

# Using geothermal energy for heating and cooling - example Warsaw

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**Energie, aber natürlich!**



## The Company

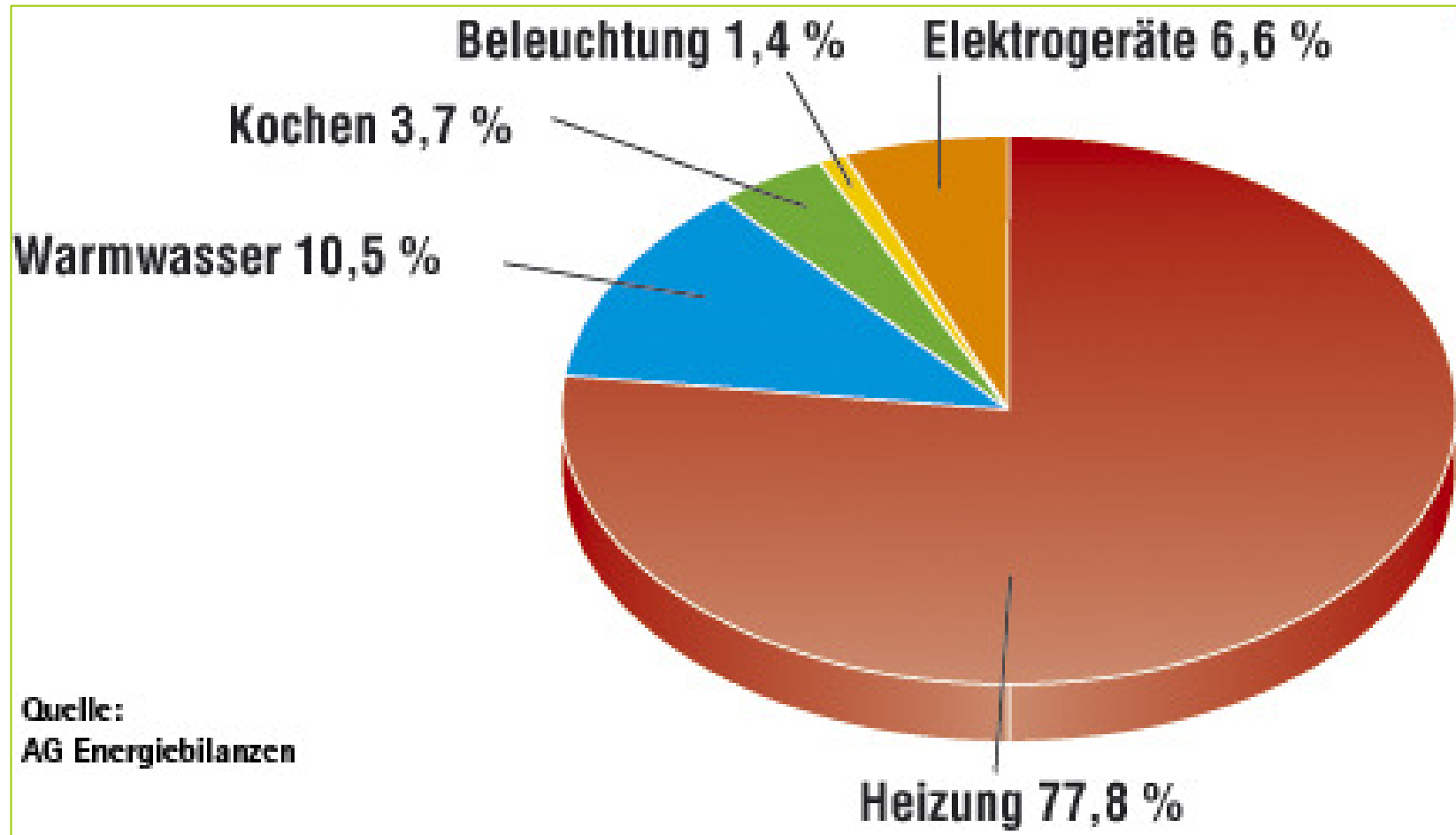
- Ruediger Grimm
- Geologist (Mining Academy Freiberg)
- Managing director of geoENERGIE Konzept GmbH
- Founded in 2007
- 5 employees
- 700 geothermal projects
- Consulting, feasibility, planning, tests, monitoring
- Since September 2008 joint venture in Albacete/Spain - FOURTEC GEO ENERGIE S.L.

