

# German Gas Industry in brief

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# German Gas Industry

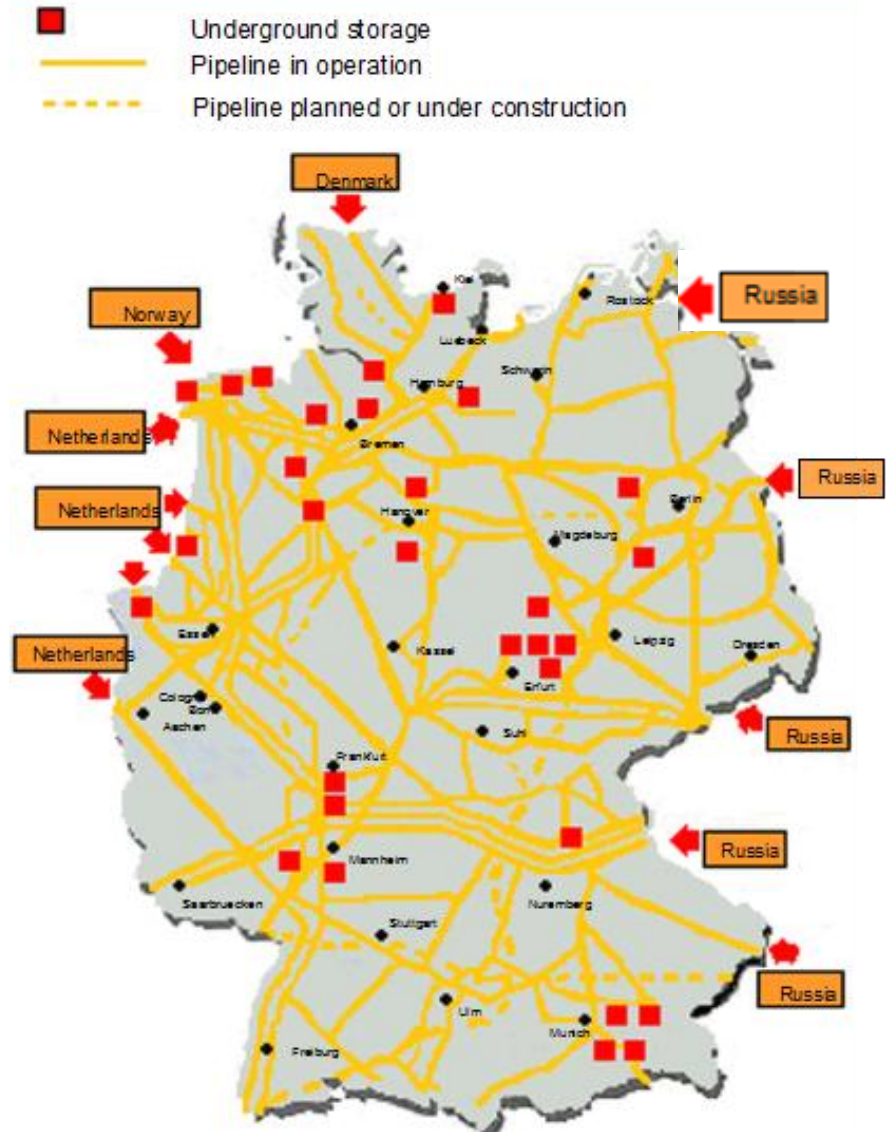
The German Gas Industry consists of:

- approx. 700 companies
  - 20 gas importers and major transporters;
  - 80 regional companies;
  - 600 local companies.
- 2 gas and water associations:
  - BDEW (Federal Association of the Energy and Water Industries):
    - marketing and politics related;
  - DVGW (German Association of Gas and Water Experts):
    - technical-scientific; producer of technical rules for gas and water; certification body.

