

# EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

SYMPOSIUM + EXPO  
NUREMBERG, 20–21.10.2015

Industrial | Commercial | Residential  
Heating & Cooling | Components & Equipment

[hp-summit.de](http://hp-summit.de)

NÜRNBERG / MESSE



Technische  
Universität  
Braunschweig

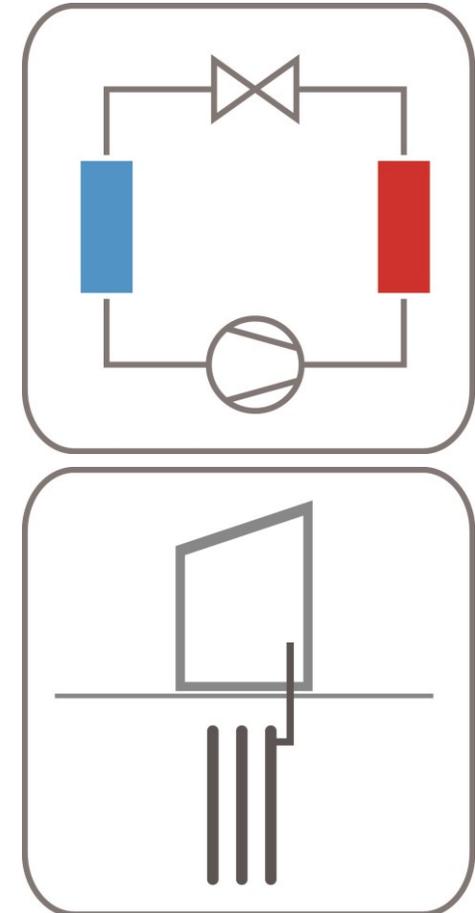
Institut für Gebäude- und Solartechnik  
Prof. Dr.-Ing. M. Norbert Fisch  
Mühlenpfordtstraße 23  
D-38106 Braunschweig  
[www.tu-braunschweig.de/igs](http://www.tu-braunschweig.de/igs)



*future:* **heatpump**

## Energetic and economic evaluation of heat sources for heat pumps

Dipl.-Ing. Franziska Bockelmann



## *future:heatpump*

Energetic and economic evaluation of heat sources for heat pumps

Operating time: 03/2015 to 02/2018

Project partners and sponsors:



