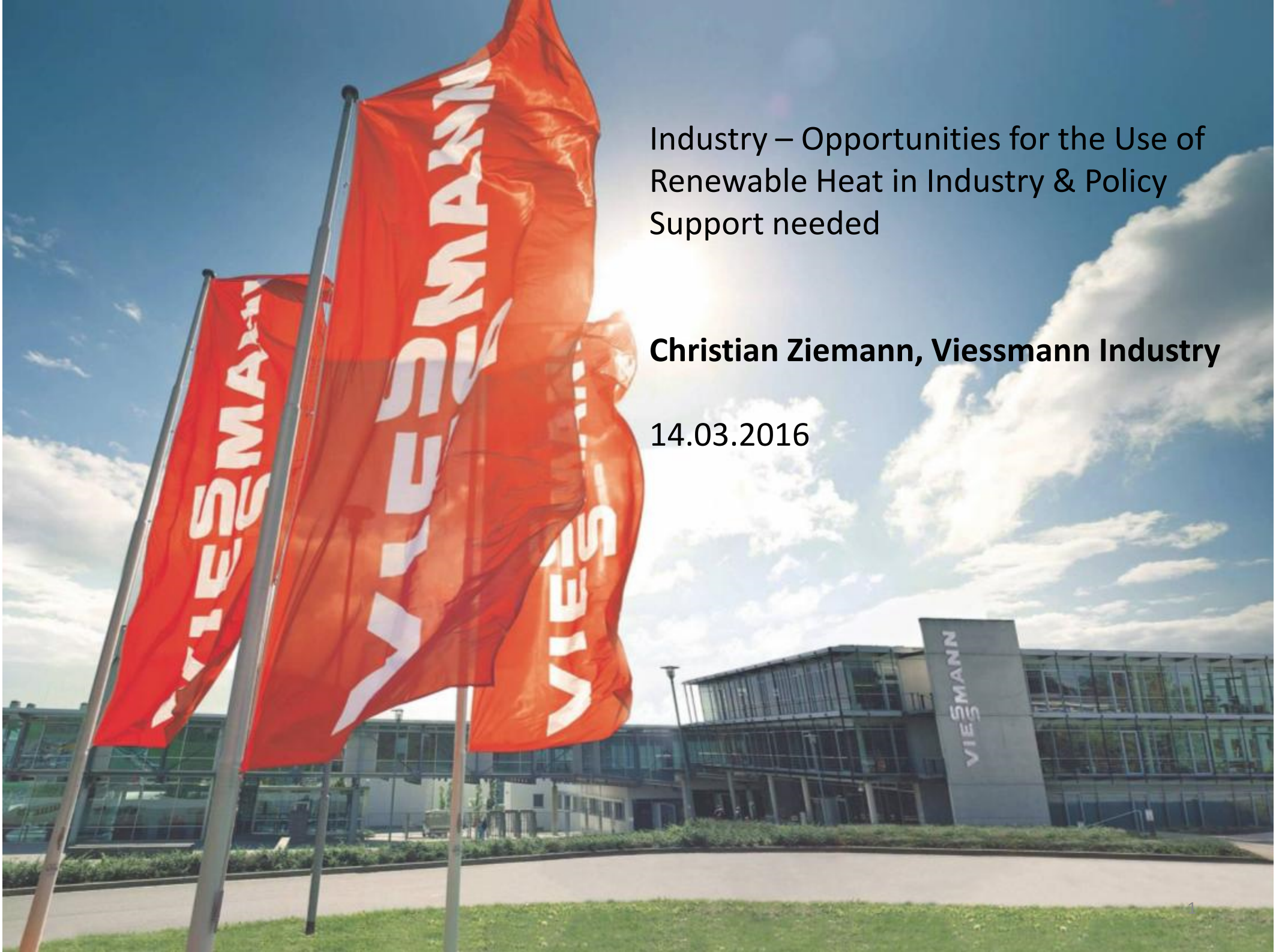


Industry – Opportunities for the Use of Renewable Heat in Industry & Policy Support needed