## The German Market

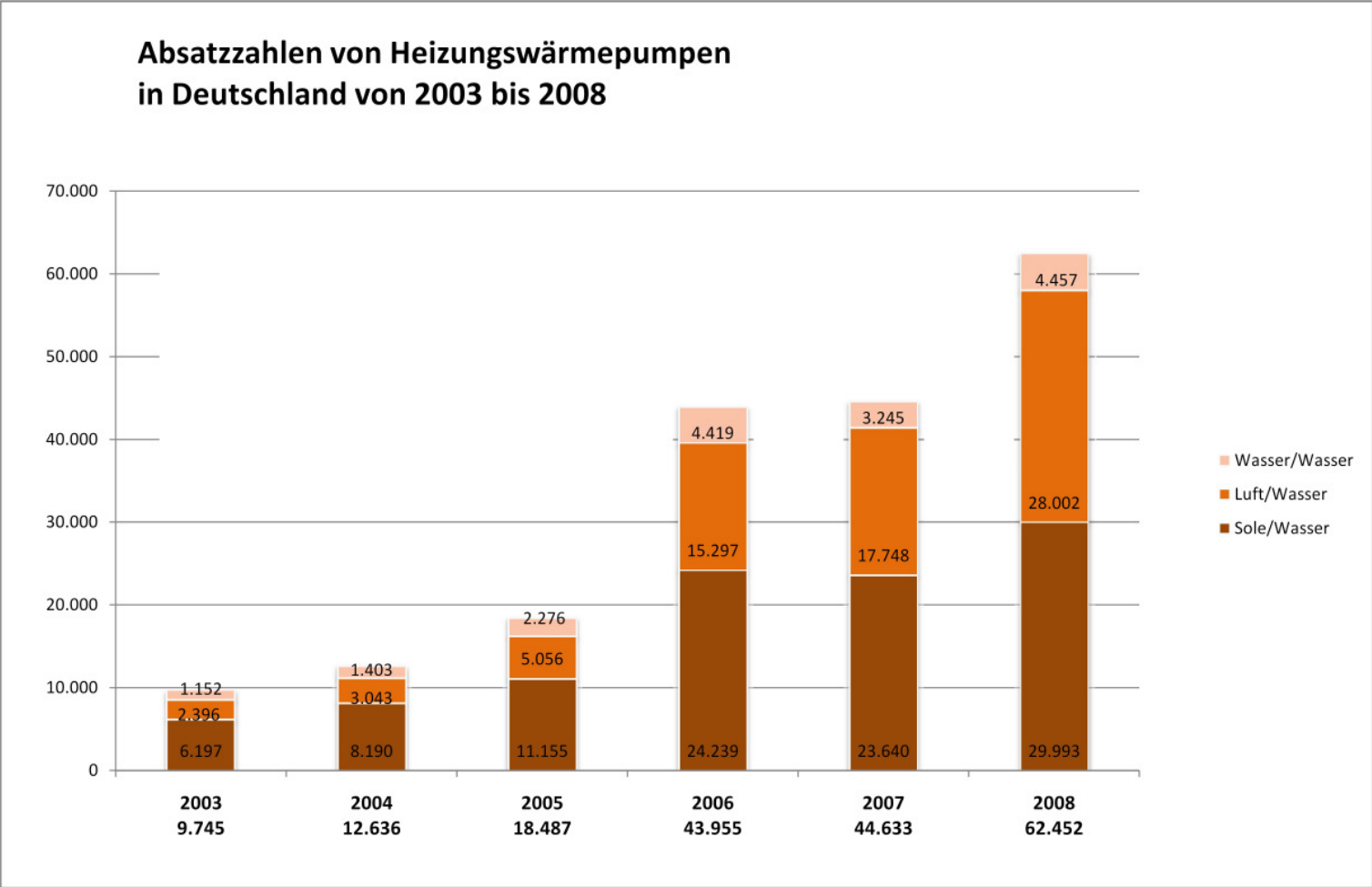


- Important heat sector
  - 75% of total energy consumption
- Increasing prices for energy
  - Prognostics?
- Fast growing market for GHP
  - 30.000 in 2008

