

Setzt neue Energien frei

Initiative
Gaswärmepumpe



Potential of the Gas-Heat-Pumps

Dipl.-Ing. Werner Wessing,
Dipl.-Ing. Hans Wackertapp

E.ON Ruhrgas AG



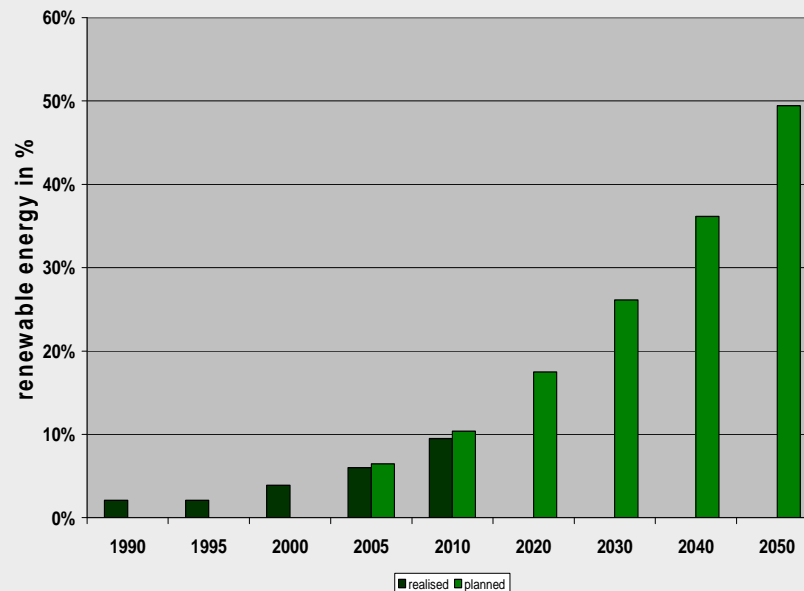
ERDGAS

Framework and political Requirements

The Goals of the German Government for the Heat Market in 2020:

- Reducing the CO₂-emissions by 40%
- Reducing the heat demand by 20%
- Share of renewable energy of 18%

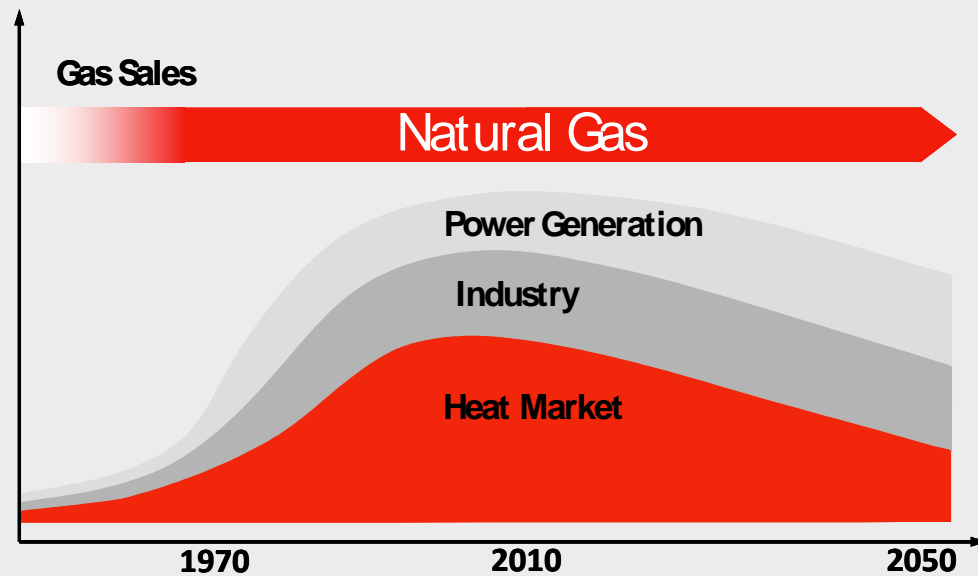
The realization will have a strong influence on the future development of the gas market.



