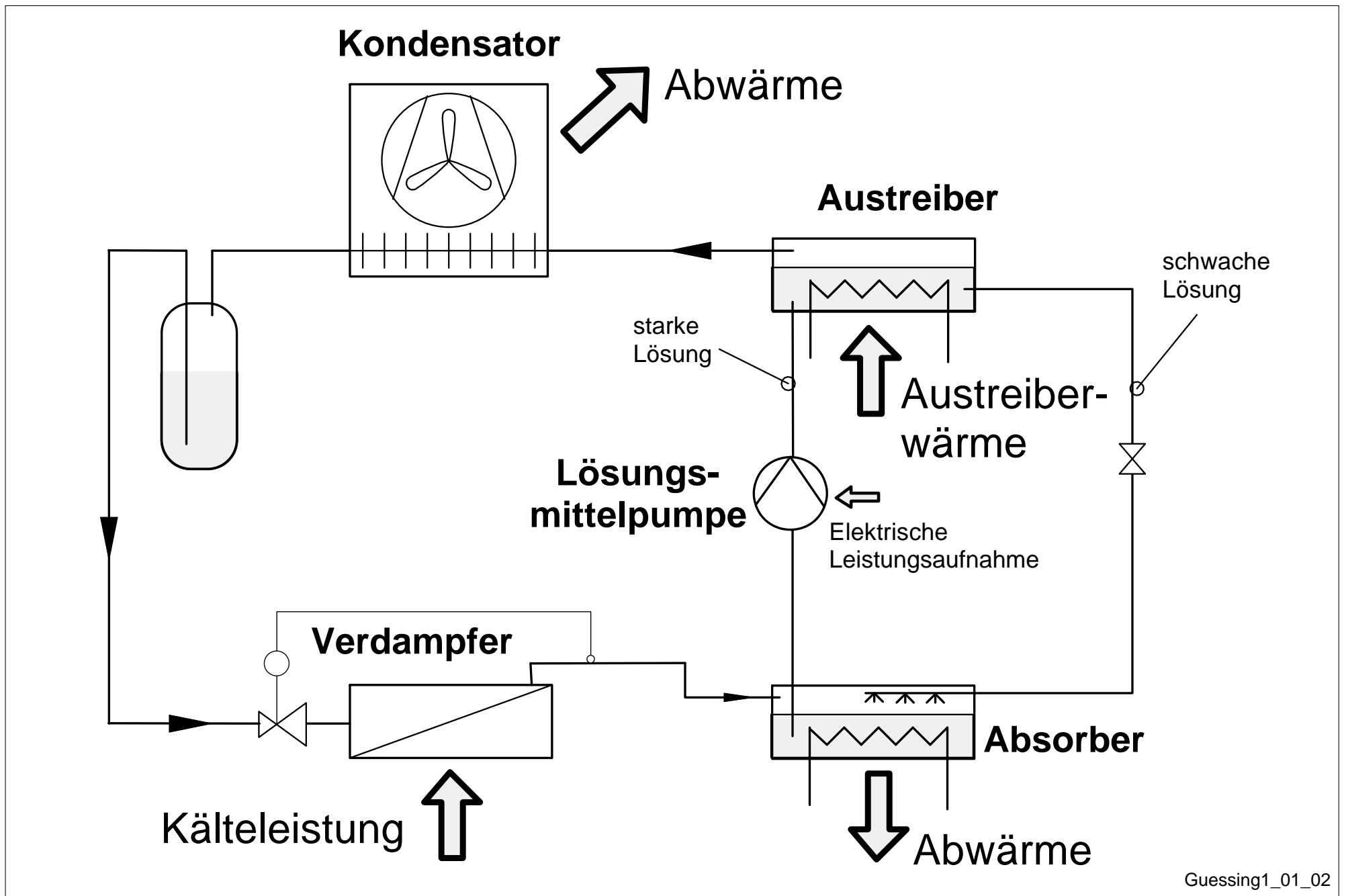


# Cooling by district heating

DI Dr. Richard Zweiler



## absorption cooling device - basic principle



## Design point / Operating conditions:

Cooling power: 210 kW (3 \* 70 kW)