# The German Market



# German Market



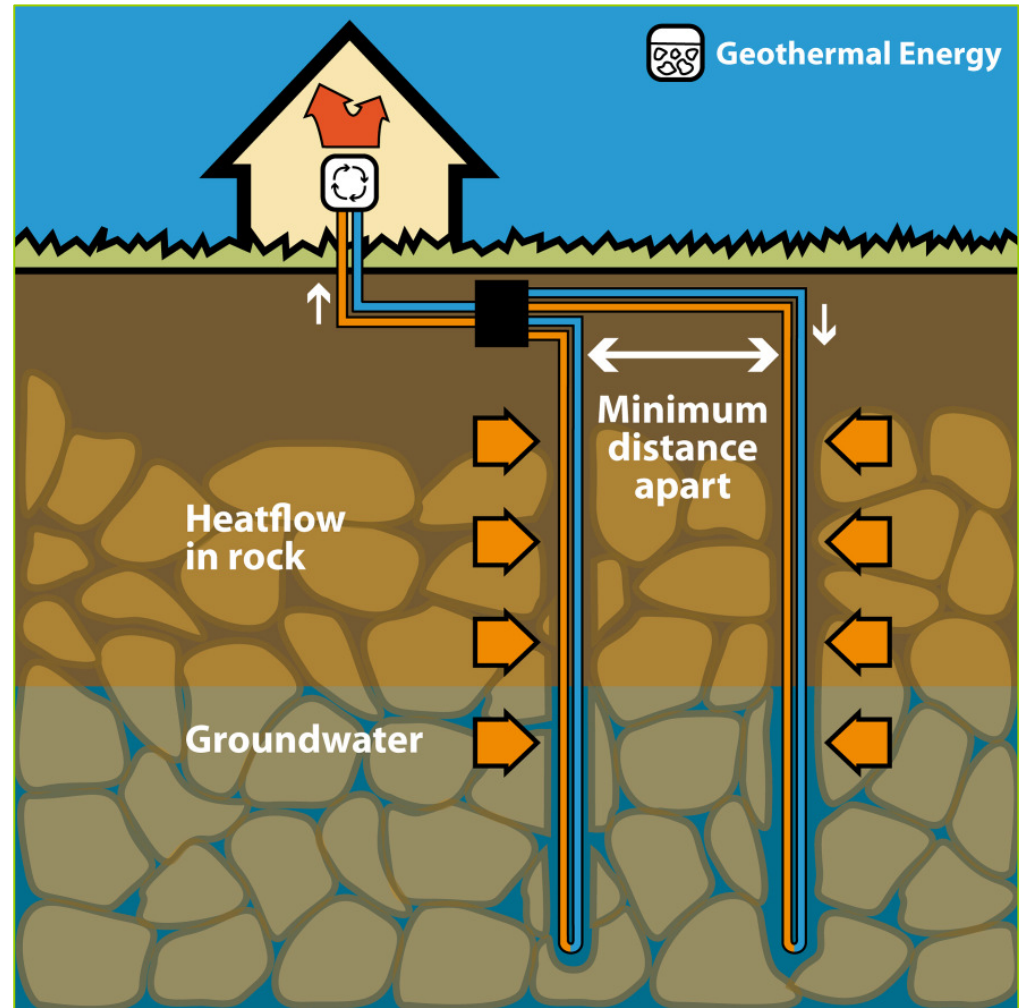
## The Technology



- BHE are the most popular geothermal systems
- Heating with heat pumps
- Direct cooling

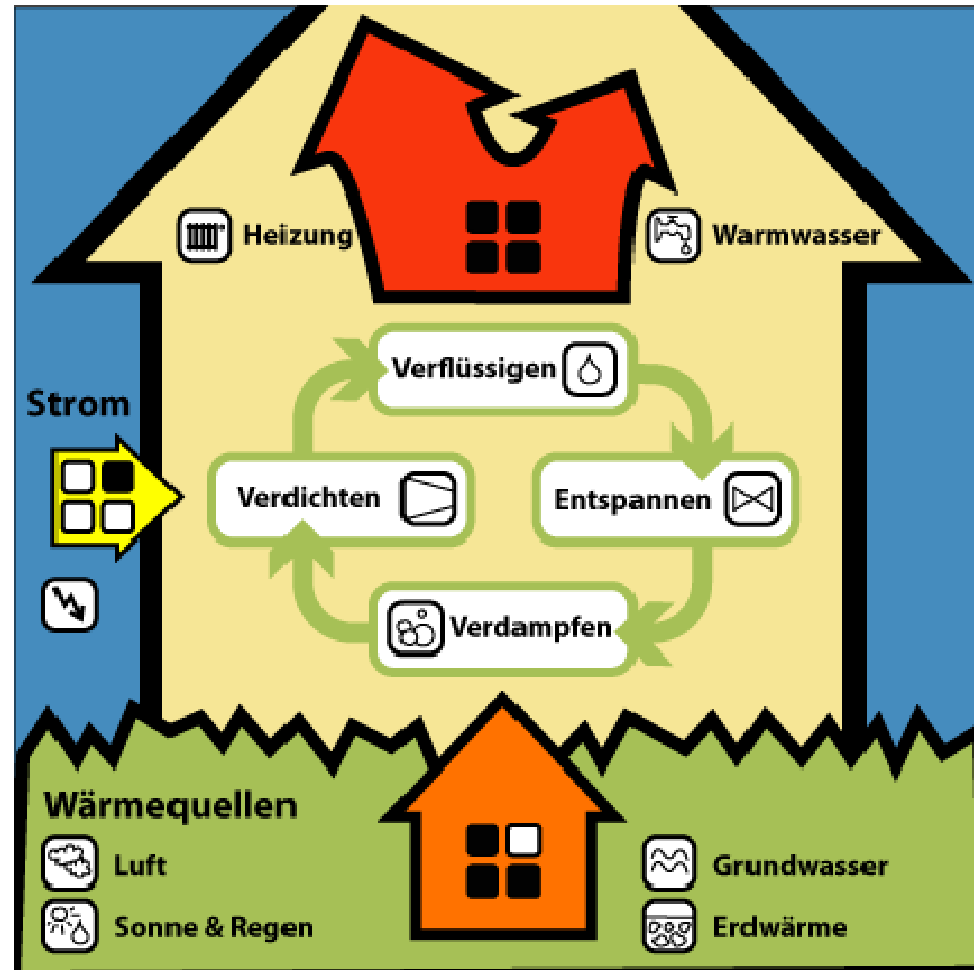
# The Technology

- Double U-pipes 32 mm
- Mostly 100 meters deep
- Fluid (Water + Glykol)
- Thermal activated grouting