Christian Ziemann, Viessmann Industry

14.03.2016

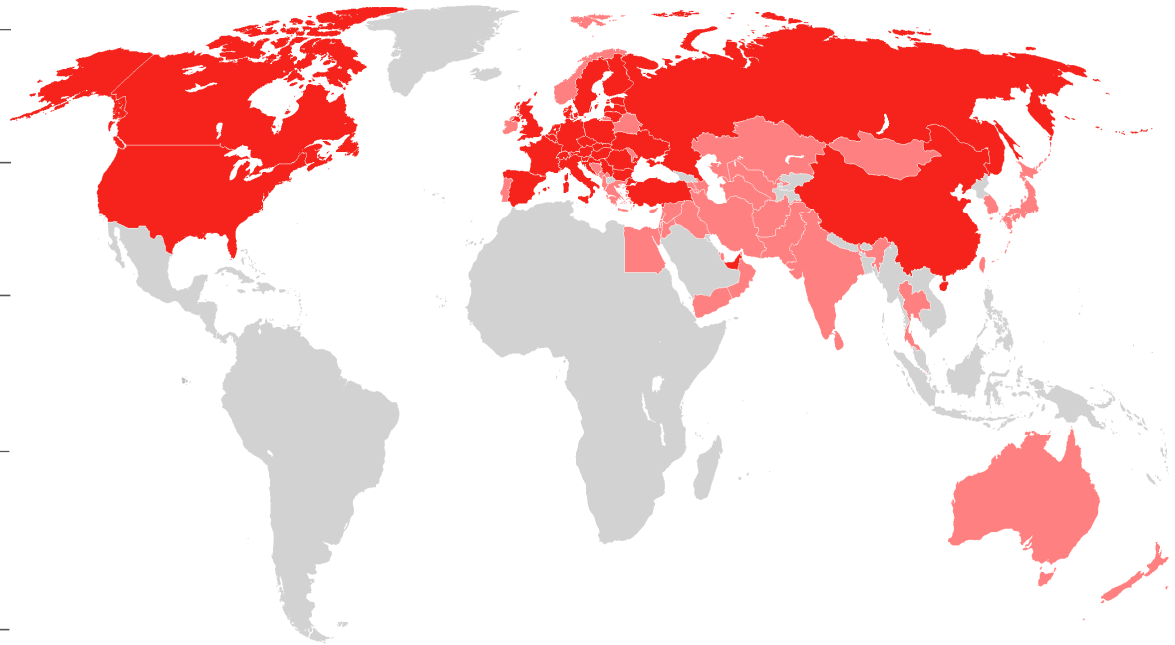
Management organization

Board of Directors of the Viessmann Group

Dr. Frank Schmidt	Joachim Janssen	Prof. Dr. Martin Viessmann	Dr. Klaus-Peter Kegel	Stefan Heer	Klaus Gantner
COO Cooling technology	CFO	CEO & President	CTO	CMO	CAdmO

Viessmann Group

1917	Company foundation
12.000	Employees
2,2	Billion EUR turnover
27	Production companies in 11 countries
74	Countries with sales activities and distribution partners
120	Branches worldwide
56	Percent of turnover derived from export activities



Heating technology

for domestic buildings and district heating from 2-2000 kW

- Boiler (Oil/Gas)
- CHP-units, Fuel Cell heating
- Hybrid devices
- Heat pumps
- Biomass-boilers (Pellets, Woodchips, Logwood)
- Solar and PV Systems
- Accessories

Comprehensive product range

For all areas of application and energy sources

VIESMANN
climate of innovation

Detached or two-family houses

Large residential buildings

Commerce and industries

Local heating networks

Oil

Gas

Solar

Biomass

Natural heat

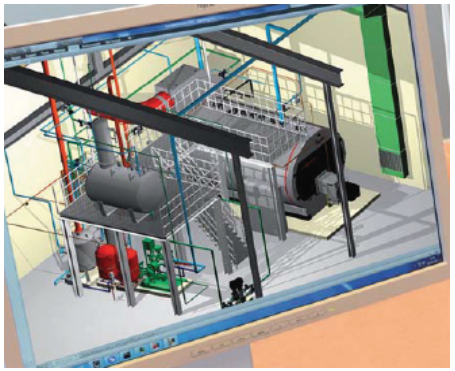
Heating technology

Industrial solutions

Cooling technology

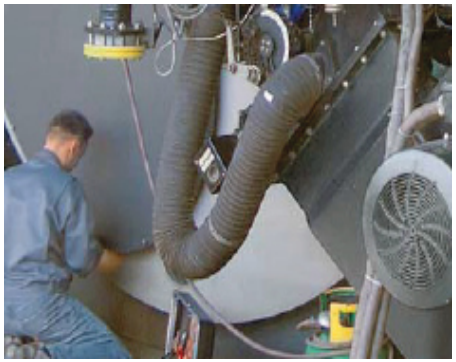
Comprehensive product range from 1 kW to 120 MW

The Viessmann range of services



Consulting/design concept
- Advice on technology and fuel type
- Best solution recommended from an ecological and economical standpoint
- Information about national and international legislation and regulations
- Plant analysis
- Viability studies

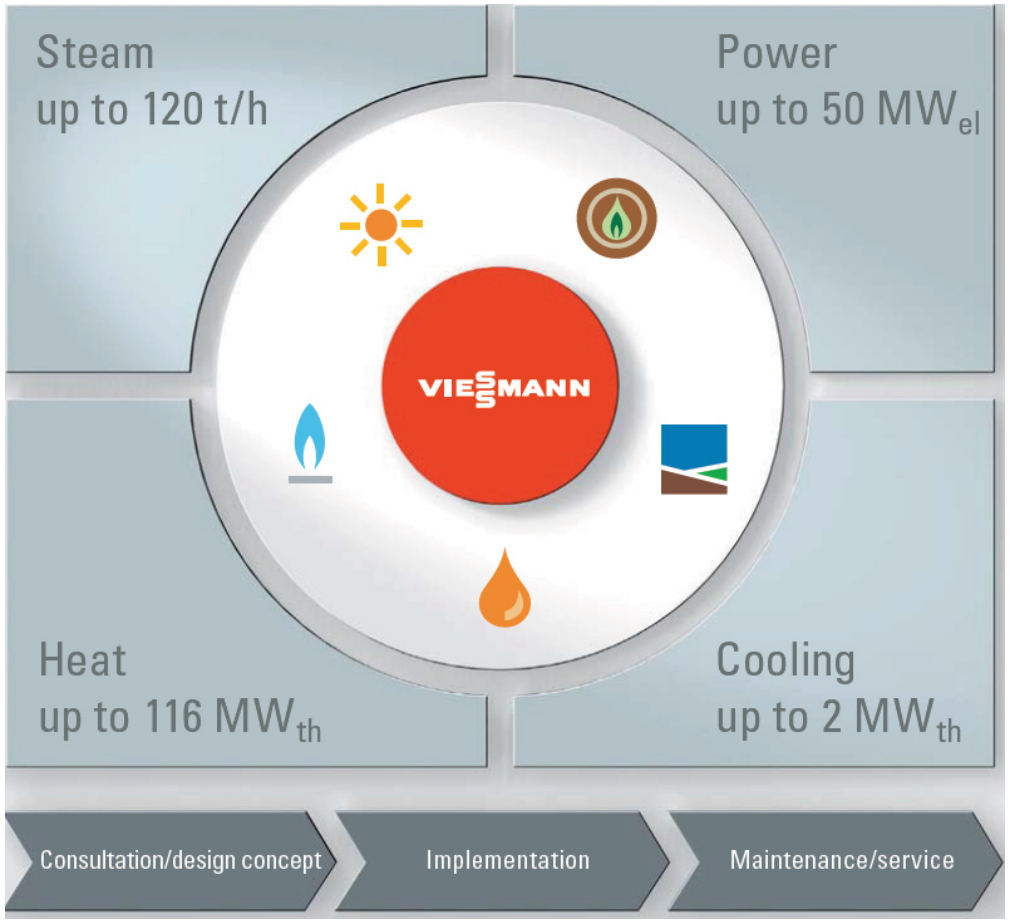
Implementation
- Design, basic and detailed engineering, site planning
- Manufactured with a high level of pre-assembly to minimise time on site
- Delivery and installation
- Trouble-free commissioning
- Comprehensive output tests
- As-built documentation



