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# Growing applications for LNG fueling development

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Čistá mobilita  
Loučeň, 2015





The advertisement graphic features the CHART logo and website (www.chartlng.com) in the top left. A horizontal bar at the top lists four stages: LIQUEFACTION, DISTRIBUTION, STORAGE, and VEHICLE FUELING, each with a corresponding image: a liquefaction plant, a LNG tanker truck, a storage facility, and a vehicle being fueled. The central text reads 'The SMART Fuel System for Today' followed by 'LNG' in large green letters and 'Liquid Natural Gas' in blue. The background is a blue water droplet pattern on the left and a white curved shape on the right.

CHART  
www.chartlng.com

LIQUEFACTION DISTRIBUTION STORAGE VEHICLE FUELING

The SMART  
Fuel System  
for Today

**LNG**  
Liquid Natural Gas

1. About Chart Ferox, a.s.
2. Fueling stations – mobile, skidded, stationary
3. LNG infrastructure development
4. LNG Bunkering
5. LNG on the rail

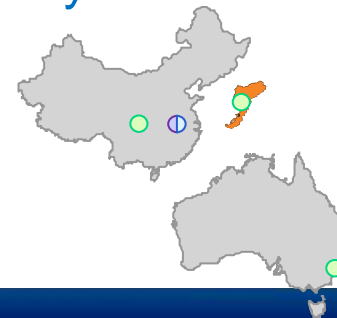
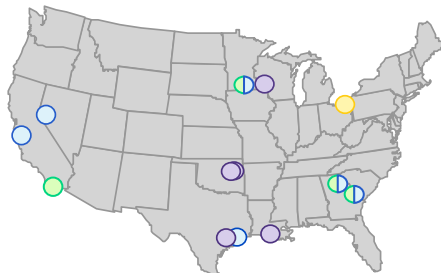
# About Chart Ferox



Chart Ferox, a.s. – the European subsidiary of Chart Industries, Inc. (**GTLS**), a leading global manufacturer of standard and custom engineered high quality products and systems for a wide variety of cryogenic and heat transfer applications. Our equipment is used throughout the liquid gas supply chain in the production, storage and end use of natural gas and industrial gases.

## CHART INDUSTRIES basic profile:

- increase of sales from \$266 million in 2003 to \$1,2billion in 2014
- more that 5000 employees worldwide
- global operations with 32 principal facilities
- from a liquefaction plant down to a small liquid cylinder delivery





# Small scale LNG chain

Ocean LNG carrier



Pipeline



ISO container

Receiving terminal

Rail car



Small LNG liquefier  
stranded gas, biogas  
or from pipeline



Vehicle fueling station



Loading LNG on tanker and truck

LNG-tanker running on natural gas



# LNG Mobile fueling station



Fully function station with LNG saturation  
LNG pump, up to 150 liters/min  
flow meter, bill printer and fueling  
hose w connector  
Automated flow control

20' ISO container  
volume 20 m3 .... up to 8500 kg LNG

hydraulic oil drive of the LNG pump



**Rental in Europe  
by our partner**



# Flexible mobile fueling station

**Pump drive from truck gear box**  
 Fully independent  
 Good traceability  
 Truck necessary all the time



**Natural gas drive**  
 Independent of the truck  
 Independent of electricity  
 Fully flexible

**Simply bring the unit to the site and serve LNG**



# Movable fueling station

30 up to 60 m<sup>3</sup> LNG tank (12 000 or 24 000 kg LNG)

- 100% automated operation, 1 button process
- MID LNG dispenser
- 11 LNG buses in Olsztyn, PL



**CNG option  
available  
up to 100 Nm<sup>3</sup>/h**



# Stationary LNG fueling station in Warsaw, Poland (2015)



## LNG

2 tanks VT 60/18  
3 LNG pumps  
3 LNG dispensers

## LCNG

2 high-pressure pumps  
2 vaporizers  
Odorizer

**5 min stop for LNG fueling**



# LNG dispenser

## MID Approved

- Single or dual LNG pressures
- 35-175 LPM flow rate
- real time density measurement
- BOG from vehicle tank management
- IFSF protocol for POS
- No moving parts
- Maintains the meter at cold temperature (no cool down period)
- 0.5% Accuracy



# Scheme of the LNG fueling infrastructure development

Optimal fleets:  
 Mobile LNG station      20 trucks  
 Moveable LNG station    40 trucks  
 Fixed LNG station        150 trucks  
**These 3 stations can serve LNG for 210 trucks**

50+ fueling



2016



20-43 m3

90+ fueling



2017



30-60 m3

180+ fueling



2018



70 m3



# LNG bunkering

## LNG bunkering facilities fuel tanks for ships (LNG)

- high operational savings for fleet managers
- environmental benefits
- the newest technology
- highest quality and safety level