Required thermal power: 234 kW

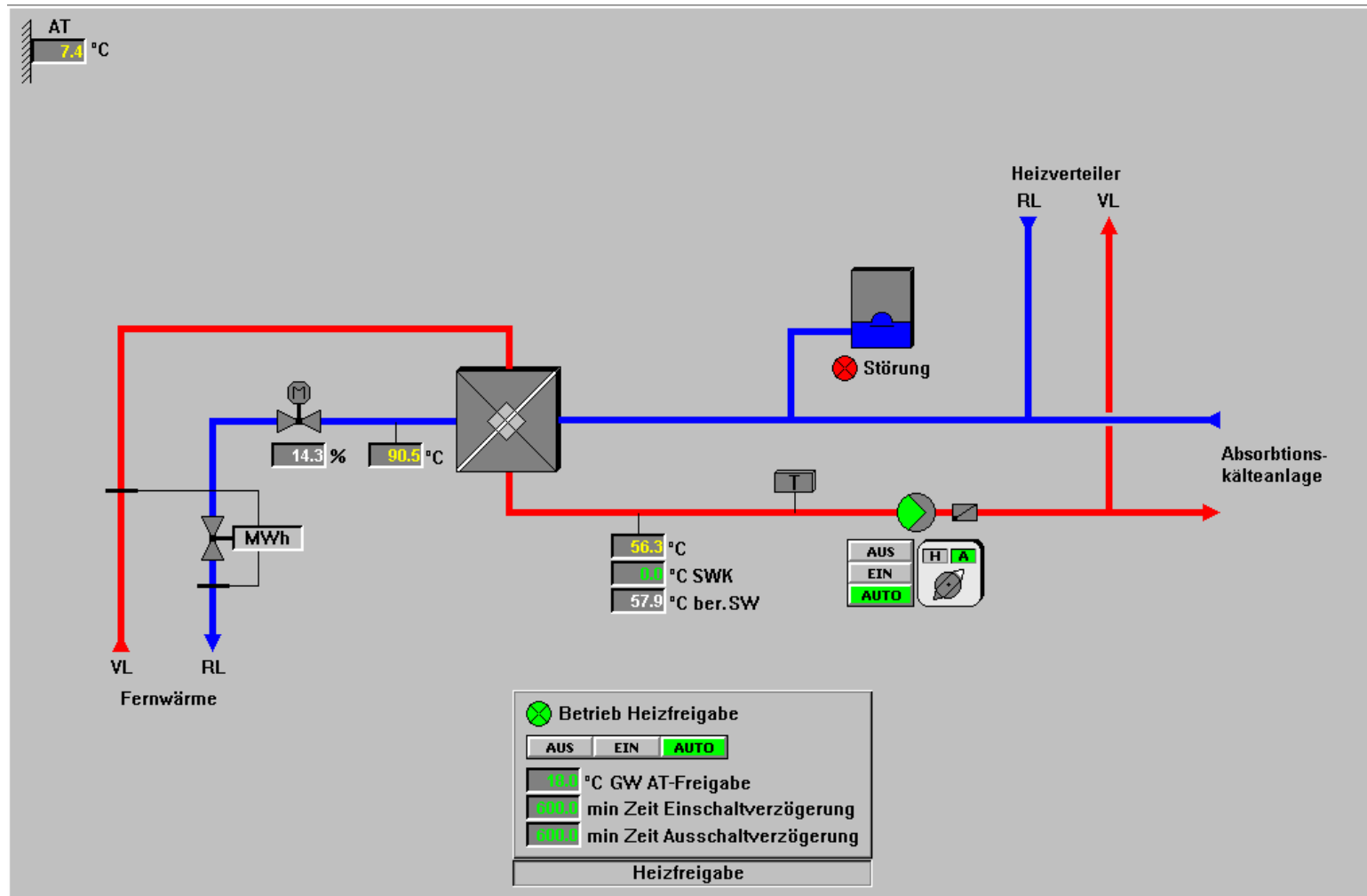
Cooling loop: 10°C / 14°C

District heating: 95°C / 85-90°C

Wet Cooling tower: 35°C / 25°C

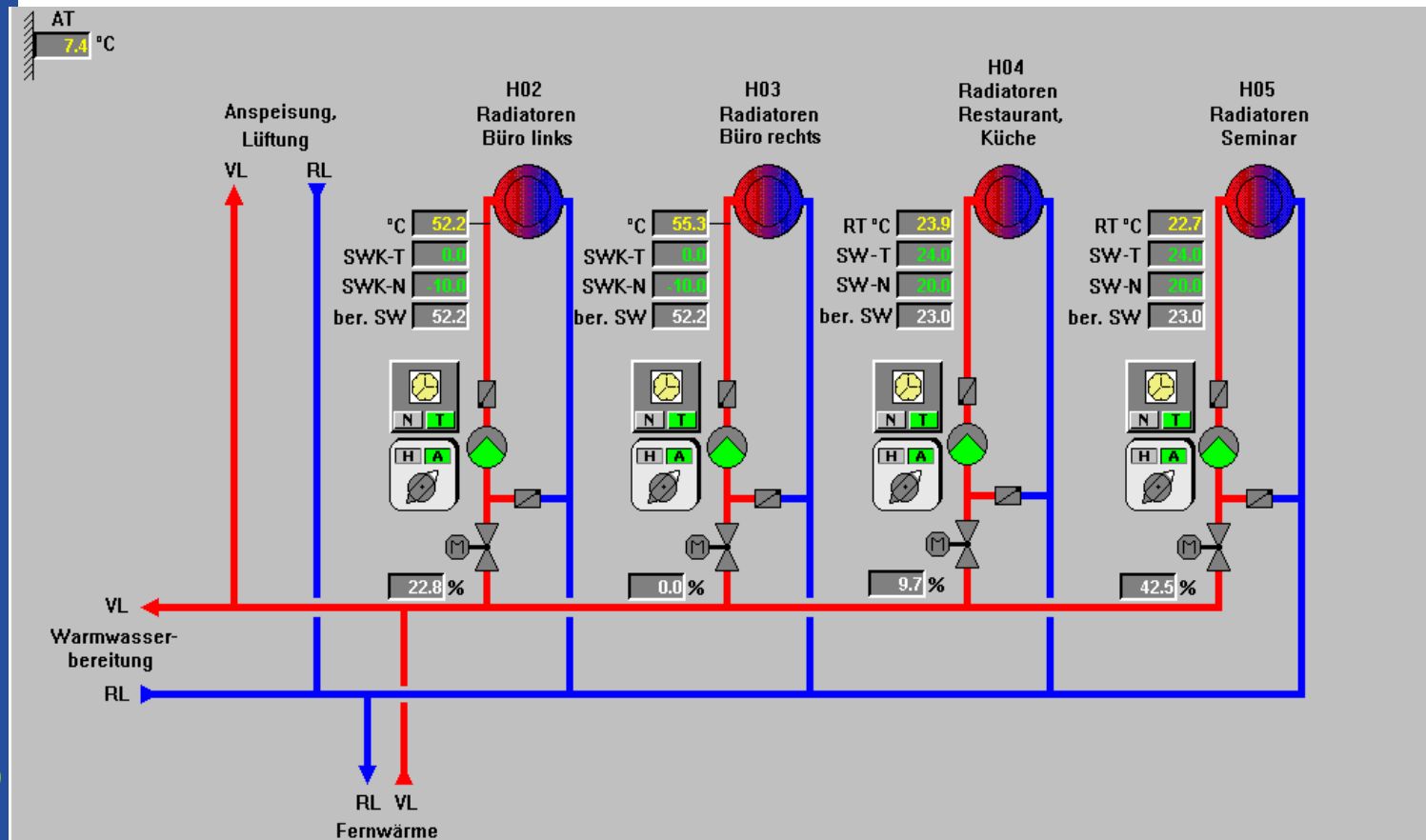
Buffer storage: 3000 Liter