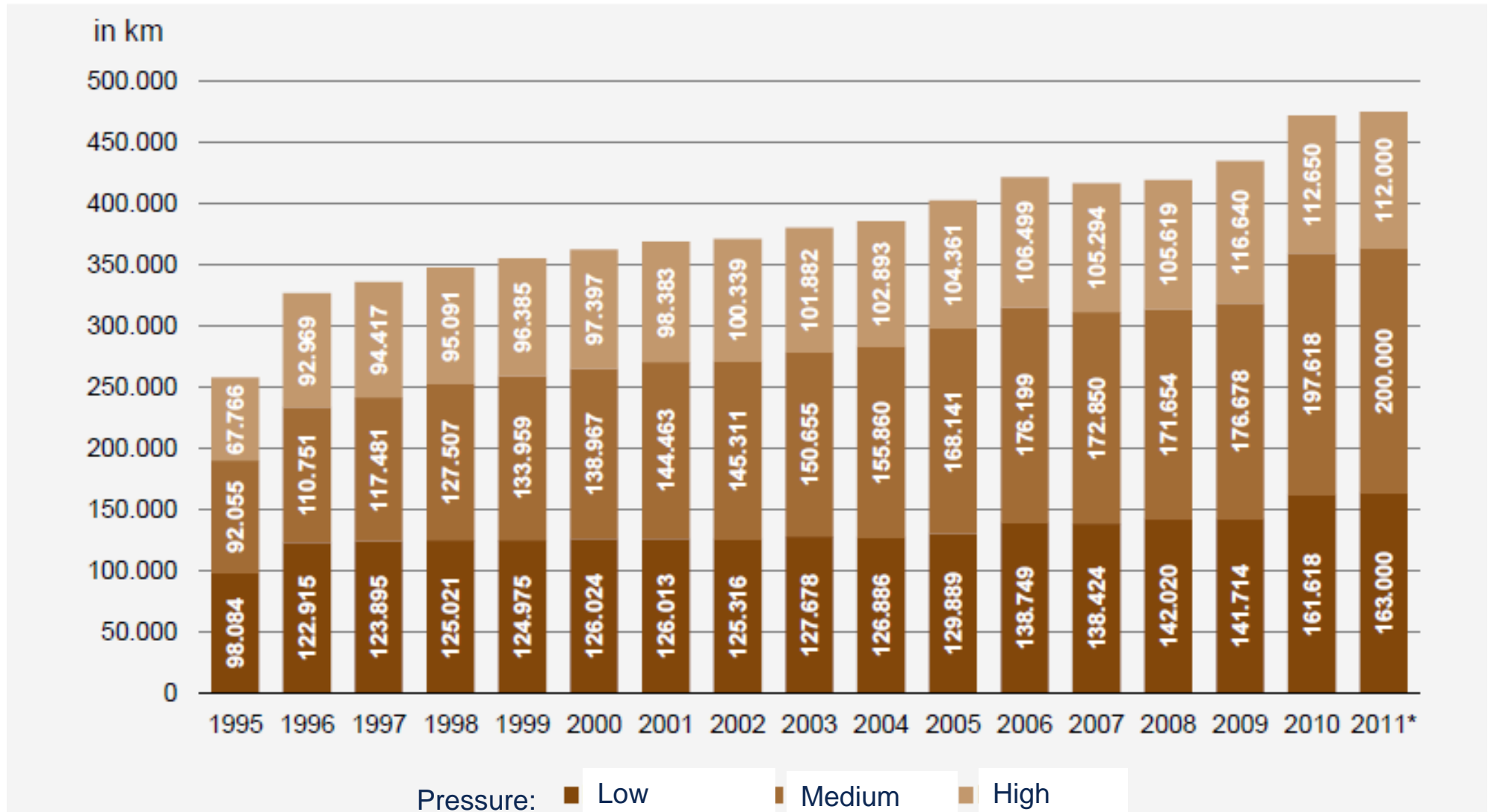
# German Gas Grid

- approx. 420 000 km in total
- 60 000 km gas transmission lines
- 46 underground storage facilities with 20 bill. m<sup>3</sup> capacity
- 10 further facilities under construction or planned