Framework and political Requirements

E.ON Ruhrgas supports the governmental goals and develops the gas market by supporting the development

- of Biogas injection
- Solar thermal energy plus condensing boilers
- Gas Heat Pumps
- cogeneration technologies
- ...

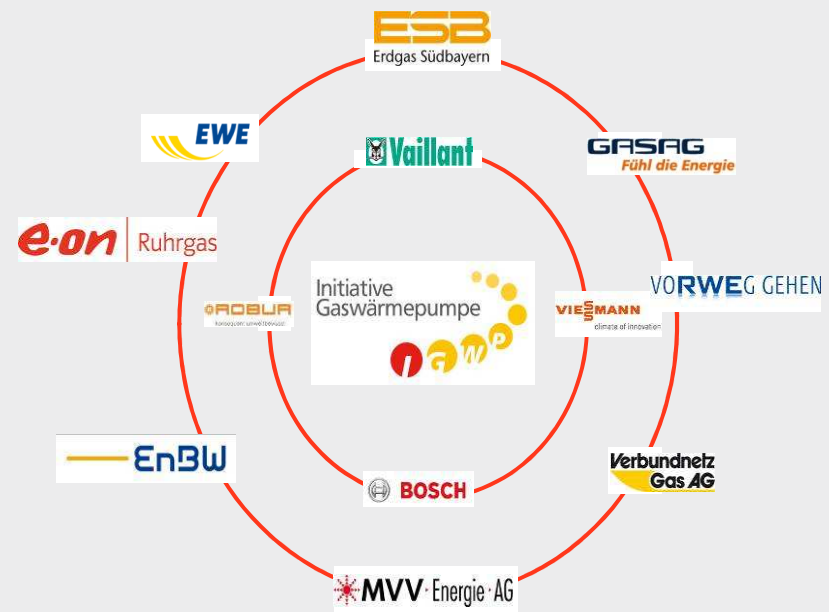


Consumption of Natural Gas,
actual and predicted until 2050

Initiative Gas Heat Pump, Objectives and Approach

The Initiative Gas Heat Pump was founded 2008 by 8 Gas Companies and 4 Manufacturers to bundle the Know How and yield gas heat pumps from development to market introduction:

- Lab Tests and Field Tests
- Marketing and Standardization work
- Lobbying



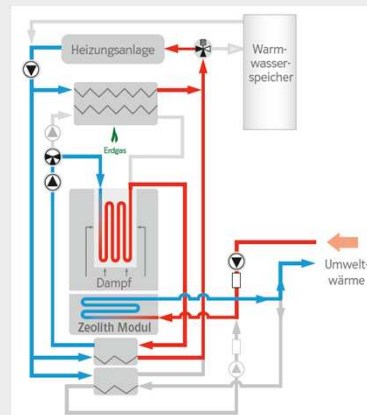
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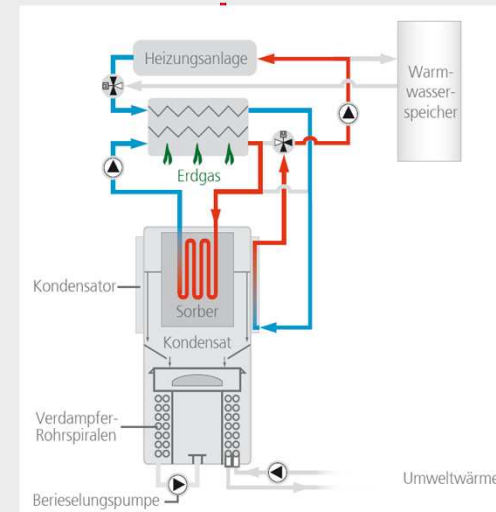
Investigated Appliances