STIEBEL ELTRON



VIESSMANN



Uponor



DOPPELACKER



EURO POLES



eTank  
Energie auf Vorrat



geoKOAX



Federal Ministry  
for Economic Affairs  
and Energy

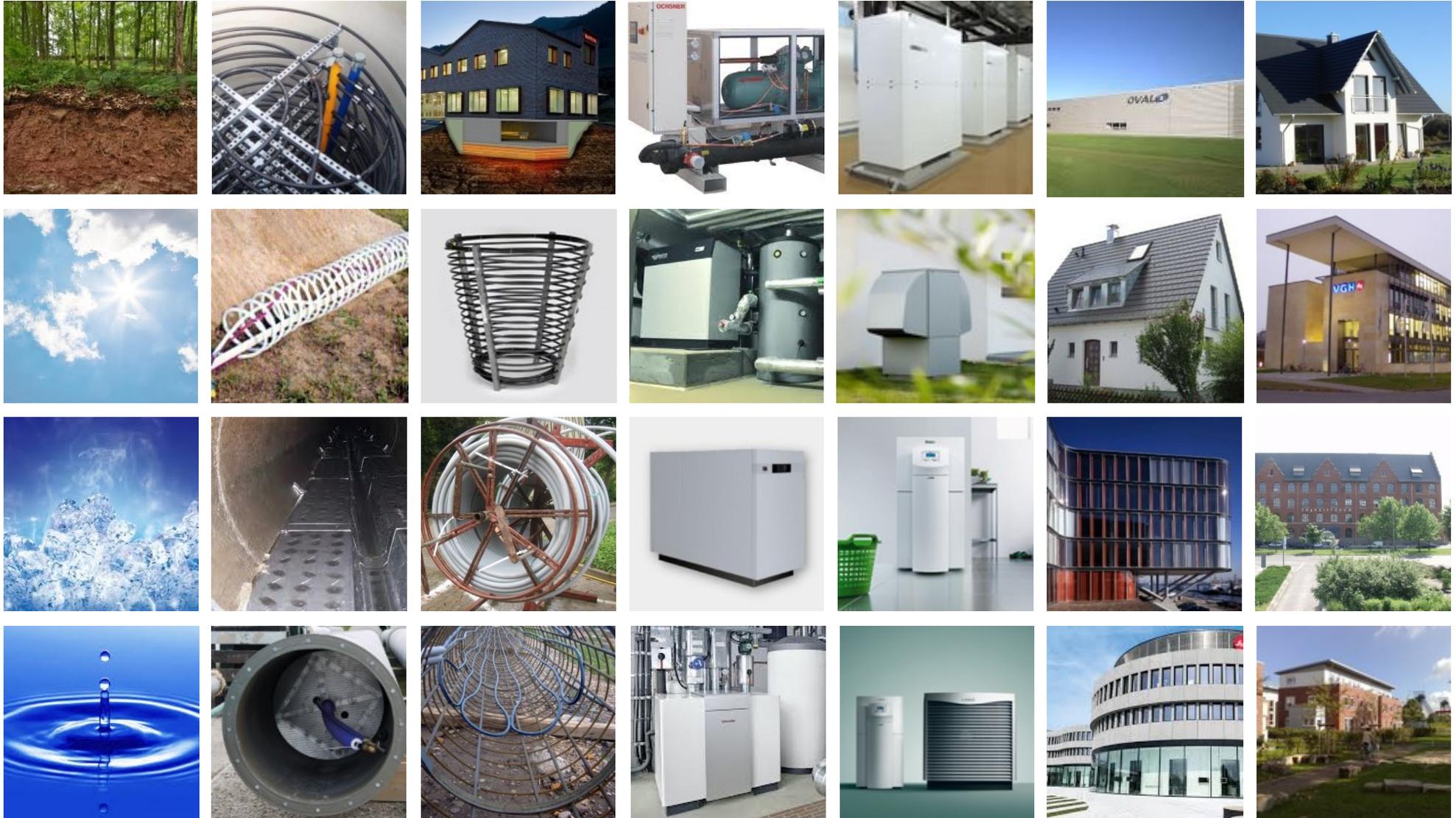


PTJ  
Projektträger Jülich  
Forschungszentrum Jülich



# Project idea and R&D goals

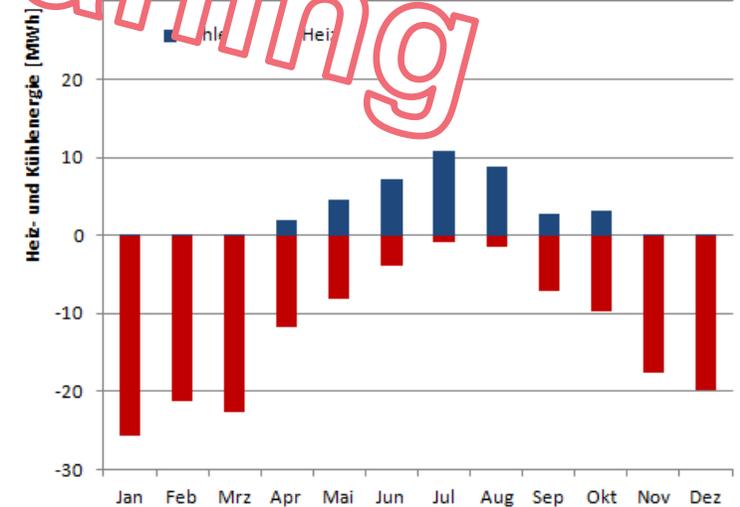
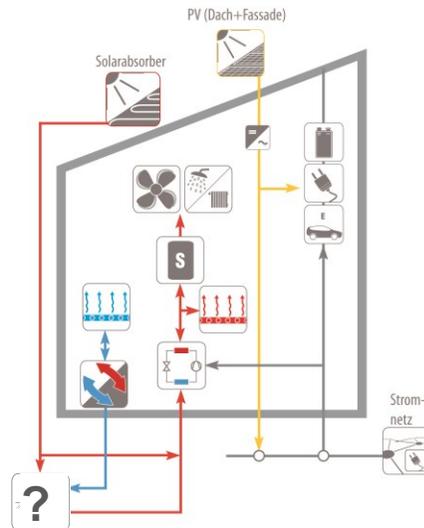
# State of the art