Maintenance/service/training
- 24/7 customer service
- Training at the Viessmann Academy
- Remote monitoring and diagnosis
- Conversion and modernisation
- Service, maintenance and repairs
- Performance of inspections and examinations
- Delivery and installation of spare parts
- Boiler hire

Energy generating systems in industry and commerce

Comprehensive range of services developed from a single source



In the four areas of steam, power, heating and cooling, **Viessmann** offers a comprehensive range of products and services for industry and commerce.

- Industrial boiler system for:
  - Steam up to 120 t/h
  - Power up to 50 MW$_{el}$
  - Heat up to 120 MW$_{th}$
  - Fuel: Oil/Gas, residual oils and fat
- Biomass plants for
  - Steam up to 50 t/h
  - Power uo to 15 MW$_{el}$
  - Heat up to 50 MW$_{th}$
- CHP units for
  - Power up to 530 kW$_{el}$
  - Heat up to 660 kW$_{th}$
- Heat pump systems for
  - Heating/ cooling up to 2 MW$_{th}$

Conditions

for successfull plant engineering with RE

Price for heating on market level

Minimized capital costs

Guaranteed energy demand

Optimized management of permissions

Optimized for the location

Optimized operating costs

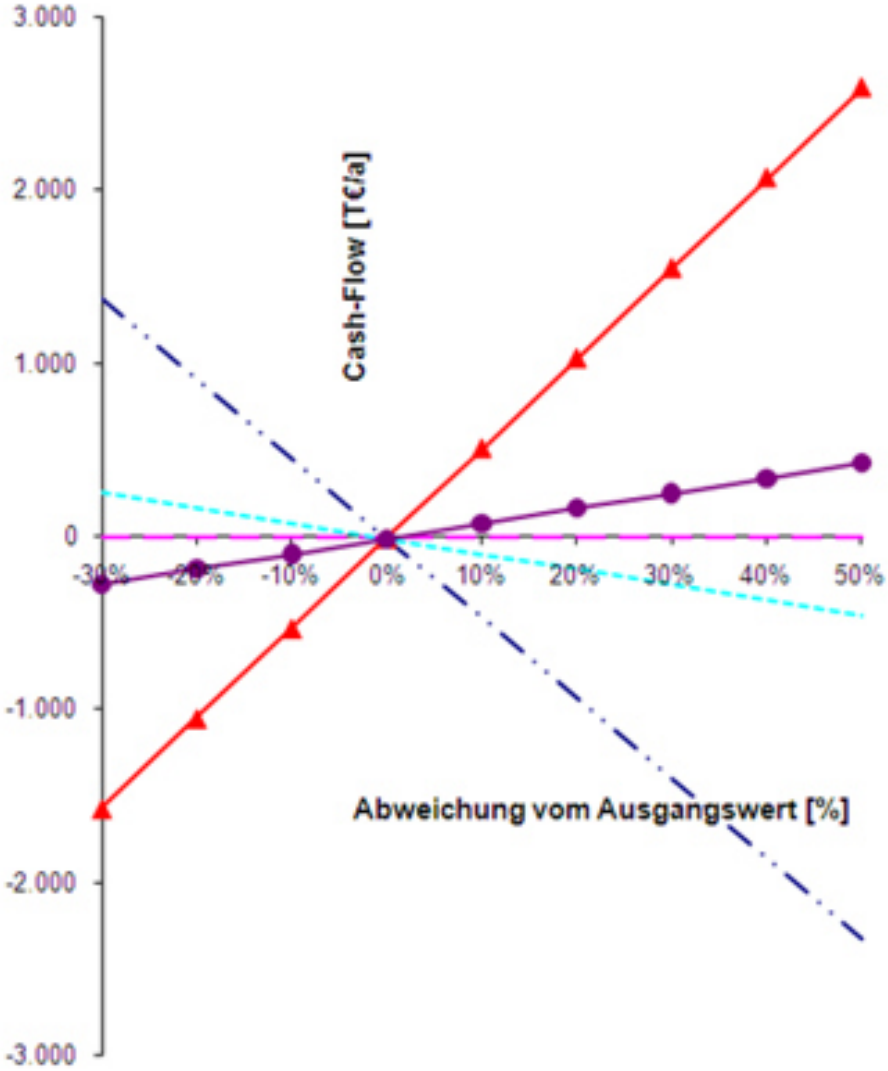
Reliable technology

Regional value chains

Optimized fuel and waste management

Use of Renewable Heat/Cold (RH)