## Gas transport grid and underground storages in the Federal Republic of Germany

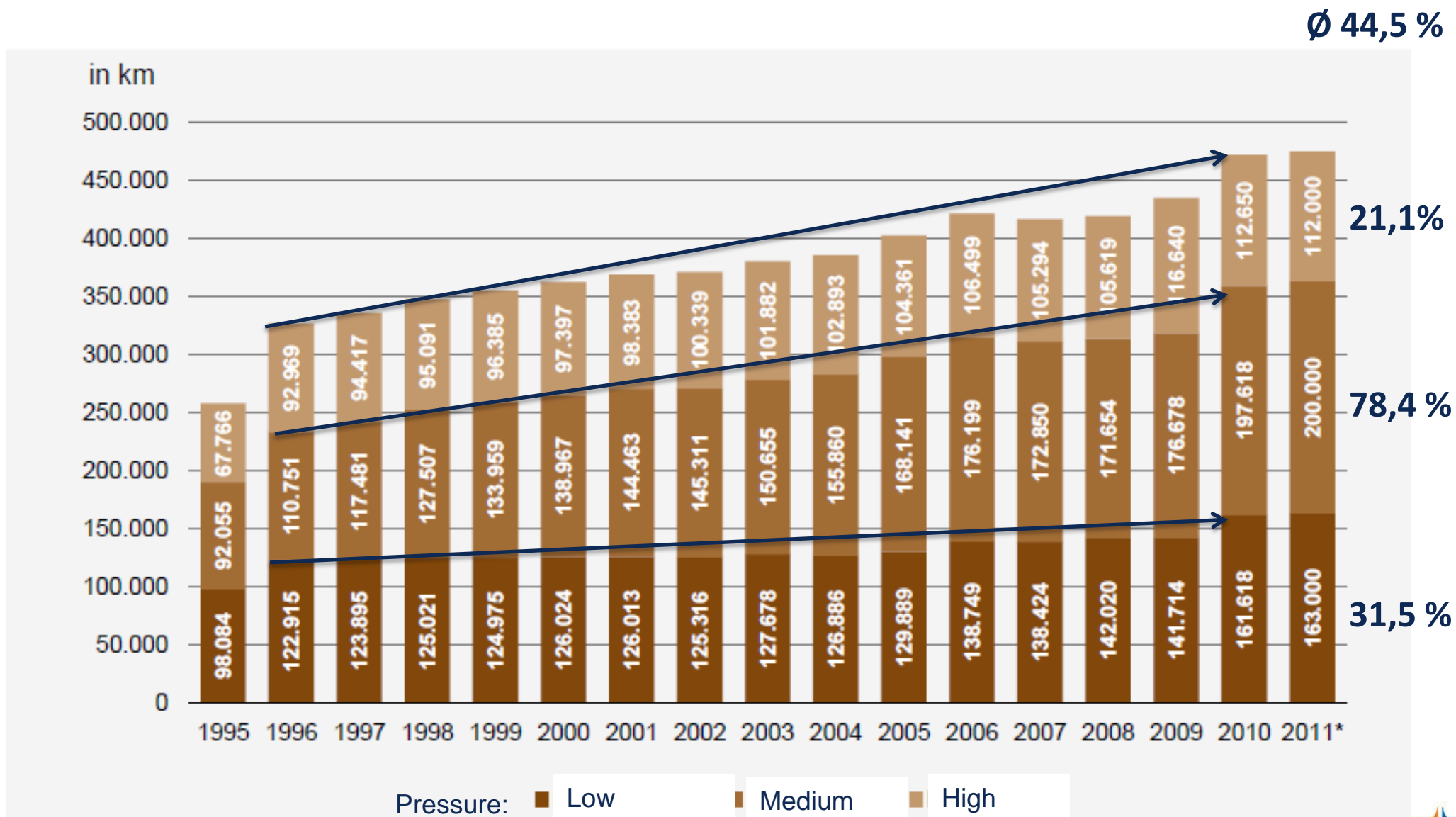


# Grid Development in Germany since 1995



Source: BDEW gas statistics

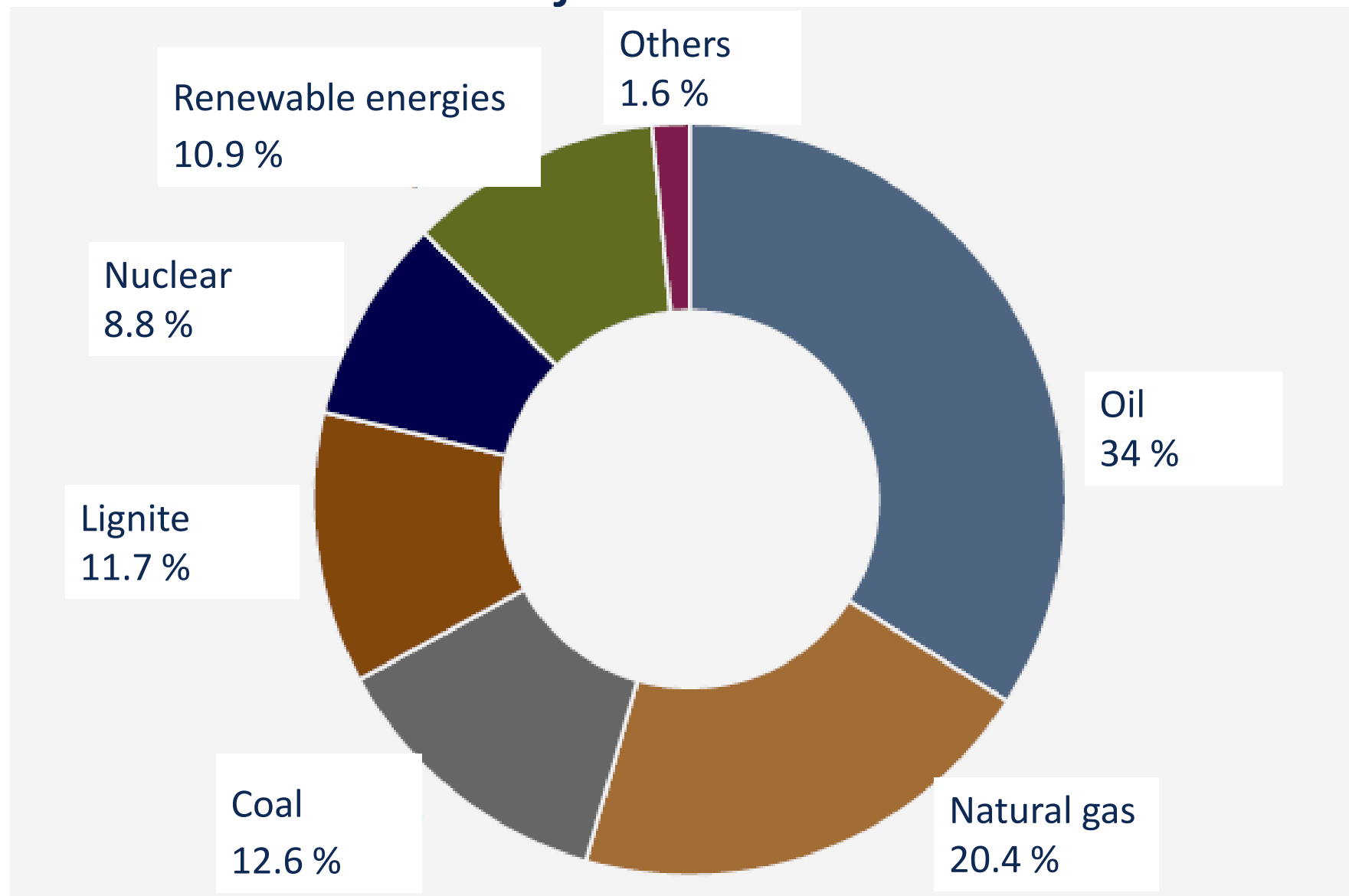
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Source: BDEW gas statistics