## Connection to the grid

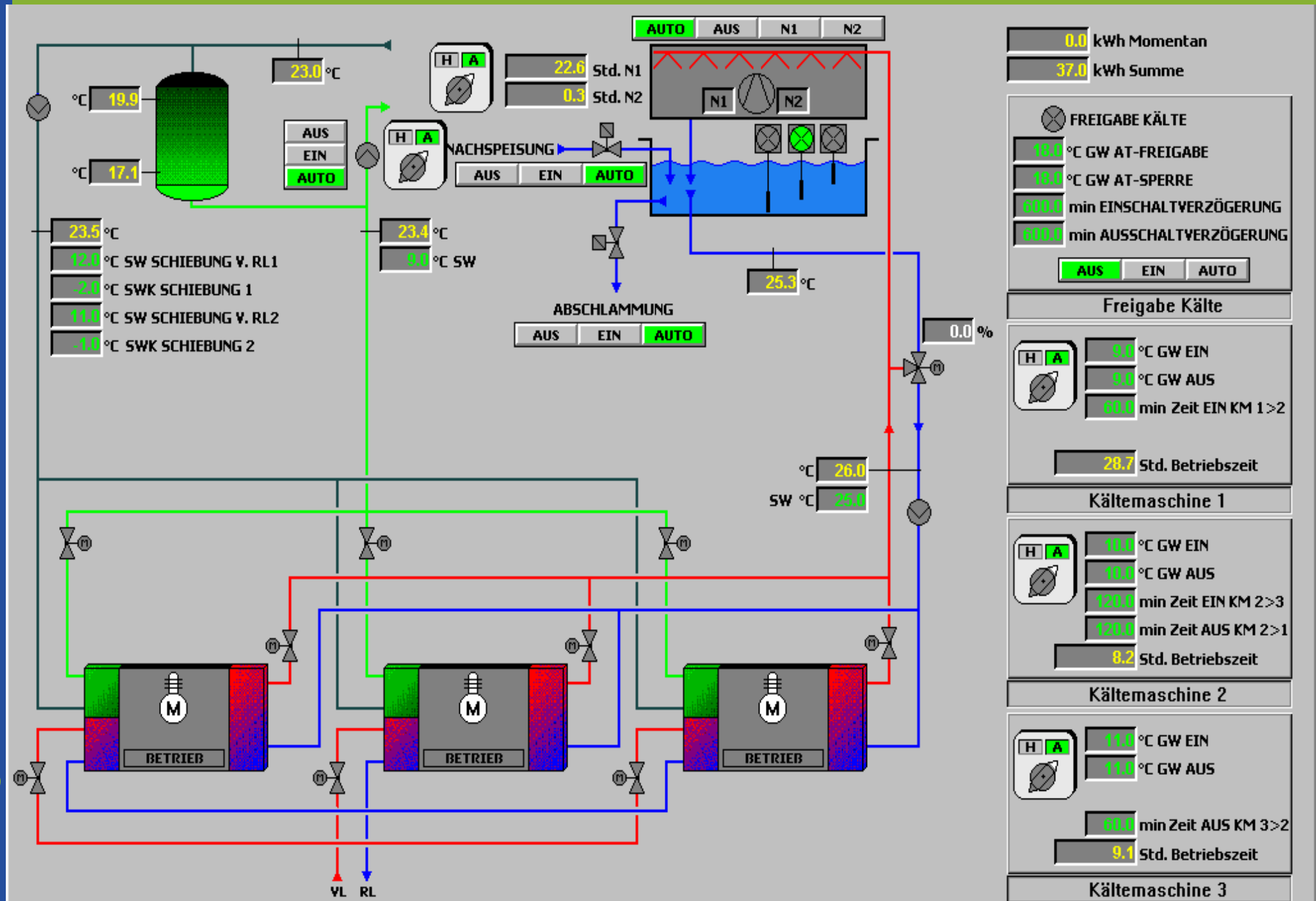


# Distribution system

Hot water kitchen	35,0 kW
Air conditioning	75,6 kW
H02	92,1 kW
H03	81,2 kW
H04	5,8 kW
H05	7,0 kW



# PLS - Screenshot



## Wet cooling tower

- Highly