Key factors of economic success



Heating price

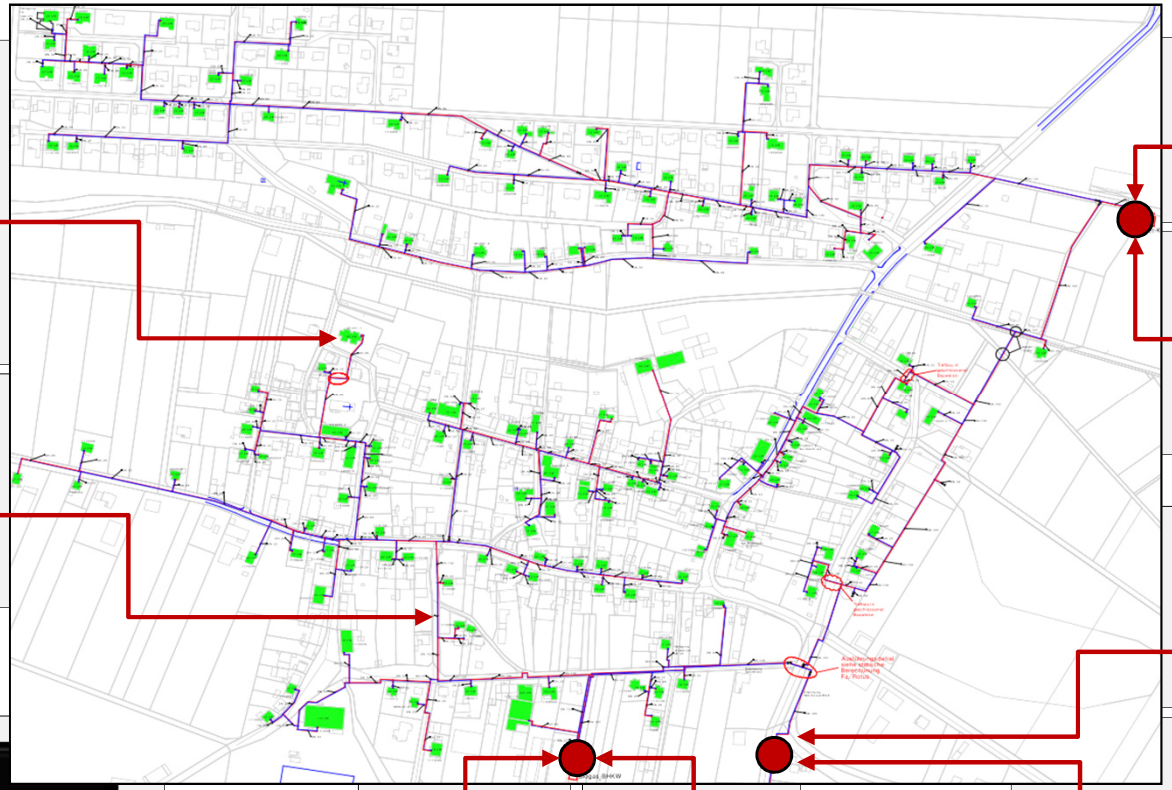
Productivity (annual full load hours)

Capital costs

Fuel costs

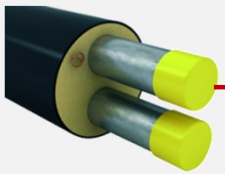
Design for local and regional demands

Mix of technologies needed to match the needs of different customers (domestic buildings and industrial customers)



