

IEA HPP ANNEX 28

Workshop, 30 May, Las Vegas

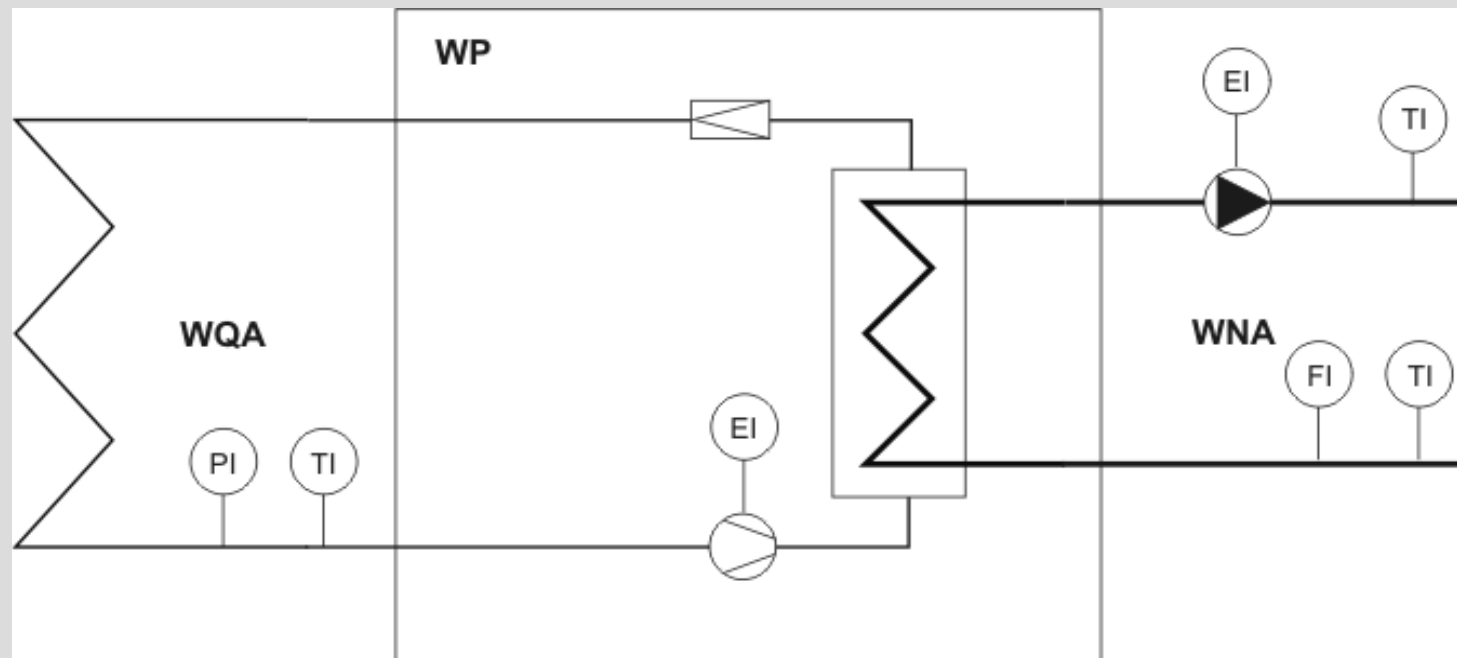
Evaluation of the System Performance by Field Test Results
Evaluation of the Calculation Approach for Direct Expansion
Heat Pumps

Andreas Presetschnik, Heinrich Huber
Sustainable Energy Systems, arsenal research

