GREENoneTEC 1
SOLAR COLLECTORS

Solar thermal energy integration on a power plant site in Vienna

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05.10.2018, ISEC Graz
Dr.-Ing. Sebastian Schramm

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How we build high to reap low hanging fruits

PRESENTATION STRUCTURE

- GREENoneTEC
- Project presentation
- Measurement results
- Energy costs
- Impressions of installation
- Conclusion

BUSINESS DIVISIONS

GREENoneTEC
SOLAR COLLECTORS

GREENoneTEC

OEM BUSINESS

Customized

SYSTEMS

PROJECTS

Heating

LARGE-SCALE COLLECTOR

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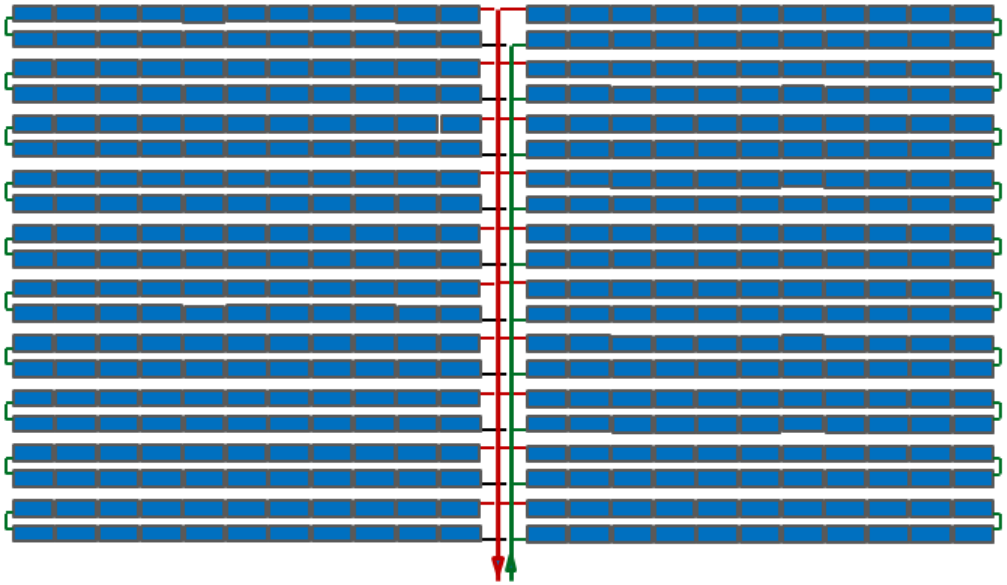
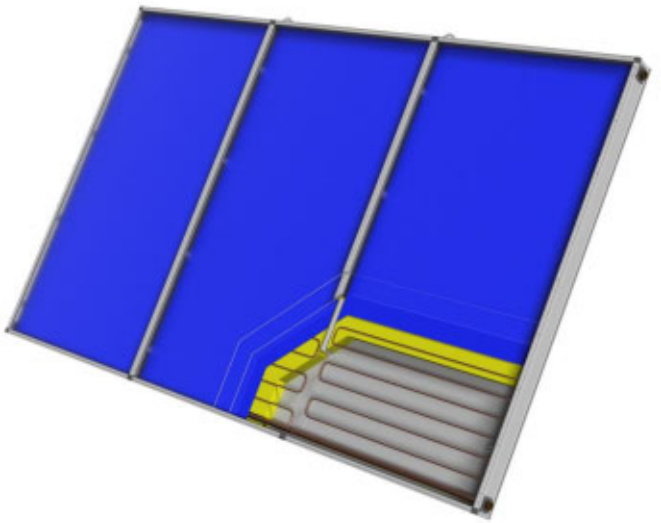
- 8 m² or 13 m² per collector, double- or single-glazed
- Up to 290 m² can be connected to one group without external piping and minmal pressure loss
- Good emptying behaviour because of meander absorber





