Germany's largest Solar District Heating System with Seasonal Thermal Energy Storage in Crailsheim
- Monitoring Results and Future Potentials -

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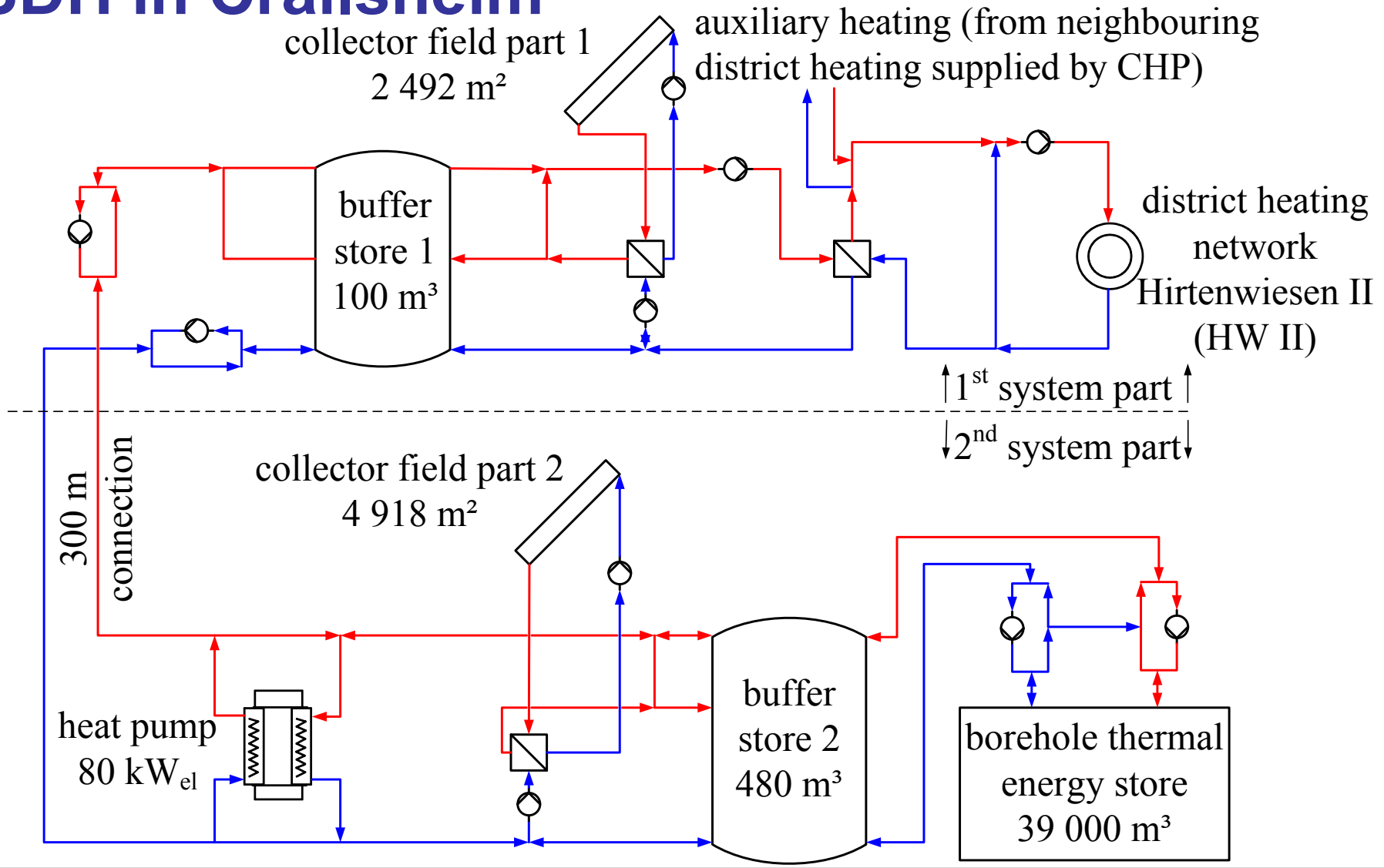
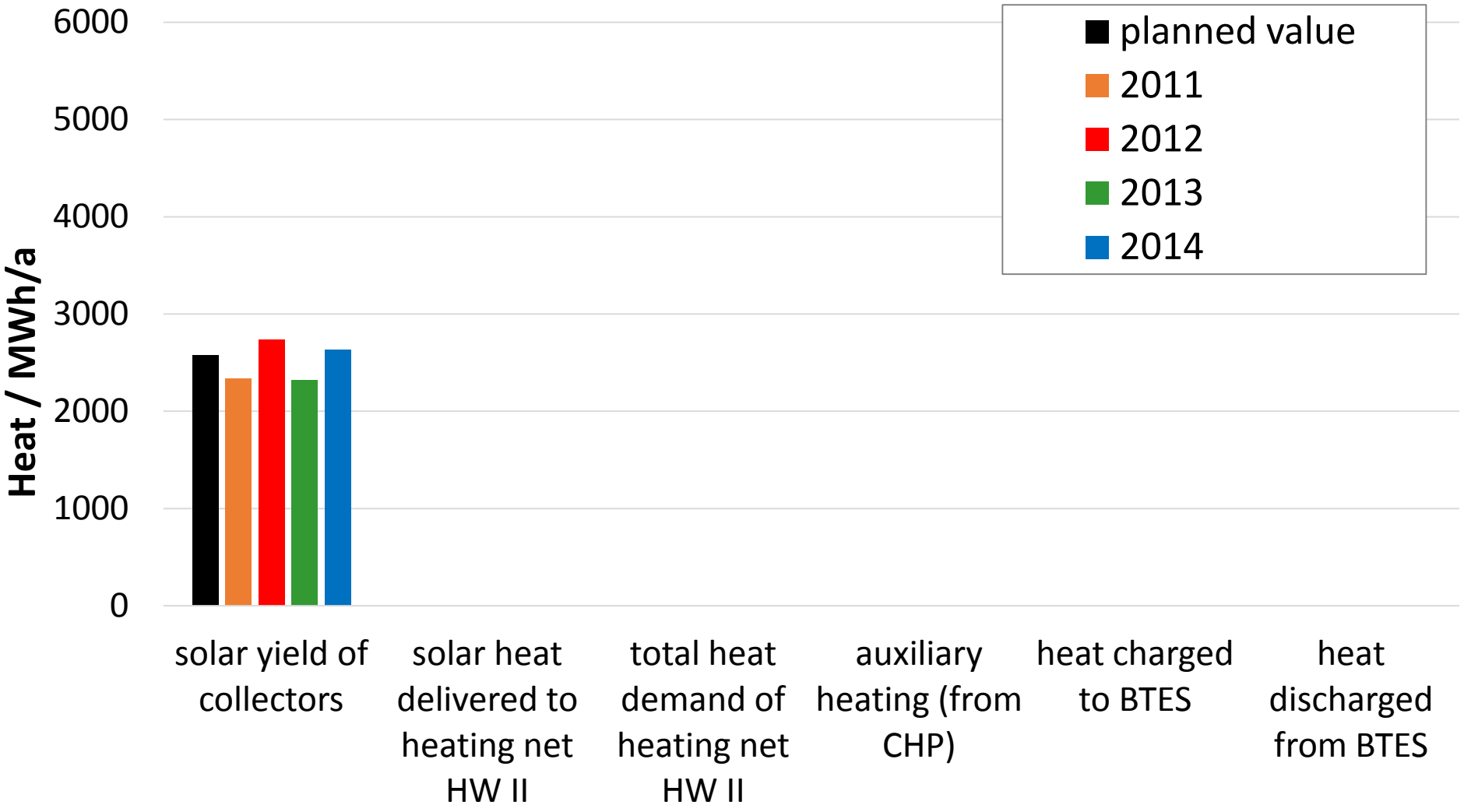
SDH in Crailsheim



