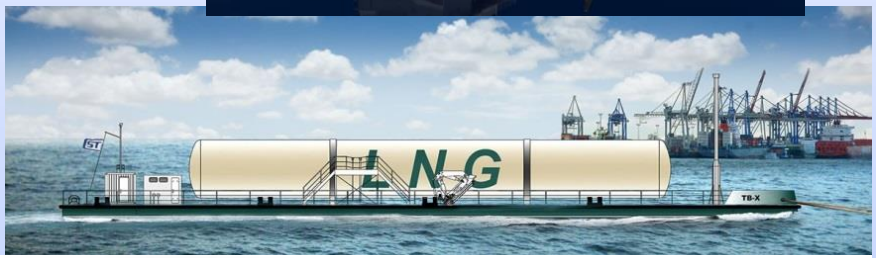
LNG SUPPLY AND PORT TANKERS



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PORT LNG SUPPLY SHIPS MAIN PARAMETERS

- Length up to 40 – 50 m
- Width up to 10 – 12 m
- Draft up to 3,5 – 5,0 m
- Capacity (LNG) from 200 up to 1200 m³
- Speed up to 10 knots

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LNG FUEL SUPPLY OF THE EAST BALTIC PORTS MAIN CONDITIONS

- **LNG fuel quantity on LNG supply vessel should be at least for the 1 – 2 ports (at least for 4 - 6 Ro-Ro vessels in one port)**
- **LNG supply vessel must have possibility fulfill at least 1 time per week on LNG terminal**
- **LNG supply vessel could provide LNG supply operations near quay walls or in port waters**
- **LNG supply vessel should be able supply LNG shore facilities**

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LNG SUPPLY SHIPS FOR THE EAST BALTIC SEA MAIN PARAMETERS

- Length up to 100 - 115 m
- Width up to 12 – 16 m
- Draft up to 5,5 – 6,5 m
- Capacity (LNG) up to 5000 – 9000 m^3
- Speed up to 14 – 16 knots

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LNG LOADING ON LNG SUPPLY TANKER

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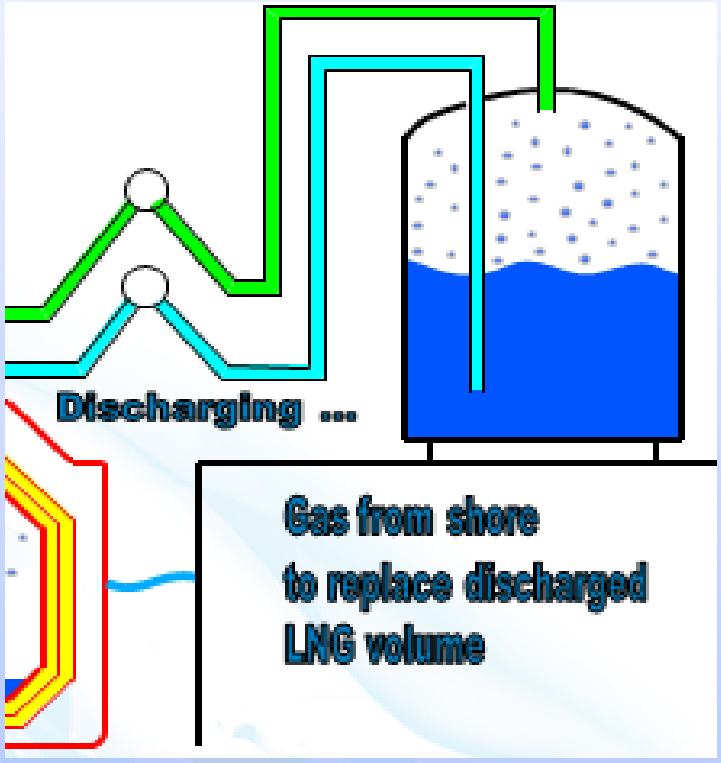
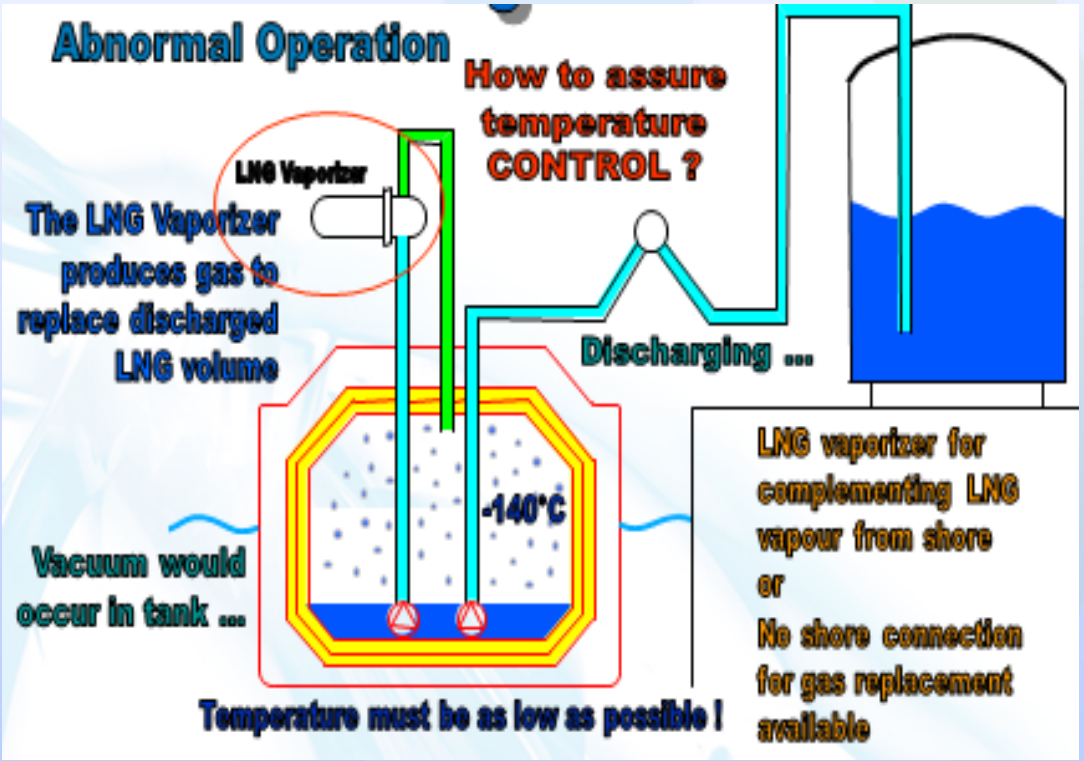
LNG TANKERS OR SHORE STORAGE TANKS LOADING BY LOADER EQUIPMENT IN NORMAL CONDITIONS AND IN NON STANDARD CONDITIONS (intensively depends of the small LNG tanker size)