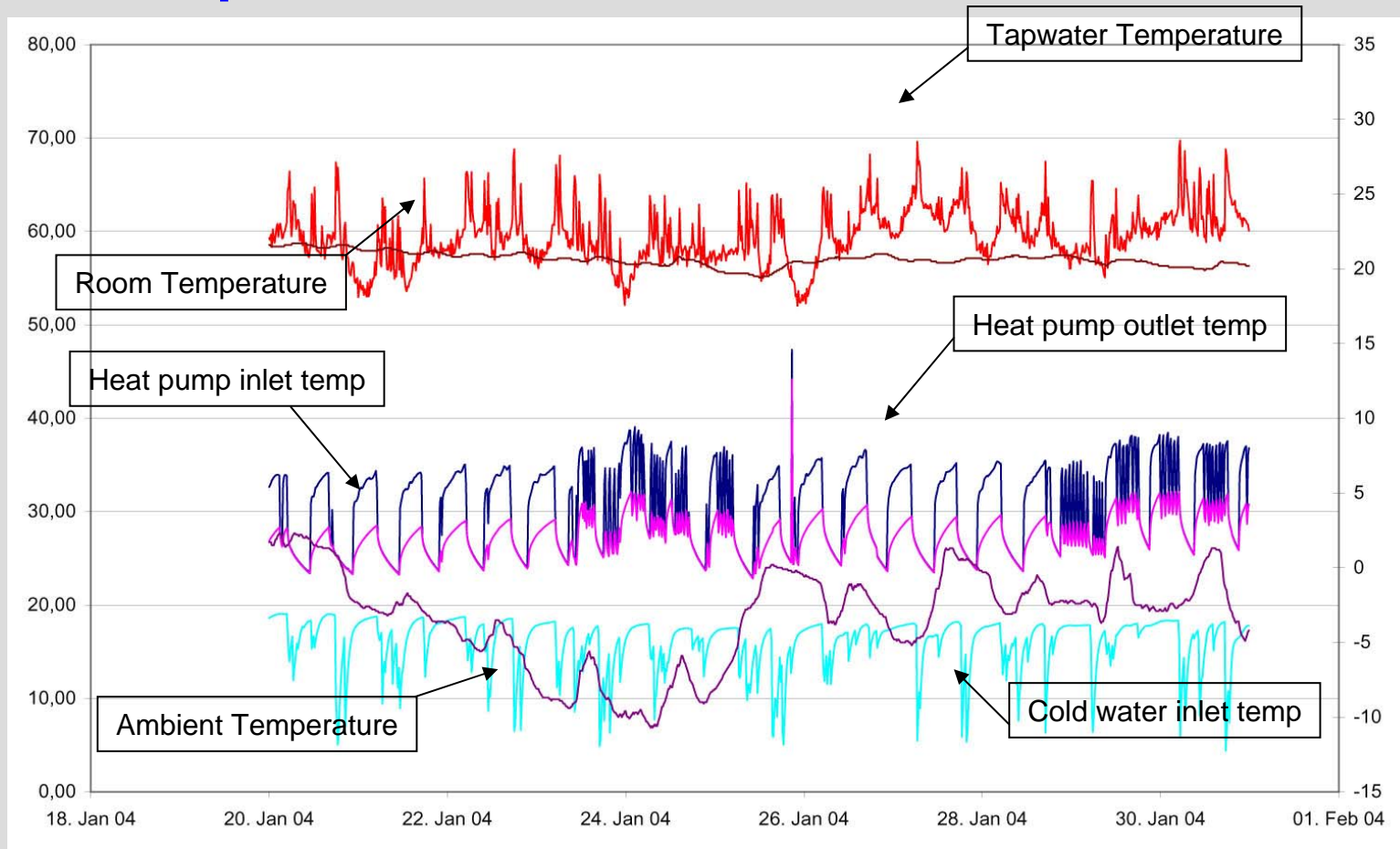
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Evaluation of the System Performance
by Field Test Results

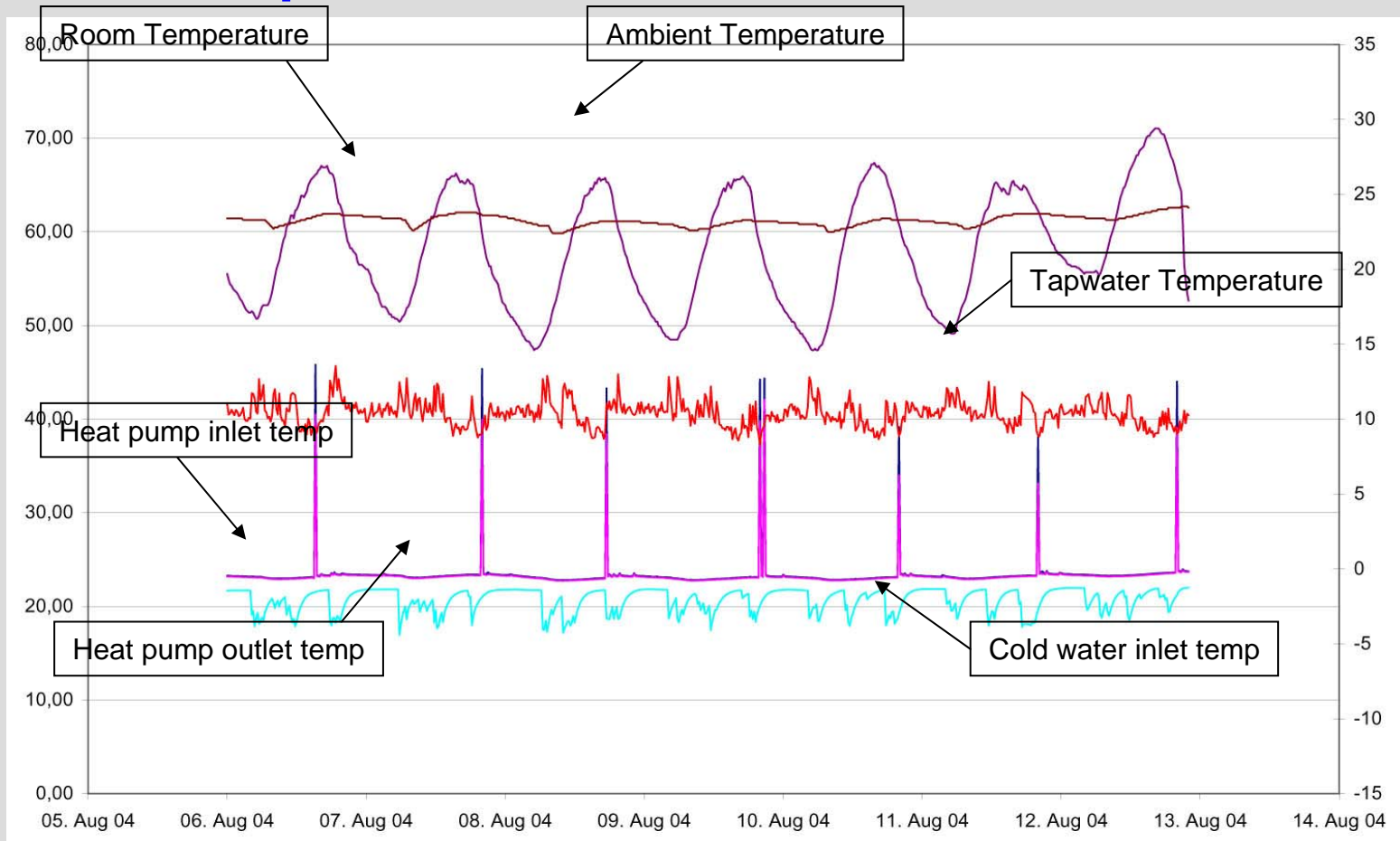
Scheme of the Direct Expansion Heat Pump Monitoring