Monitoring Results



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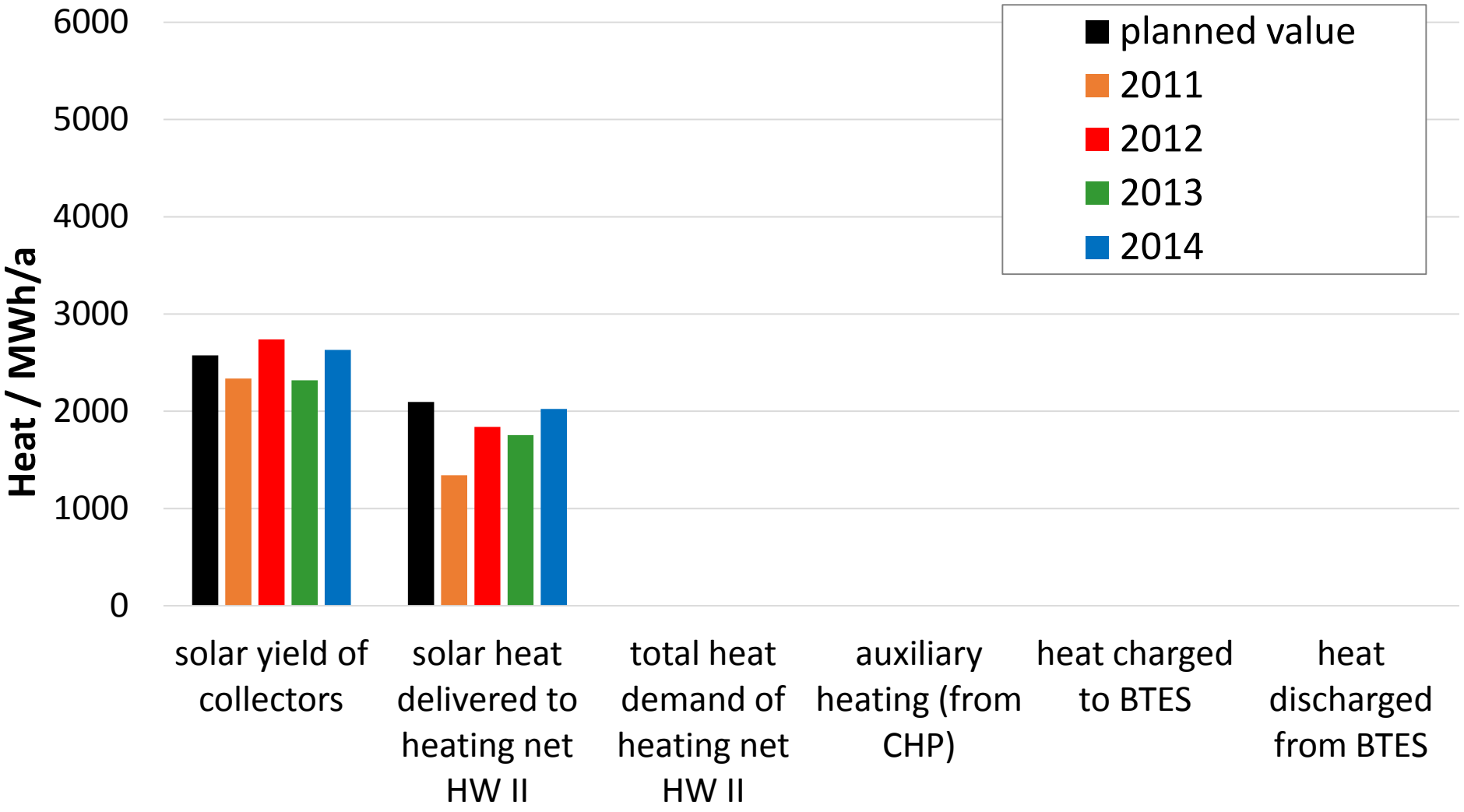