Vaillant



Viessmann



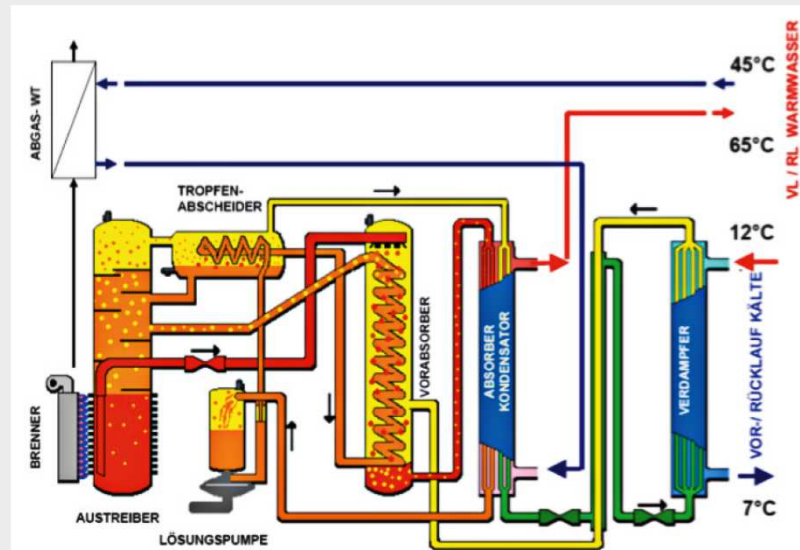
Adsorption Heat Pumps with solar panels (Vaillant) or ground spikes (Viessmann)



Investigated Appliances



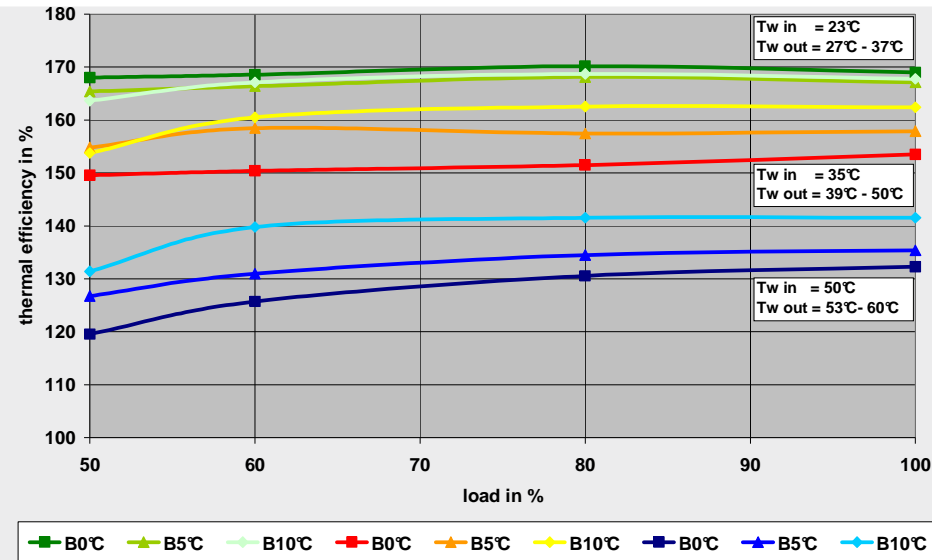
Robur



Bosch Thermotechnik

Absorption Heat pumps with ground spike (Robur) or ambient air as renewable energy source are investigated.

Results of Lab Tests



- Measurement of stationary efficiencies (Robur, brine/water-system) depending on
 - heating temperatures 0 °C – 45°C – 70°C,
 - load 100% - 50% - 30%
 - brine temperatures 0°C - 10°- 30°C

- Verification of optimization potential of first prototypes
- Long term tests of summarized 50,000 h prove the high reliability.