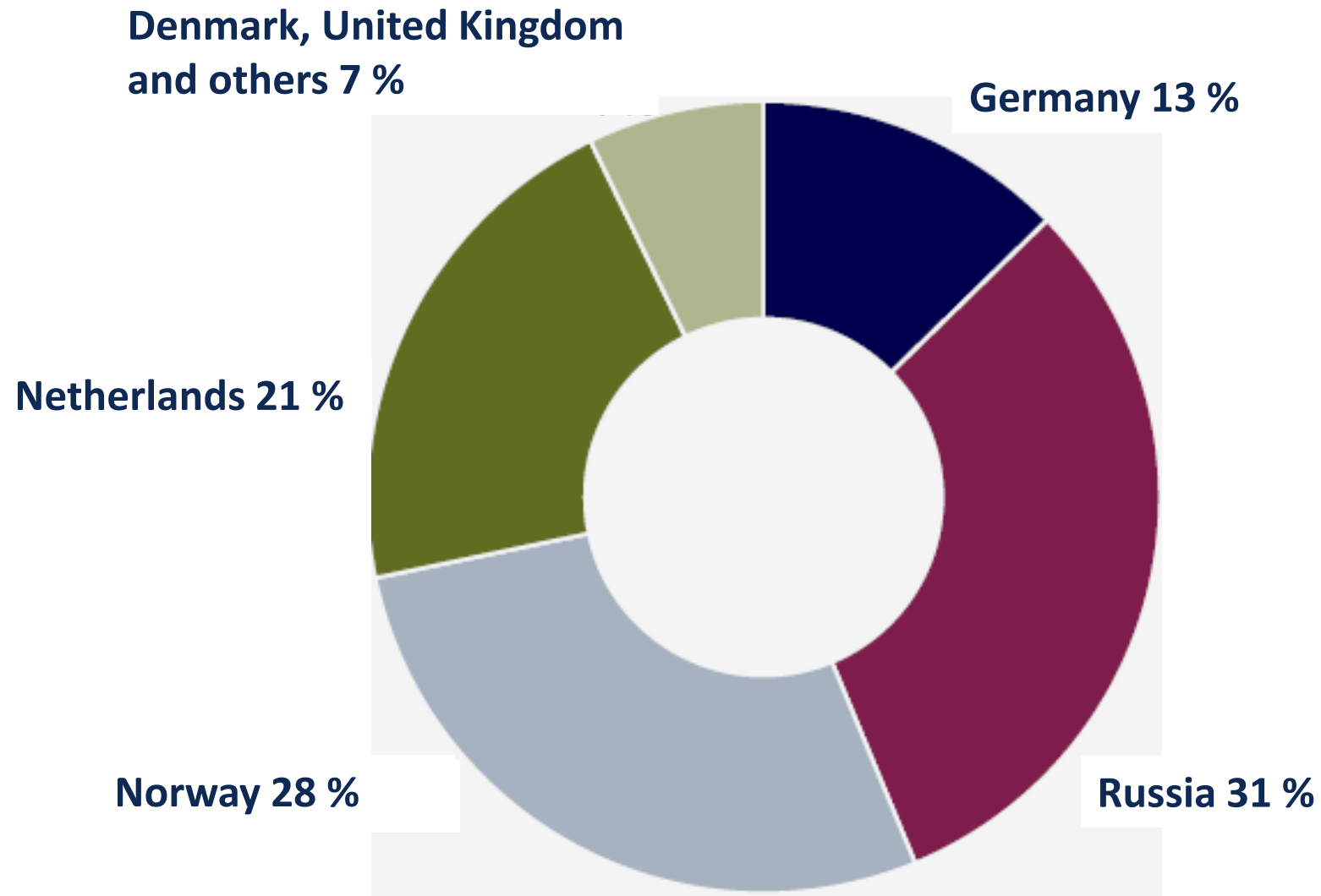
# Primary Energy Consumption in Germany

Total: 13 374 Petajoule



Source: Arbeitsgemeinschaft Energiebilanzen, Feb. 2012

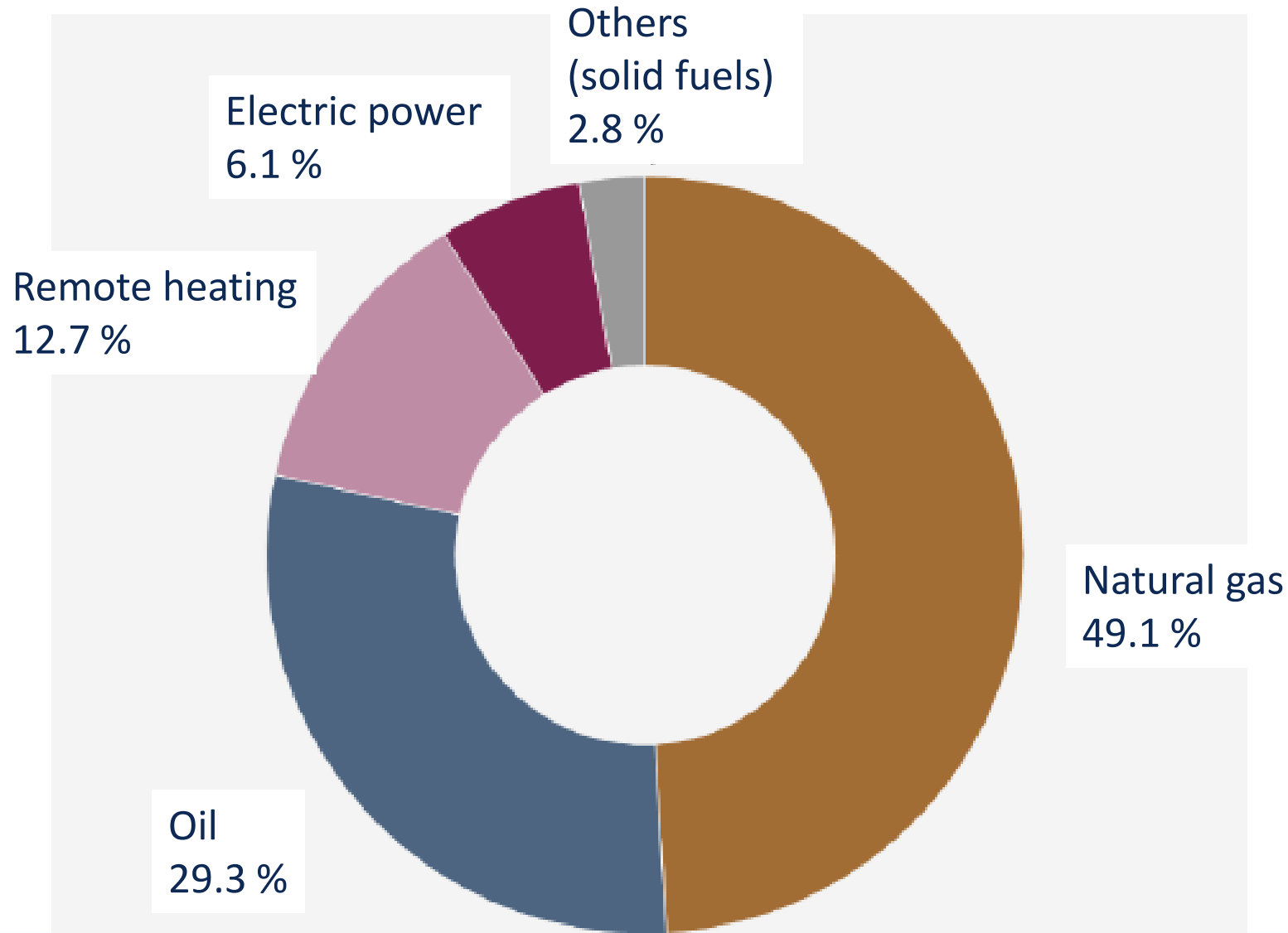
# Natural Gas Supply Sources Germany



Source: BDEW 2011

# Heating Structure in Dwellings (total)

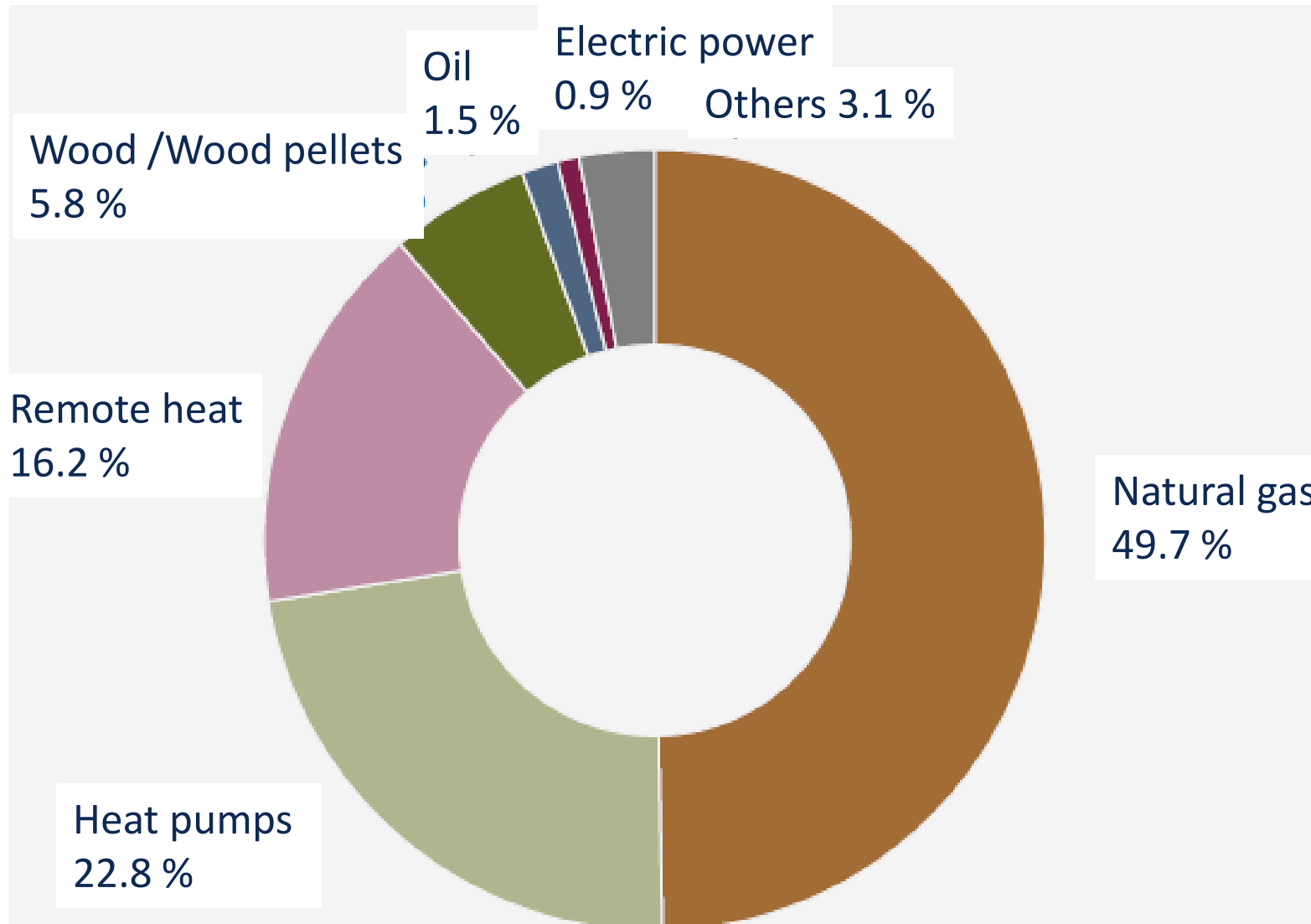
Dwellings in 2011: 28.3 Mio.