Fuel tank with „gas tight box“



125 m3 capacity



LNG fast ferry



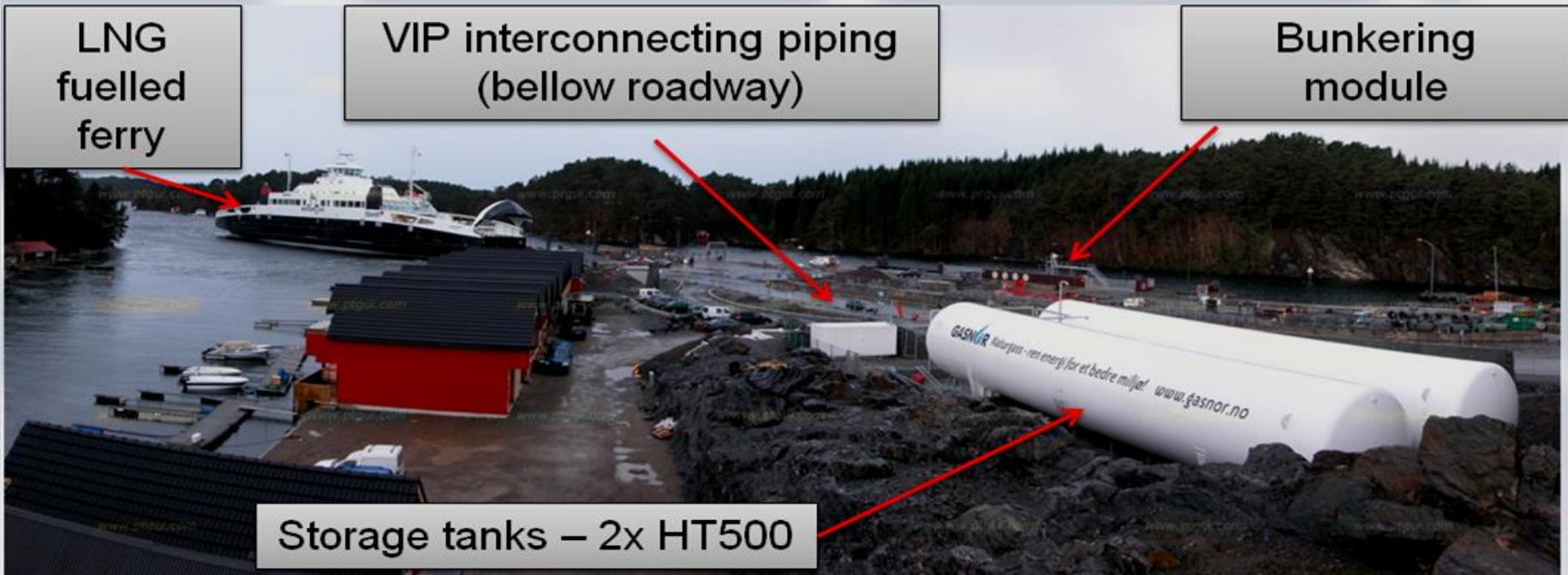
LNG power barge

# LNG bunkering

## LNG bunkering facilities + ship onboard LNG tanks

- Storage tank: 2x HT 500 m<sup>3</sup> (total 1000 m<sup>3</sup> gross volume)
- Cryogenic pump: 1700 liter/min
- VIP: DN150; 100 meters (under the ground)
- Refilling of the ships (e.g. BergensFjord – Norway – 2x 125 m<sup>3</sup>)
- Frequency of filling of ships – every night !

**TURN KEY DELIVERY**





# LNG Rail Car



## Why LNG on Rail?

### Benefits

- Maximized payload
- Optimized for LNG and ethylene transportation
- Positive environmental effect
- Solid, reliable design
- Best thermal performance
- Safe & Easy operation
- Utilize existing rail infrastructure

**Gross volume 111m<sup>3</sup> = 2 road trailers**

6 weeks holding time without vapor losses

Payload between 42.1 tons

Maximum Allowed Working Pressure 7 bar

Length 25 meters

# LNG transport option to vehicle fuelling station

Initial



Medium



Advanced



6400 m<sup>3</sup>



# Conclusion

- LNG fuelling technology is fully developed for initial projects and market expansion
- Rental arrangement decreases risk of investment in initial steps
- Different kinds of LNG transport bring environmental and economical benefits at each stage of market growth
- Synergy of LNG satellite regasification station and vehicle fuelling makes LNG affordable and attractive



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# Thank you for your kind attention

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