# Carbon Asset Management

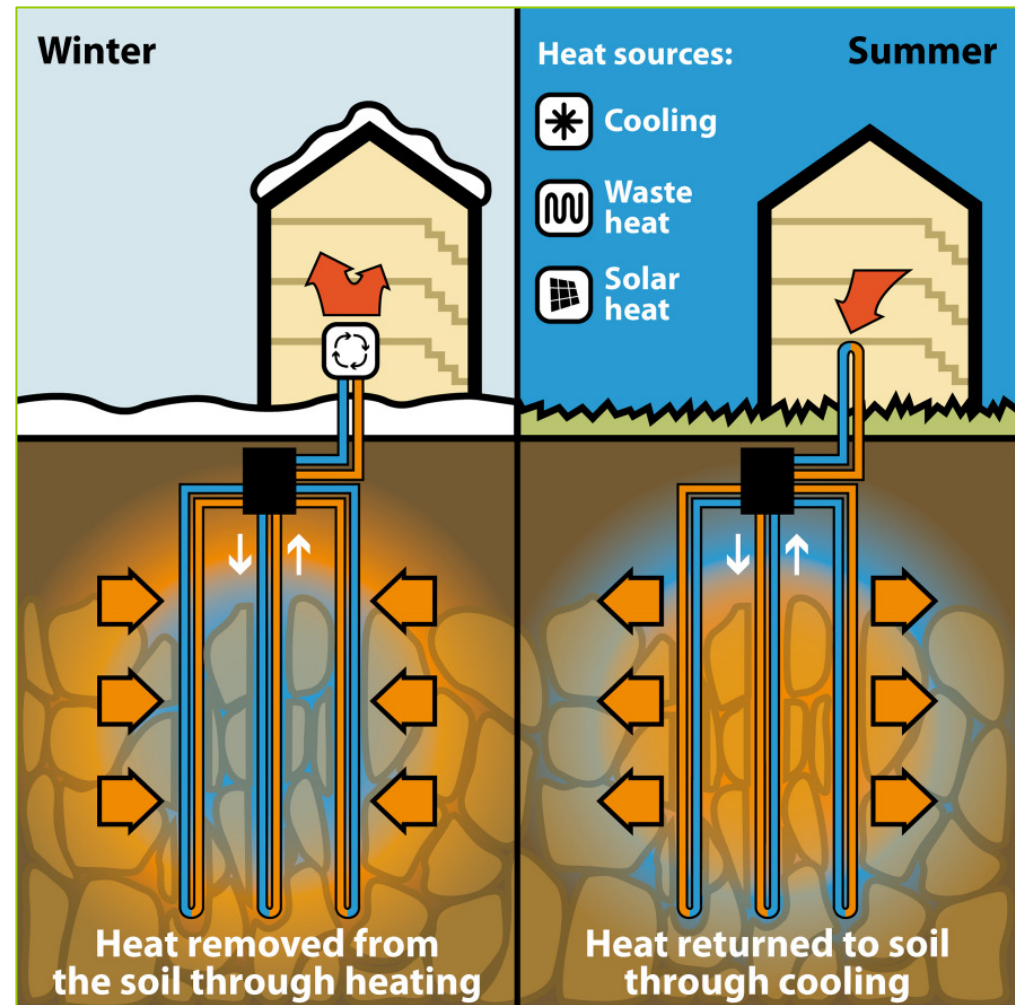
- Heat pump
- COP (coefficient of performance) = 4,0
  - 25% electricity (to be paid)
  - 75% geothermal energy (for free)





# Heating & Cooling

- Heating with heat pump in winter
- Direct cooling in summer
- „Storage system“
- High efficiency
- ROI - around 4 years



## Seven Steps



- Easy technology
- Important to follow the 7 steps
- geoENERGY Konzept offers support throughout these 7 steps