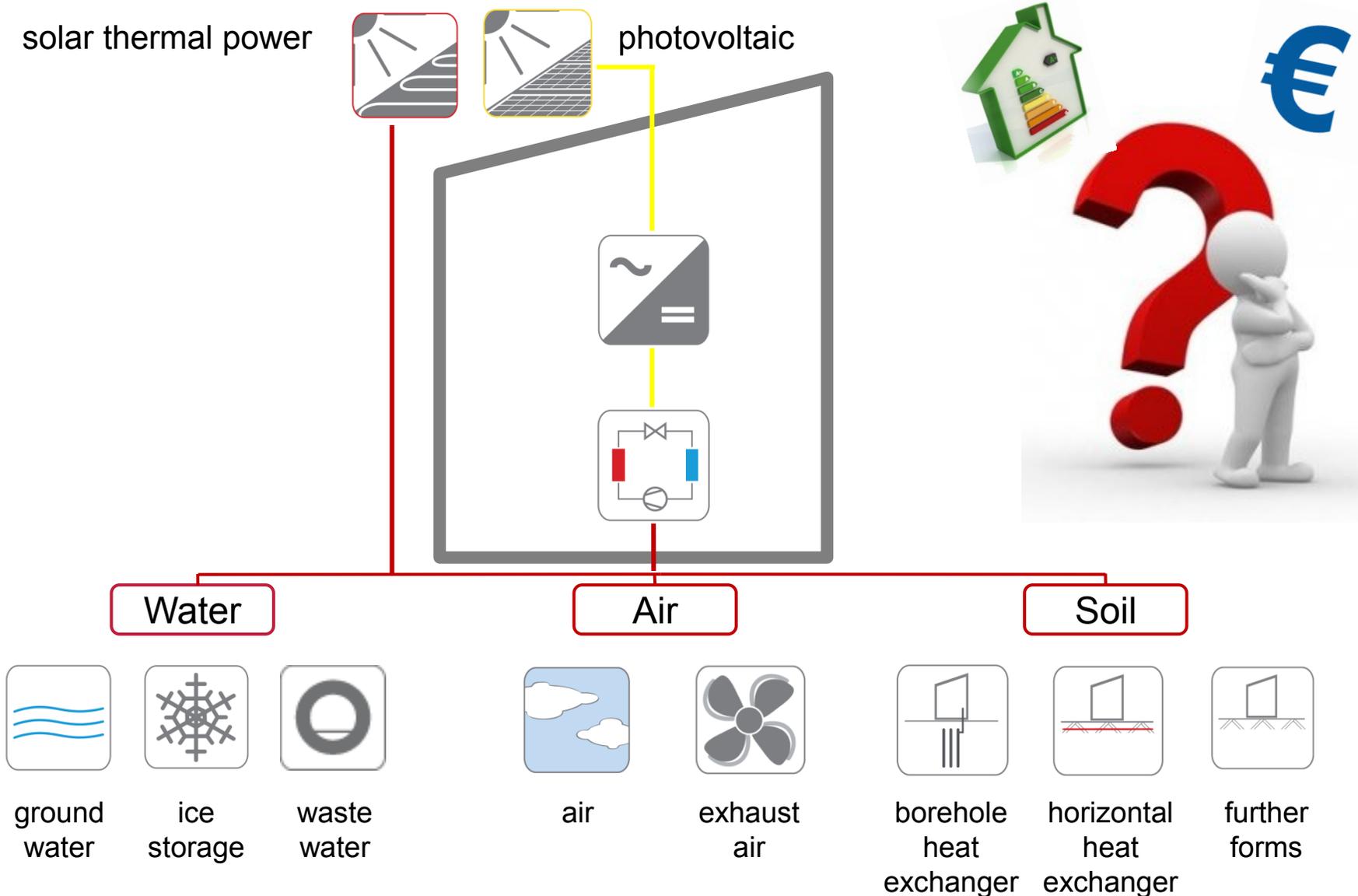
# Planing and energy concept



Planing



# Project idea



## Energetic and economic evaluation of heat sources for heat pumps



heat source \*)