Operating Hours / Laboratory

Manufacturer	Operating Hours	Status
Robur	2000h	completed
Viessmann	Unit 1: 8,900h Unit 2: 1,500h Total: 10,400h	ongoing
Vaillant	Unit 1: 19,585h Unit 2: 17,904h Total: 37,489h	ongoing

Standardization work: VDI 4650-2 (for Germany)



Outcome

- Directive for absorption und adsorption gas heat pumps
- Determination of the annual heat rate
 - Annual heat rate with electricity requirement
- Determination of the standard efficiency
 - Standard efficiency without electricity requirement → Comparable with DIN 4702-8

Measurement

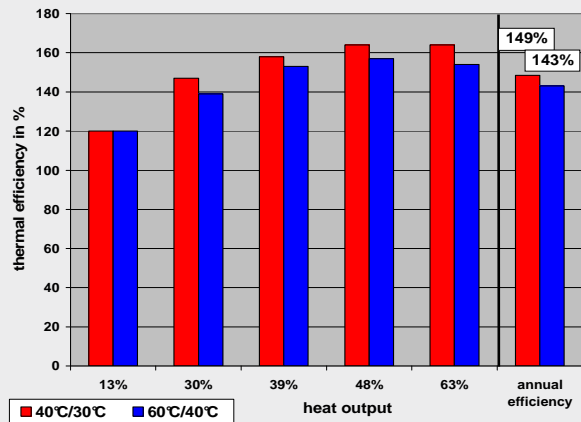
- 5 points are measured (63%, 48%, 39%, 30%, 13%)
 - Points are derived from an annual continuous curve
 - All points have the same energy quantity
- 3 heating systems are considered (35/28°C, 55/45°C, 70/55°C)
- Efficiency calculation for DHW according to DIN EN 12203-2/-3



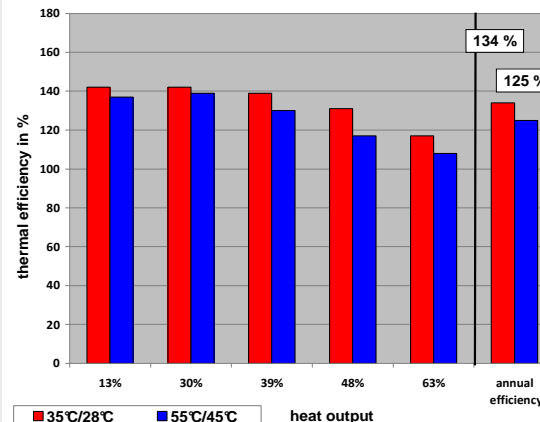
Standardization: Test conditions according to VDI 4650-2

Test conditions to determine the part load efficiencies								
load (P/PN)	brine in temperature (°C)	air temperature (-10°C t _{a,N})	Heating system 70/55		Heating system 55/45		Heating system 35/28	
			water inlet temperature (°C)	water outlet temperature (°C)	water inlet temperature (°C)	water outlet temperature (°C)	water inlet temperature (°C)	water outlet temperature (°C)
0,13	9	16,2	27,8	29,7	24,8	26,0	21,3	22,2
0,30	8	10,9	34,7	39,2	29,6	32,6	22,8	24,9
0,39	7	8,4	37,6	43,4	31,7	35,6	23,5	26,2
0,48	6	5,7	40,4	47,6	33,8	38,5	24,2	27,5
0,63	5	1,2	44,9	54,3	37,2	43,4	25,3	29,7

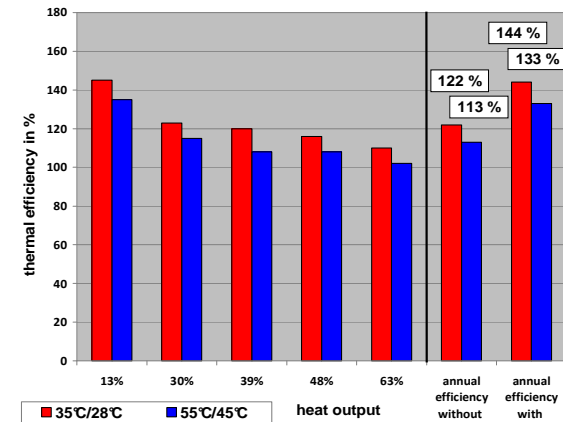
Efficiency Results of Lab Tests



Robur
(brine/water-system)
Quelle: E.ON Ruhrgas



Viessmann
(brine/water-system)
Quelle: Viessmann, E.ON
Ruhrgas



Vaillant
(solar-system)
Quelle: GWI, Essen

Annual efficiencies are calculated from five part load efficiencies, which were measured in the lab.