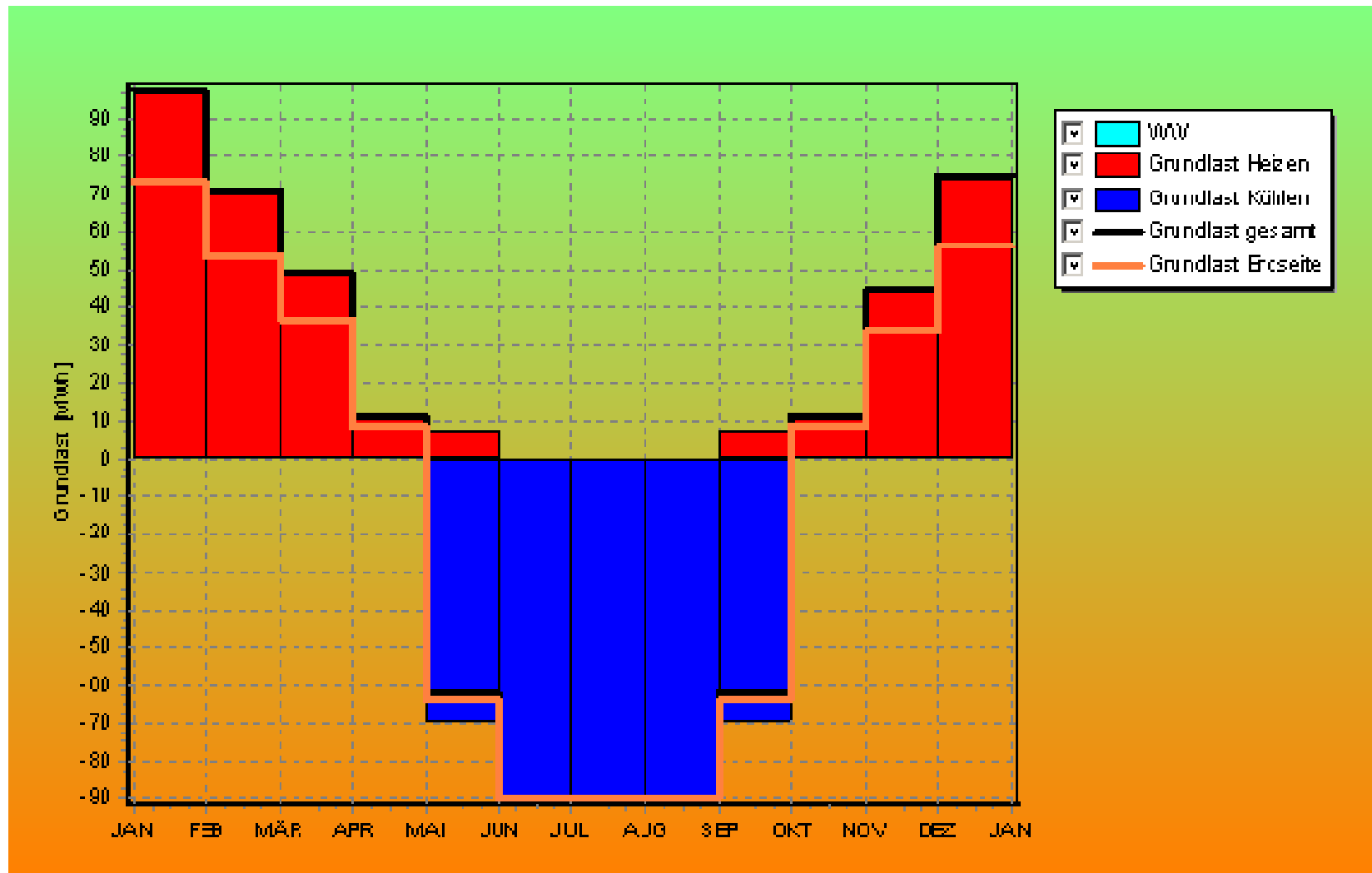
## Seven Steps

1. Determine energy requirements
2. Underground assessment
3. Evaluate feasibility
4. Plan the site
5. Carry out sample tests
6. Installation
7. Monitoring

## Example Warszaw-Pruszkow

- Project: January 2009
- DORSYSTEM Jelenia Góra
- Test and design BHE
- Office building
- 350 kW heating & 370 kW cooling
- 51 x 140 m

# Energy demand



## Office Building „STRABAG“



## Thermal Response Tests

- 72 hours
- smar**TRT**
- parameters
  - Thermal conductivity
  - Ground surface temperature
  - Thermal resistance