heat pump



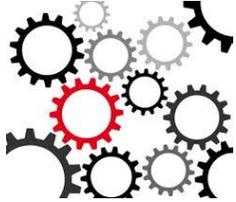
building

\*) Low temperature heat sources for heat pumps, shortcut heat sources

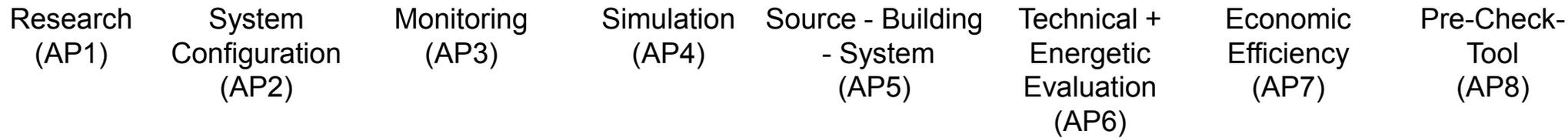


# Work packages

# Work packages



## Work packages



# Processing



## Work packages

- Research (AP1)
- System Configuration (AP2)
- Monitoring (AP3)
- Simulation (AP4)
- Source Building System (AP5)
- Technical + Energetic Evaluation (AP6)
- Economic Efficiency (AP7)
- Pre-Check-Tool (Excel) (AP8)

**Which functions should the tool have?  
 What is needed as an input and / or background information?  
 Which results are provided by the tool – the output?  
 How will this tool be implemented?**

## Processing of work packages

- ...
- Simulation (AP4)
- System Configuration (AP2)
- Research (AP1)
- Pre-Check-Tool (AP8)

# Building Typology

	Single family houses	Multiple family houses	Non-residential buildings	Heat sources and transfer
New building	  	  	  	  
Refurbishment	  	  	  	



# Pre-Check-Tool

# Pre-Check Tool



- Overview of heat sources for heat pumps
- Basics and boundary conditions for the systems
- Feasibility study / implementation study
- System configuration and preliminary design of the source
- Benchmarks for costs and economic efficiency

## Online Pre-Check for planners and architects

**Initial situation**  
**(various providers)**

**Functionality**  
**Performance**

**Holistic comparison**  
**Costs and efficiency**

## Ideas and approaches for input / selection

IGS - Pre-Check-Tool

**INPUT**

PRESELECTION

**BUILDING**

- Singel family house
- Multi family house
- Office building

**STANDARD**

- EnEV 2014
- EnEV 2007
- Old building

Heat demand [kWh/a]

Heating power (demand) [W/m<sup>2</sup>]

**SYSTEM**

- Low-temperatur (e.g. floor heating)
- High-temperature (radiator)

**BACK**

IGS - Pre-Check-Tool

**INPUT**

PRESELECTION

**SYSTEM**

- Low-temperature (e.g. floor heating)
- High-temperature (radiator)

**PLOT**

Length [m]

Width [m]

Ground area building [m<sup>2</sup>]