Handing over station

Local heat network



Control technology

Solar system

CHP Unit

Heating plant

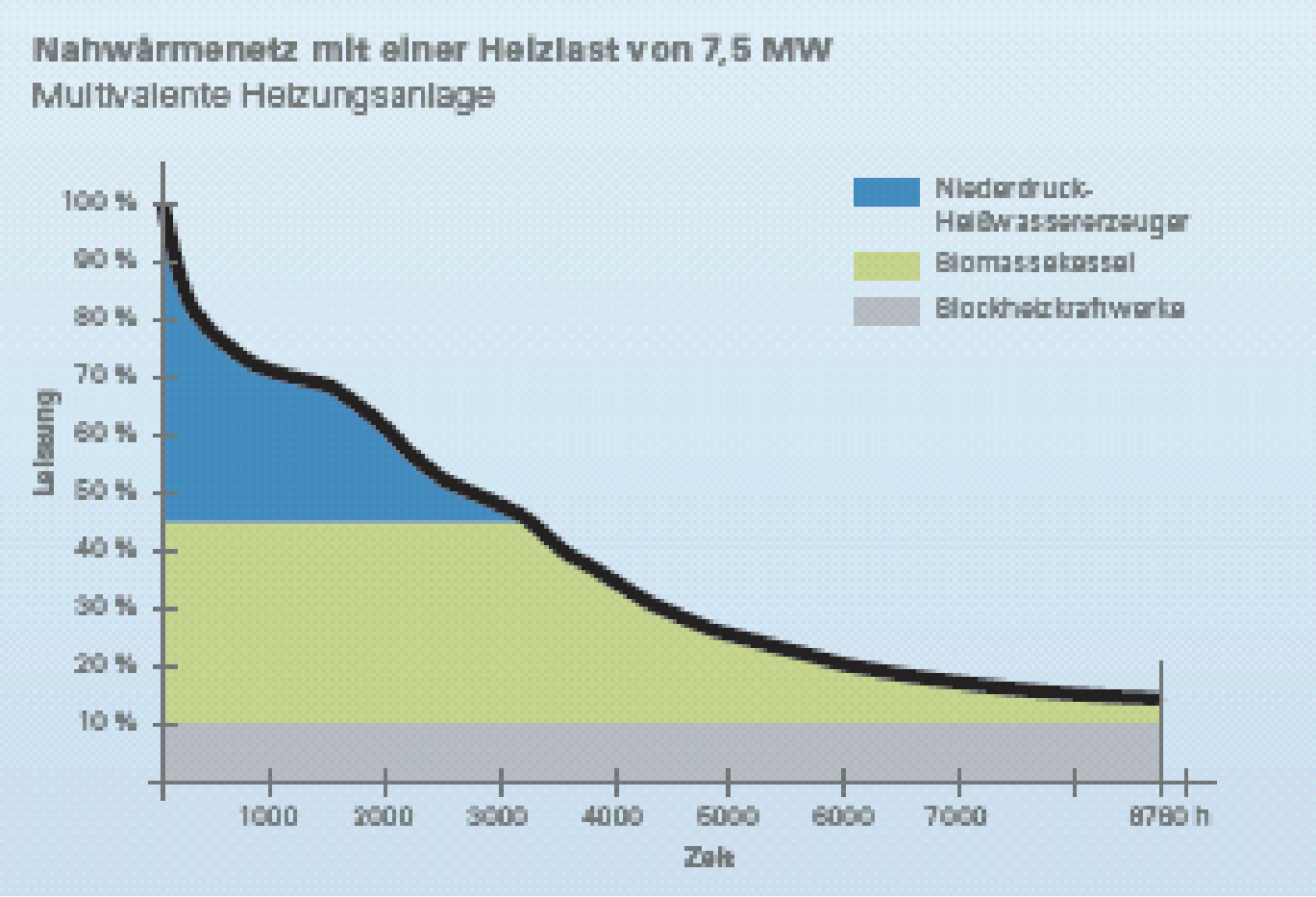
Biomass boiler

Biogas boiler

Biogas plant

Design for local and regional demands

Optimized plant design



Steam | Power – B. Braun, Germany

Biomass cogeneration plant for power and process steam supply

Specification

▪ Output	24 t/h
	3.5 Mw_{el}
process steam	14.7 t/h
▪ Working overpressure	65 bar
▪ Hot steam temperature	485 °C
▪ Fuel	Biomass
▪ Year of commissioning	2015
▪ Branch	Pharmaceutical sector

Scope of delivery

- Water tube boiler
- Emission measurement
- Air condenser
- Discharge combustion
- Flue gas cleaning
- Pipelines
- Water treatment
- Heating and boiler
- Fuel storage and transport
- Steam turbine
- Compressed air generation
- Electro and control technology
- Process control technology

Services

- Engineering
- Purchasing
- Manufacturing
- Project management
- Installation
- Commissioning

Power – heating plant in Memmingen, Germany

Local heating of a central heating with biomass firing

Specification

▪ Output	
– Biomass boiler	3300 kW_{th}
– CHP unit	140 kW_{el} / 207 kW_{th}
▪ Temperature	90 °C / 70 °C
▪ Fuel	Biomass, Natural gas
▪ Year of commissioning	2010
▪ Branch	Communal energy supply

Scope of delivery

- Biomass boiler
- Combined heat and power unit
- Economizer
- Buffer storage

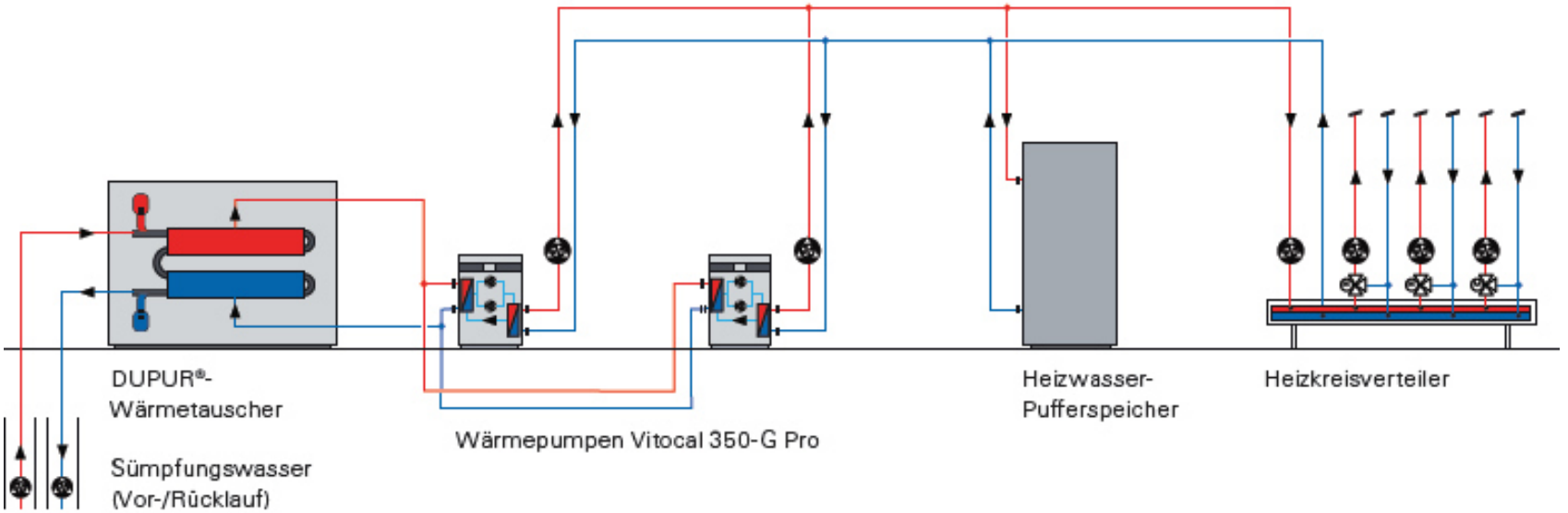
Project Erftverband

Use of residual heat from waste waters in heat pumps

- Investment costs: 650.000 EUR
- Cost savings: 58.000 EUR/a
- Heat output: 620 kW th