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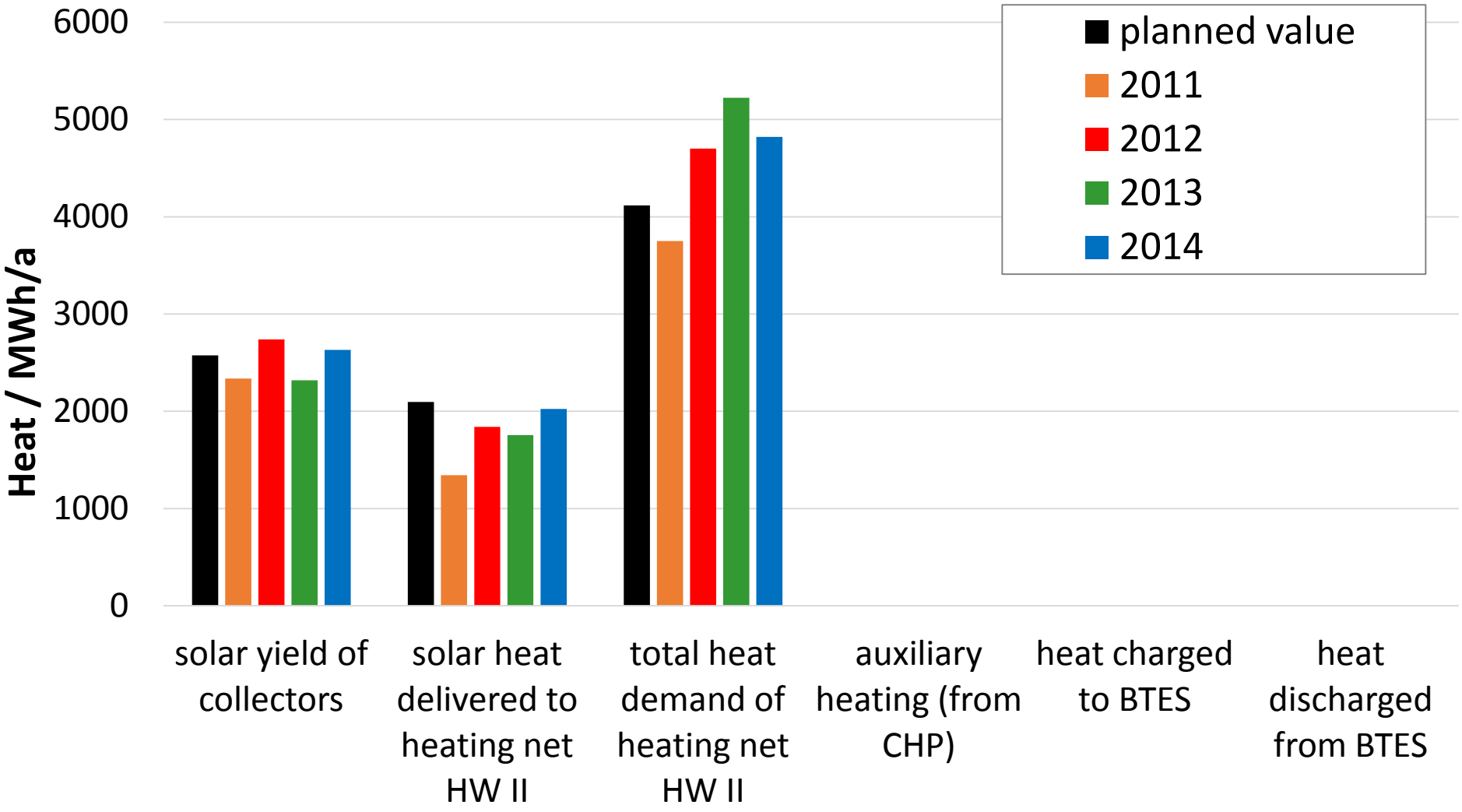