Groundwater level

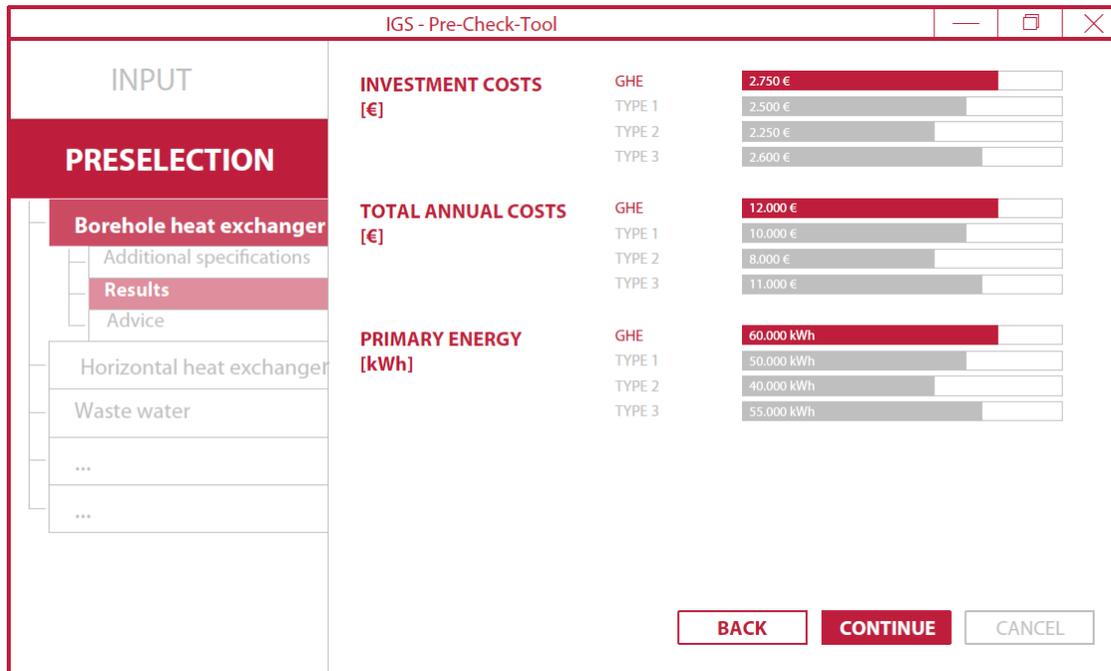
Soil quality

**Limitations**

- Laws
- Water protection area
- ...

**BACK** **CONTINUE** **CANCEL**

## Ideas and approaches for results / output



## Notes and warnings

e.g.

- ground water -> Pumping test
- realization of TRT
- fulfilling sound protection
  