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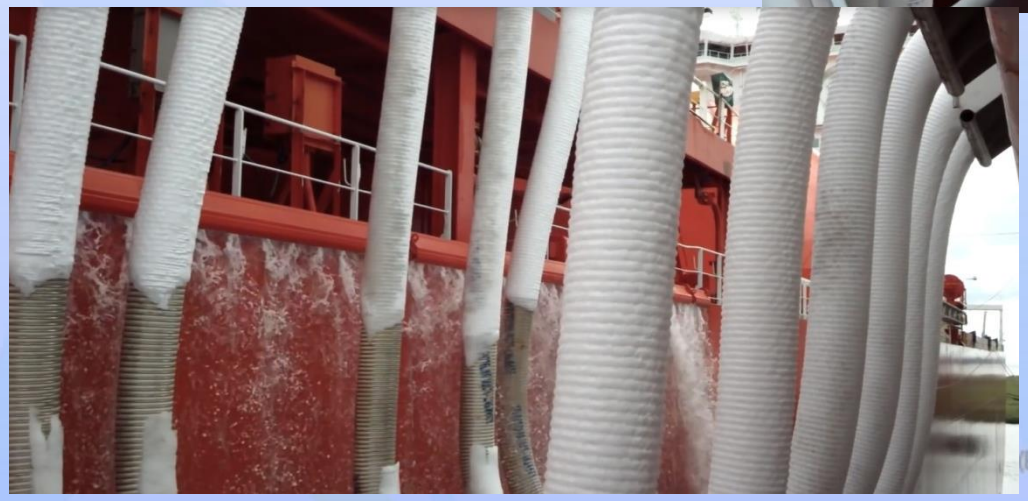
WATER FLOW UNDER PIPES (to avoid ships construction damages in case of LNG leakage)



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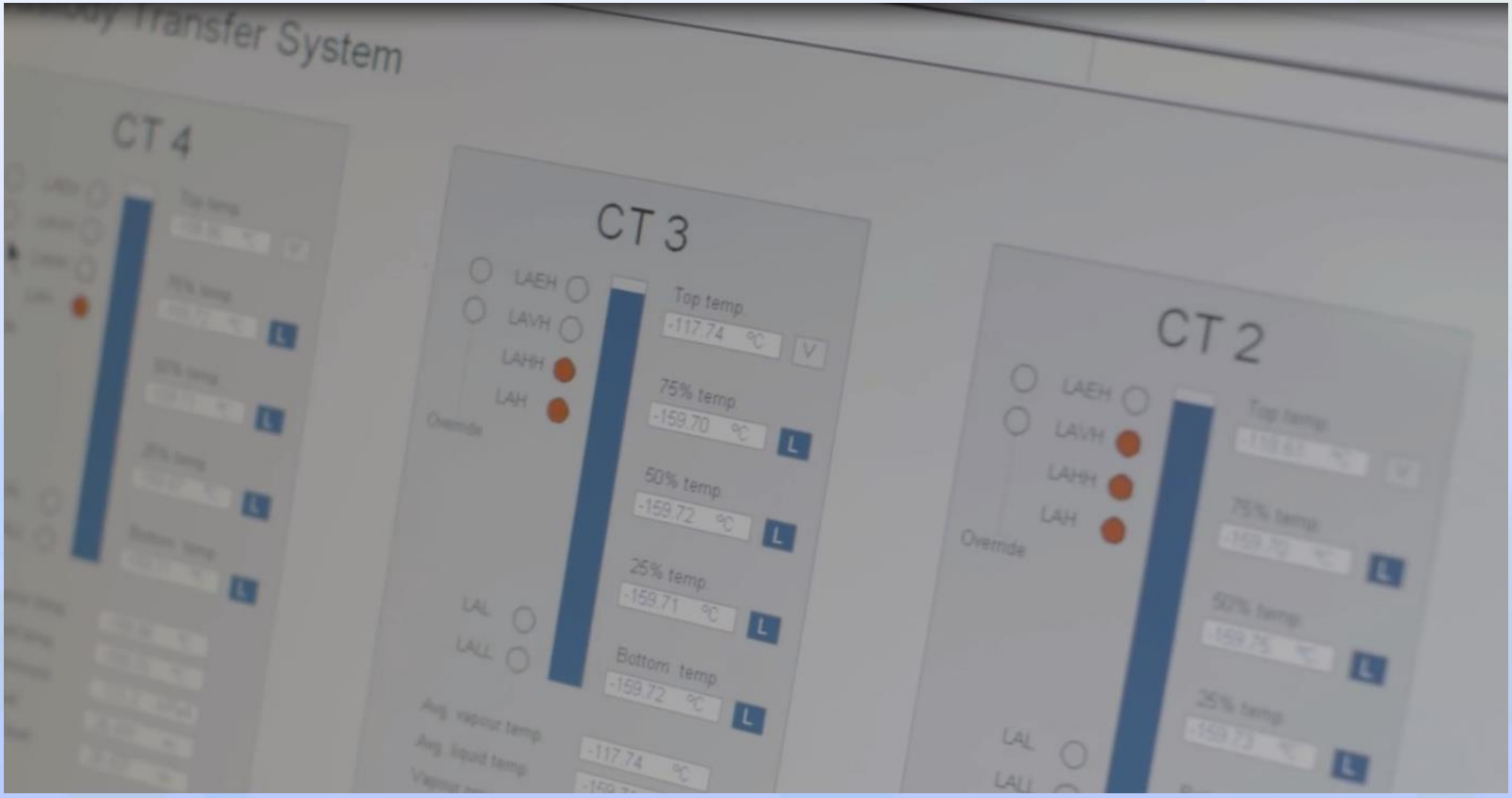
LNG LOADING DATA IN LNG CONTOL ROOM (tanks fulfil up to 98 %)