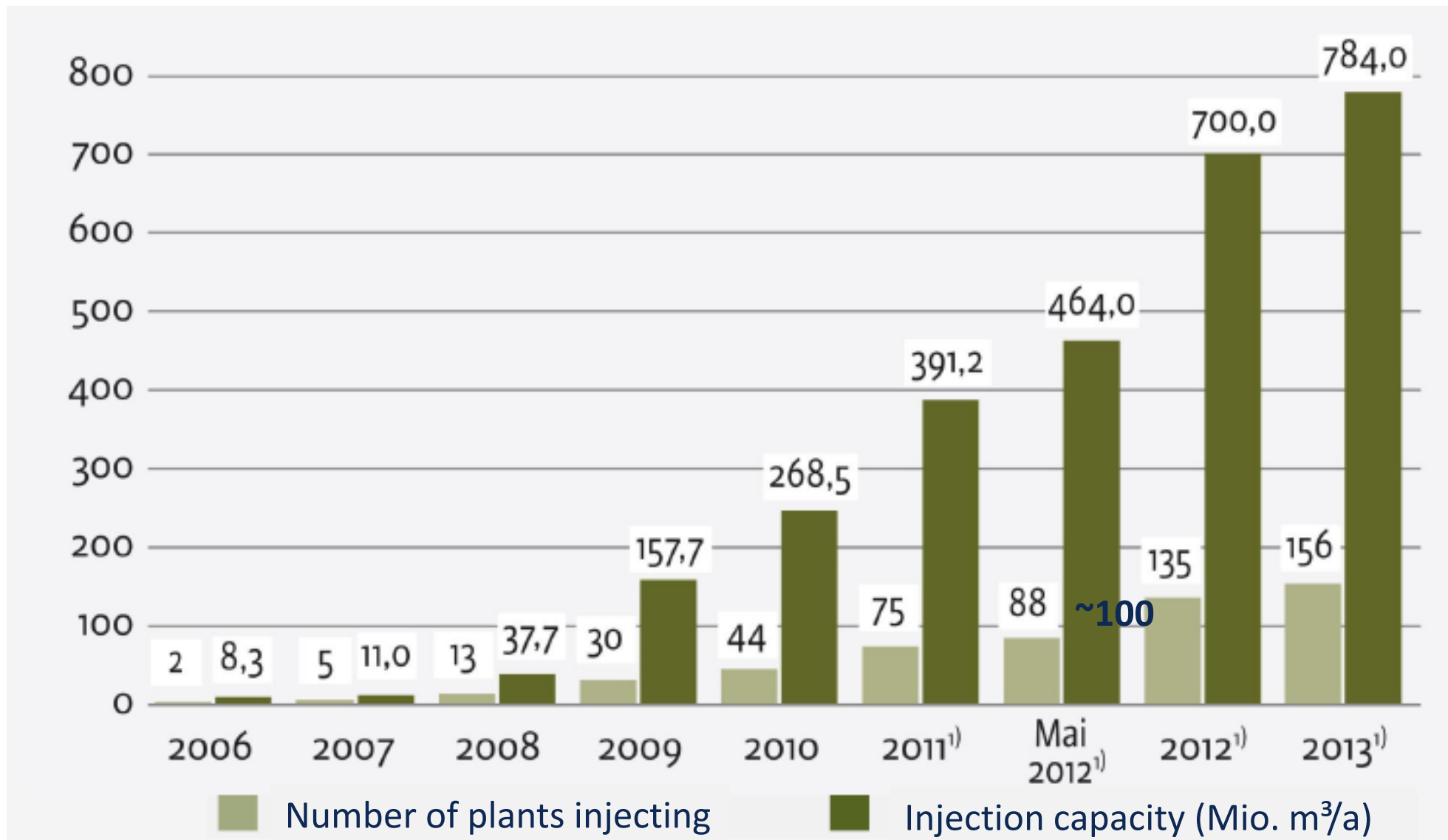


# Heating Structure in new Dwellings in Germany 2011

Construction permits granted: 195 500 (0,7 % new dwelling rate)



