CHALLENGES OF THE UPCOMING GERMAN GAS MARKET CONVERSION: CONTRIBUTION OF LNG USE FOR THE LOW CALORIFIC GAS NETWORK'S SAFE AND SUSTAINABLE OPERATION

3rd Trondheim Gas Technology Conference

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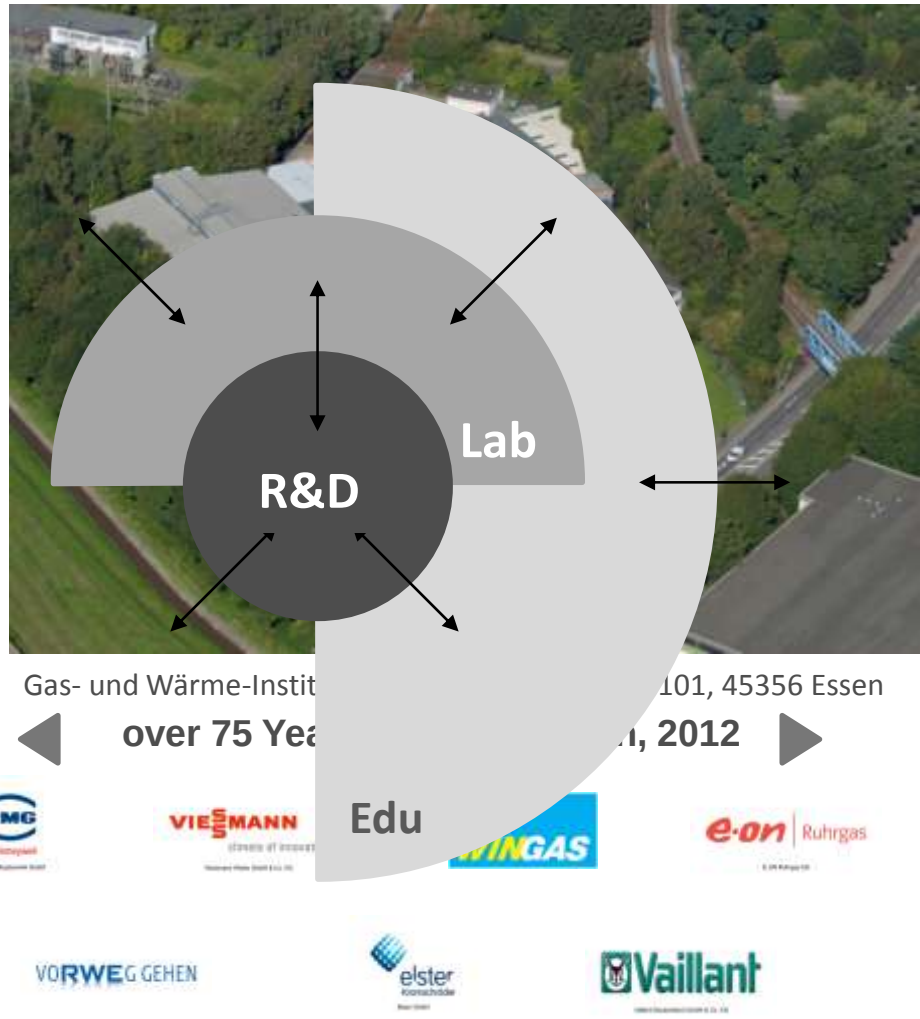
Demand and production of natural gas in Germany

GWI is a research institute dedicated to applied technology – Gas and heat are our specialty

- Legal Status:
  Non-Profit Association
- Founding:
  by the German Gas Industry
- 62 Members:
  - Gas distribution companies,
  - Gas transportation companies,
  - Equipment manufacturers,
  - Public utilities,
  - Associations
- 63 Staff