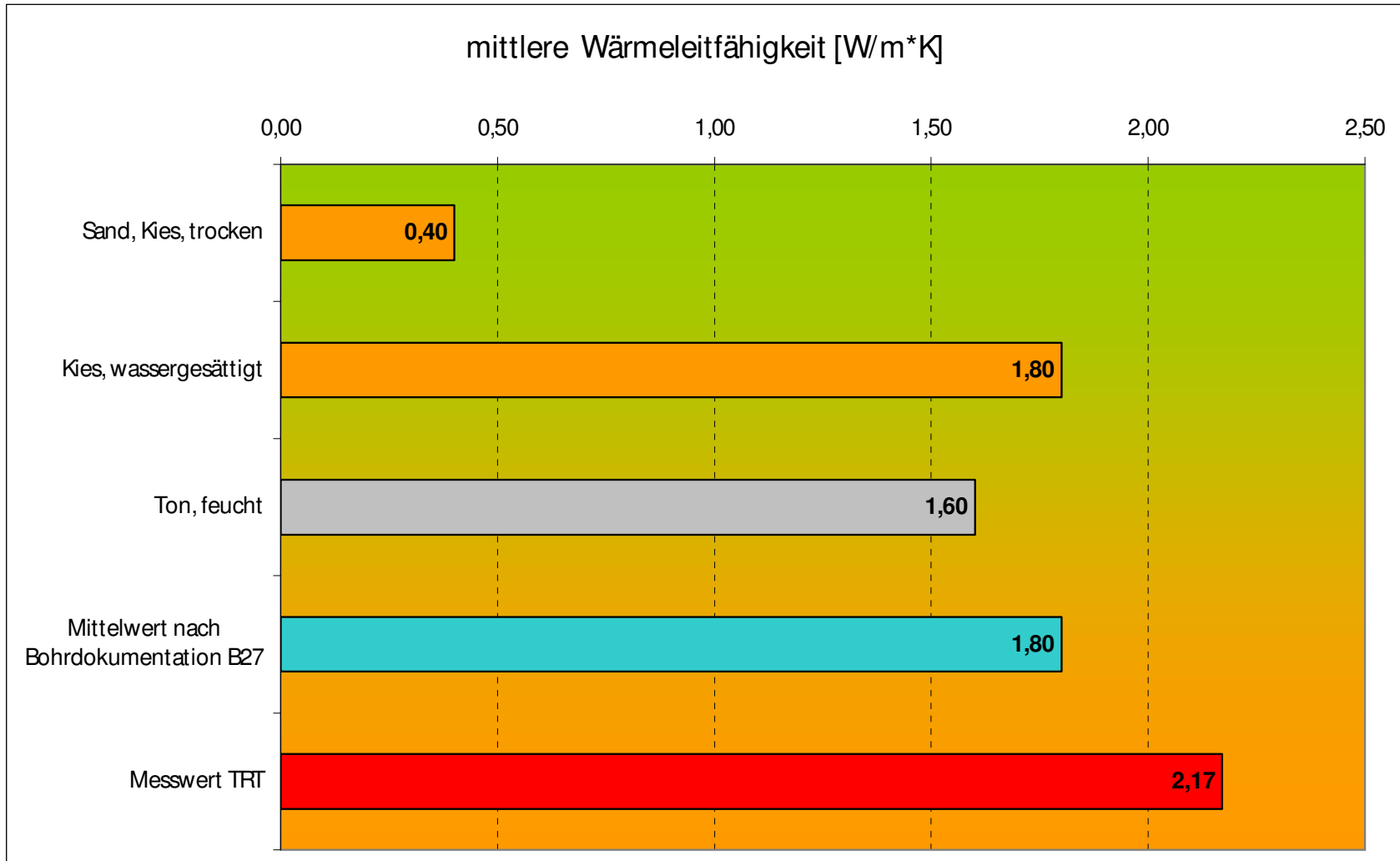


# Test





# Results TRT



# Design of BHE

Earth Energy Designer - 886 TALSTRASSE FREIBERG.DAT License for GRIMM, GEOTHERMIE KONZEPT GMBH

Earth Energy Designer - EED  
 Version 3.13  
 798 configurations (0-797)

**Bohrungen und Erdwärmesonden**

Erdwärmesonde

Sondentyp: Doppel-U

Sondenanzahl: 24

Tiefe ("6 : 2 x 5, L-configuration"): 146.0 m

Sondenabstand: 10.0 m

Bohrerdurchmesser: 152.000 mm

Übergangswiderst. Rohr/Verfüllung: 0.0000 (m·K)/W

Wärmeleitfähigkeit der Verfüllung: 2.000 W/(m·K)

Umwälzvolumen pro Bohrung Q:

für alle Bohrungen  pro Bohrung 0.700 l/s

Art der Anbindung (1=parallel): 1 Qbh=Q=0.7 l/s

**U-Rohr**

Außendurchmesser: 40.000 mm

Wandstärke: 3.700 mm

Wärmeleitfähigkeit: 0.420 W/(m·K)

U-Rohr-Mittenabstand: 82.000 mm

U-Rohr-Mittenabstand: 112 (smiley) / 56.569 (frowny)

**Daten- und Ergebnistabelle der letzten Simulation (886 TALSTRASSE FREIBERG.DAT)**

DATEN KURZFASSUNG

Kosten	48050 EUR
Anzahl Bohrungen	6
Tiefe der Erdwärmesonde	146.00 m
Erdwärmesondenlänge gesamt	876.00 m

EINGABEDATEN (PLANUNG)

UNTERGRUND

Wärmeleitfähigkeit des Erdreichs	2.900 W/(m·K)
Spez. Wärmekapazität des Erdreichs	2.100 MJ/(m³·°C)
Mittl. Temperatur d. Erdoberfläche	7.70 °C
Geothermischer Wärmefluss	0.0600 W/m²

BOHRUNG UND ERDWÄRMESONDE

Sondenanzahl	24 ("6 : 2 x 5, L-configuration")
Tiefe der Erdwärmesonde	146.00 m
Abstand der Erdwärmesonden	10.00 m
Sondentyp	DOUBLE-U
Bohrerdurchmesser	152.00 mm
U-Rohr, Außendurchmesser	40.000 mm
U-Rohr, Wandstärke	3.700 mm
U-Rohr, Wärmeleitfähigkeit	0.420 W/(m·K)
U-Rohr, Mittenabstand d. U-Schenkel	82.000 mm
Wärmeleitfähigkeit der Verfüllung	2.000 W/(m·K)
Übergangswiderst. Rohr/Verfüllung	0.0000 (m·K)/W

