

# Chart Industries Company Overview

Leading global independent manufacturer for the energy, industrial gas and biomedical markets.

Net sales for the year 2015 improved to **\$1.040 million**

Global footprint for our operations on four continents **with 4000 employees**

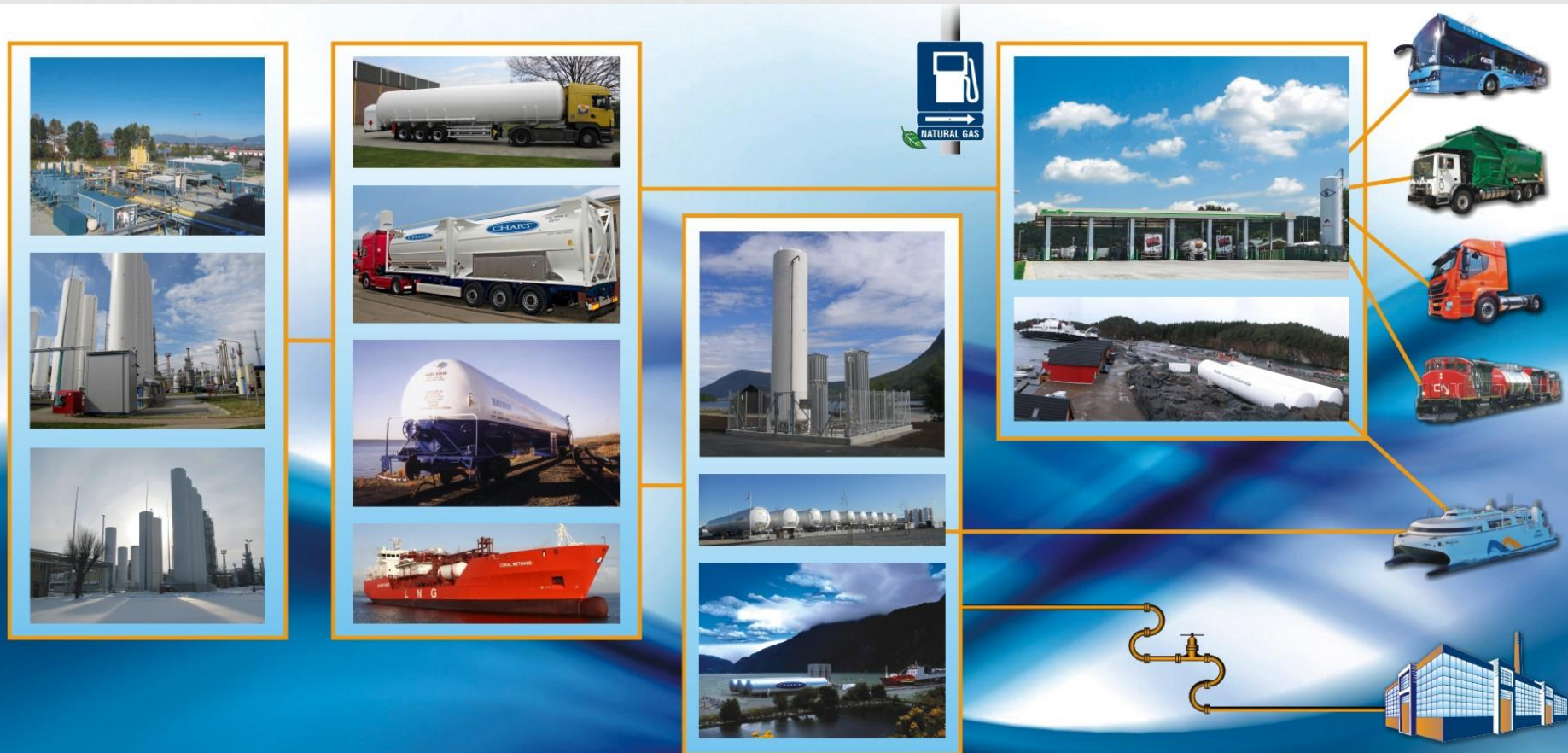
We growth in our core industrial gas and LNG markets in 2016.