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SUPPLY SMALL SCALE LNG TERMINAL IN KLAIPEDA

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LNG BUNKERING FACILITIES IN BALTIC SEA (Planning)

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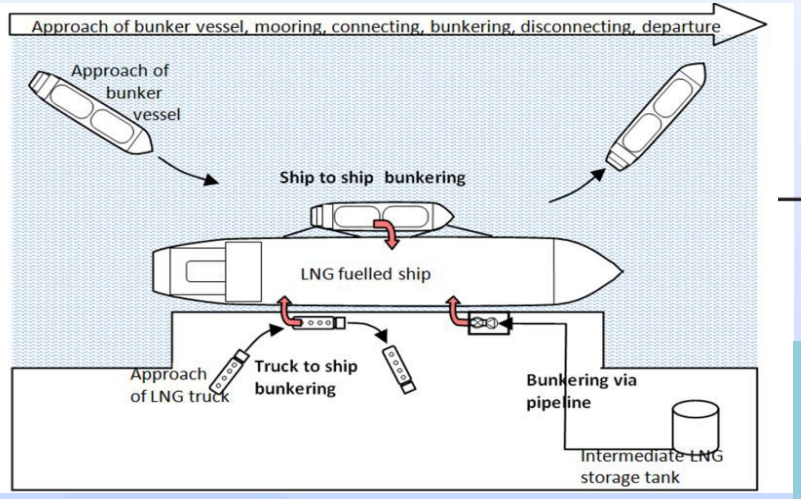
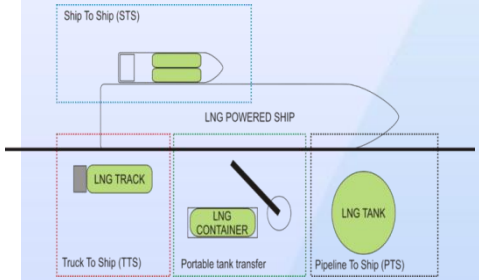
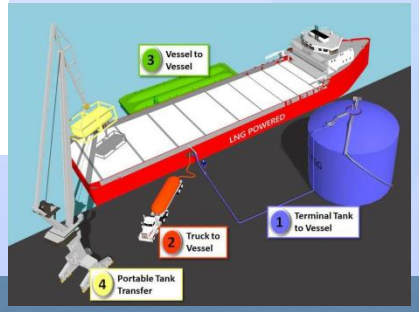
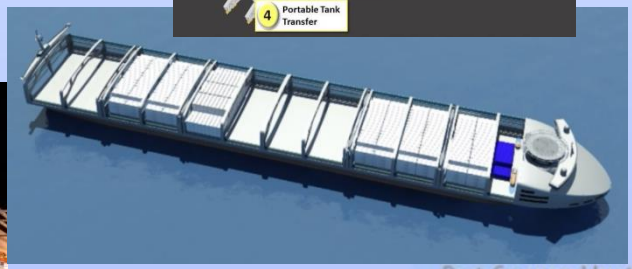
SHIPS LNG BUNKERING SYSTEMS









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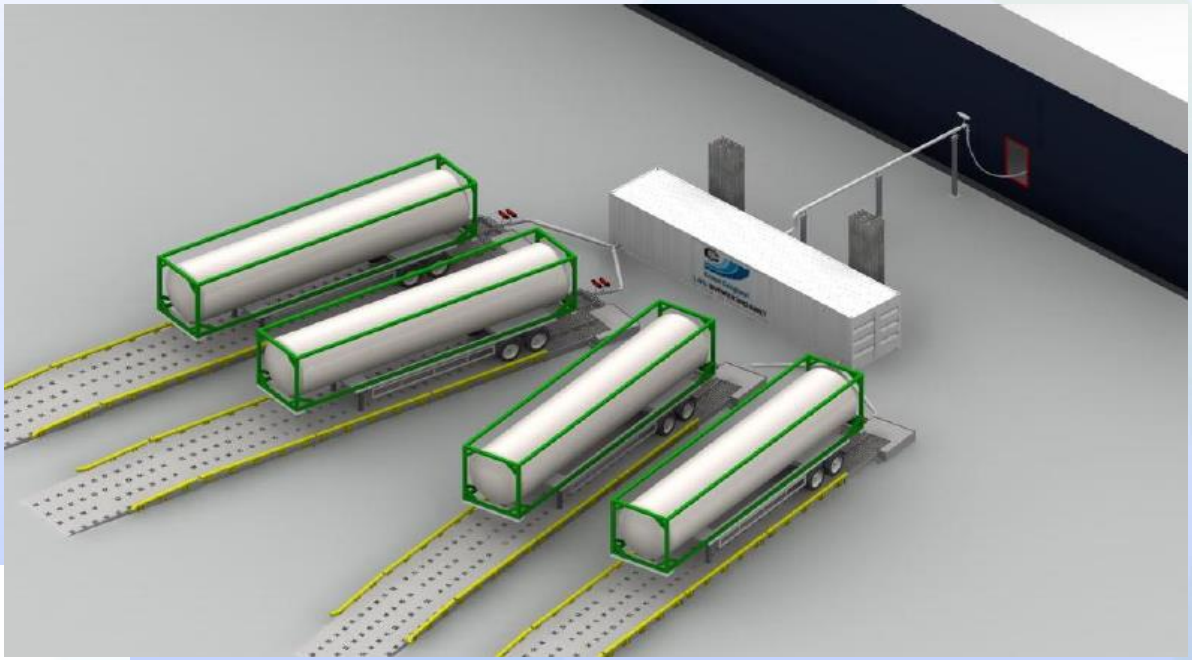
BUNKERING FROM MULTIPLE TANK TRAILERS