THERMISCHE WIDERSTÄNDE

Thermischer Bohrlochwiderstand wird berechnet

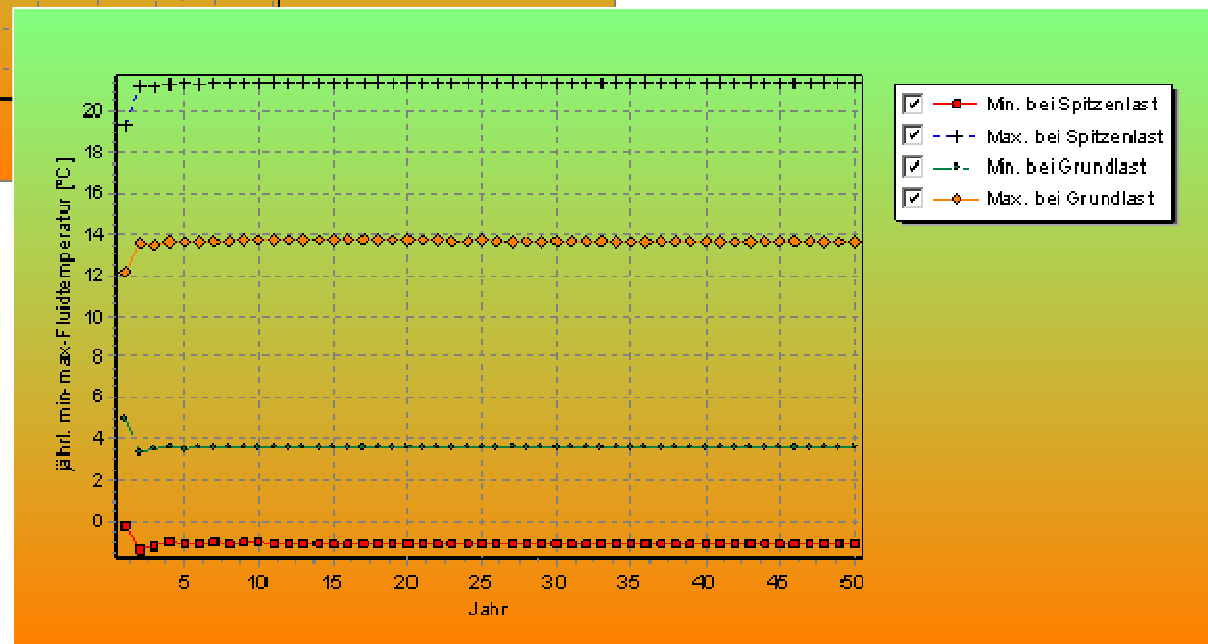
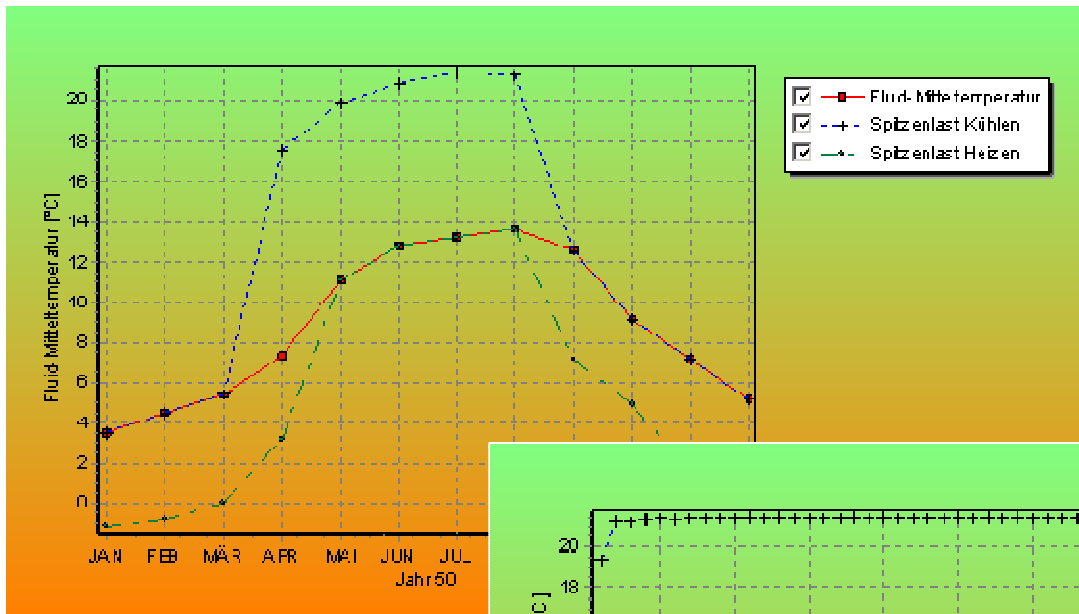
Anzahl der Berechnungspunkte: 4