- possibility for cooling mode

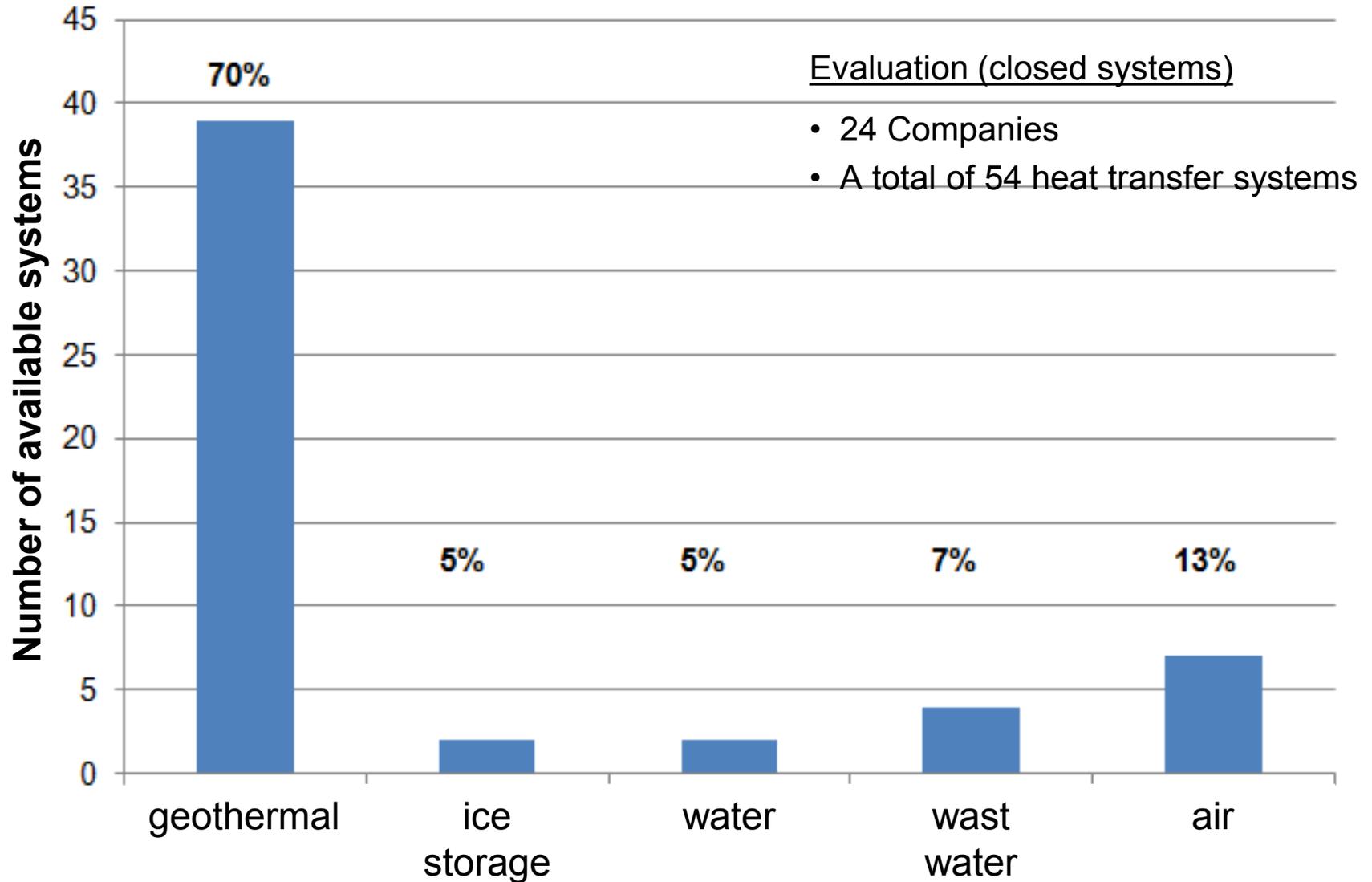


# First Results

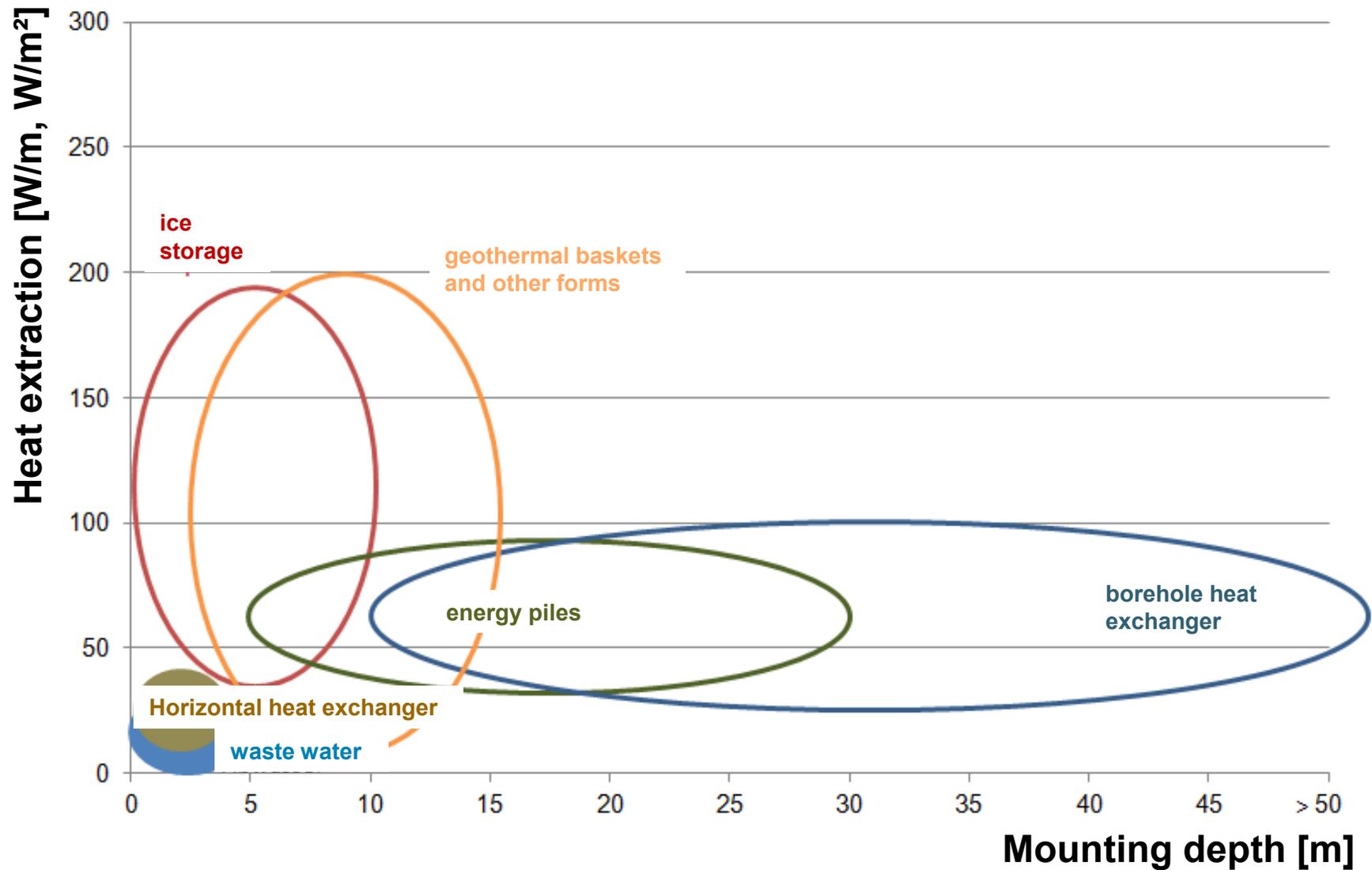
Firma	Systembezeichnung	Abbildung	Wärmequelle	Wärmeträgermedium	Aufbau	Abmessung	max. Einbautiefe / Abteufung	Einbauart	Entzugsleistung (Bodenkennwerte, Anmerkungen)	Eintragsleistung (Bodenkennwerte, Anmerkungen)	Einsatzgebiete
Uponor	„Geo Hortis“ Flachkollektor		Geothermie	Wasser-Glykol	z.B. PE-Rohre	D= bis 40mm, Länge= bis 200m	1,2-1,5m Tiefe	Aushub	bis 40 W/m <sup>2</sup>		EFH, MFH, Nichtwohngebäude
	„Geo Vertis“ Energiepfahl		Geothermie	Wasser-Glykol	Verlegung mäanderförmig, o.ä.	D= bis 130-180cm	10-30m Tiefe	Bohrung, Rammen	bis 84 W/m		EFH, MFH, Nichtwohngebäude
	„Geo Calix“ Erdwärmekorb		Geothermie	Wasser-Glykol		D=1,4-2,4m, Höhe= bis 2,7m, Länge= bis 200m	1,0-4,0m Tiefe	Aushub	bis 1500 bzw. 100 W/Km <sup>2</sup>		EFH, MFH, Nichtwohngebäude
eTank / deematrix	„eTank“ Energiespeicher		Solarthermie / Geothermie				Bis 1,5m Tiefe	Aushub			Neubau Sanierung
Doppelacker	Agrothermie-Flachkollektor		Geothermie, Abwärme	Wasser-Glykol	Ackerfläche, Sportfeld	Länge=100m, Breite=100m, Höhe= 0,05-0,25m, Volumen= 1000m <sup>3</sup>	2,0m Tiefe	Aushub	10-40 W/m <sup>2</sup> bei 2000 Vollbetriebsstunden		EFH, MFH, Nichtwohngebäude