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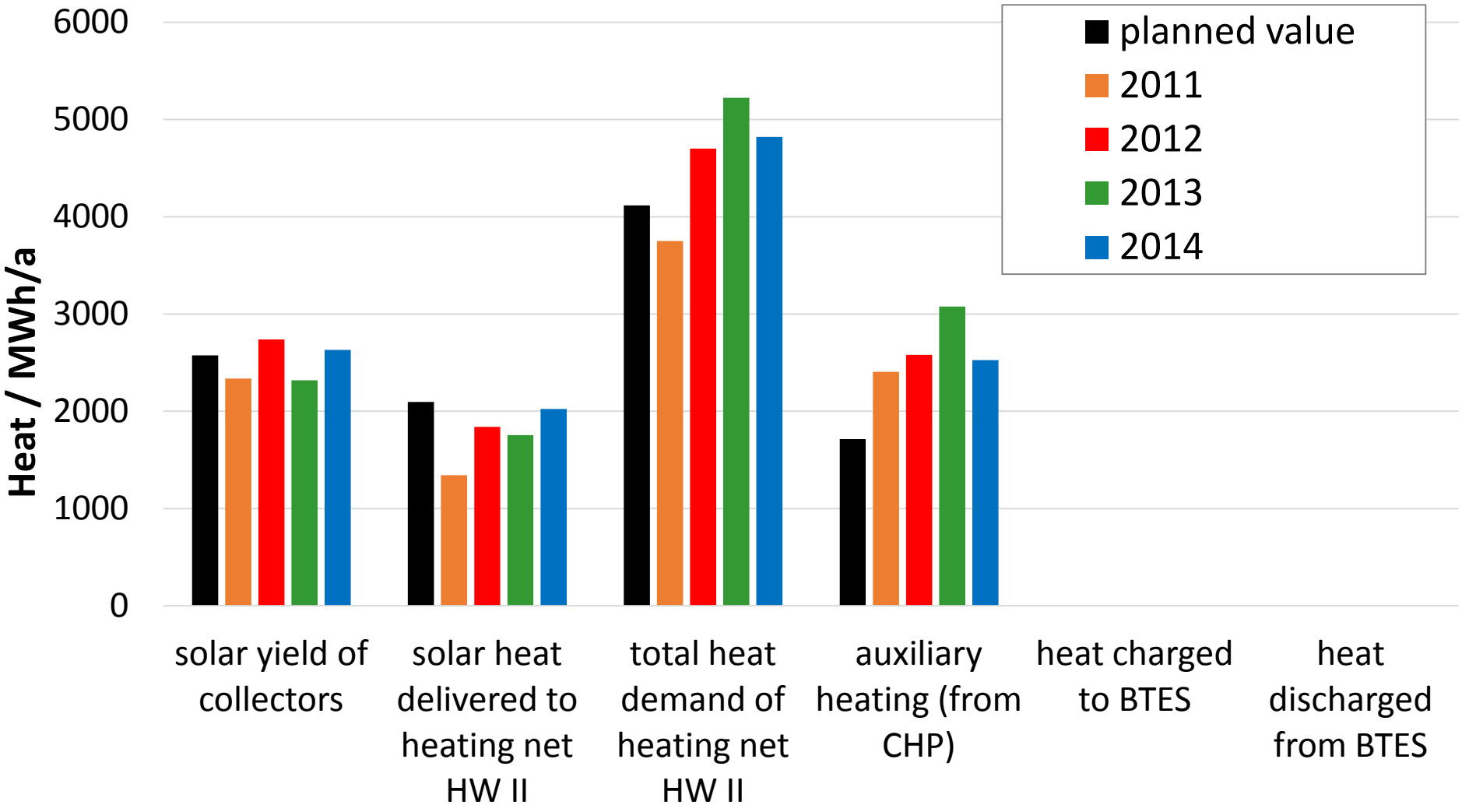

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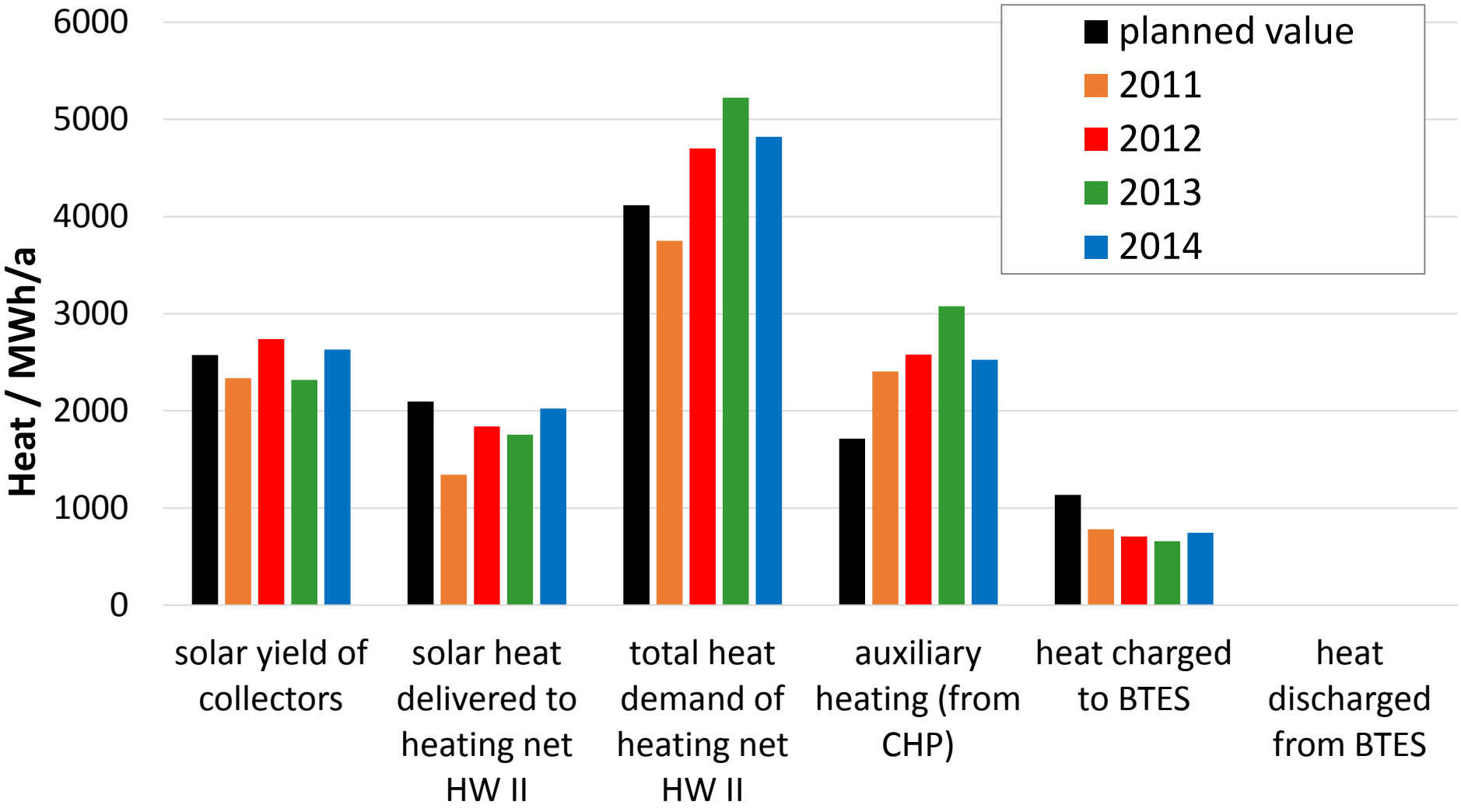