Interner Wärmeübergang zw. auf- und abwärts führenden Rohren

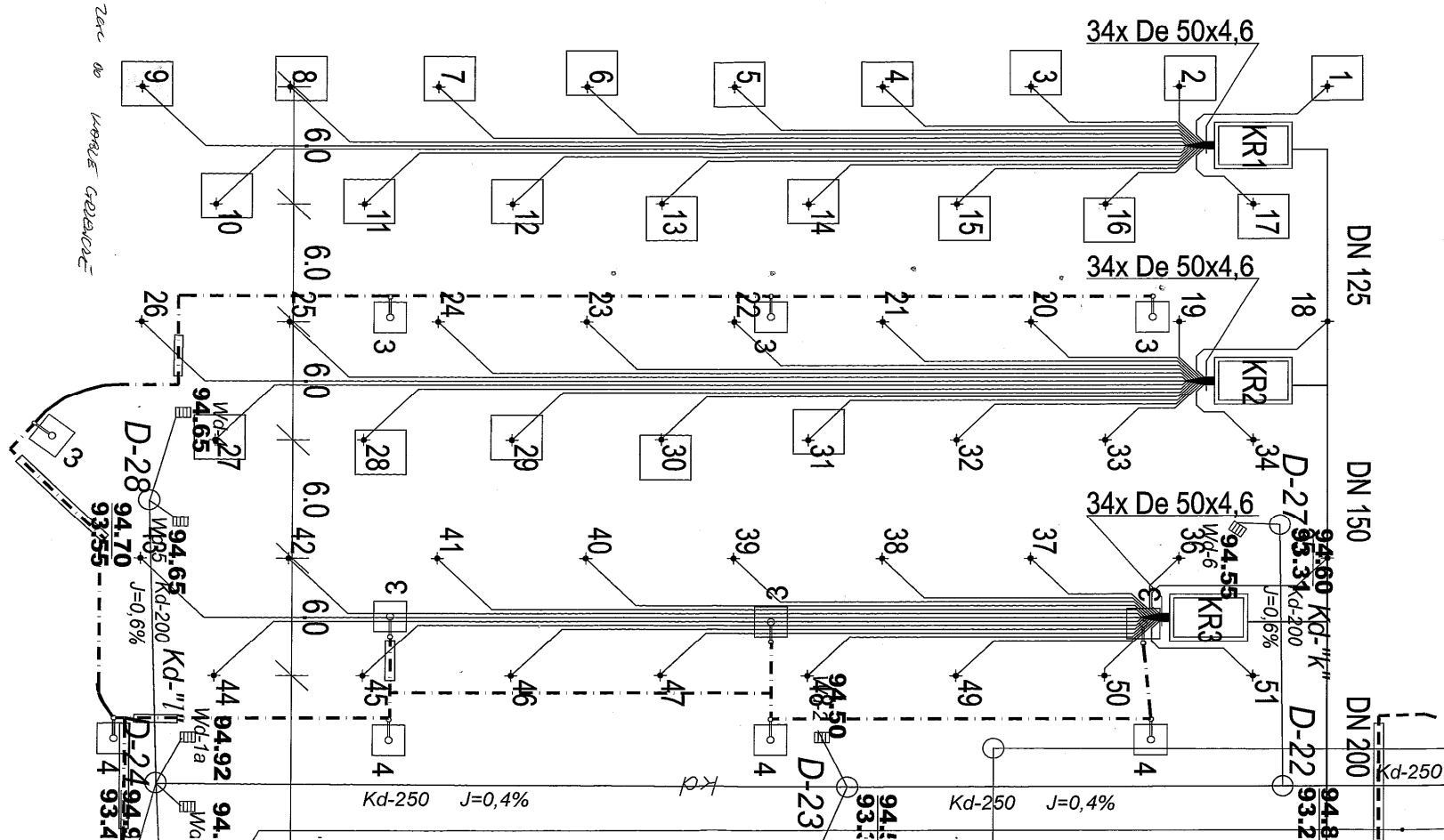
**Graphik der Fluidtemperaturen**

Start | Posteingang - Microsoft... | 09 Grimm - 50 W pro m.ppt | EED | 11:27

# Modelling of temperatures



# Drilling plan



# Drilling, Material...



## Facts for geothermy

1. Higher invest costs than gas or oil (boreholes).
2. Lower costs of operation (25% of elecricity).
3. Price for energy plays the main role.
4. Design and planning are important facts for optimized systems.
5. We need to take a lot of preliminary assumptions. We minimise the risk with field tests.



**Keine Angst!**

Es ist genug  
**Erdwärme**  
für alle da!

geo**ENERGIE**  
(Konzept)

[www.geoenergie-konzept.de](http://www.geoenergie-konzept.de)