Winter period



Summer period



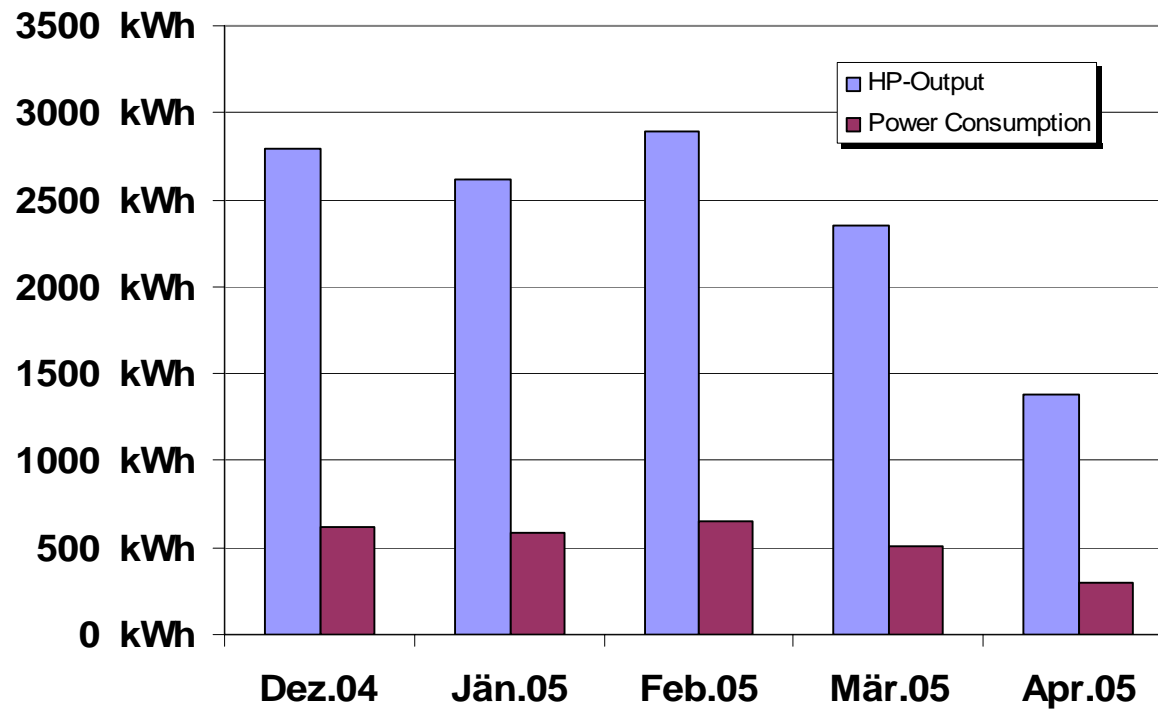
Monitoring I

- Single family house
- Heating area 240 m²
- Heating power demand 14 kW
- Horizontal Collector (DX)