4 Tank Trailers

Serial or Parallel Connections

2 Pumps each with 60 m3/h

Flow rates 120 m3/h

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LNG BUNKERING – INTERMEDIATE TANK ON QUAY

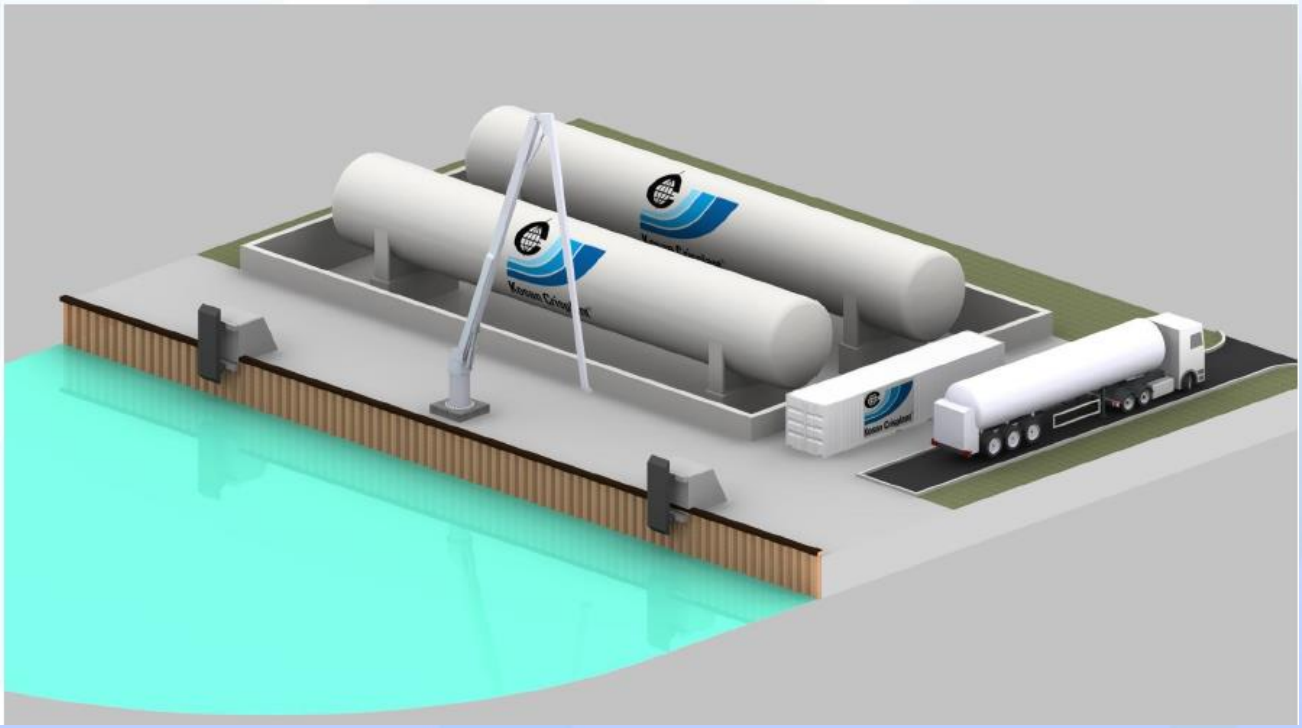
2 x 300 m3 tanks

Pump unit

2 x 65 m3/h pumps

Flow rates from 40-130 m3/h

One truck loading point



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LNG BUNKERING – STATIONARY STORAGE TANK WITH MULTI TRAILER