effective cooling due to evaporation of the water
- Water treatment system required



## District heating:

Flow to low.

Pump control system calibrated to fix that problem.

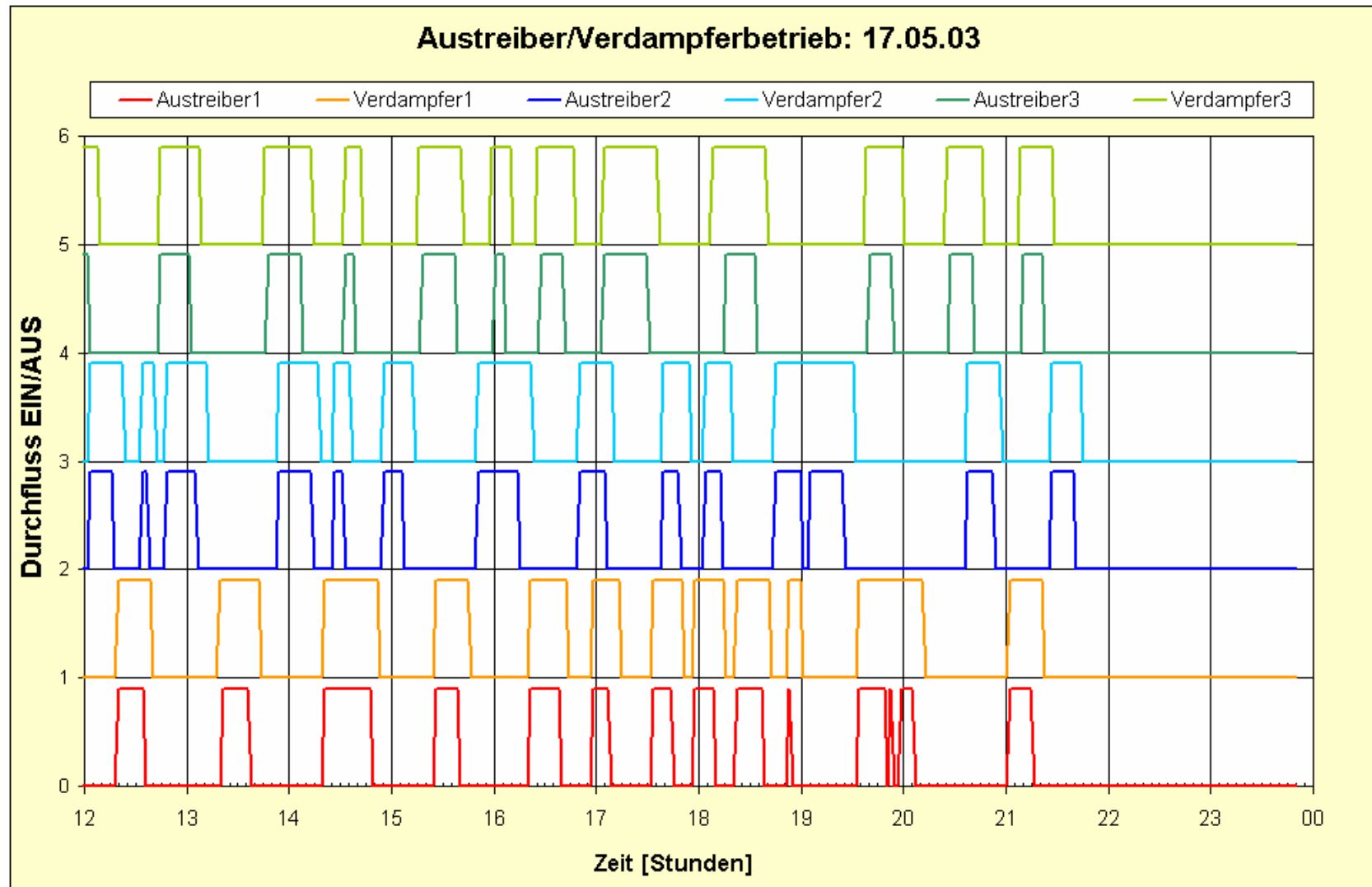
## Cooling water:

Flow to high.

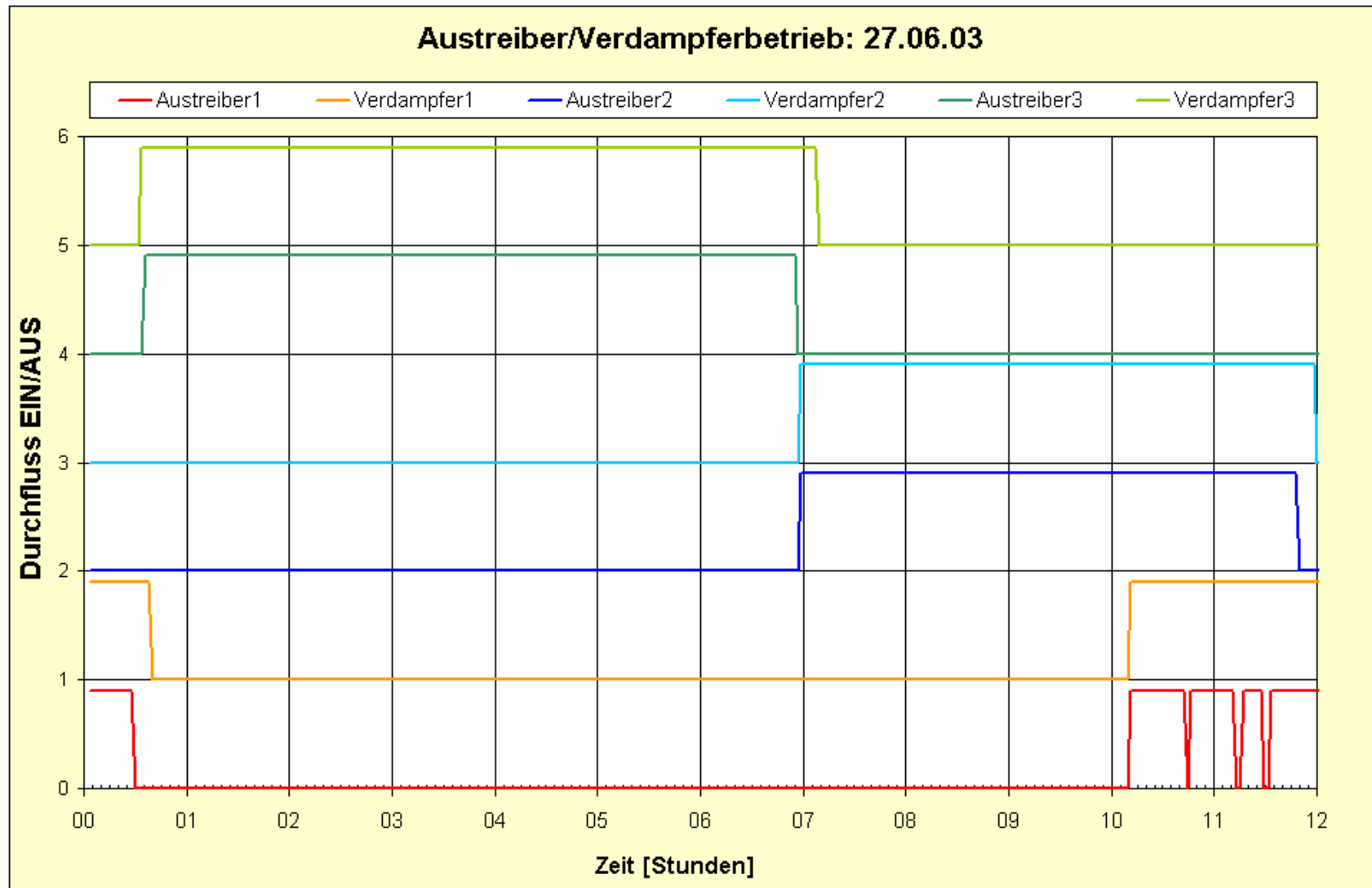
Calibration of distribution system.