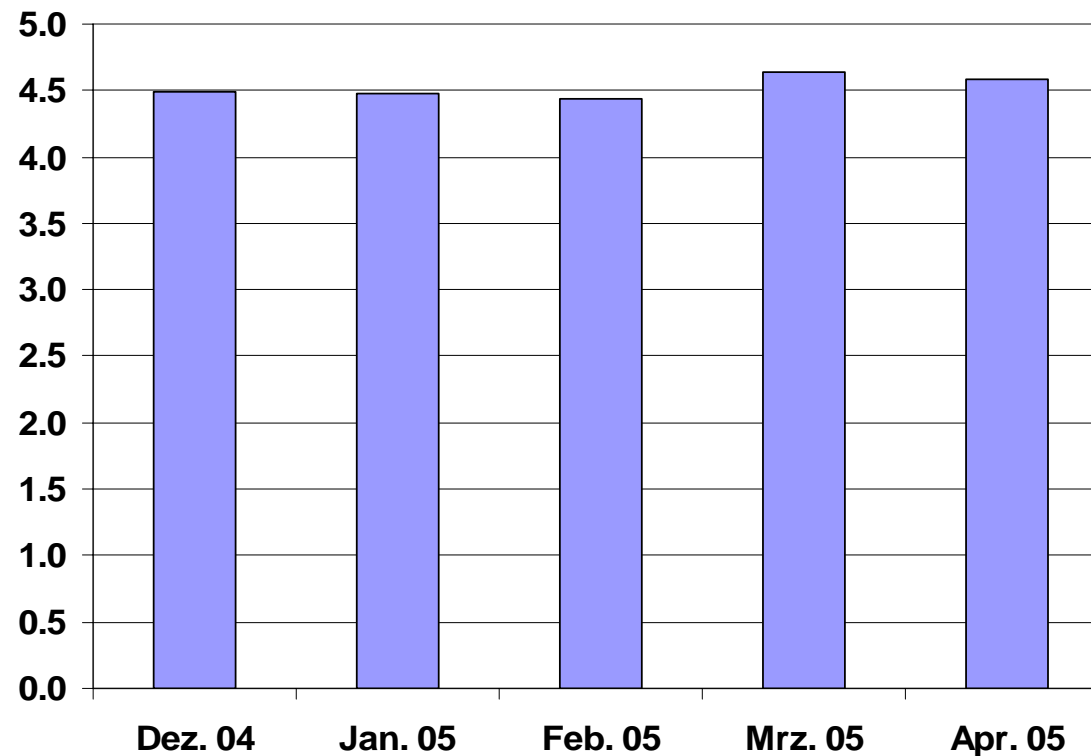
Monitoring Results I

Heating Demand - Power Consumption



Monitoring Results I

Monthly Performance Factor



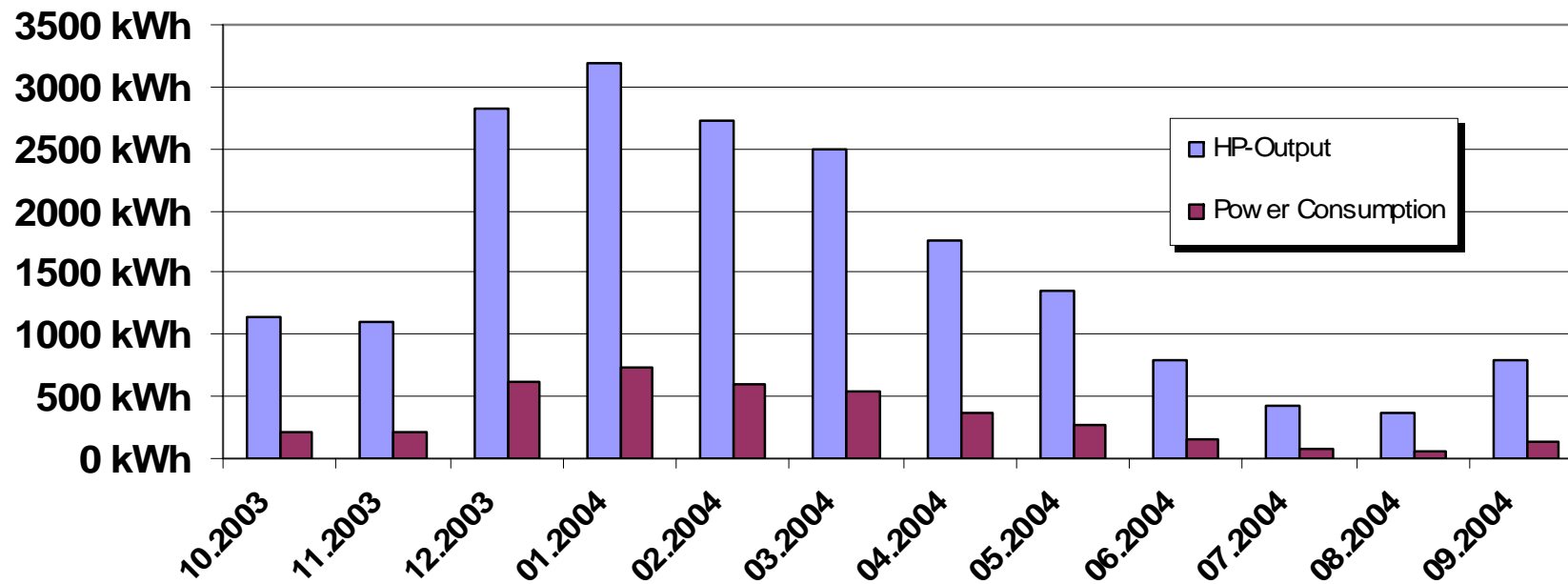
Monitoring II



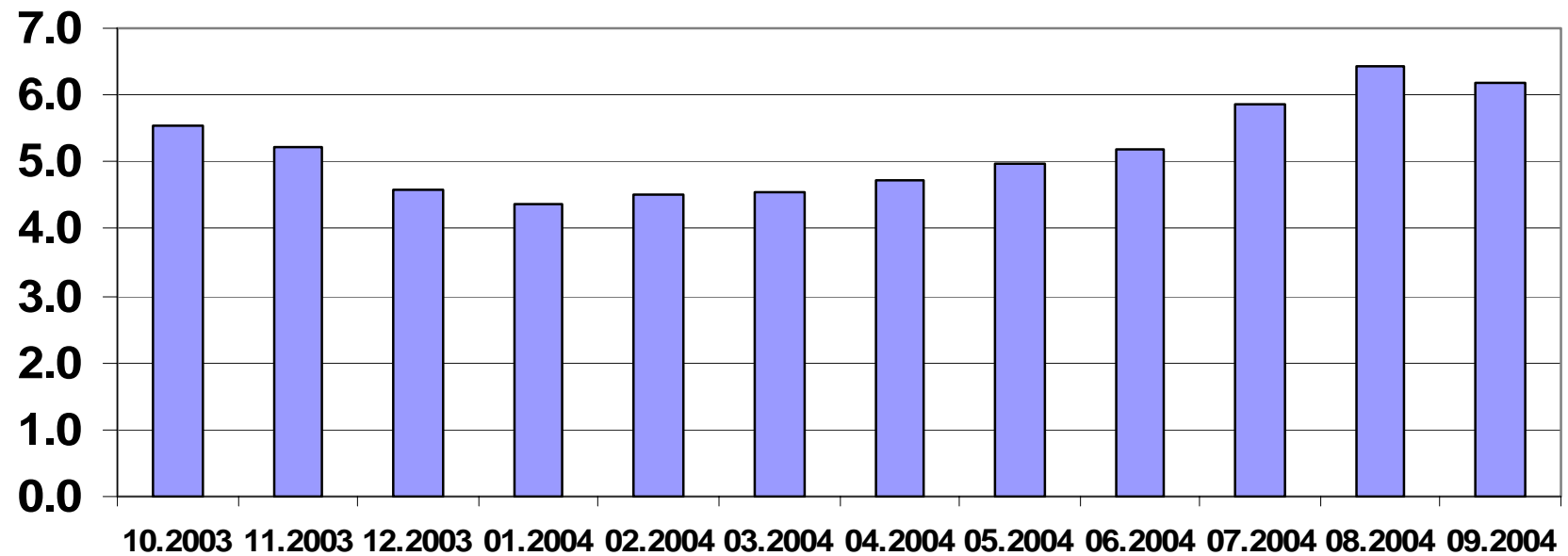
- Single family house
- Heating area 170 m²
- Heating power demand 9 kW
- Horizontal Collector (DX)

Monitoring Results II

Heating Demand - Power Consumption



Monthly Performance Factor



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Evaluation of the Calculation Approach for
Direct Expansion Heat Pumps