Values between 125 % and nearly 150% were achieved depending on the temperatures of the heating system.

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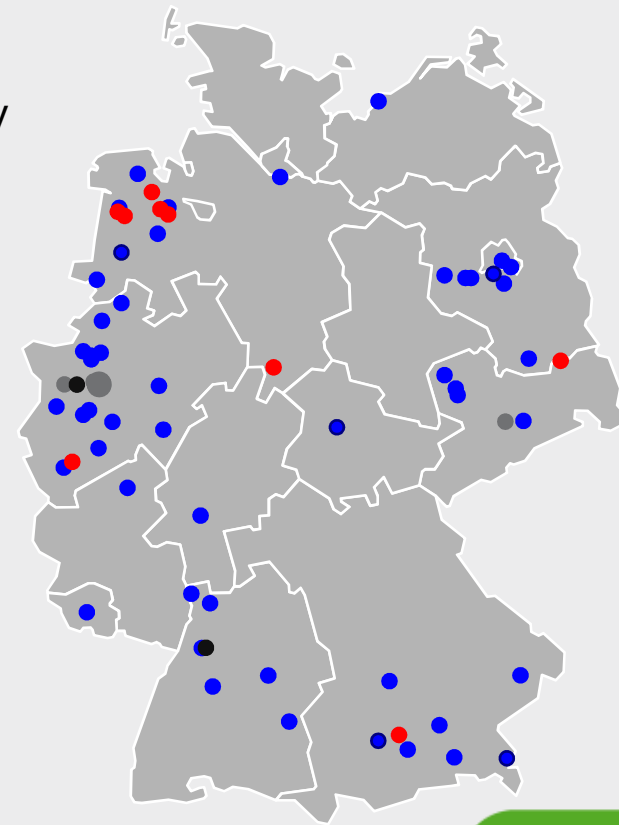
Field Tests: The Initiative Gas Heat Pump in Germany

Each gas utility, member of the Initiative Gas Heat Pump, installed one or several gas heat pumps from each manufacturer. So far, 50 installations are equipped with sophisticated instrumentation and are continuously monitored by E.ON Ruhrgas



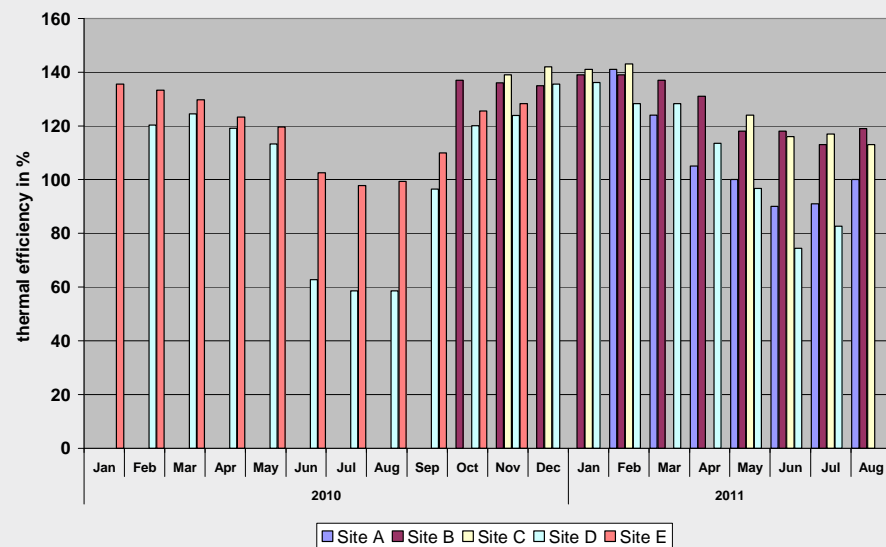
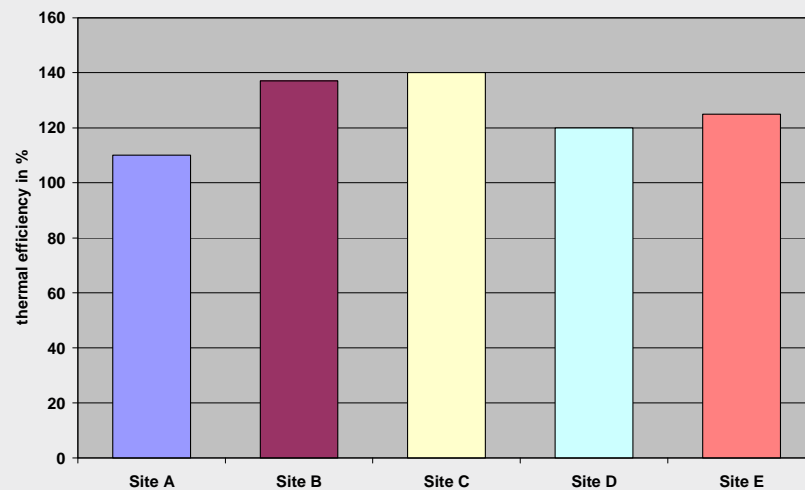
Field Tests in Germany

