Innovation for the track:
Breaking new ground in LNG supply

LNG Transportation For Rail Pipeline
Concept For LNG Distribution
In Europe

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Heinz-Jürgen Hiller

VTG Deutschland GmbH

Agenda

1 VTG Aktiengesellschaft

2 The LNG tank wagon

3 LNG supply chain

VTG: Leading European rail logistics and wagon hire company

VTG Aktiengesellschaft

Wagon hire

European leader for private-sector wagon hire with more than 80,000 wagons worldwide and further ambitions for growth.

Rail logistics

Leading European rail logistics provider with tailor-made logistics solutions.

Tank container logistics

Global logistics and tank container hiring with a fleet of approx. 7,600 tank containers.

VTG and Chart bring the transportation of LNG in Europe onto the tracks as an environmentally-friendly mode of transport

VTG	**Leading private wagon hire company in Europe**	▪ Project management ▪ Definition of development goals ▪ Coordination of development and design activities ▪ Marketing and operation ▪ Logistics solutions

CHART
Innovation. Experience. Performance.™
	Leading manufacturer of storage, transportation and distribution systems for LNG	▪ Development and design
		  ▪ Cryogenic tank
		  ▪ Loading, unloading and safety technology
		▪ Manufacture of cryogenic tanks

WAGGONBAU GRAAFF
Member of the VTG Group
Since 1914
	100 years of experience in developing and producing of premium quality railway wagons	▪ Development and design
		  ▪ Understructure
		  ▪ Complete wagon
		▪ Manufacture of the understructure
		▪ Final assembly of the wagon
		▪ Testing and approval

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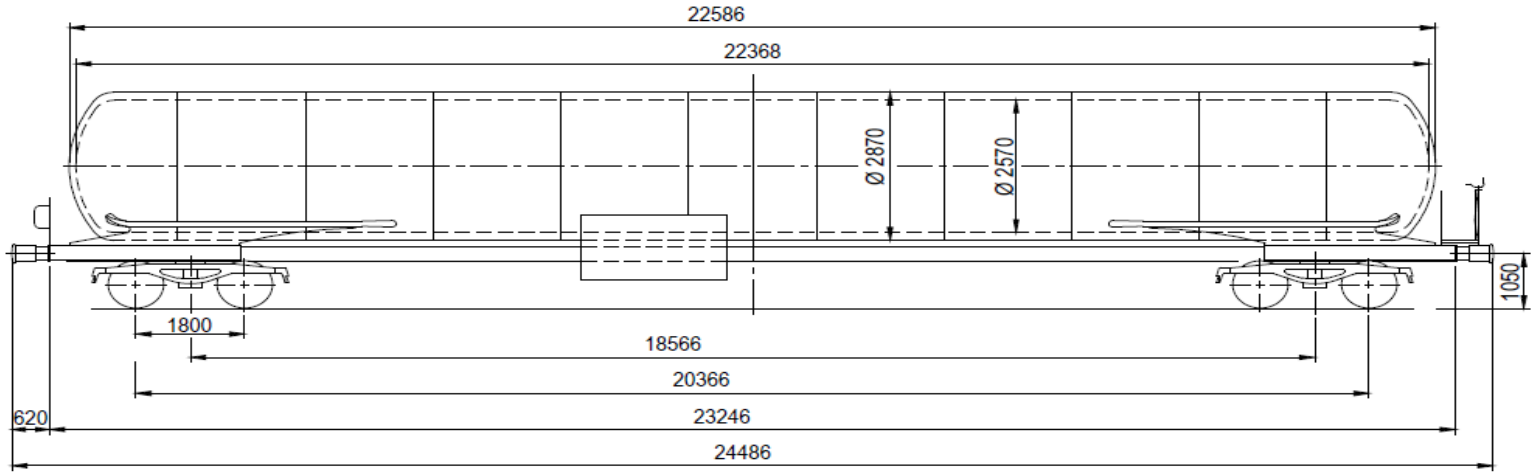
The LNG tank wagon

Technical data for the LNG tank wagon



- Tank materials: inner tank stainless steel (1.4301), outer tank S355NL2
- Tank capacity (RID): approx. 111m³
- Tank code: R10, 4BN
- Calculation pressure (gauge pressure): 1.04 MPa = 10.4 bar
- Test pressure (gauge pressure): 1.04 MPa = 10.4 bar
- Operating pressure (inner tank): 0.7 MPa 0 7.0 bar
- Outer gauge pressure (outer tank): 0.1 MPa = 1.0 bar
- Operating temperature: -196 / +50°C
- Insulation: vacuum insulation
- Tare weight: approx. 45,7t

■ 22.5t axle load **→ max. payload line category C: ~ 36.6t** **→ max. payload line category D: ~ 42.0t**

Technical equipment on the tank wagon

- Filling and drain valve
- Degassing valve
- Safety valve
- Pressure gauge
- WBG buffer override protection ACS 2013
- PBUC evaporator unit on the tank
- Probe on the tank for checking the vacuum
- Valve for monitoring the filling level when filling the tank
- Valve for extracting LNG samples
- Equipped with telematics system incl. pressure monitoring