Principle of the Bin-Method

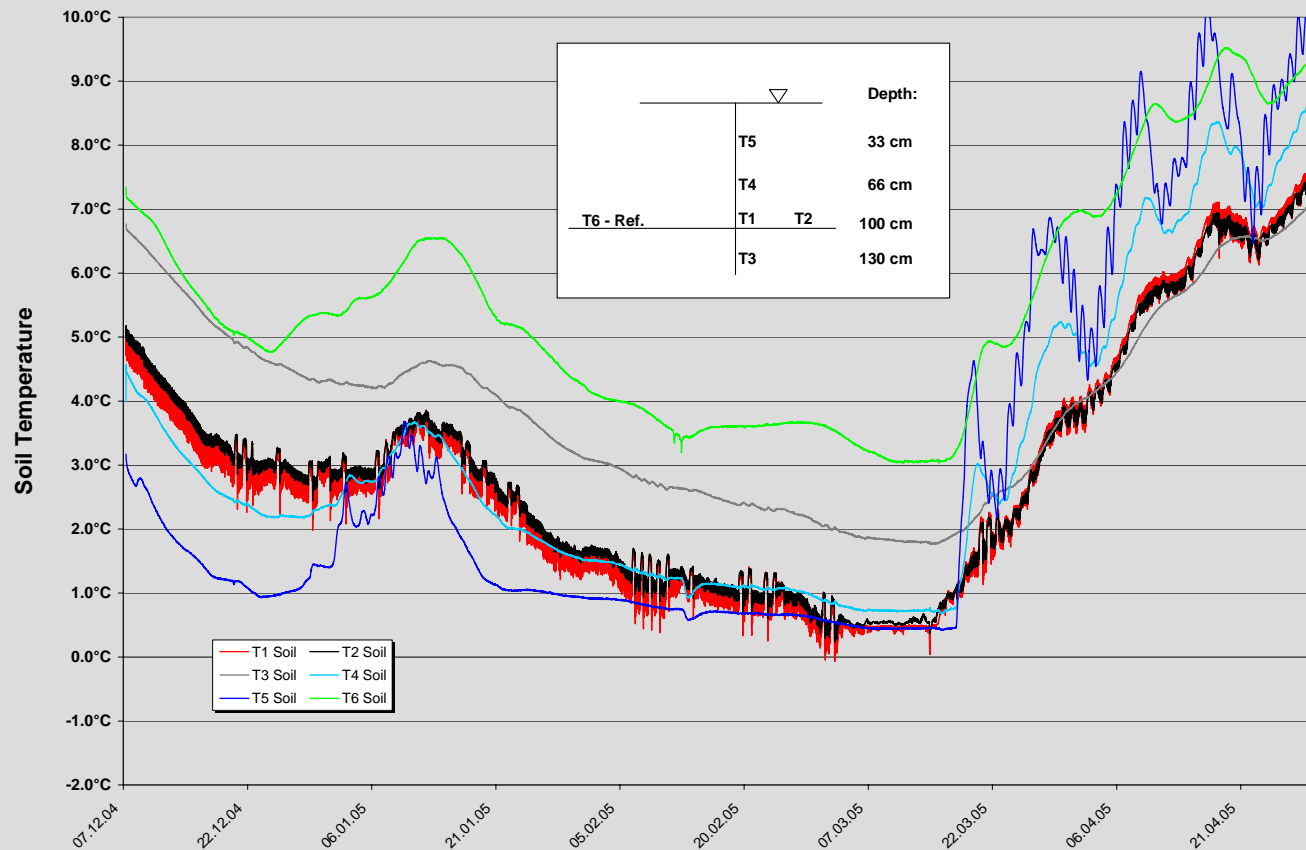
- **Partitioning the total heat consumption in bins**
- **To perform the calculation, the source temperature as a function of the outside temperature has to be defined.**
- **Difficulty: function describing this correlation, when soil is used as a heat source (brine and DX HP)**

Monitoring III



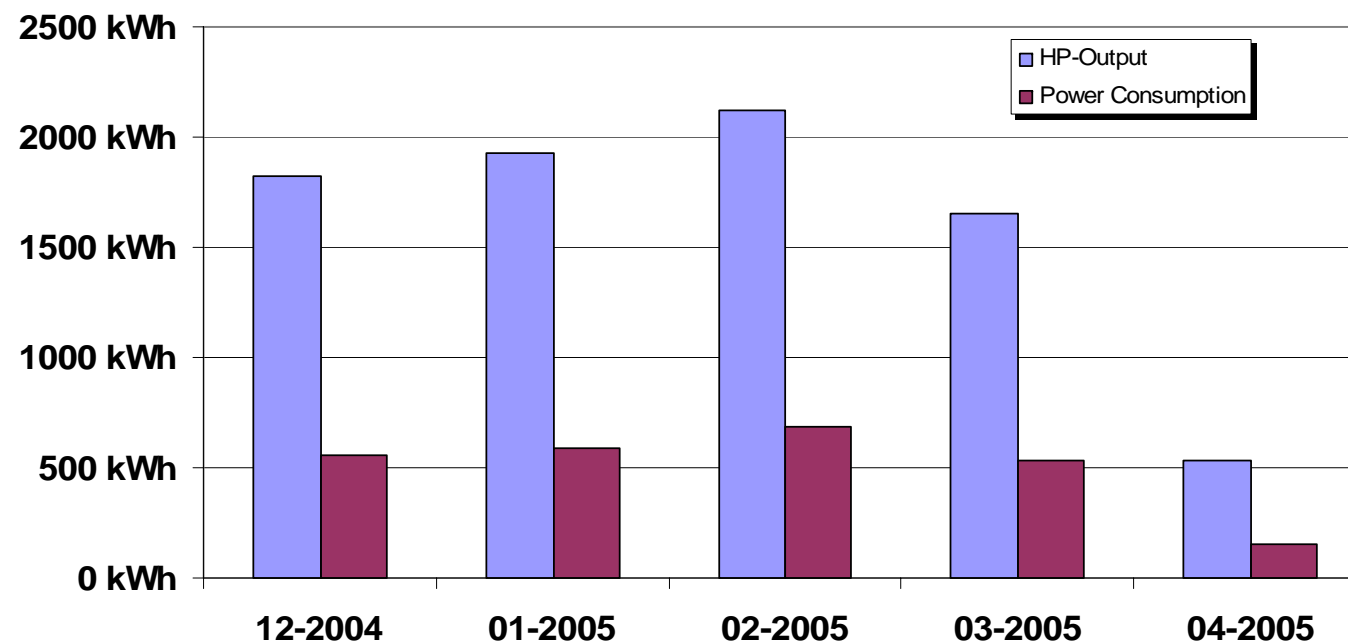
- Single family house
- Heating area 180 m²
- Heating power demand 11 kW
- Horizontal Collector (Brine)