# Development of Biomethane Injection Capacities in Germany



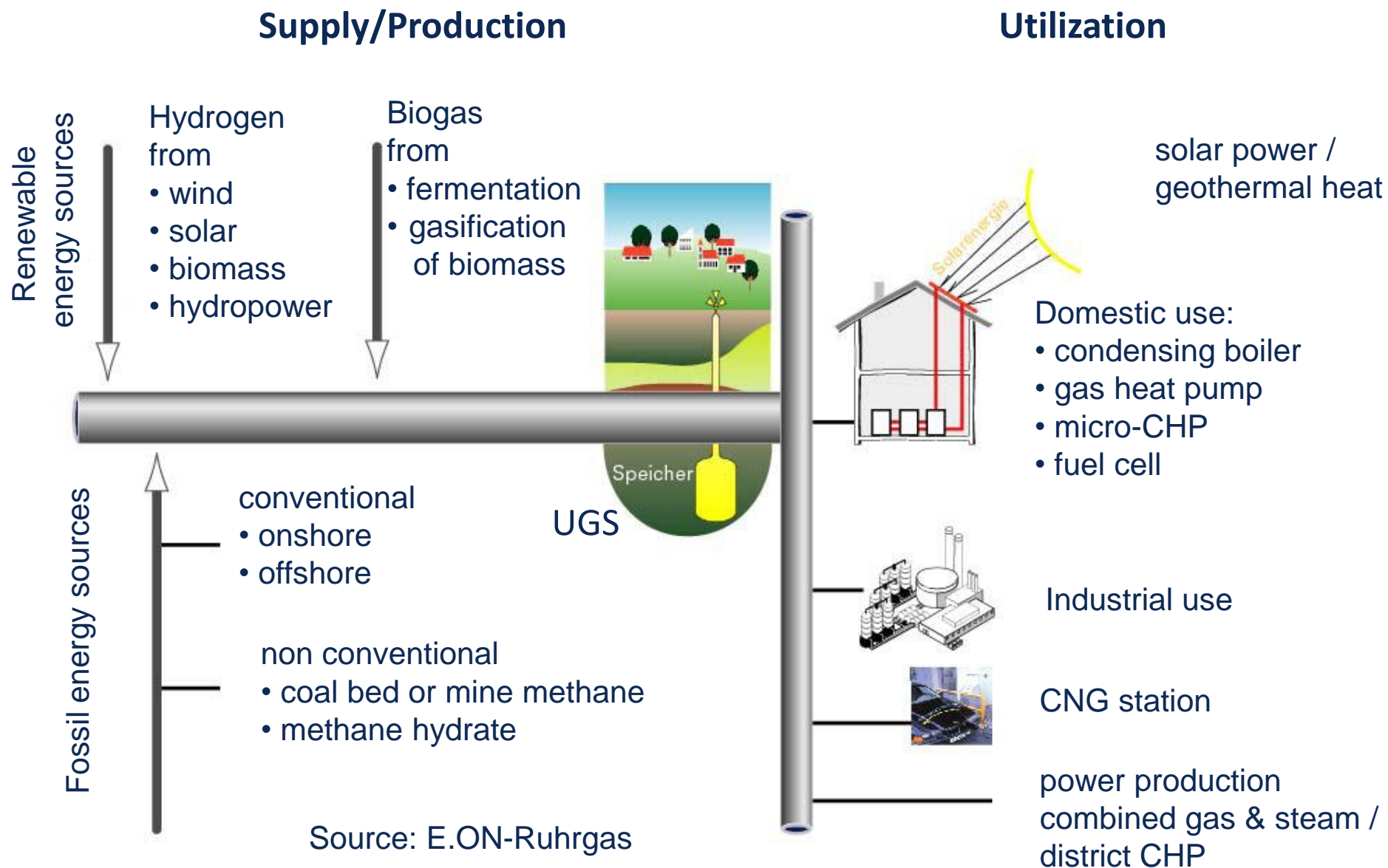
Source: dena/BDEW

## What are smart grids?

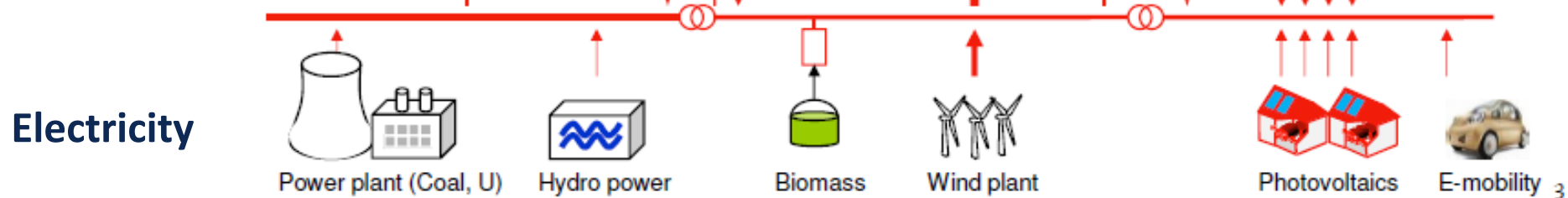
The expression „smart grid“ includes the communicative linking and regulation of power production, storage, consumer and grid operation in energy transport and distribution grids.

This enables an optimization and control of the linked components with the objective to guarantee energy supply on the basis of an efficient and reliable system operation.