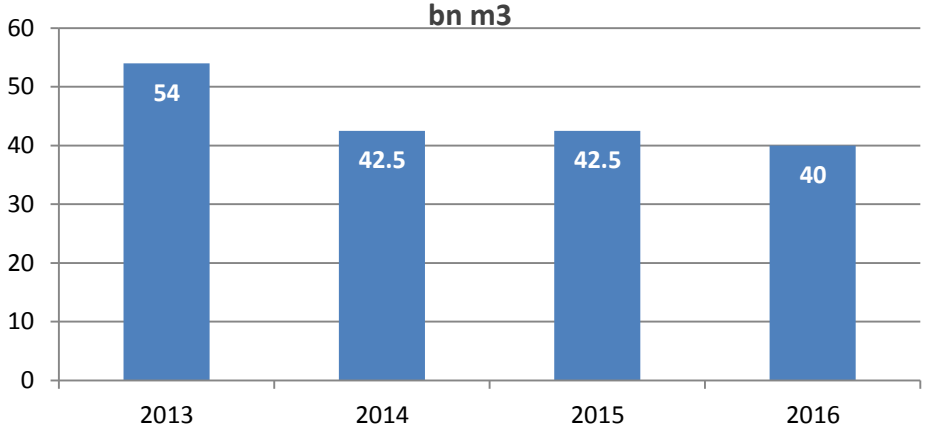


Demand and production of natural gas in Germany

The natural gases used in Germany

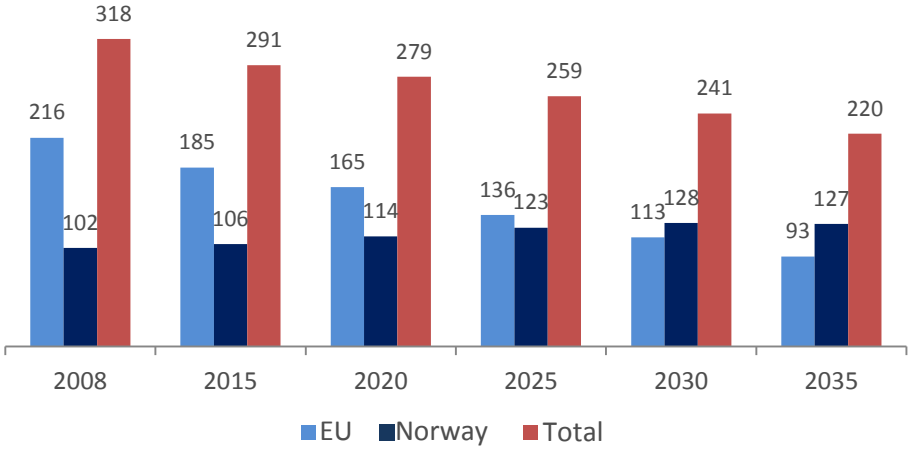
Source: IEA

Annual production of natural gas in Groningen gas field, bn m3



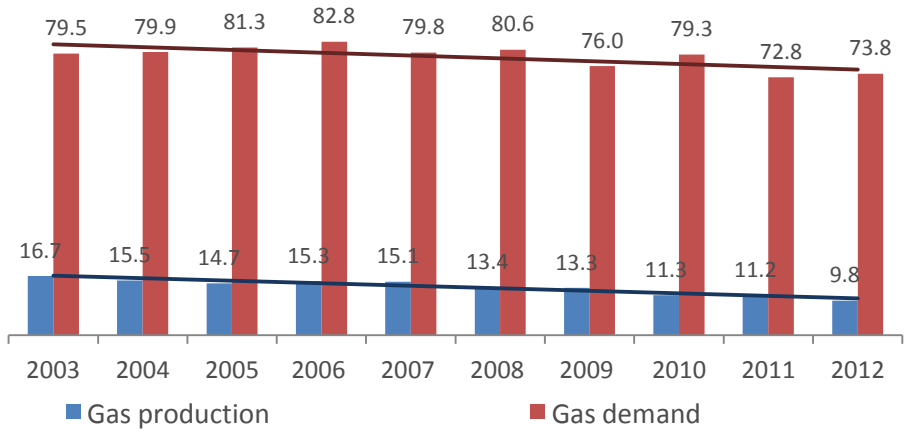
Source: Energate

Annual production of natural gas in the EU and Norway, bn m3



Source: IEA

Annual production and demand of natural gas in Germany, bn m3



Source: EUROGAS

Demand and production of natural gas in Germany

- Reduction of the imports from the Netherlands
- Exhaustion of the German own natural gas sources