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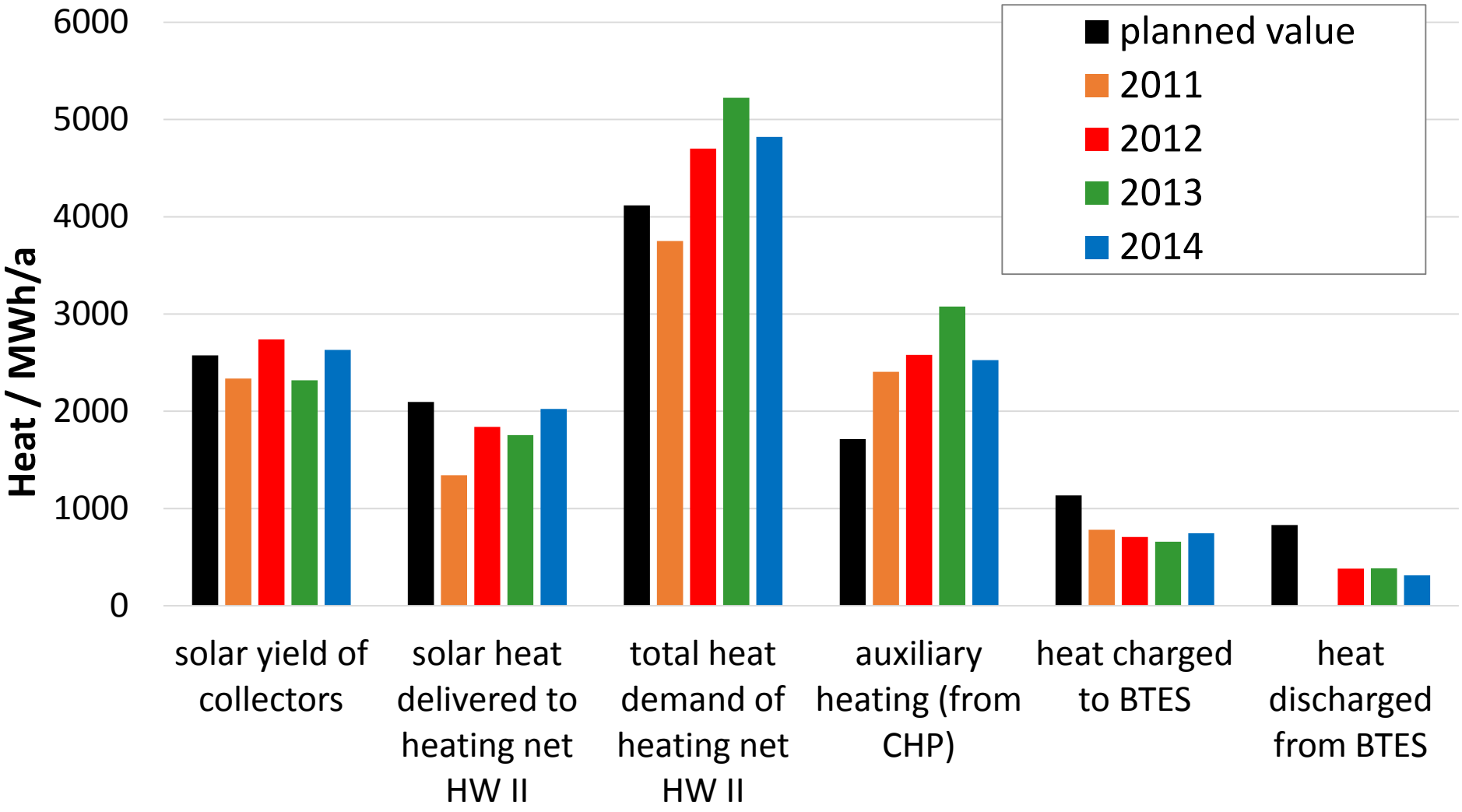