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PROJECT

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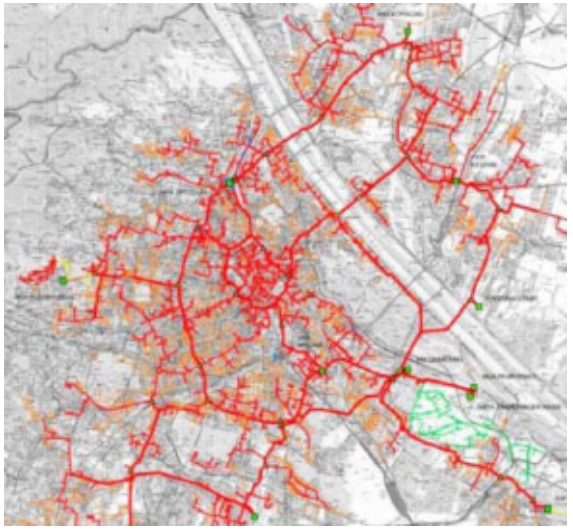
- Preheating of feed-in water
  for the district heating network

- Conditions for the solar system
  - ✓ Low temperatures (20°C / 60°C)
  - ✓ Continuous energy demand
  - ✓ Available area on 70m high roof
    - → working static pressure caused by altitude
    - → installation by 350to crane constitues a risk of costs
    - → weather conditions in Vienna necessitate a collector type which is pressure prooved by 3.000 Pa



Source: AIT Austrian Institute of Technology GmbH, Energy Department

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LAYOUT PLAN

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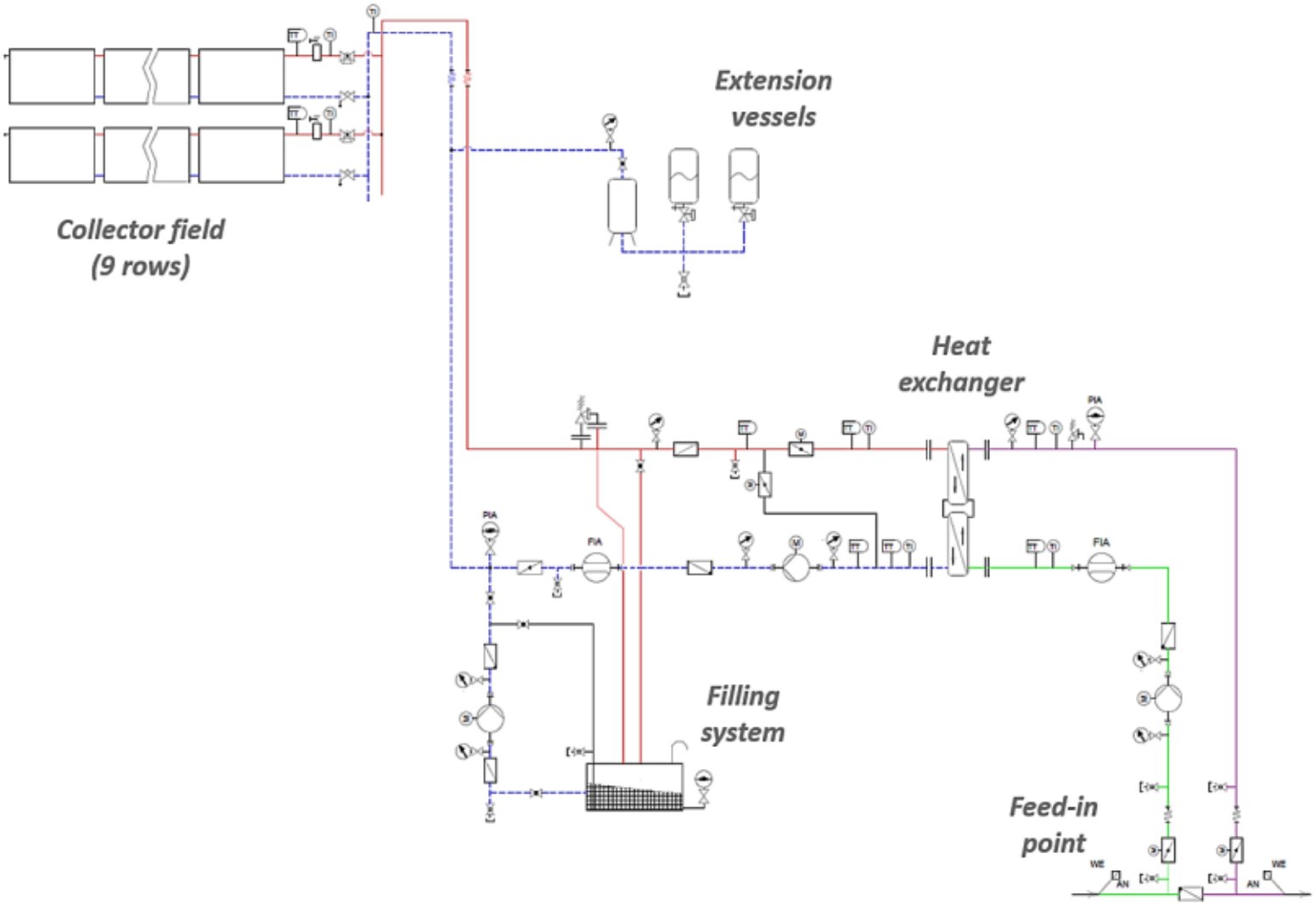