The changing information support

Before 2021	Now 2014

Reduction of L-gas imports
after 2020 by 10 % per annum

Shut down of gas imports from the Netherlands by 2030

5 million units of domestic gas appliances

1.2 + ... bn EUR

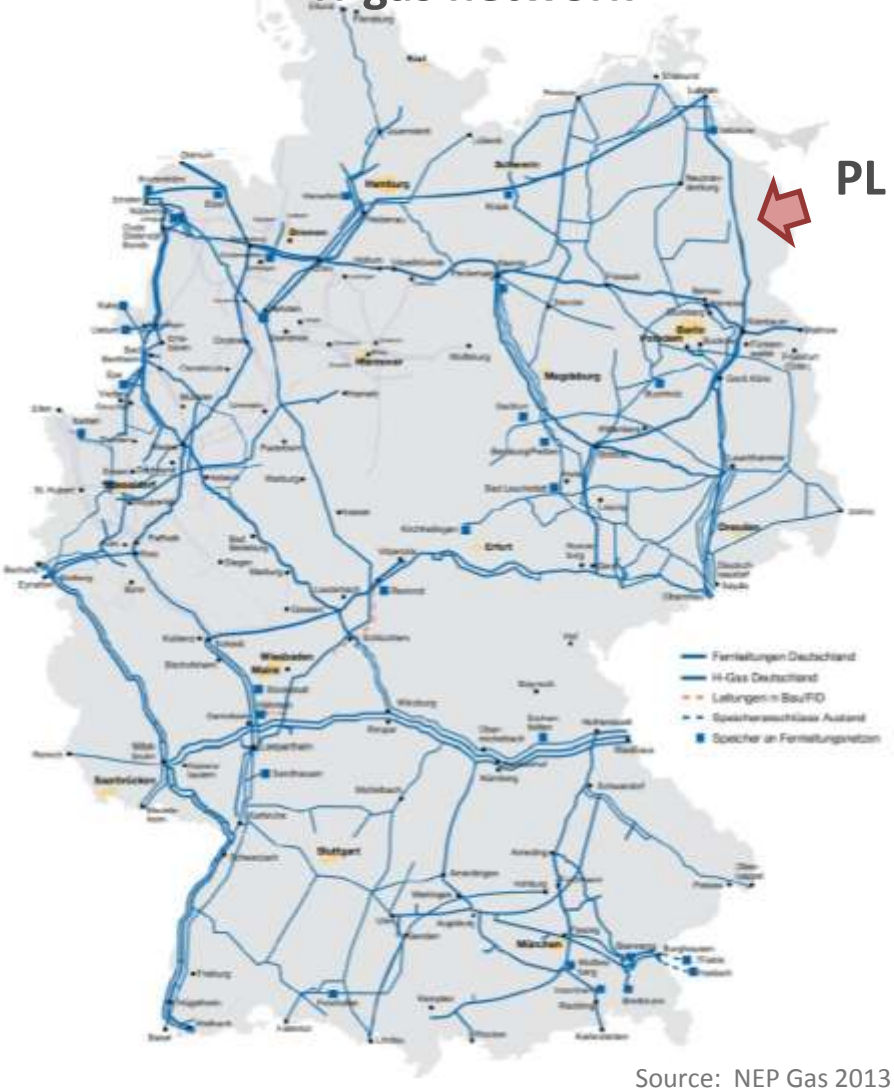
Source: Buderus

Source: NEP Gas 2013

Ways of LNG transport to Germany

L-gas network

H-gas network



Source: NEP Gas 2013

Ways of LNG transport to Germany

Existing and being constructed LNG infrastructure in Germany and around it

Source: Gas LNG Europe

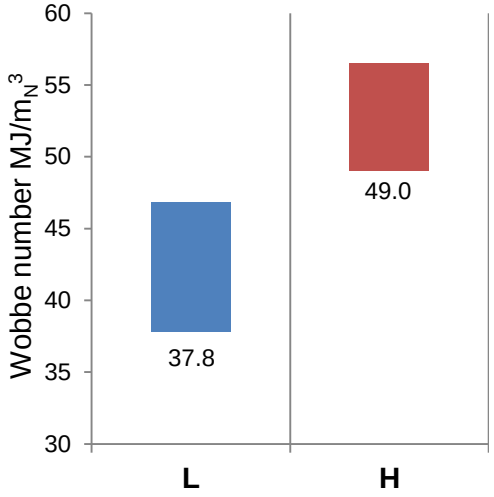
LNG and natural gas qualities

The average compositions of LNG being delivered or to be delivered to the LNG terminals in Rotterdam and Swinoujscie

Origin	Nitrogen [mol%]	Methane [mol%]	Ethane [mol%]	Propane [mol%]	Butane and higher hydrocarbons [mol%]
Algeria / Arzew	0.71	88.92	8.41	1.59	0.37
Nigeria	0.03	91.70	5.52	2.17	0.58
Norway	0.46	92.03	5.75	1.31	0.45
Qatar	0.27	90.90	6.43	1.66	0.74
Trinidad and Tobago	0.01	96.78	2.78	0.37	0.06

Source: GIIGNL

Wobbe number range defined by DVGW Code of Practice G 260



GCV and Wobbe number of gas being delivered or to be delivered to the LNG terminals in Rotterdam and Swinoujscie

Origin	GCV [MJ/m$_N^3$]	Wobbe number [MJ/m$_N^3$]
Algeria / Arzew	43.38	55.00
Nigeria	43.32	55.39
Norway	42.58	54.68
Qatar	43.34	55.18
Trinidad and Tobago	40.94	53.99