- 51 Sites running
- 12 Sites planned



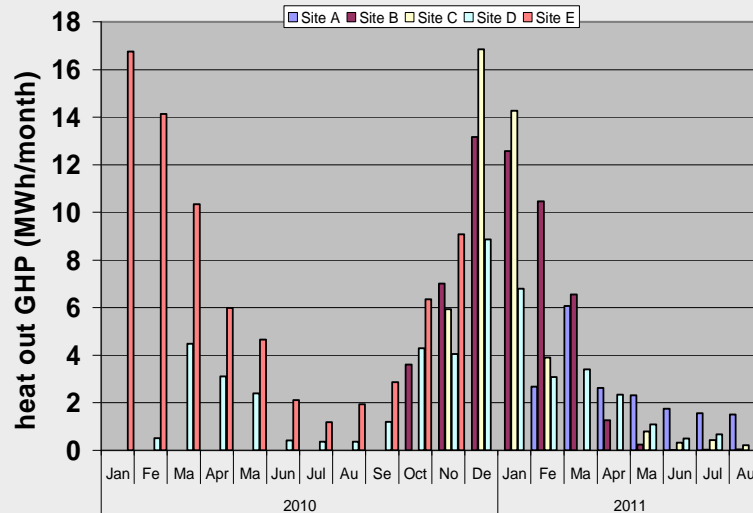
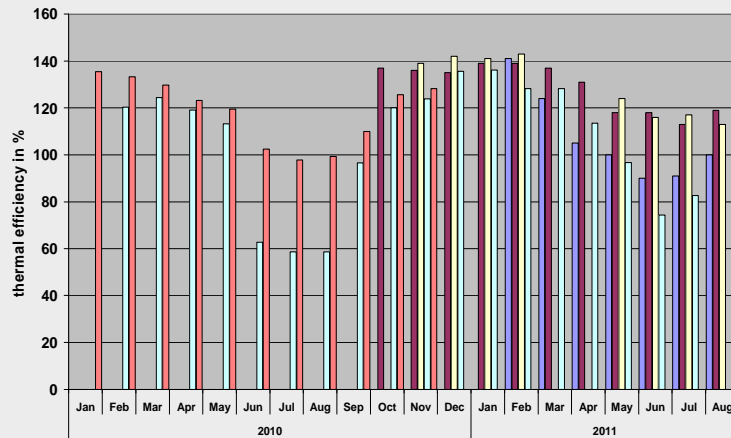
Field Test Results of the Robur Gas Heat Pump (brine / water-system)

First measuring results of the gas absorption heat pump with ground spikes in multi family houses and integrated private and commercial buildings: The overall efficiency including hot water production reaches values between 120% and 140%.