# Chart LNG Value Chain

Full range of LNG products in six continents worldwide

LNG (Liquefied natural gas) is a clear, colorless and non-toxic liquid which forms when natural gas is cooled to  $-162^{\circ}\text{C}$ , ( $-260^{\circ}\text{F}$ ). The cooling process shrinks the volume of the gas 600 times, making it easier and safer to store and ship. In its liquid state, LNG will not ignite.





# LNG Storage Systems

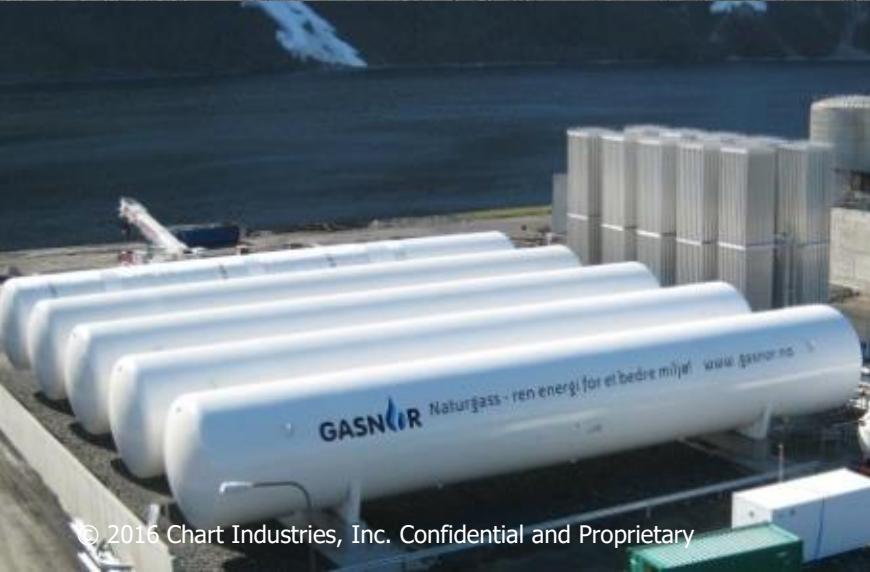
## LNG plants, stations & terminals

- Evaporation/regasification plants
- Storage depot and distribution plants
  - Distribution with LNG road transport vehicles
  - Distribution with coast-carriers
- LNG refueling stations
- Vehicle fueling stations
- Bunkering stations
- Coastal receiving plants and reloading terminals





# Evaporation Plants





# LNG Distribution

ISO Containers, Semi-Trailers & Rail Cars

TPED and ASME approved cryogenic vessels  
Optimized for LNG and ethylene transportation  
Available for road, rail and ship transportation



LNG Rail car with storage capacity 111m<sup>3</sup>



20, 40 and 45 ft. Iso Containers

# Virtual pipeline concept



**≈ 1,000 km**

**LNG Terminal  
Sines, PRT**



M/V Funchalense sails to Madeira island



**TE Power Plant  
Madeira island,  
PRT**



# LNG Rail Car



Transport LNG on rail for long distances

Transport capacity 111 m<sup>3</sup> (approx. 2 LNG road tankers)