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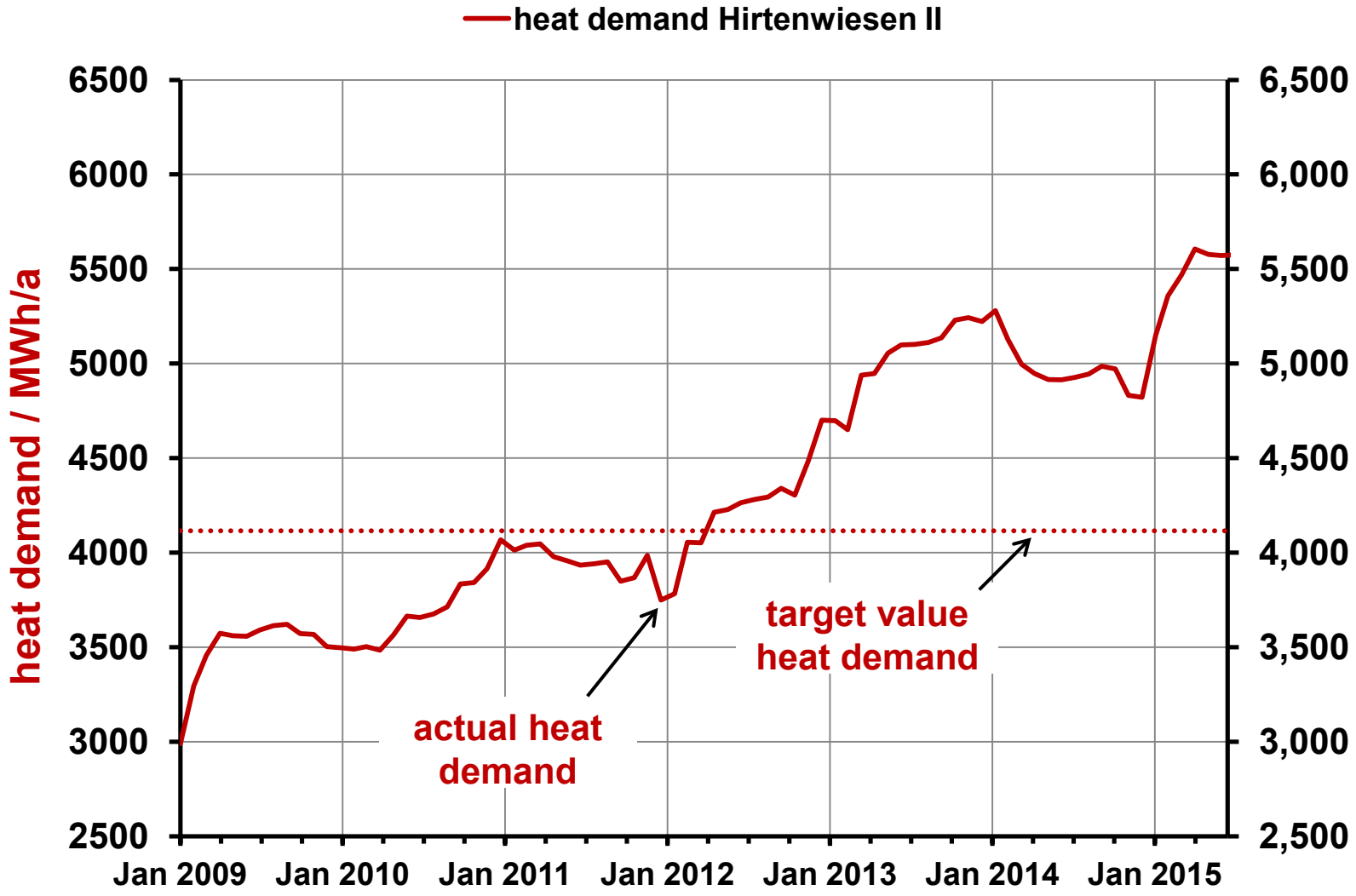

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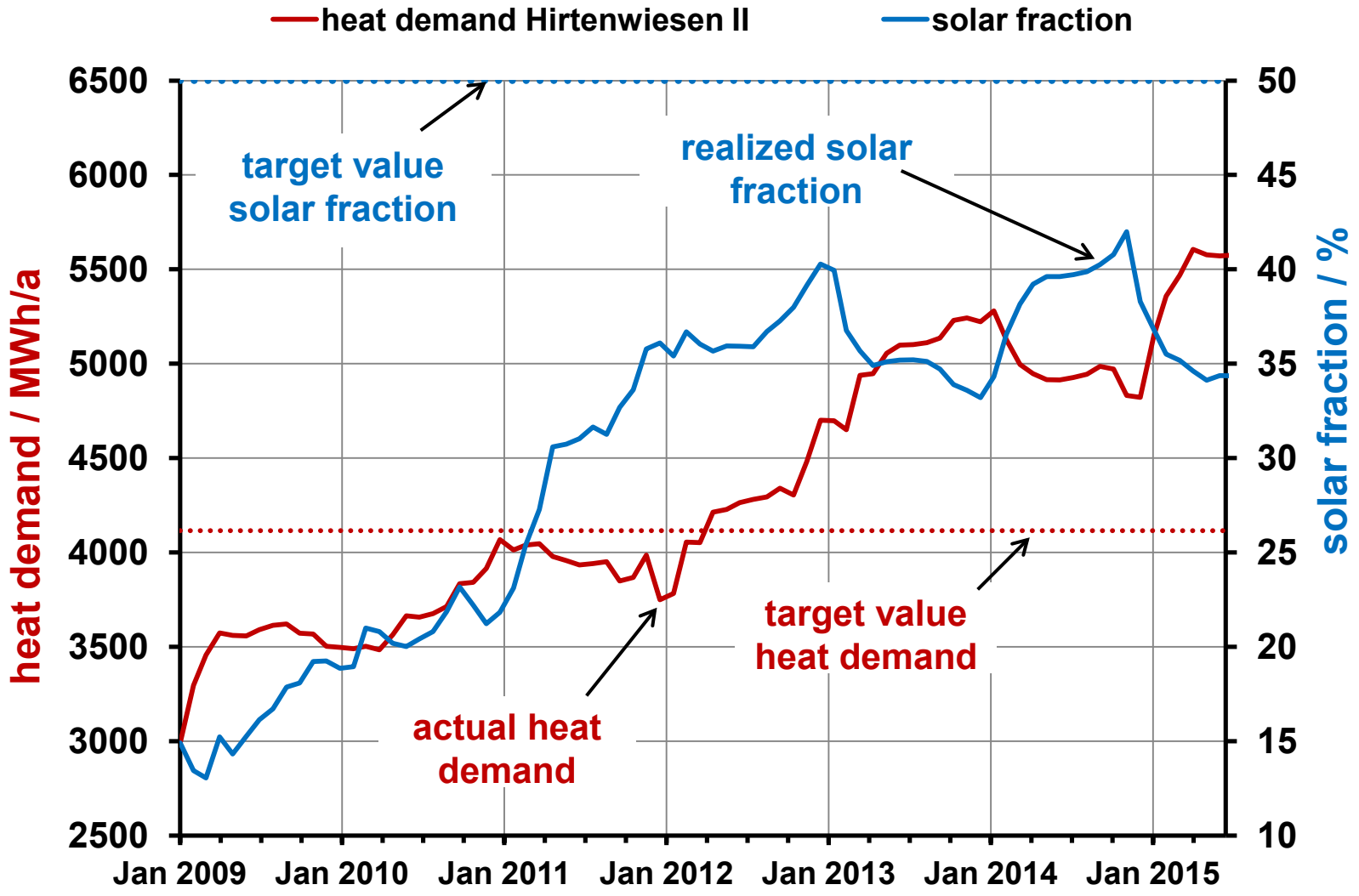