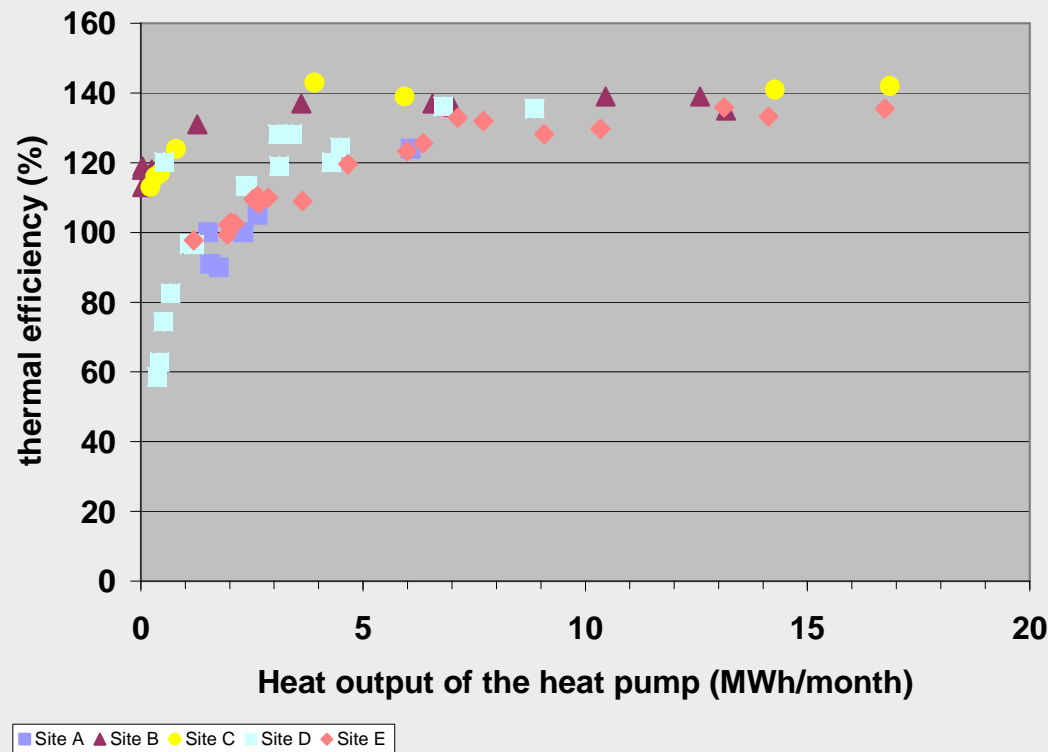
- The monthly efficiencies show
 - the successive installation and measuring of the sites,
 - the strong summer/winter variation
 - the highest values during the deep winter month

Monthly Efficiency of Robur Gas Heat Pump in Field Test (brine / water-system)



- maximum efficiencies are observed in winter
- heat demand reaches its peak
- long operating times
- efficiency equals stationary measurements
- reduced efficiencies during the summer
- low heat demand during summer
- increasing number of on/off cycles
- but low influence on annual efficiency

Efficiency in Dependence of the Heat Demand (brine / water-system)



For a heat demand > 6 MWh/month:
efficiency > 130 % for all sites

For a heat demand < 6 MWh/month
efficiencies between 60% and 140%
depending on installation, control, etc...

Detailed analysis of the influence of installation, storage integration, control and user behaviour will be done to find out the reasons for the variation of efficiencies at lower heat demand.



Conclusions and Further Action

Conclusion:

With new developed gas heat pumps the energy demand for heating may be reduced by up to 30%. Field tests showed a high reliability of the new technology.

Further actions:

- Detailed analysis of the sites concerning installation, integrated storages and control
- Evaluation and analysis of the data from the other heat pump sites
- Ongoing support in standardization
- Ongoing support in marketing and lobbying