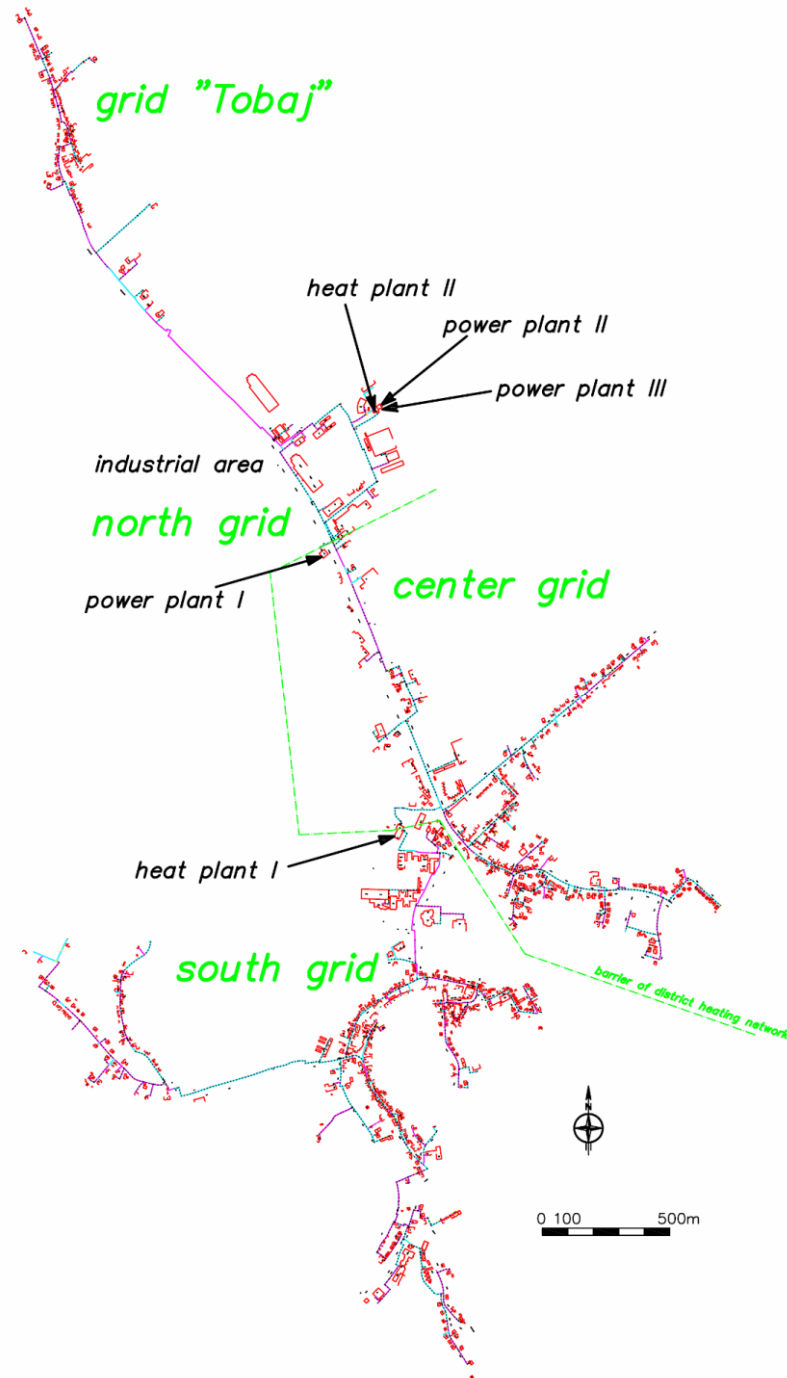
## Operation cycle before optimization



## Operation cycle after optimization



## District heating system Güssing



temperature level:

120°C / 70°C

Consumers:

Constant thermal load of 2 MW

This means lucky conditions  
with a high base load

## Operation during summertime:

120°C / 70°C for industrial consumers

95°C / 85°C for **A**dsorption **C**ooling **D**evice

Power ACD: ~ 200 kW

Power district heating system: ~ 2000 kW

Power ratio (ACD / ind. consumers) ~ 1:10

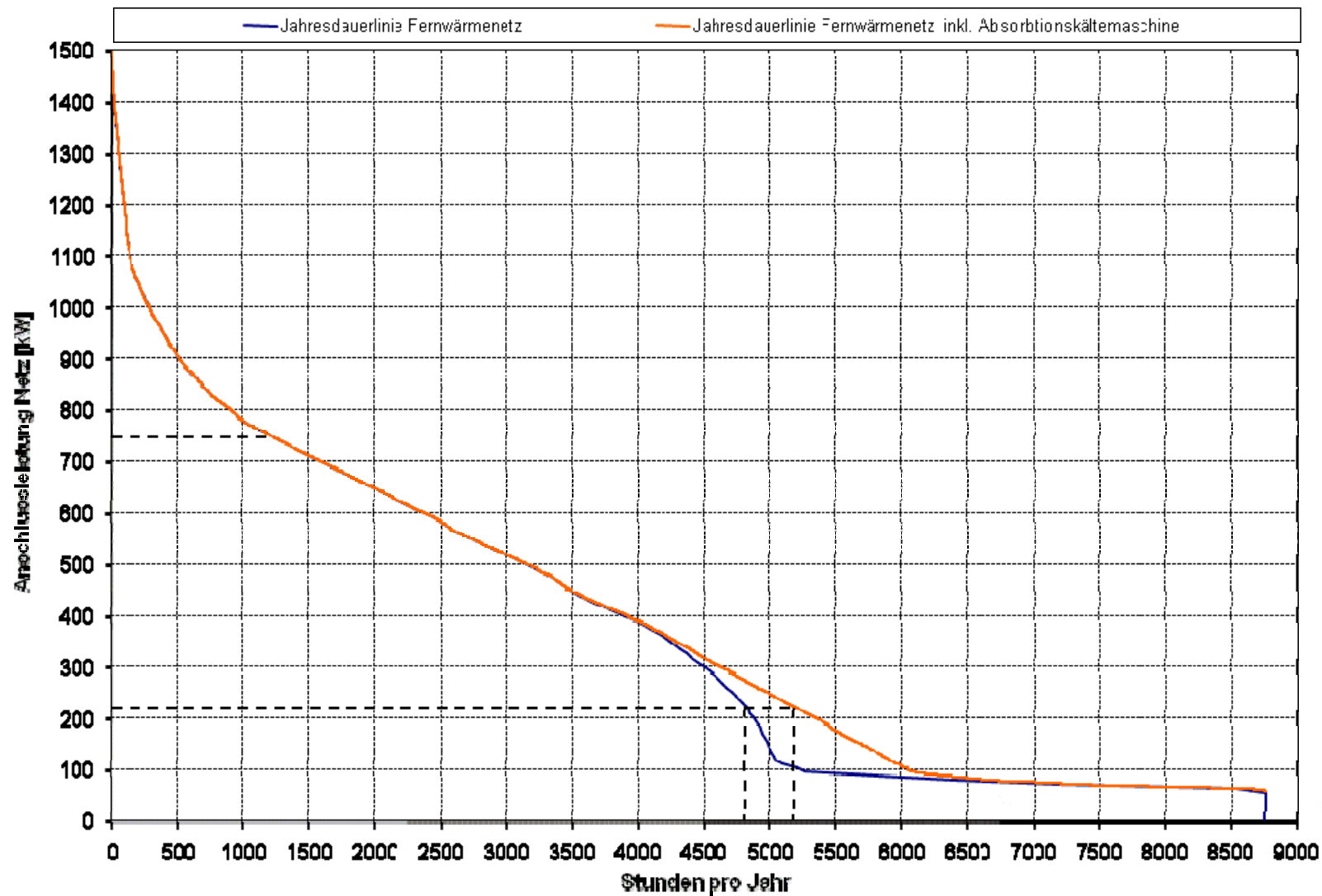
Ratio mass flow (ACD / ind. consumers) ~ 1:2

## Annual load line

- ◆ Cooling power corresponding to outside temperature 20°C – 36°C
- ◆ Max. power district heating ACD 250 kW<sub>therm</sub>
- ◆ Peak power district heating 1500 kW
- ◆ thermal power boiler 750 kW
- ◆ Minimum load biomass boiler 30%