Monitoring Results - Discussion

Reasons for missing the aim of achieving 50 % solar fraction:

- Heat demand of district higher than planned
  - More auxiliary heat is needed
- Usable storage capacity of BTES lower than planned
  - Maximum charging temperature reduced from 80 to 70 °C
  - Heat pump capacity lower than panned 80 kW_{el} instead of 258 kW_{el} → higher minimum temperature of BTES
  - Less solar heat usable in heating season
- Buffer store 2 smaller than planned 480 m³ instead of 600 m³
  - Overheating of system part 2
  - Heat delivered to neighboring DH to avoid stagnation
  - Less heat charged into BTES

Future Potentials

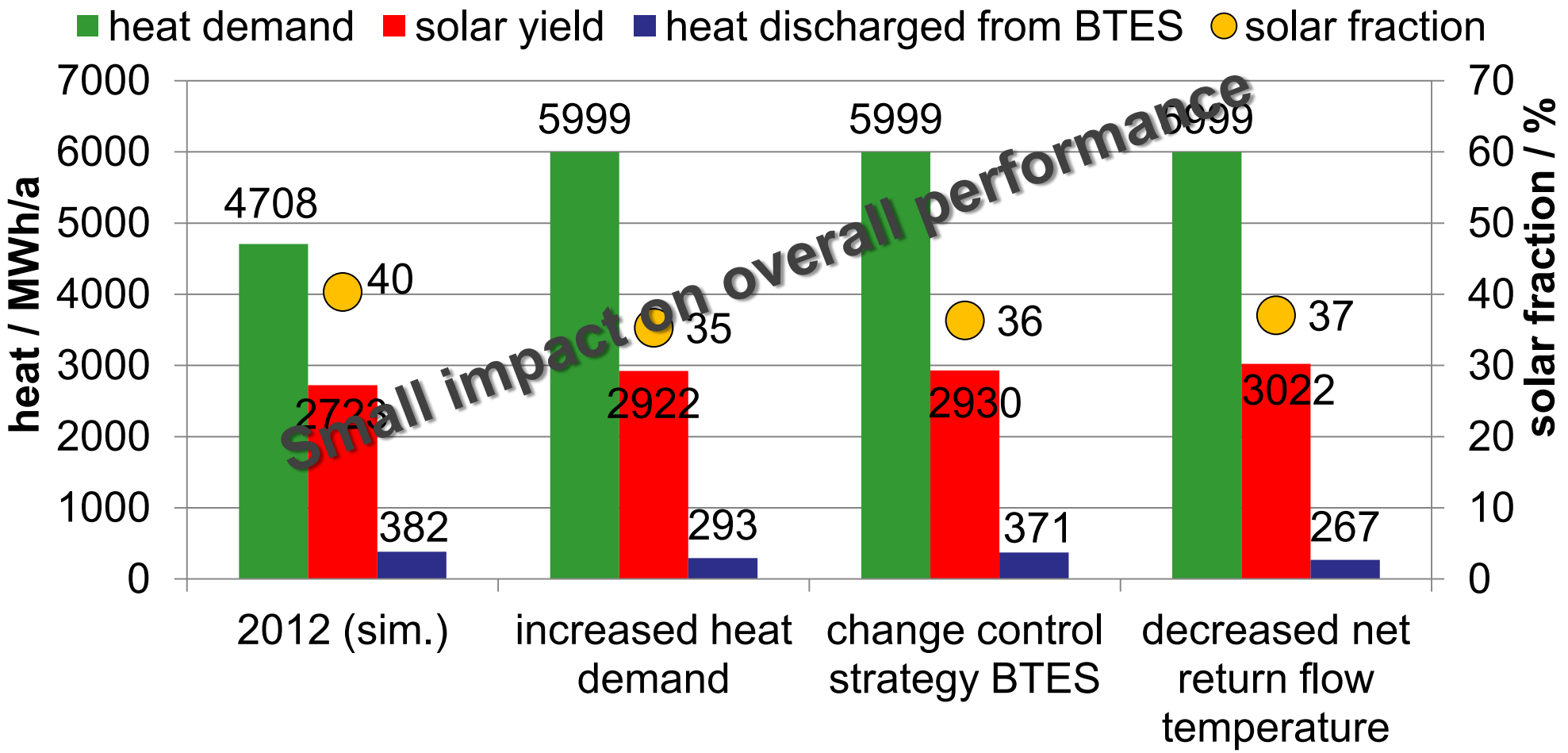
Aim: Efficient use of solar thermal energy and 50 % solar fraction at final stage of extension of district.