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OUTPUT & EFFICIENCY

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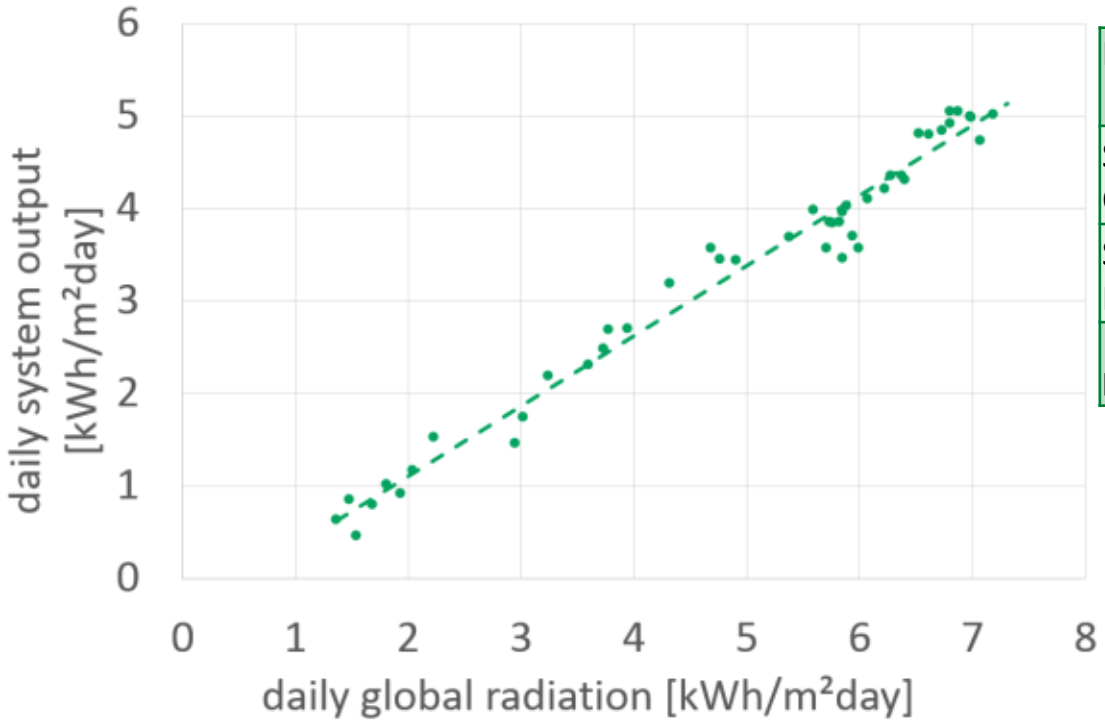
- System output = measured at feed-in point
- System efficiency = system output / solar irradiation
- about 67% system efficiency



Period	45 days		
System Output	97 MWh	3,3 kWh/m²d	148 kWh/m²
Solar Irradiation	144 MWh	4,9 kWh/m²d	
Efficiency	**67,4%**		