# Smart Gas Grid: Example for Input and Output Options

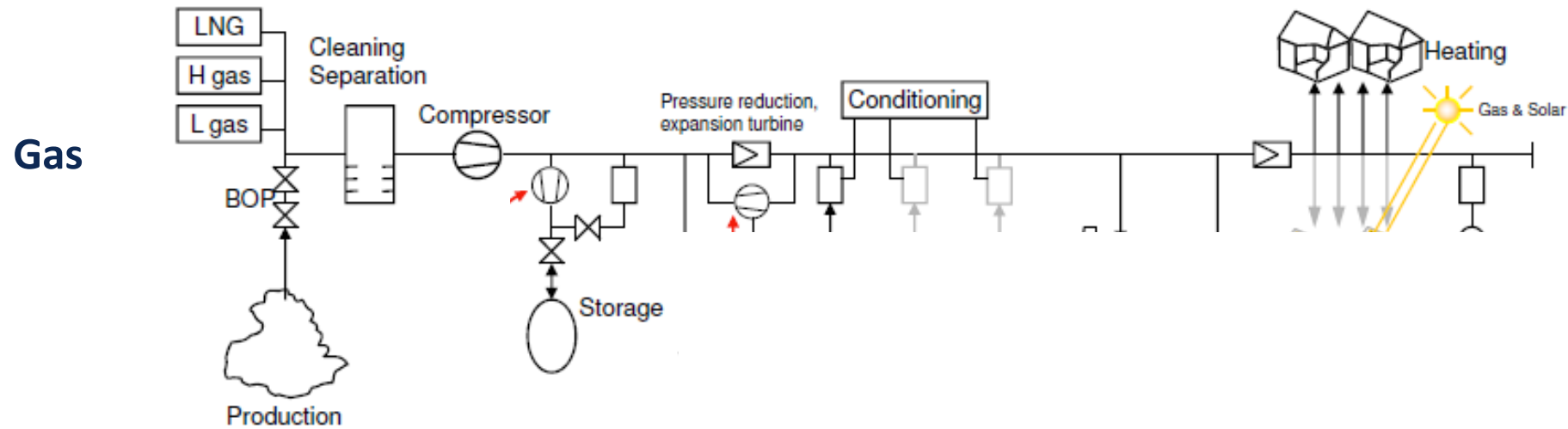


# Convergence of Power and Gas: a Smart System with many Components



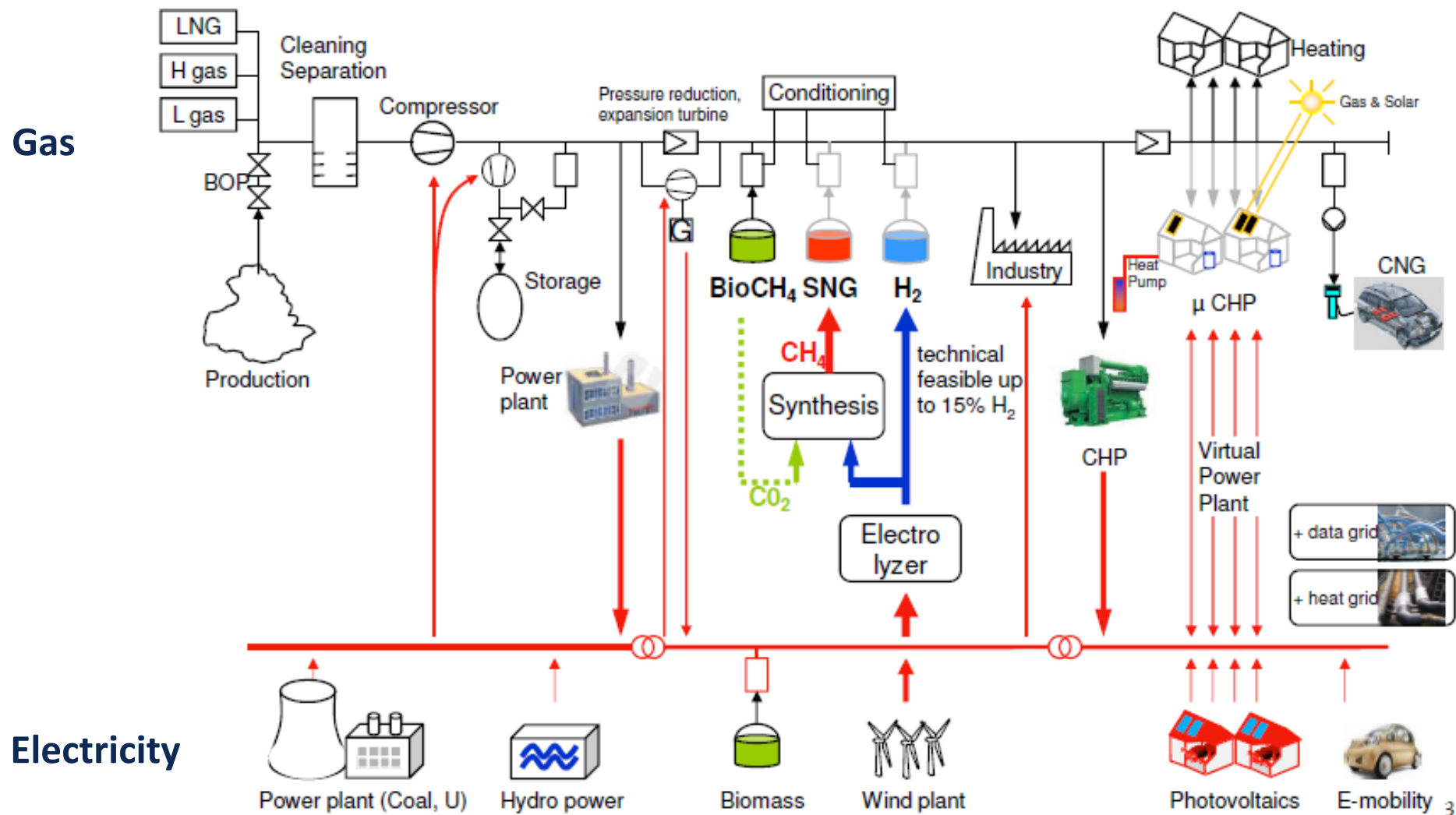
Source: E.ON-Ruhrgas

# Convergence of Power and Gas: a Smart System with many Components



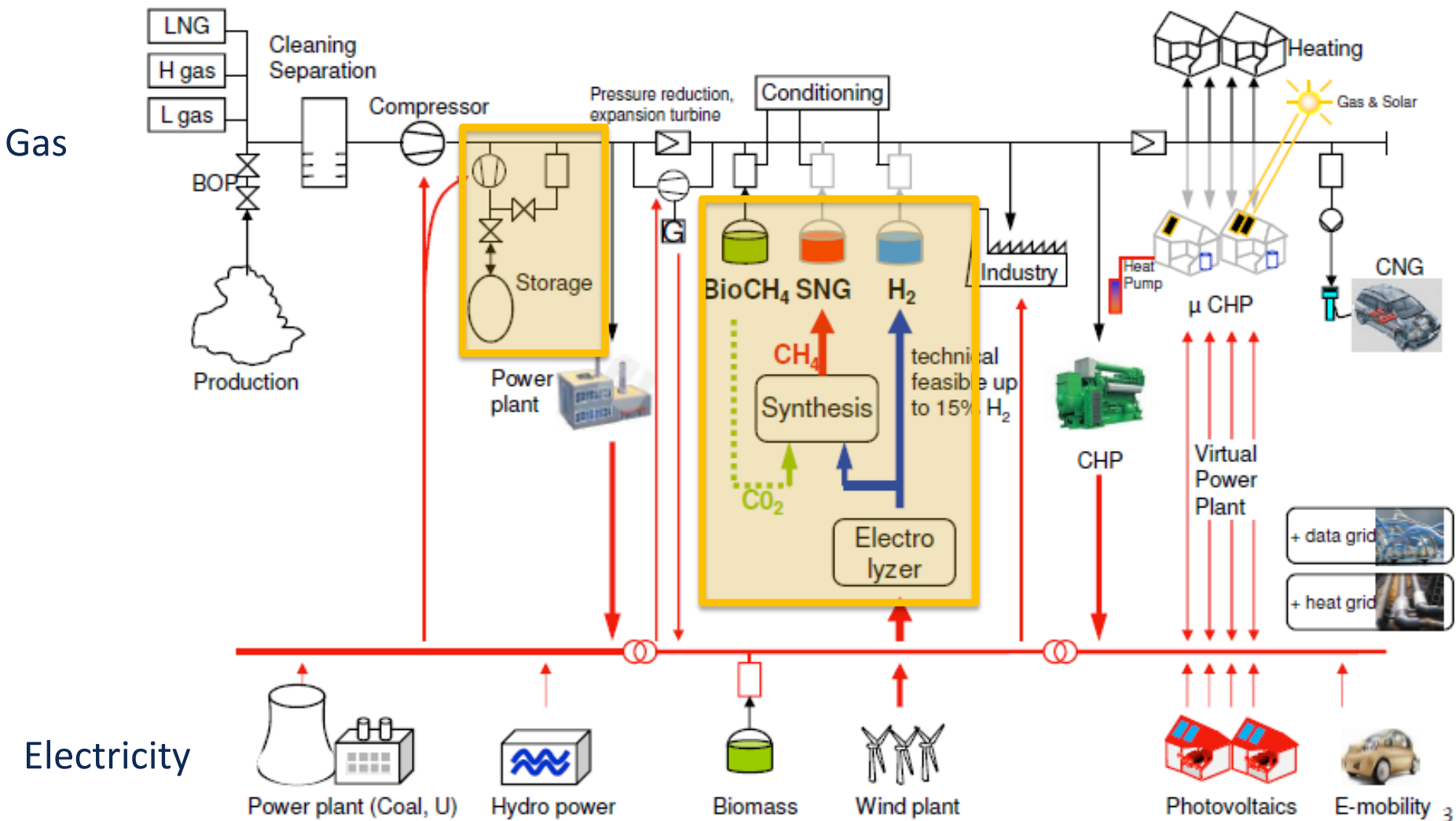
Source: E.ON-Ruhrgas

# Convergence of Power and Gas: a Smart System with many Components



Source: E.ON-Ruhrgas

# Convergence of Power and Gas: a Smart System with many Components



Source: E.ON-Ruhrgas



# DVGW Research Initiative on Smart Grids

- “Smart Gas Grids“ are about the safe, reliable and affordable offer of energy on one hand and about the ecologic and economic feasible integration of renewable energies in the existing gas infrastructure.
- Objective of DVGW’s project “Smart Gas Grid 1“ is the development of a concept for a branch bridging grid operation, including of the transport management system and the gas quality tracking.
- “Smart Gas Grids 2“ targets the grid hardware required to meet the existing and new supply challenges, as e.g. the dynamic injection ability, the energy storage as well as the load shift. Requirements for the “Smart Gas Grid“ are defined. The decentralized integration of gases from regenerative production is one of the highlights of the project, i.e. to store renewable energies, where necessary to reproduce electric power from that storage as well to establish flexible loads for load shifting to cover the energy consumption.