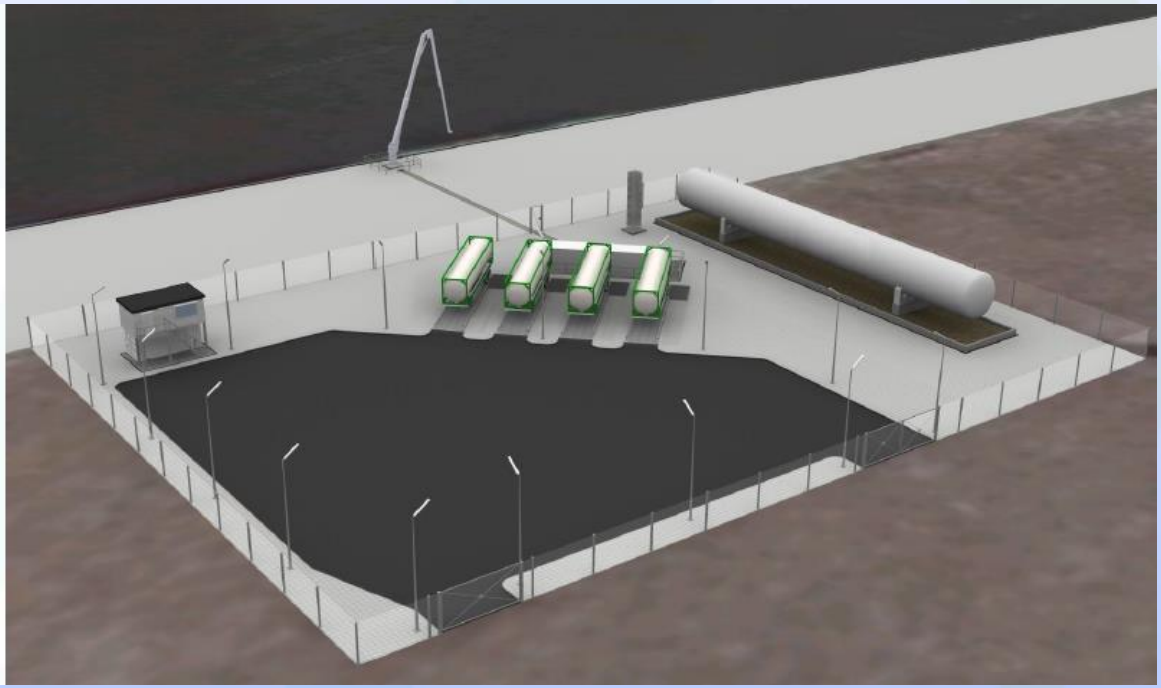
40 - 320 m3/h bunkering flow

5-450 m3 per bunker operation

Optionally equipped with PBU for fast bunkering

Ideal to achieve high flow and maximum flexibility

Possible to increase capacity and flow rate in phases



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MULTIPLE FUEL STATION

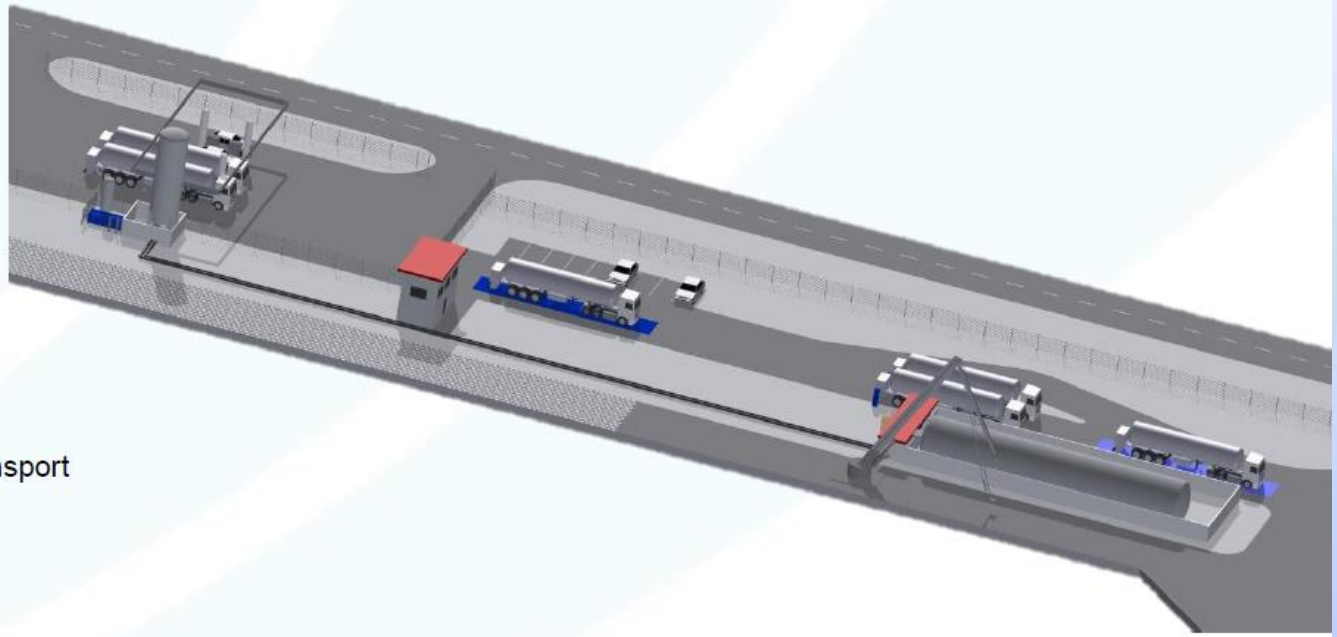