Monitoring Results to propose the Soil Temperature as a Function of the Outside Temperature

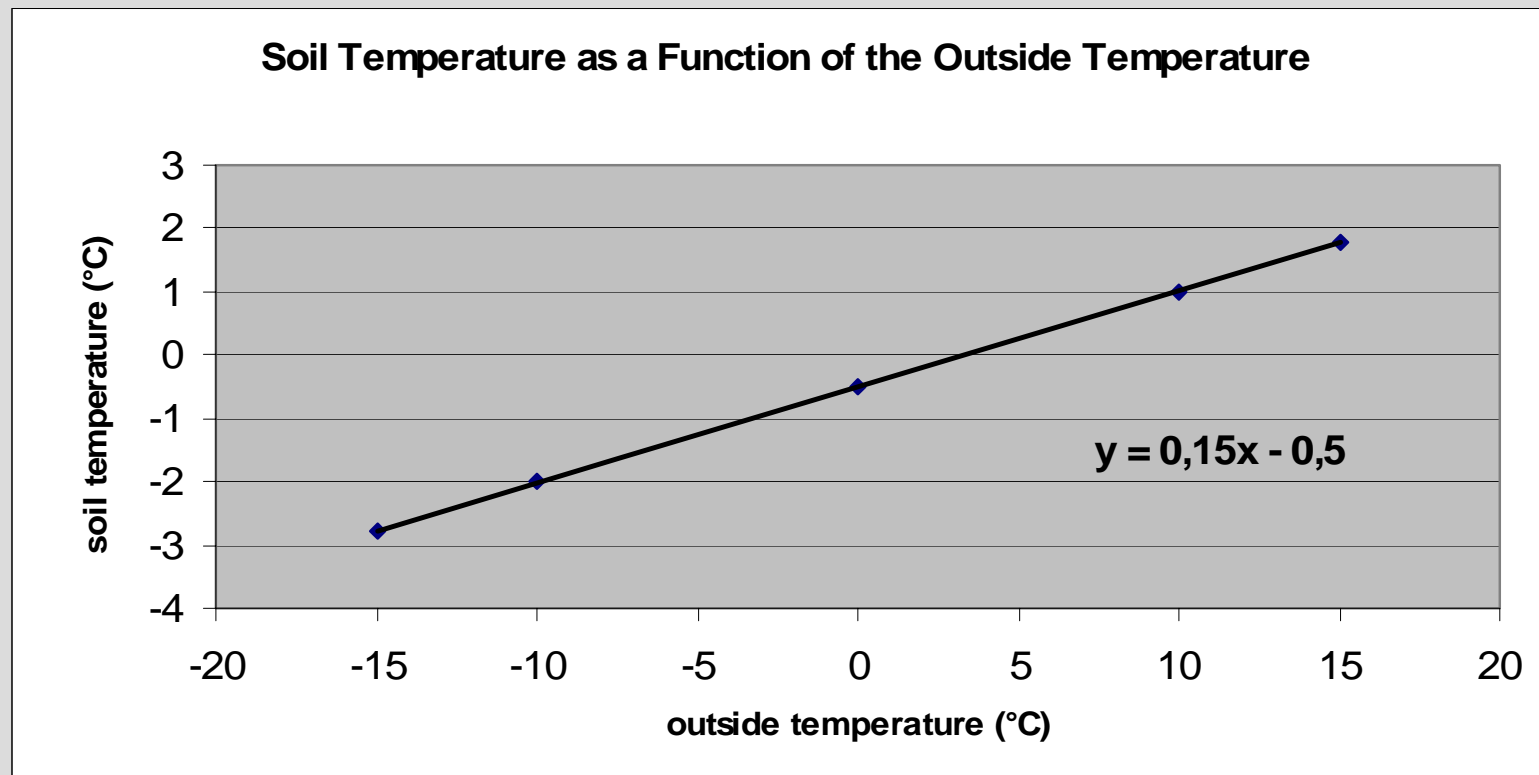


Monitoring Results to propose the Soil Temperature as a Function of the Outside Temperature