Comparison between different means of transport: 1 LNG block train replaces up to 52 tank containers

	1 tank wagon	Block train (20 tank wagons)	1 ISO tank container (40 ft.)	1 Semi-trailer (40 t)	1 Semi-trailer (44 t)
Tare weight	≈ 46.2 t	≈ 924 t	≈ 11.5 t		
Max. load	≈ 42.6 t	≈ 852 t	≈ 16 t	≈ 19.1 t	≈ 21.6 t
			2.5 ISO = 1 tank wagon	2.2 trailers = 1 tank wagon	2 trailers = 1 tank wagon
Total weight	Max 90 t	Max 1,800 t	Max 34.6 t	Max 52.5 t	Max 58 t
Volumes	≈ 111 m³	≈ 2,220 m³	≈ 43.5 m³		
Calorific value	≈ 600,000 kWh	12,000,000 kWh			
CO_2 emissions	Locomotive: 30-45 [g/t-km]			Semi-trailer: 60-80 [g/t-km]	

LNG tank wagon: Approval and regulations

General approvals for freight wagons

- TSI certificate: Technical specifications for interoperability in rail transport in the European Union
- Series approval/authorisation for placing in service (APS) by the Federal Railway Authority

Provisions for the LNG tank wagon

- In accordance with RID, LNG has the UN No. 1972 and the Hazard Identification Number 223
- This means that the LNG wagon is subject to certain conditions, which it has to comply with,
- For example, the safety regulations TU 14, TU 38, TM 6, TA 4, TT 9, CW 30 and TE 22

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LNG: A fuel with a future

Demand for LNG will rise in the long-term

A Environmental protection

- Up to 20% less CO2 emissions than for other fuels
- Up to 90% lower nitrogen oxide emissions
- Almost no sulphur oxides

B Efficiency

- The storage and transportation of LNG takes up 600 times less volume than natural gas in an ambient condition

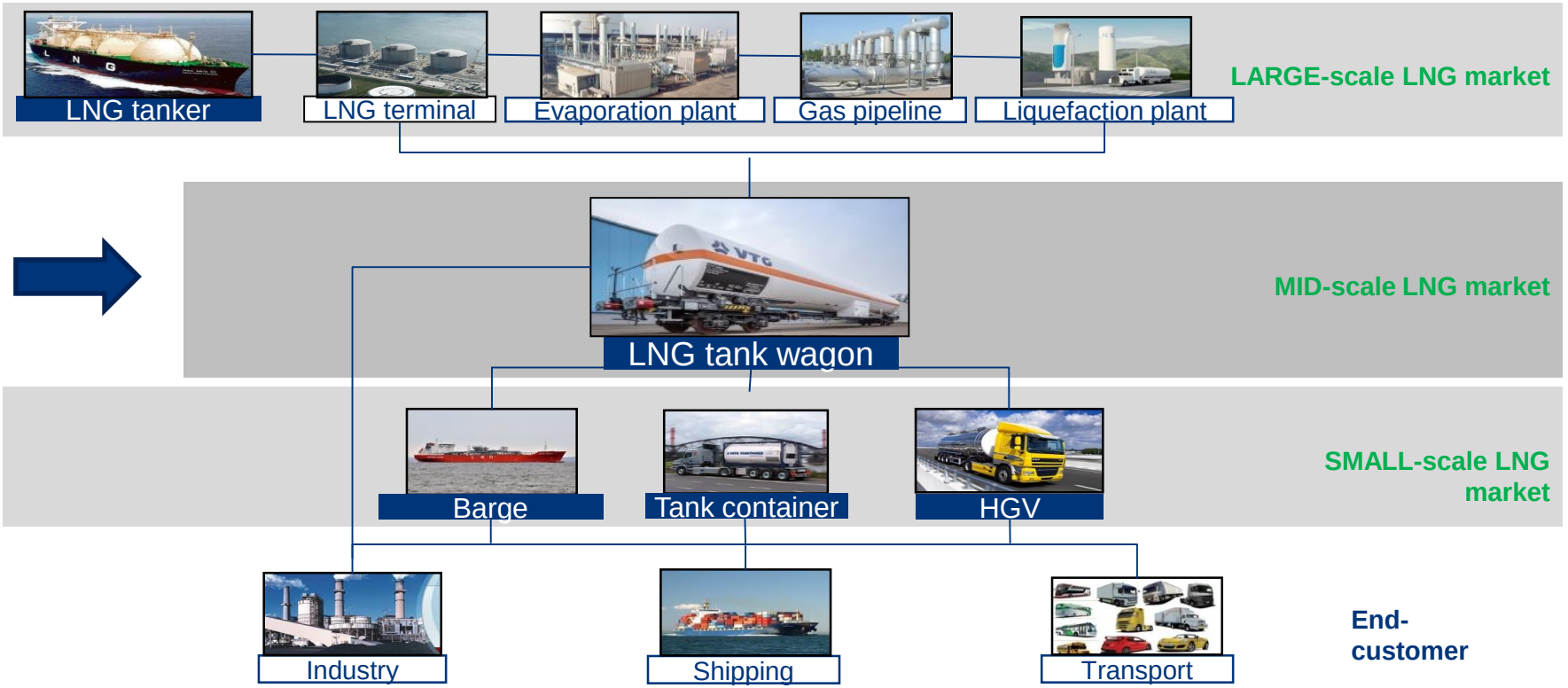
C Safety

- Transport and storage risks lower
- Flash point lies at 55° Celsius
- In a gaseous state, LNG ascends and moves away from potential sources of ignition