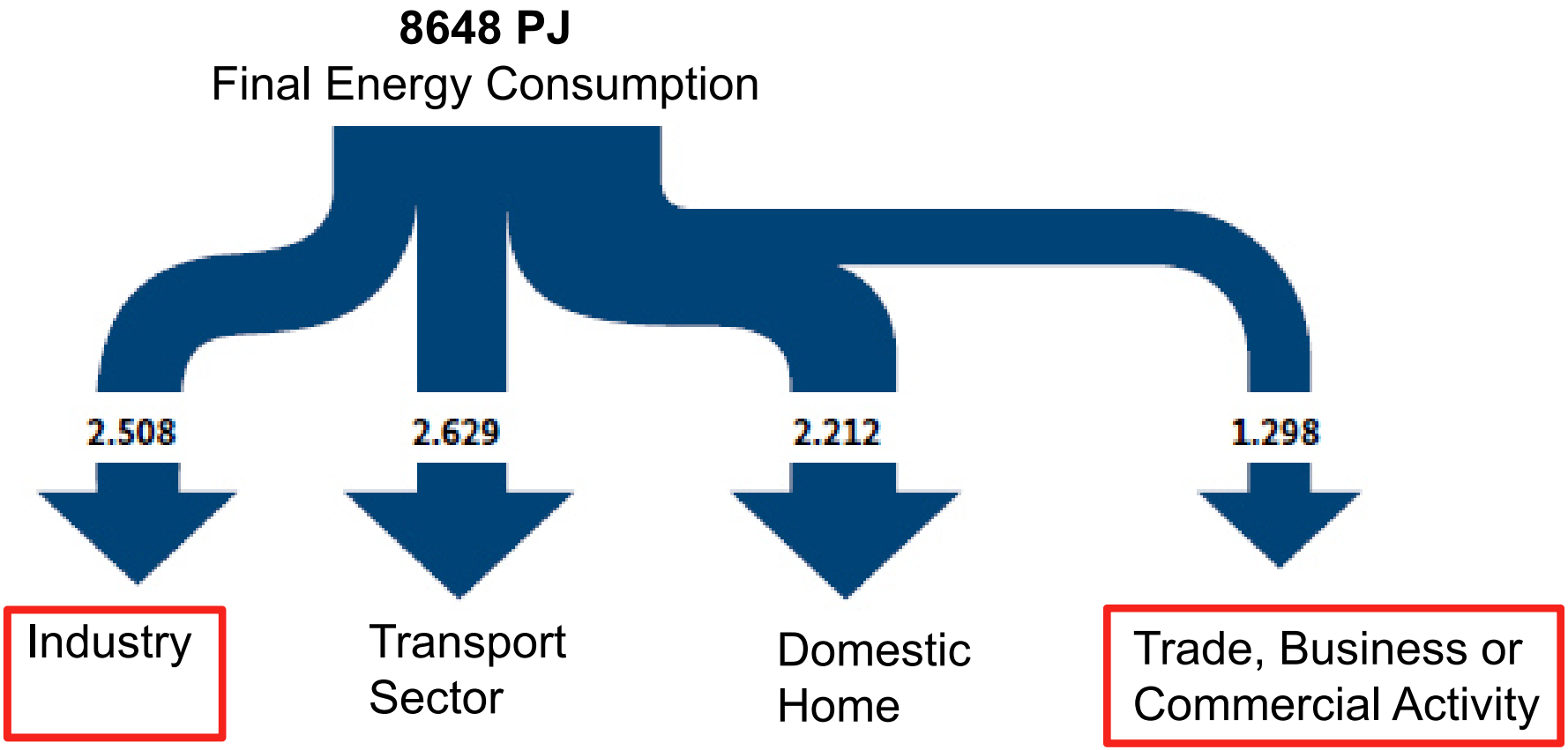
Project Erftverband

Use of residual heat from waste waters in heat pumps



Final Energy Consumption Germany*

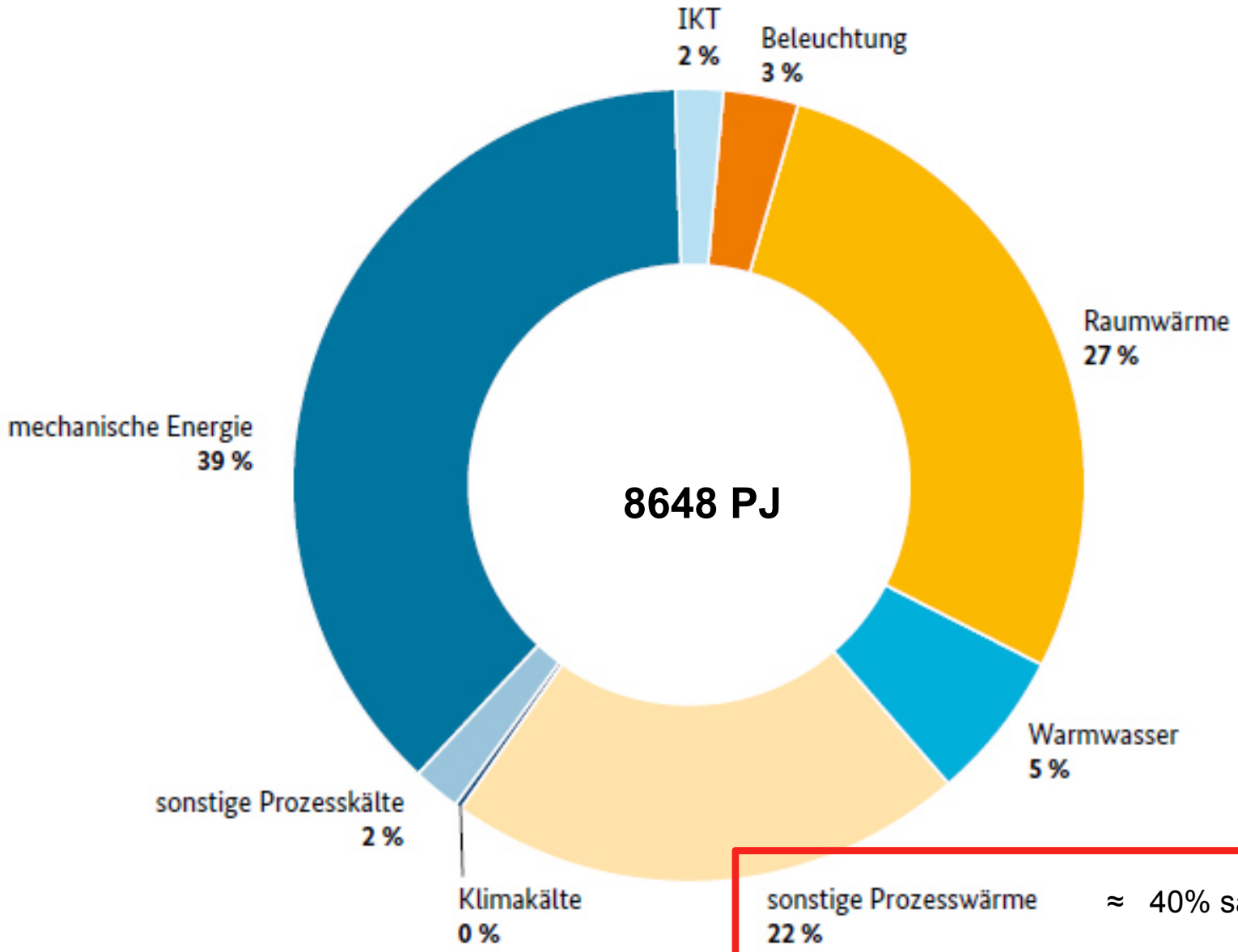