400 m3 & 30 m3 LNG storage tanks

LNG transfer pumps

LNG measurement system

LNG bunker system on the quay

LNG and CNG filling station for road transport



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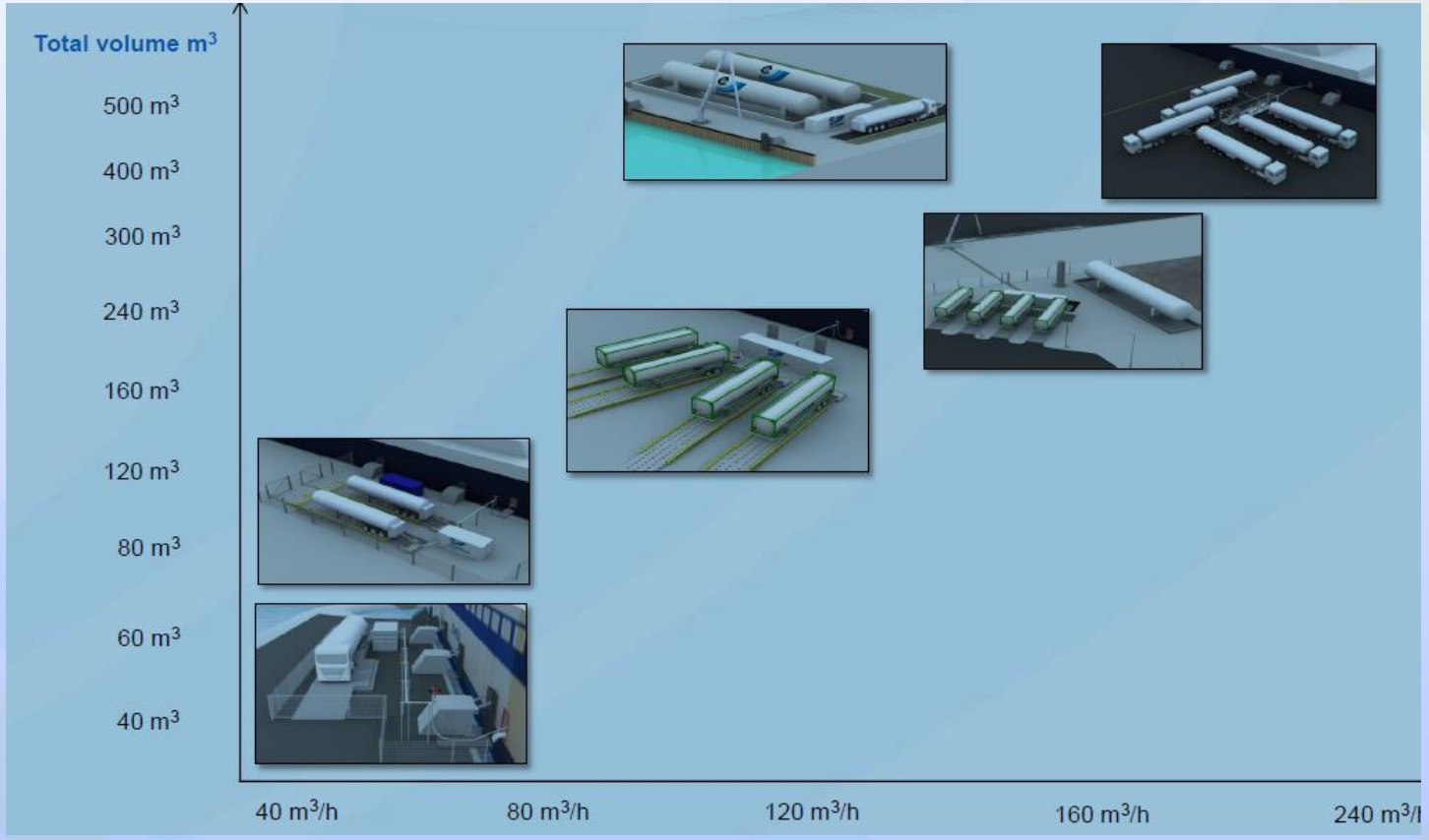
BUNKERING CAPACITIES AND INTENSIVELY



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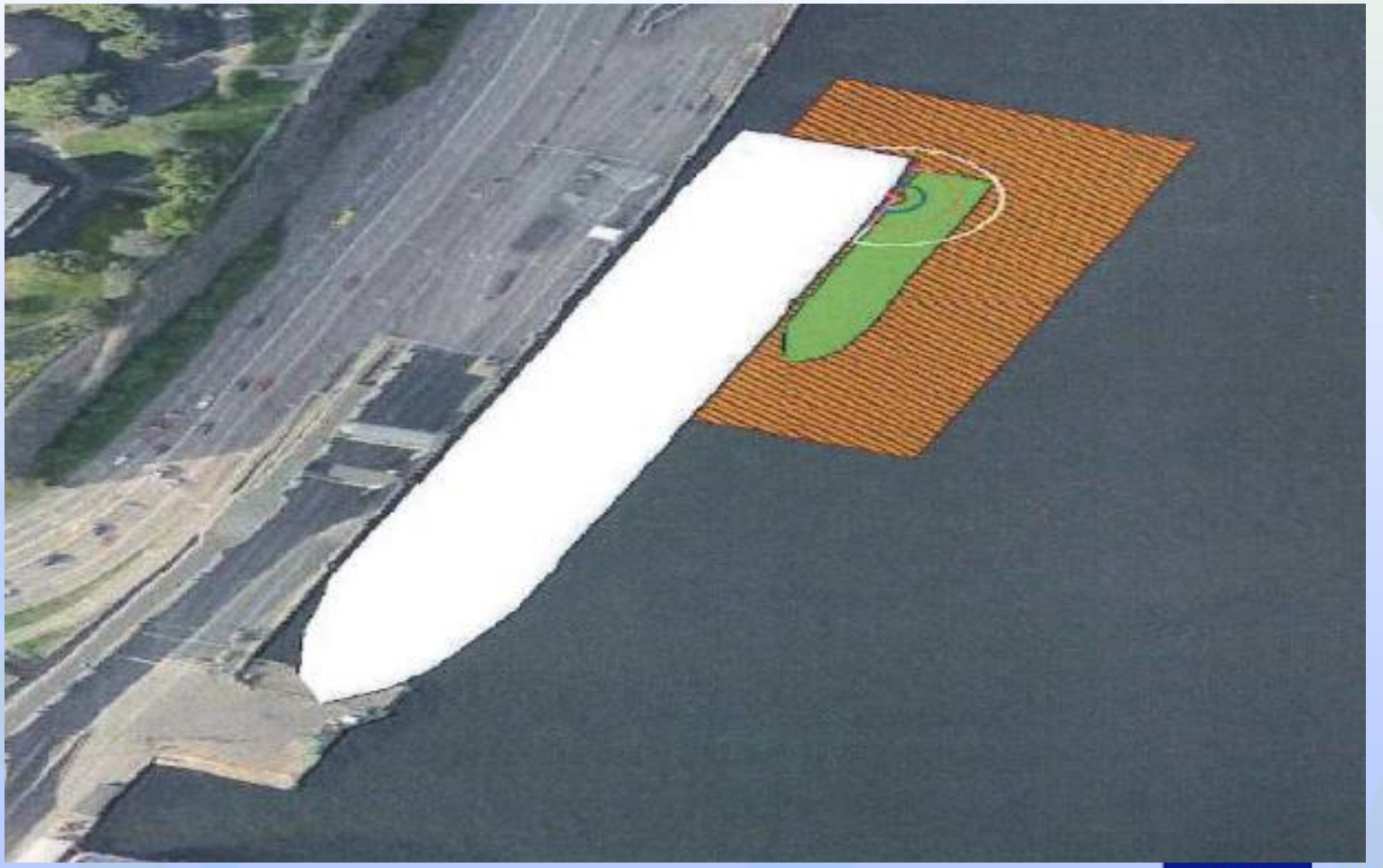
LNG BUNKERING STS SAFETY ZONE