D Regulatory compliance

- SECA: Limits on sulphur in shipping
- Euro IV, V, VI: Emission limits for heavy haulage
- National and regional noise control guidelines

The LNG tank wagon creates a new volume segment within the LNG supply chain



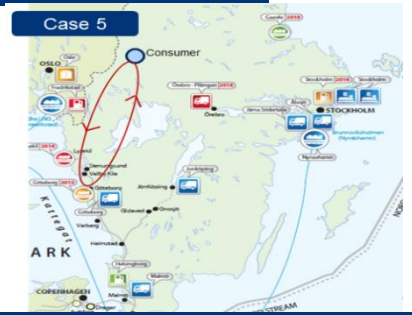
Advantages of transporting LNG by rail

Transportation of large quantities per transport batch at low costs

Flexible inland supply compared to ship

Long distances can be bridged

Direct delivery to the end-customer



Permanent supply with LNG

Mid-scale LNG supply chain: Necessary infrastructure

Investments in transport modes

- LNG terminals
- Tank depots
- Bunkers

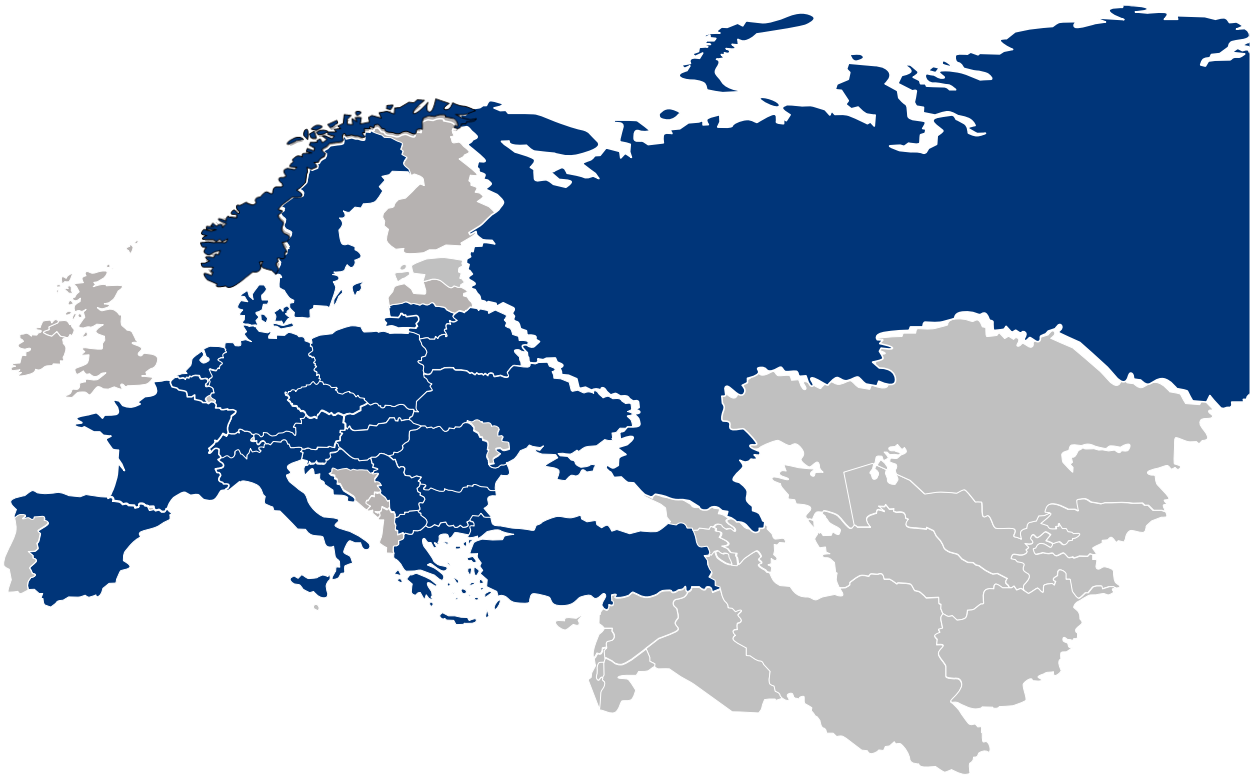
Rail-specific investments

- Sidings
- Loading and unloading points for LNG

Interface topics

- LNG tank wagons as temporary storage units

Pan-European haulage in rail logistics



Many thanks for your kind attention.