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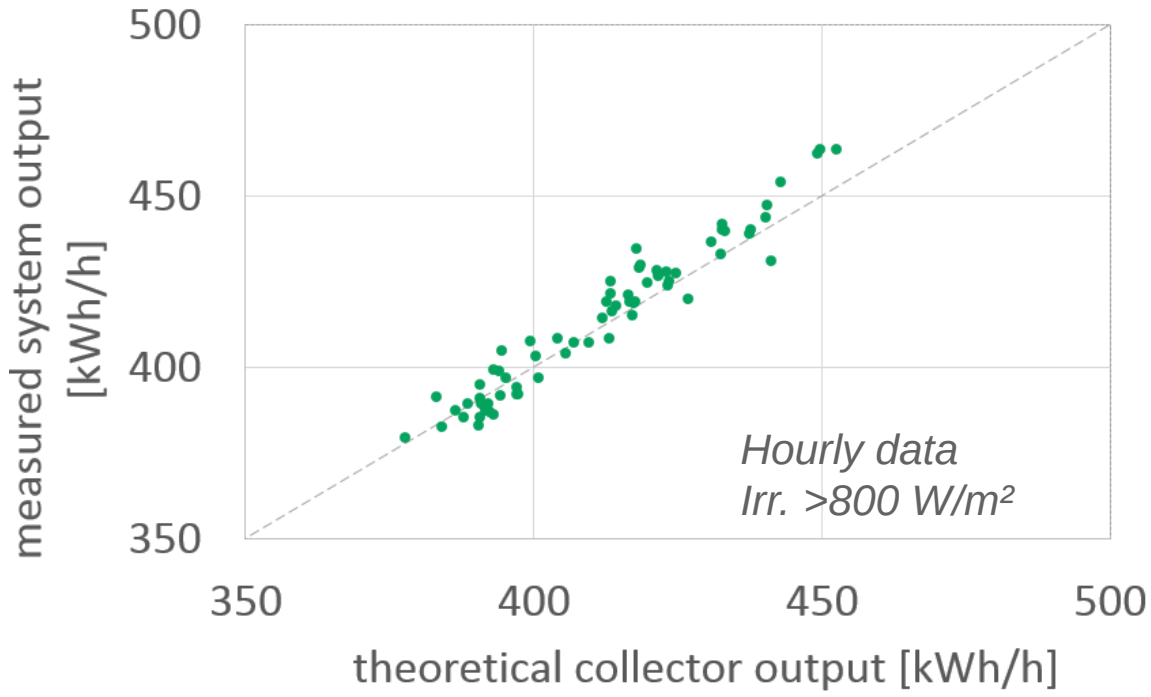
VALUATION OF SYSTEM OUTPUT

- Performance test result $_{SKM}$ * Safety factors
  (*Nielsen* IEA SHC task 45)
  - factor fp = 0,97 for heat losses fom pipes, heat exchanger etc.
  - factor fu = 0,98 for measurement uncertainty
  - factor fo = 0,98 for other uncertainties e.g. related to non-ideal conditions



OPERATION MODE

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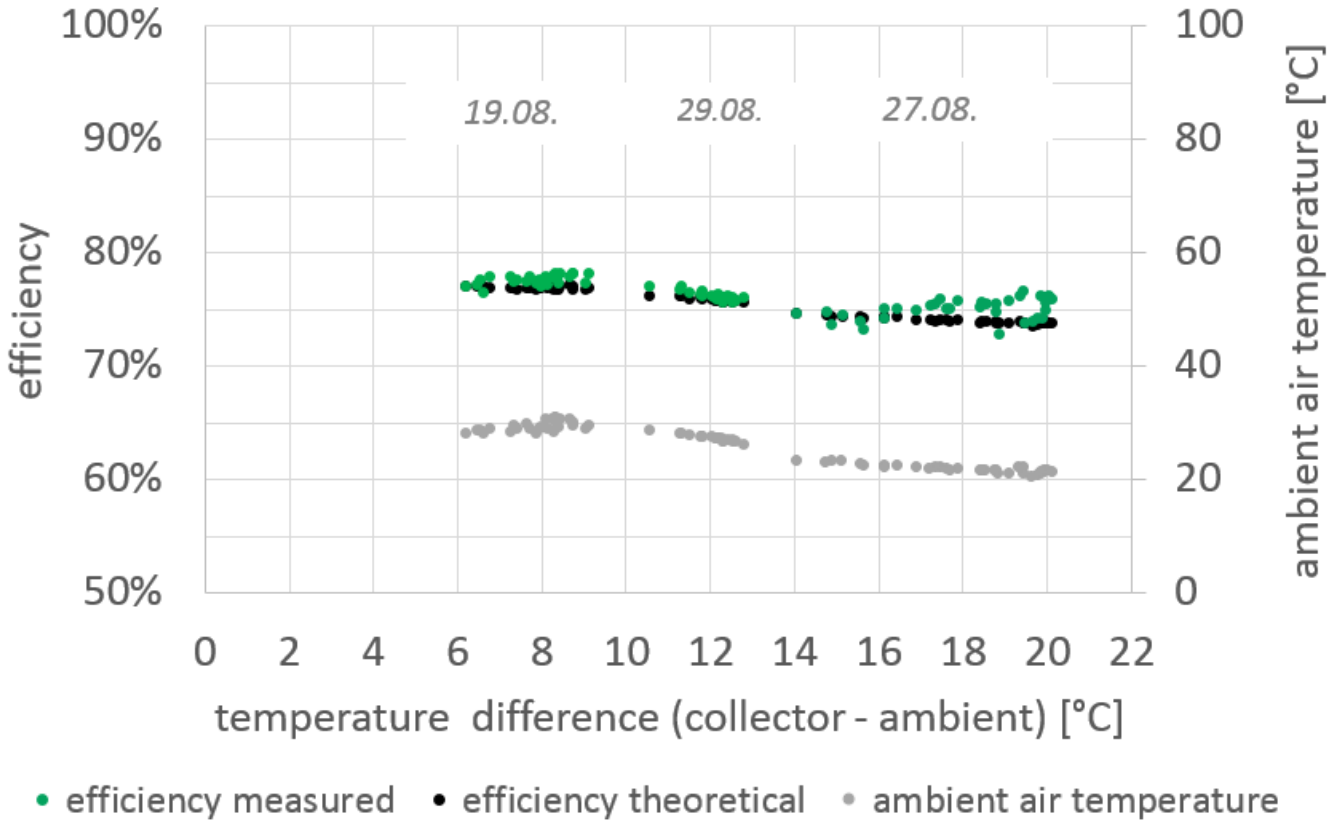
- High collector efficiency
- Caused by low collector operation temperatures