geoKOAX	„geoKOAX“ Erdwärmespeichersonde		Geothermie	Wasser, Wasser-Glykol		D=140mm, Vol.=13,5l/m, Länge=30m,	10-100m Tiefe	Bohrung	30-100 W/m		EFH, MFH, Nichtwohngebäude Neubau Sanierung
Europoles	„Terra Cool“ HEP-Energiepfahl		Geothermie	i.d.R. Wasser		Bis 28m Länge, D=1,6m, 56m <sup>3</sup>	10-28m Tiefe	Bohrung			EFH, MFH, Nichtwohngebäude
Viessmann	Solar-Luftabsorber		Luft, Regen	Wasser-Glykol		Länge= 2,10m, Breite=1,20m, Höhe=2x0,05m, Vol.=45l	Aufdach	Montage			EFH, MFH, Nichtwohngebäude Neubau Sanierung
	Eisspeichersystem		Geothermie	Wasser-Glykol		Durchmesser=2,5m, Höhe=2,40m, Vol.=130l	bis 3,40m Tiefe	Aushub	4,0-18 kW		EFH, MFH, Nichtwohngebäude Neubau Sanierung

Heat transfer systems  
Overview

# Comparison



# Comparison



# Summary and Outlook

## SUMMARY

- Pre-Check-Tool for a quick and easy heat source selection is helpful and necessary for the praxis.
- A lot of different heat transfer systems are on the market, especially for geothermal applications, but no comparison between them is available.
- A wide range of heat extraction capacity is covered by the existing systems (dimensioning).

## OUTLOOK

- Further steps in the project
  - Collecting and analyzing the monitoring data and the systems.
  - Go on with the evaluation and comparison of the heat transfer systems (costs, etc.).
  - Go on with the realization of the tool.

Thank you for your attention!