Technical options considered:

- Improvement respectively adaption of control strategy
- Extension respectively modification of heat generating system and components
  - Originally planned values for final stage of system:
    - 10 000 m² collector area
    - Enlargement of BTES by additional 80 borehole heat exchangers to a volume of 76 000 m³
    - Increased heat pump capacity

Future Potentials

Adaption of control strategy – simulation results



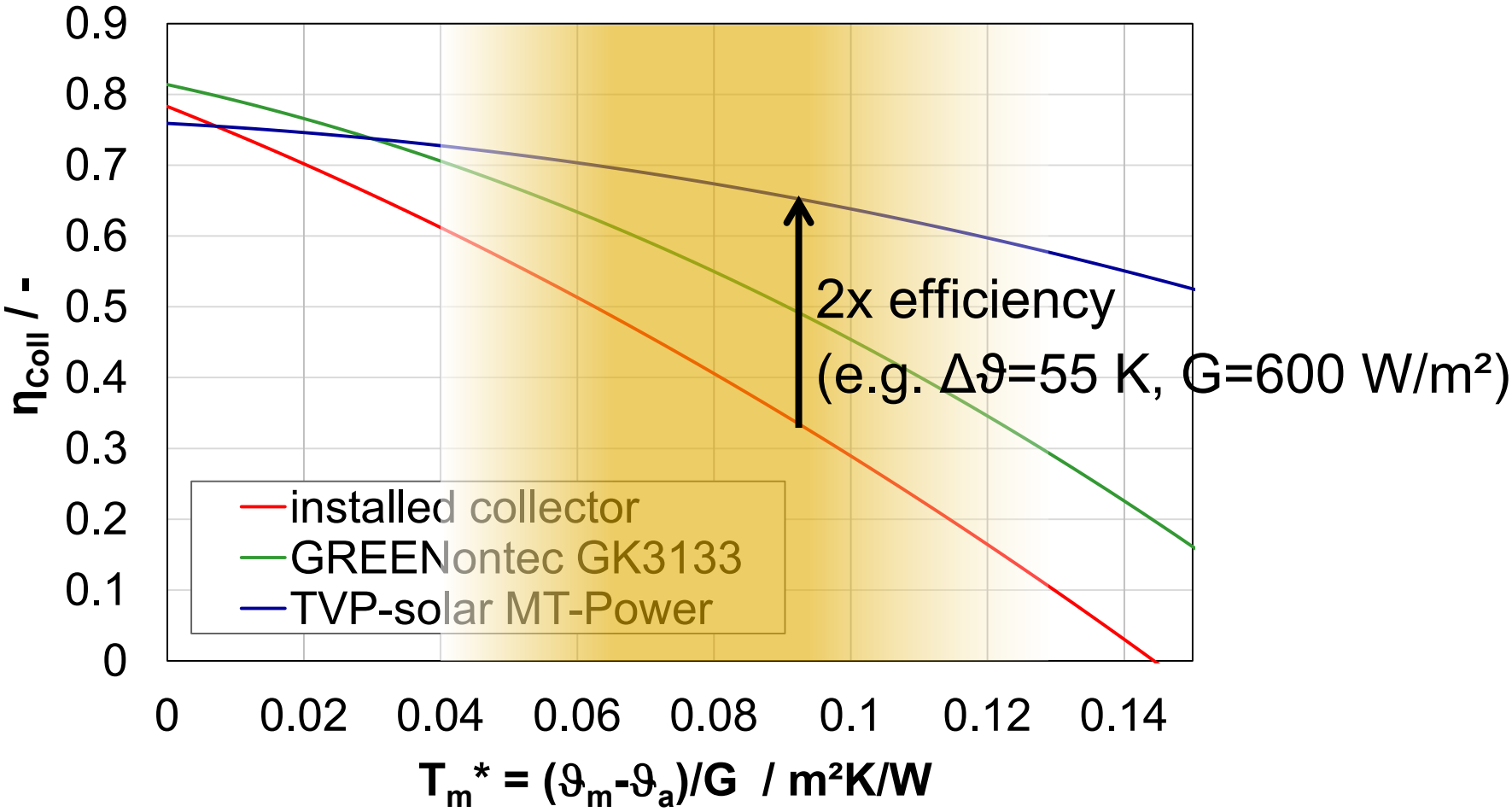
Future Potentials

New developments since system planning (early 2000 years):

- Improvements in technology solar thermal collectors
- Technical issues with installed collectors in Crailsheim

Future Potentials

Comparison of different flat plate collector efficiency curves



T_m^* … reduced temperature difference

Conclusions

- For more than 10 years consecutive monitoring of the SDH system in Crailsheim
- Rapid enlargement of the heat demand of district and minor changes of the system setup compared to initial planning causes lower solar fractions than planned
- New technology developments can increase the system performance
- Novel refurbishment approach for SDH system will be investigated
- Upcoming research project will adapt the system to new and future requirements also under economic considerations

Thank you!

PTJ Projektträger Jülich Forschungszentrum Jülich
Federal Ministry for Economic Affairs and Energy

Monitoring Results

		value planned	2011	2012	2013	2014
collector area at the end of the year	m²	7 325	7 410	7 410*	7 410*	7 410*
solar yield of collectors	MWh	2 575	2 337	2 740	2 319	2 631
solar heat delivered to heating net HW II	MWh	2 097	1 342	1 841	1 754	2 025
total heat demand of heating net HW II	MWh	4 116	3 750	4 700	5 223	4 822
auxiliary heating (from CHP)	MWh	1 715	2 407	2 580	3 078	2 525
heat charged to BTES	MWh	1 135	781	707	659	747
heat discharged from BTES	MWh	830	-	382	386	312
solar fractions	%	**51.0**	**35.8**	**39.2**	**33.6**	**42.0**

* since May 2012 are 7 164 m² in operation (corresponding to 246 m² out of operation)