Heating Demand - Power Consumption



Monitoring Results to propose the Soil Temperature as a Function of the Outside Temperature

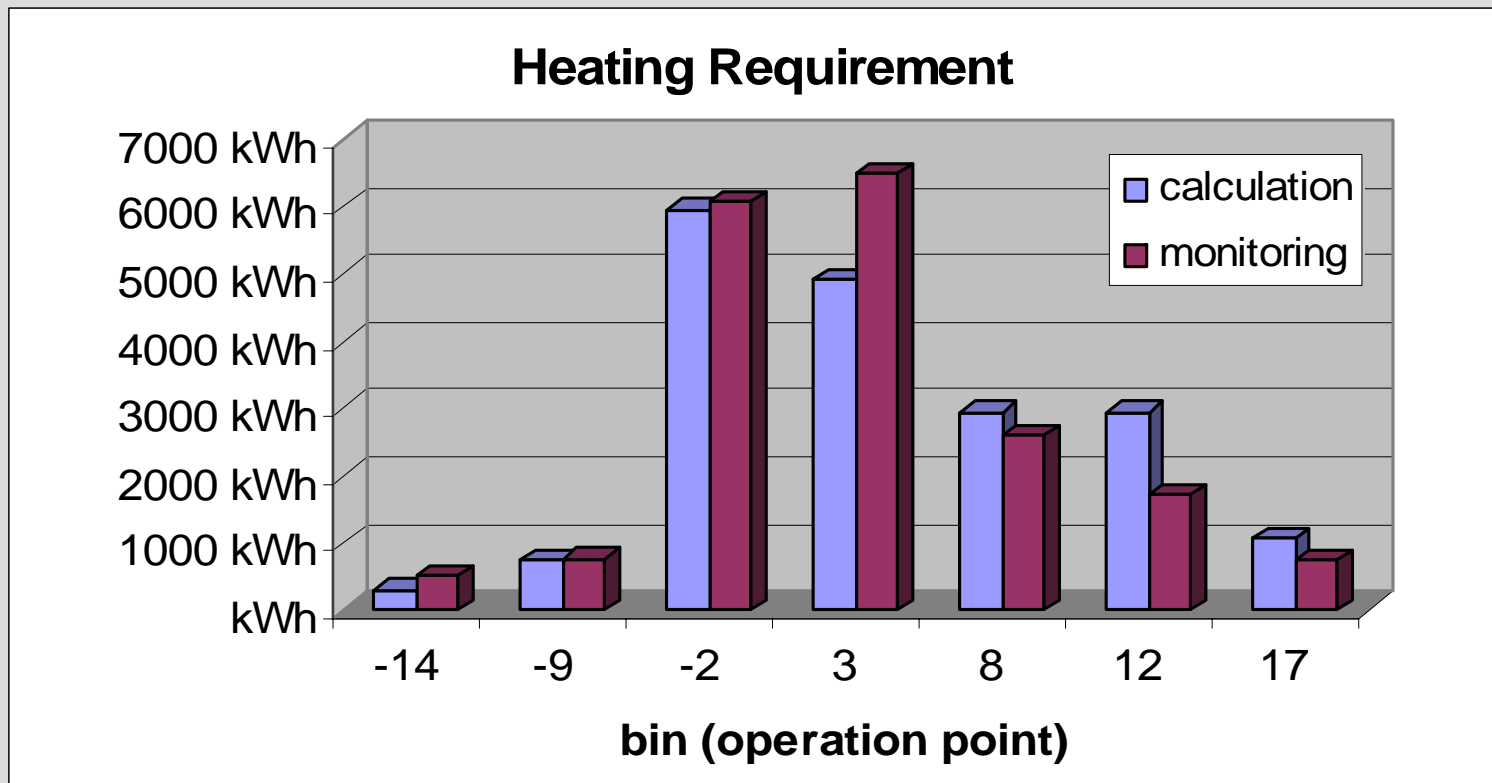


Evaluation Results of the Bin-Method for DX-Heat Pump Systems

Data of the monitored Heat Pump System:

- Heating energy requirement of the distribution system: 18905 kWh
- Emitter type: floor heating
- Upper temperature limit for heating: 18°C
- Outdoor design temperature: -16°C
- Indoor temperature: +22°C
- Supply temperature at outdoor design temperature: 35°C

Evaluation Results of the Bin-Method for DX-Heat Pump Systems



Evaluation Results of the Bin-Method for DX-Heat Pump Systems

- Results of the monitored Heat Pump System:

SPF: 4,3

Running Time: 2063 h

- Results of the Calculation according to the Bin-Methode with heat source temperature as a linear function of the outside temperature:

SPF: 4,4

Running time: 2038h

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