Industry, Trade, Business, Commercial Activity > 40%



(*BMWI 01/2016)

Final Energy Consumption Germany*

Percentage of process heat > 22%



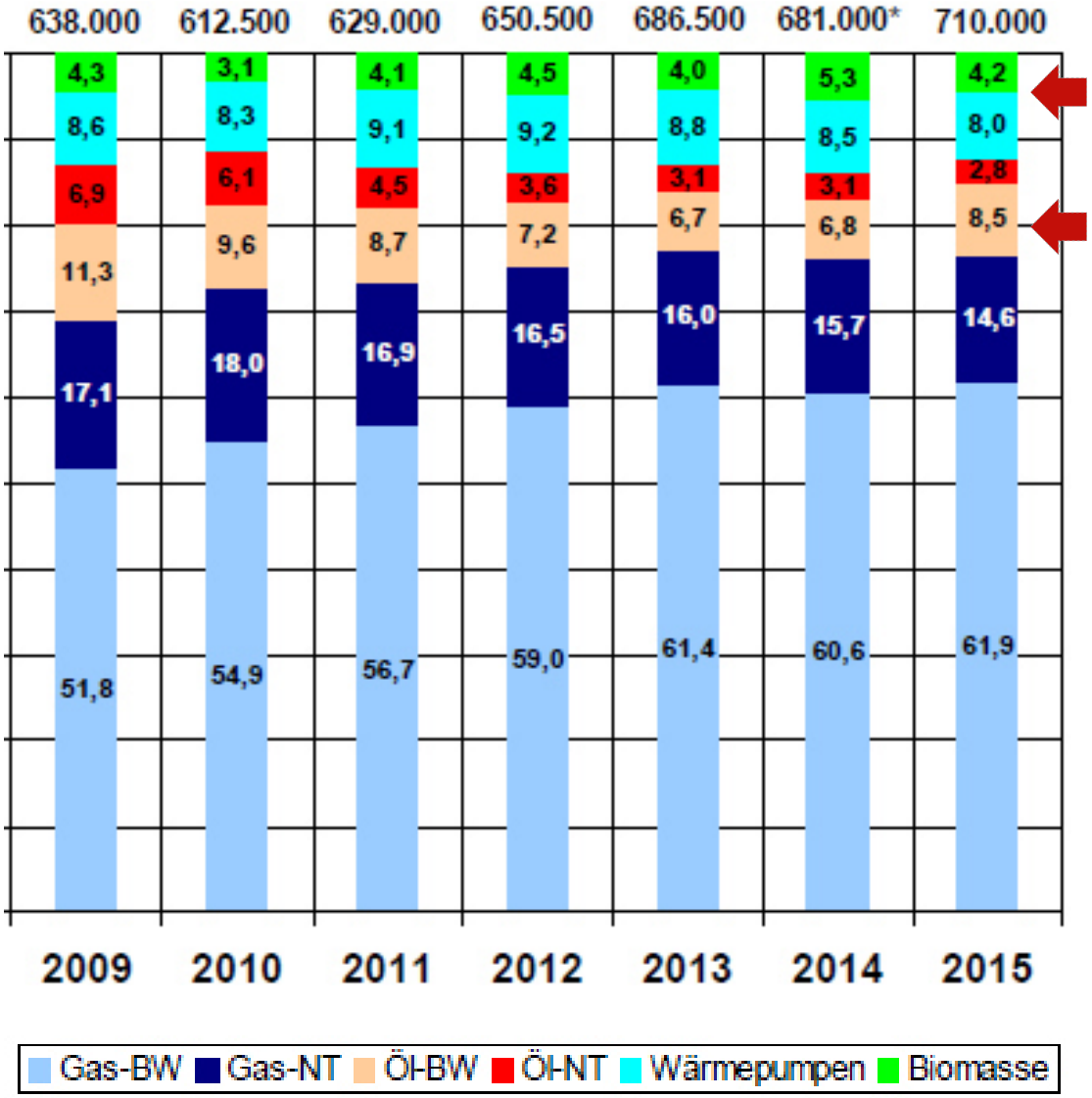
≈ 40% savings potential

(*BMWI 01/2016)