# Smart Grid Project (1)

Central elements of the project are:

- The integration of decentralized energy production and the storage of energy, in particular of electric power in caloric gas. The development of functions to track calorific values, e.g. when injecting hydrogen or when integrating less treated biogases in order to adhere to the existing technical rules for gas quality (DVGW-code of practice G 260 and G 685).
- The adaptation of the existing grids concerning their topology and the degree of automatization of their components.
- The elaboration of requirements for a control of the smart components to match the demand, as e.g. CHP, Power-to-Gas and Micro-CHP installations.

# Smart Grid Project (2)

- The development of information and communication technologies for the branch bridging grid operation as the basis for the convergence of gas and power grids.
- The production of a guidebook for the planning to give grid operators advice e.g. for the planning of measures to integrate smart components.

# Smart Grid Project (3)

This project shall also help to create a basis for the discussion about the advantages and the effects of a smart grid in the legislative and regulatory environment.

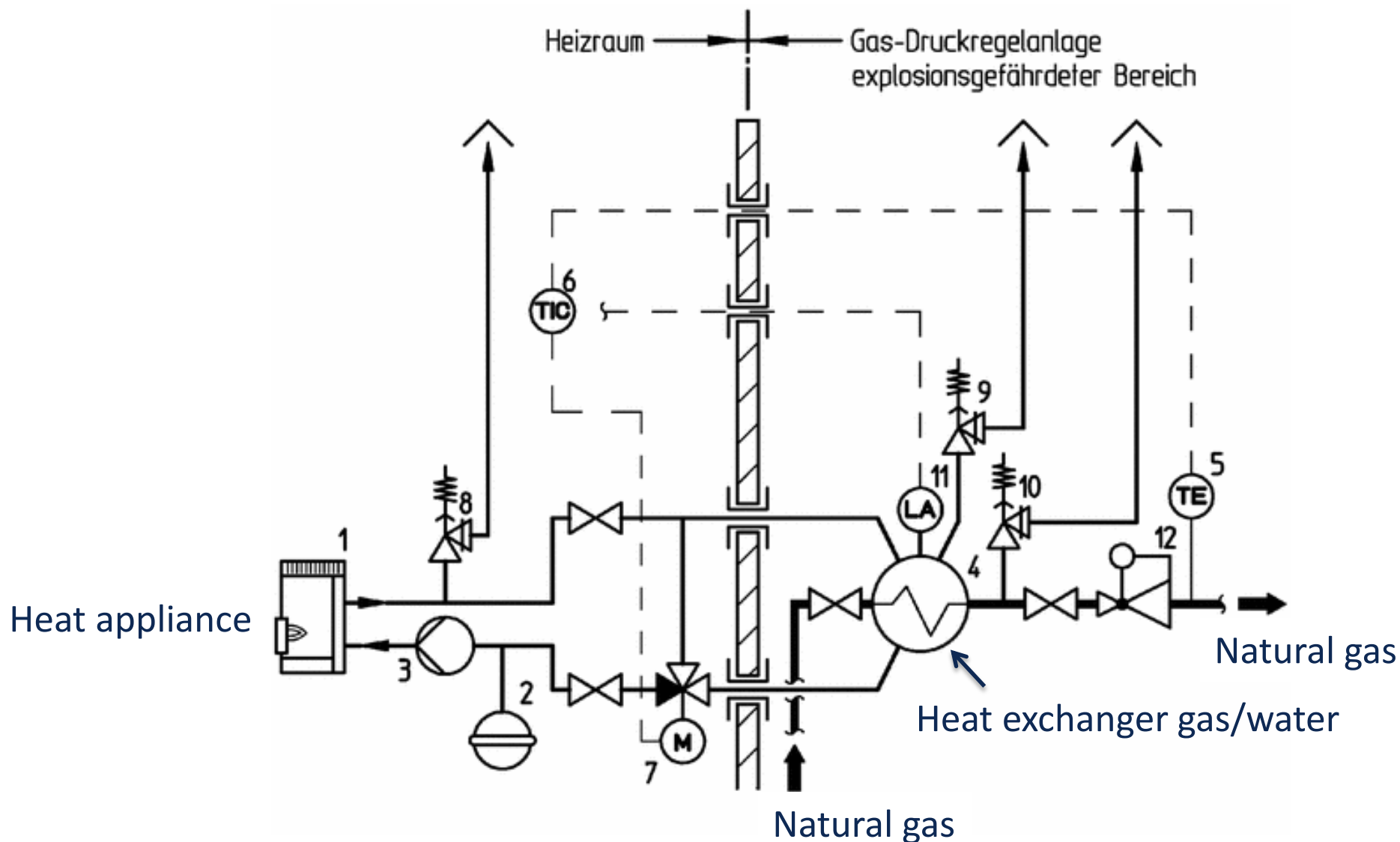
Based on this concept the frame conditions for the “Smart Gas Grid“ and its components were defined:

- Branch bridging grid control (levelling of load input and output in the gas and power grid);
- Injection-, transport- and storage capacity (intake, transport and eventually storage of bio gases as well as hydrogen for power storage);
- Transport management (securing the transport even in regard of the temporary unbalance from e.g. continuous biogas injection at low gas consumption in rural areas);
- Dynamics (flexible reaction in case of production and load alterations to guarantee grid stability);

# Smart Grid Project (4)

- Gas quality tracking (collection of accurate data relevant for billing despite changing gas quality due to injection of alternative gases);
- Information management (extension and operation of the measurement and control techniques as basis for the operation of a smart grid).
- The systematic analysis has resulted in new smart components:  
**E.g.**, for load shift in power grids electric operated pre-heaters may be used in gas pressure regulators. The smart property rises from operation with surplus power from wind and photovoltaic. This way, the refurbishment of gas preheating devices can provide a flexible load up to 750 MWel without delay.  
Also gas compressors may be used this way. Additionally gas pressure regulators could be controlled intelligently and be equipped for bidirectional gas transport. For this, concepts have been developed in close cooperation with the industry.

# Example of a Pressure Regulation System with Pre-heater



Source: DVGW code of practice G 499

**Thank you for your attention.**

**For questions please contact:**

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