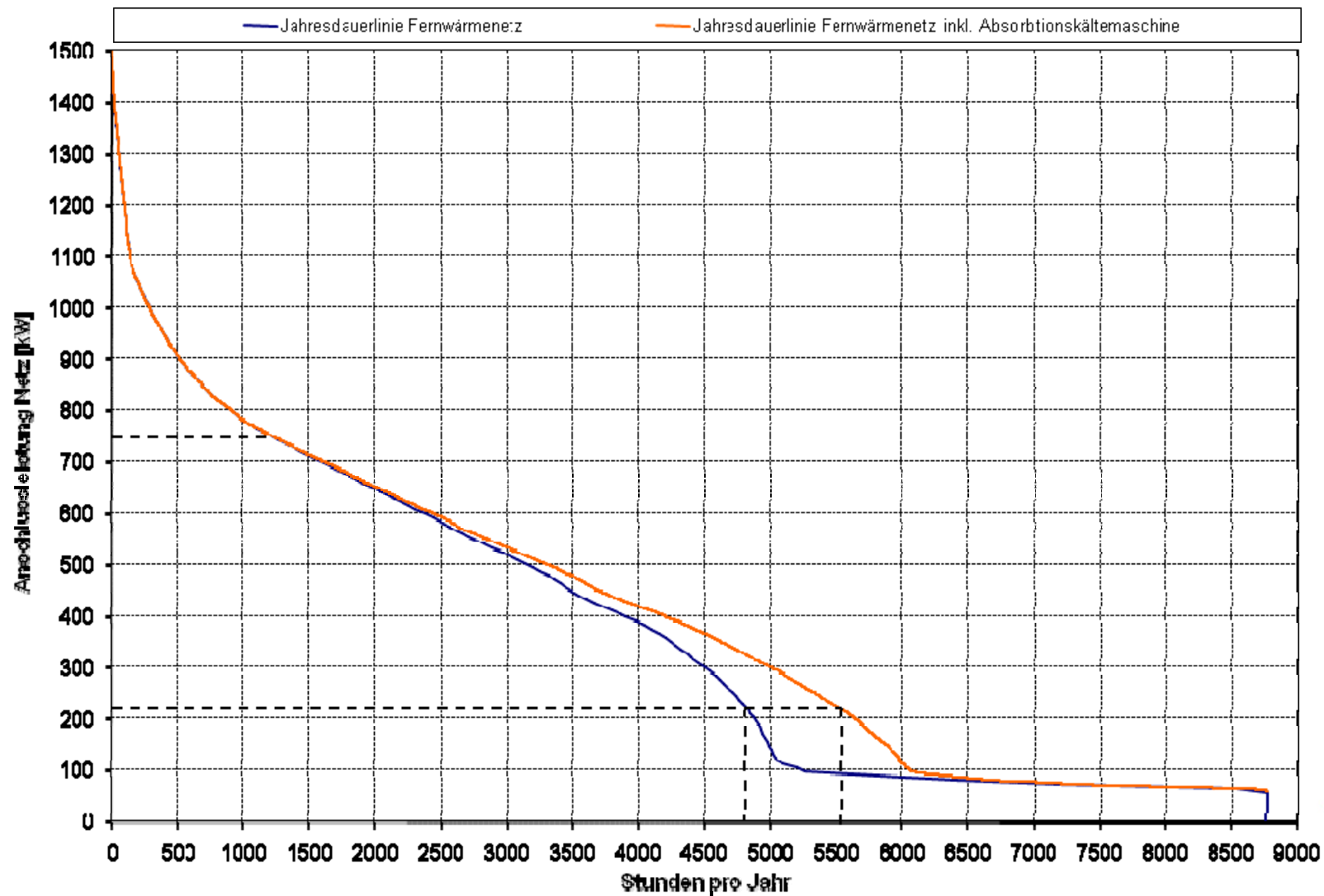
3295 MWh total  
2680 MWh Biomass  
615 MWh Oil

3414 MWh total  
2804 MWh Biomass  
610 MWh Oil



3295 MWh total  
2680 MWh Biomass  
615 MWh Oil

3533 MWh total  
3191 MWh Biomass  
559 MWh Oil



## Border conditions for evaluation of economic efficiency:

- ◆ 2003
- ◆ Costs district heating 33,4 €/MWh



## Specific costs conventional systems

Operational costs conventional air conditioner (01.04.2003 - 30.09.2003) Cooling Power 120 kW	
<b>COP</b>	<b>2,76</b>
Cooling demand [kWh]	47730
Network access fee [€]	2943
Electricity costs [€]	1628
<b>Total costs for cooling [€]</b>	<b>4571</b>
<b>Specific costs [€/kWh]</b>	<b>0,095</b>

### Calculation of economy for ACD

(01.04.2003 - 30.09.2003)

cooling power 120 kW

COP	COP 2003	COP	COP	COP
	0,36	0,5	0,6	0,7
Cooling demand [kWh]	47730	47730	47730	47730
Network access fee [€]	1149	1149	1149	1149
Electricity costs [€]	450	450	450	450
Costs district heating [€]	4491	3188	2657	2277
<b>Total [€]</b>	<b>6090</b>	<b>4787</b>	<b>4256</b>	<b>3876</b>
<b>Specific costs [€/kWh]</b>	<b>0,127</b>	<b>0,100</b>	<b>0,089</b>	<b>0,081</b>