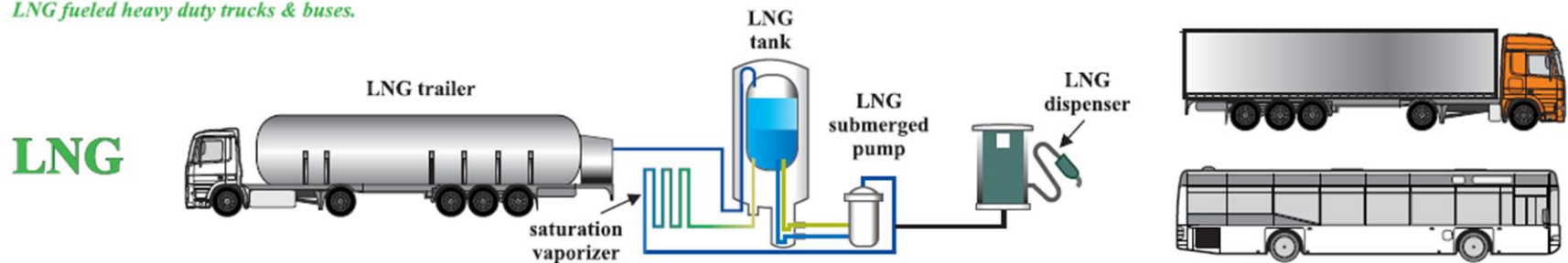
Chart & VTG Germany project

Highest operational and safety standards

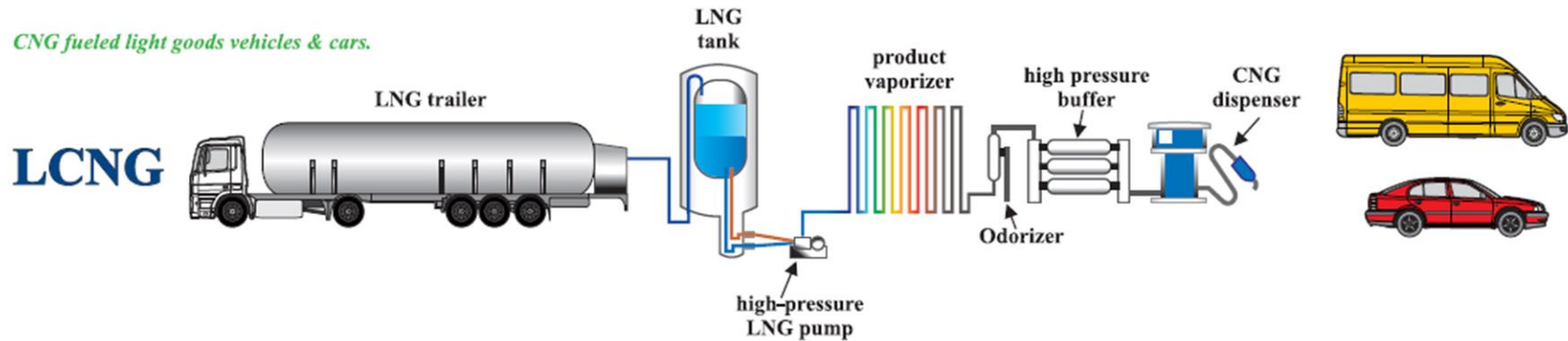
# Vehicle Fueling Process

## Schema of LNG and LCNG Refueling Stations – 3D

*LNG fueled heavy duty trucks & buses.*



*CNG fueled light goods vehicles & cars.*





# LNG Vehicle Fueling Station

LNG Permanent Vehicle Fueling Station with LNG dispenser



## **For fueling of 30 LNG buses**

- 1x 60 m<sup>3</sup> LNG storage tank
- 1x LNG DYNAFLOW 3000 Dispenser
- 1x LNG Pump skid
- 2x saturation vaporizer

# LNG Vehicle Fueling Station

LNG Permanent Vehicle Fueling Station with LNG dispenser



reddot award 2015  
winner industrial design





# LNG/LCNG Fueling Station

LNG and LCNG dispensers available



## LNG

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

## LCNG

2 high-pressure pumps  
2 vaporizers  
Odorizer

High-pressure buffer  
2 CNG dispensers

# LNG/LCNG Fueling Station

LNG and LCNG permanent station

in Warsaw, Poland celebrated a milestone with its 2000th bus fill in 2015



LNG dispenser MID certified  
with remote controle



# LNG/LCNG Skided Fueling Station

LNG compact system

Comfortable operation

Fully automated and remote control access

Highly accurate and reliable LNG dispenser, fully integrated in the skid



LNG – for trucks

LCNG – for passenger cars

LNG Compact Station with dispenser MID certified

# LNG Mobile Vehicle Fueling Station

Flexible LNG fueling on wheels



Fueling for heavy duty vehicles and buses

Fully function station with LNG saturation LNG pump, up to 150 liters/min

Equipped with flow meter, bill printer and fuelling hose w connectors

Automated flow control

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



# Independent LNG Station



Innovation. Experience. Performance.