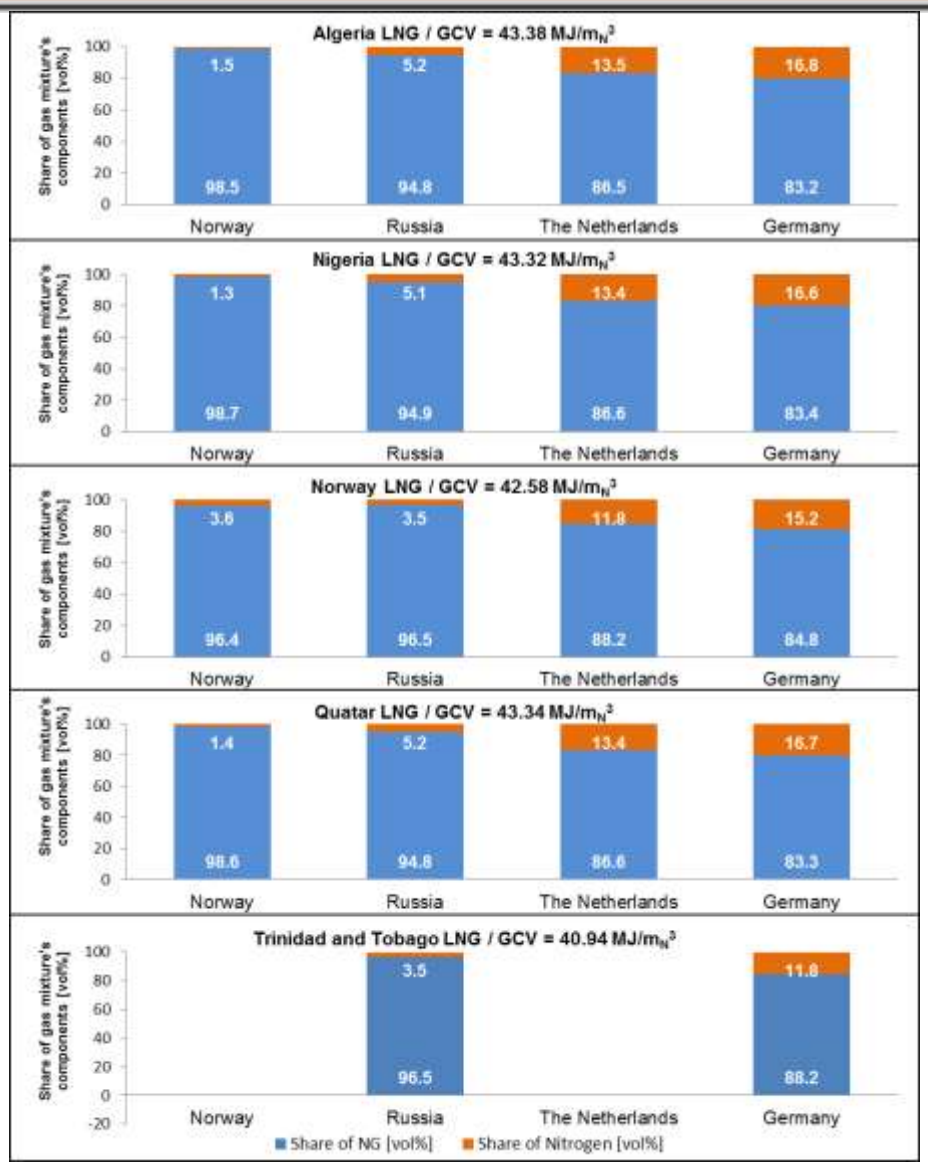
Source: GIIGNL

The German gas sources' Wobbe number and GCV

Origin	GCV [MJ/m$_N^3$]	Wobbe number [MJ/m$_N^3$]
Russia	40.3	53.1
Norway	41.9	52.9
The Netherlands	36.8	46.0
Germany	35.4	44.7

Source: DVGW e.V.

LNG and natural gas qualities



DVGW Code of Practice G 260:2013
"Gas composition"

Relative density
Calculated 0.59 - 0.69
▶ 0.55 ***requirements*** 0.75 ◀

DIN 51624:2008 "Automotive fuels – Compressed natural gas – requirements and test methods"

requirements
below 50 mol% nitrogen

highest calculated value 16.8 mol%

DVGW Code of Practice G 685:2008 „Gas billing"

deviations of GCV in networks of more than ±2 % over the billing cycle is **not allowed**

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