Sales figures domestic boilers 2009 - 2015*

RE sales drop and rise of oil/gas boilers due to oil price level in 2014, 2015

Domestic market:



(*BDH 2015)

Industrial market:

- sales drop of RE
- no beneficial effects on sales figures of energy solutions with Oil/Gas

Use of Renewable Heat/Cold (RH) in industrial environments

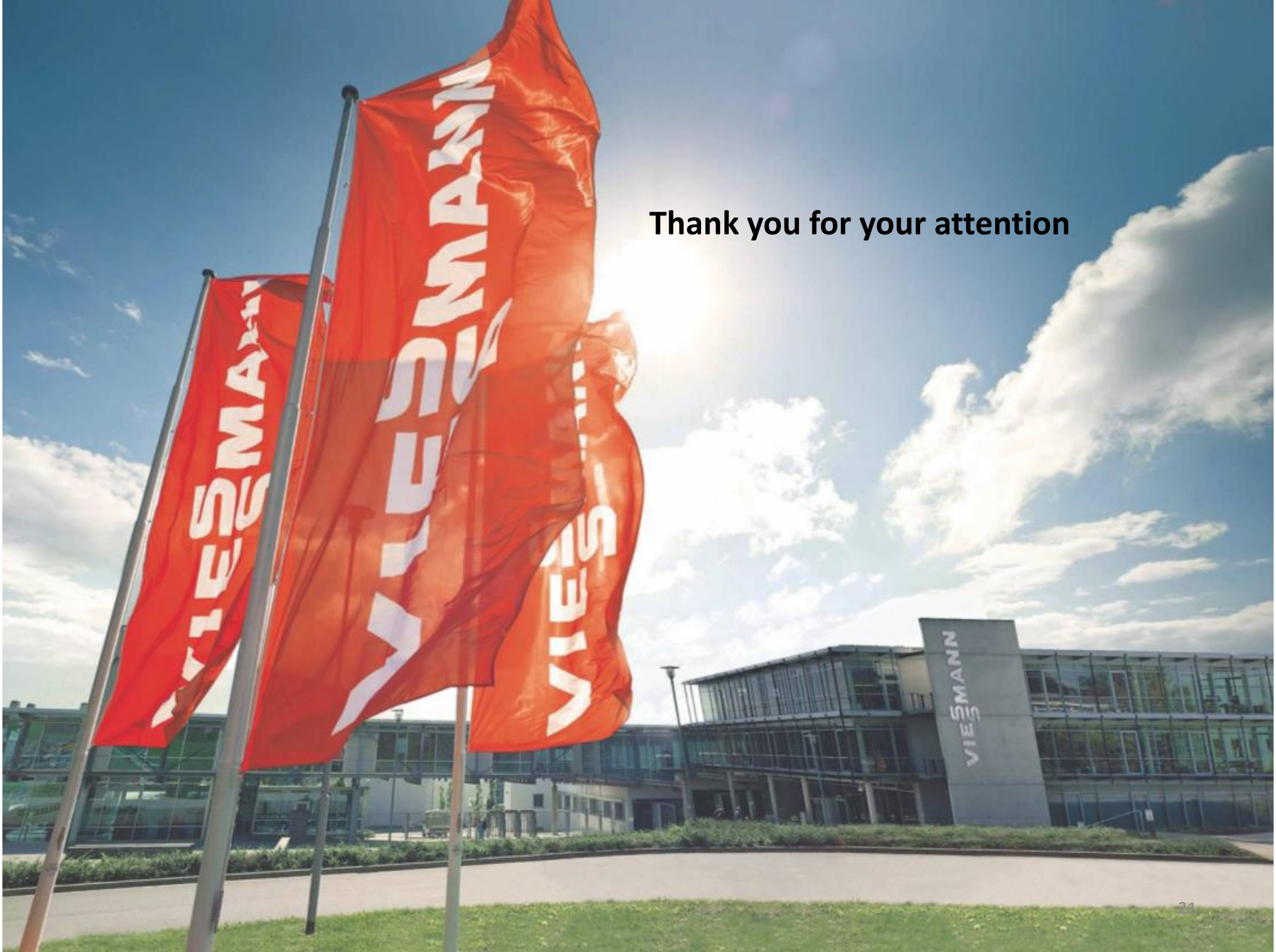
Barriers to the use of Renewable Heat/Cold (RH)

- **Fuel costs (RH) unsteady**
- **Heating prices not always competitive (due to low price for Oil)**
- High capital costs, used to short pay back periods
- Customers are used to and satisfied with conventional solutions
- Knowledge of end-customers about RH
- Image of RH
- Complex planning and engineering
- Technological barriers (high temperature level needed)
- No regulatory incentives
- Changes/Interventions of production processes are not wanted

Use of Renewable Heat/Cold (RH) in industrial environments

Approaches and Policy Support needed

- **Change of cost structure in favour of RH (e.g. internalization of external environmental costs)**
- **Ensuring/ Improvement of cost stability**
- **Incentives for the replacement of heating systems (different for the target groups domestic heating and industrial heating)**
- Image campaign: heat from RH/ RE
- Better training of multipliers (e.g. planners)
- Liberalization of heating networks



Thank you for your attention