## Mobile Solution with a power box (2015)

- Engine on NG from the station
- Independent from external energy source
- Bring to site and fuel LNG to trucks
- LNG 20 m3 - recommended for fueling 30-50 buses/trucks per day

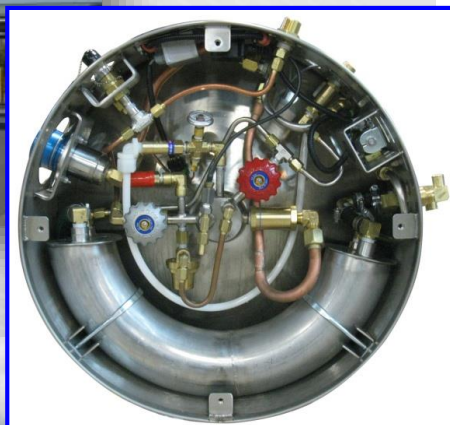




# LNG Vehicle Fueling



LNG & LCNG Fueling Stations



UNECE Regulation 110



LNG Truck & Bus



LNG Skided Fueling Stations





# Bus Onboard Fuel System

LNG Fuel tank, Vaporizer, Controls



Bus stops at the station for 5 min

On board vehicle system Chart: Fuel tank  
Chart model - HLNG 97 24\*71 TPED

Volume 369 liters,  
Diameter 610 mm,  
Length 1803 mm,  
Max. pressure 16 bar





# LNG Ship Fueling Terminals

## LNG Bunkering Station



Storage tank: 2x HT 500 m<sup>3</sup> (total 1000 m<sup>3</sup> gross volume)

Cryogenic pump: 1700 liter/min

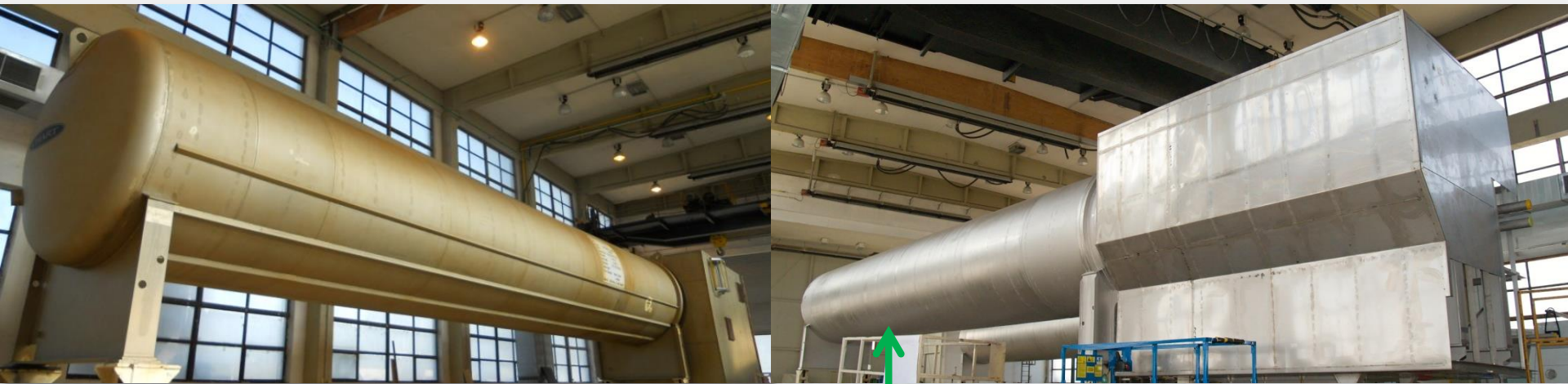
VIP: DN150; 100 meters (under the ground)

Refilling of the ships (e.g. BergensFjord – Norway – 2x 125 m<sup>3</sup>)



# LNG Ship Onboard Fueling

LNG vessel and cold box for ship, barges, ferries and boats



2 fuel tank 40 m3 with cold box



**Fast Ferry – Francisco** – Catamaran with LNG propulsion system



# LNG Ship Onboard Fueling

Overseas and inland waterway systems



**Fish heed carrier - Fuel tank 135 m3**



**LNG Power Barge in Hamburg**



**Fast Ferry – Francisco - 1000 passengers, 150 cars**



**LNG Ferry Fanafjord leaving Halhjem for Sandvikag**



# THANK YOU FOR ATTENTION

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