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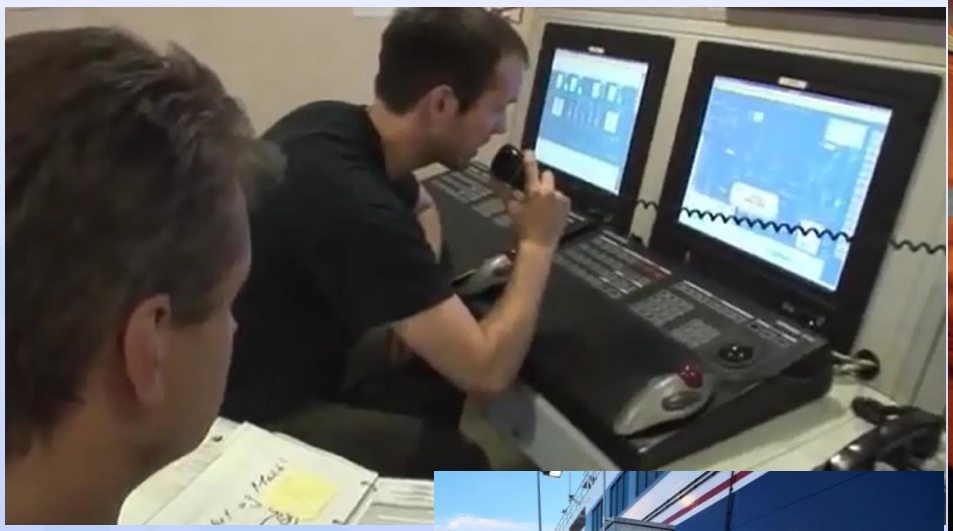
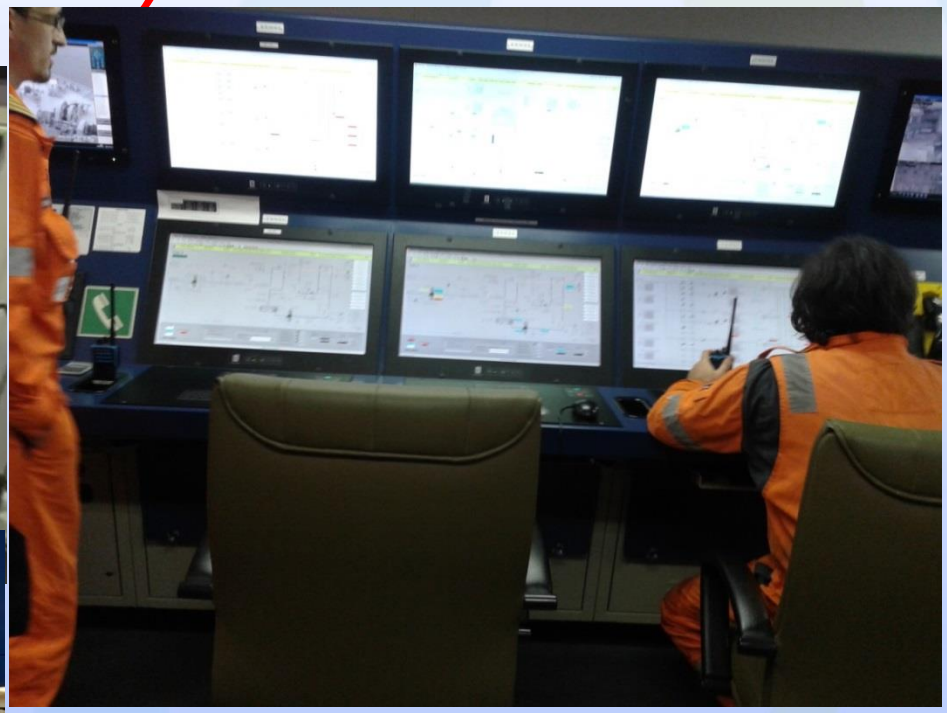
SAFETY FIRST (at least 2 persons must be on important operations, but???)





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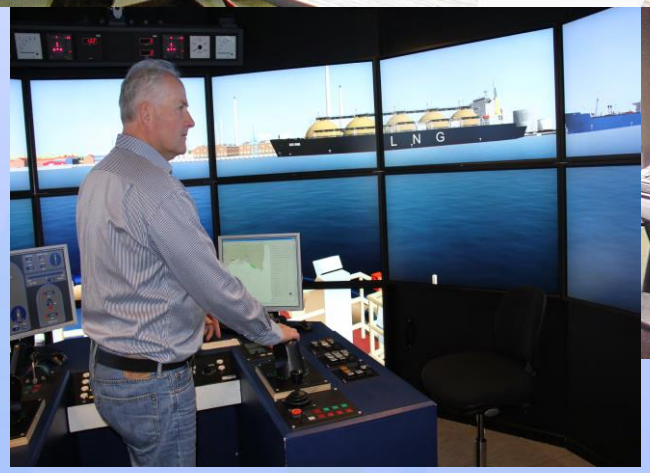
PERSONAL EDUCATION AND TRAINING



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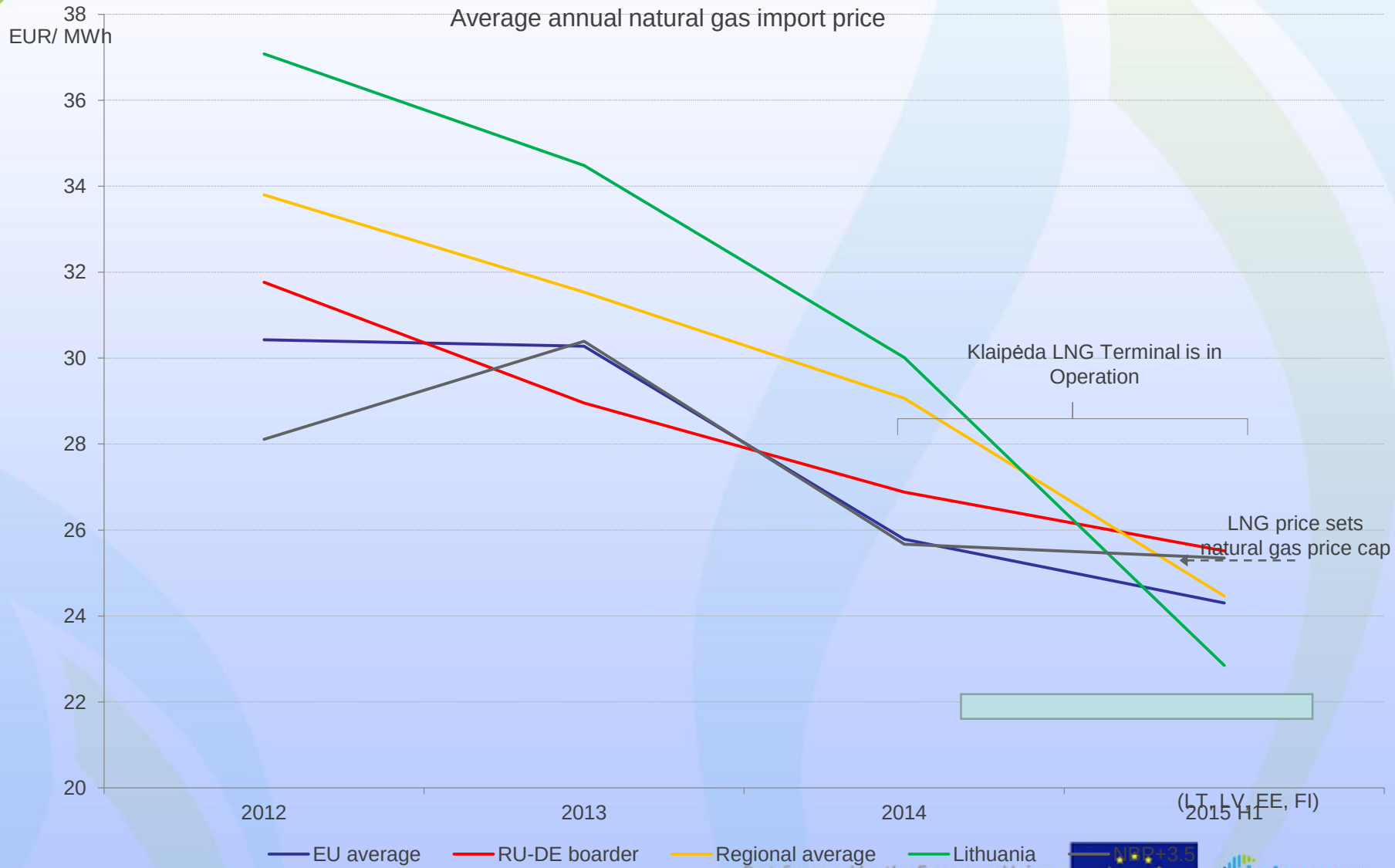
A Cap for Natural Gas Prices in the Region



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LNG AND NATURAL GAS PRICES (EUR /MWh)

Year	2012	2013	2014	2015	2016	2017	2018
NG Regional Price (LT, LV, EE, FIN)	33	31	29	25	25	25	25
NG Price (LT)	38	35	30	25	23	23	23
LNG direct price	-	-	-	21	20	20	20
Gas price with LNG terminal costs, inc. quality recalculation	-	-	-	22	21	21	21

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CONCLUSIONS

- **LNG transfer from LNG import terminals to ships and bunkering stations could be by LNG supply vessels, trucks, tank-containers**
- **Safety during LNG transfer must be on basis fulfil IMDG Code, ADR Agreement, etc. basis**
- **Safety during bunkering operations must be fulfil according terminal safety regulations and ISM Code on LNG ships**
- **LNG ships and terminals personal education and train is the main way minimize non standard situations.**

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