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ENERGY COSTS

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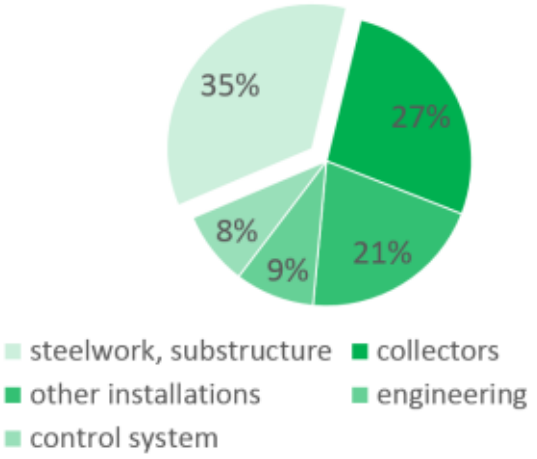
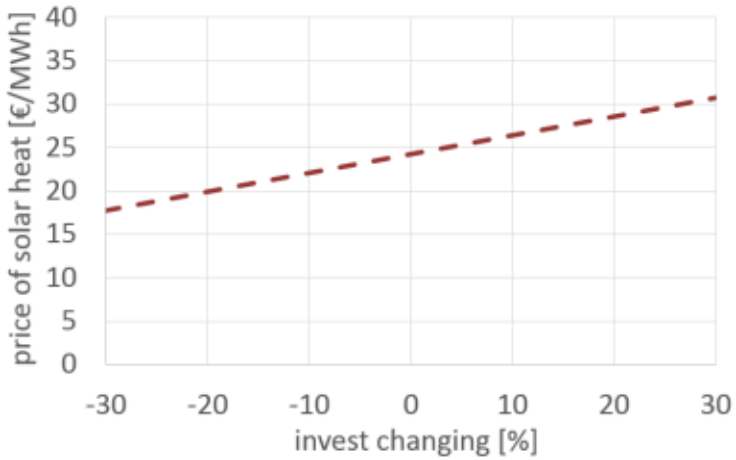
- Atypical cost allocation due to the installation effort
  - More than 1/3 steelwork
  - About 30% less for a ground-based installation



- 42 €/MWh without funding
- 24 €/MWh with funding
- Annuity loan divided by energy output
  - 600 €/m² investment costs
  - 25 year calculation period
  - 2% interest rate
  - 1.200 €/a maintenance costs
  - 510 MWh/a system output
  - 45% funding rate



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July 2018

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Connection with existing steel construction

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Crane set up

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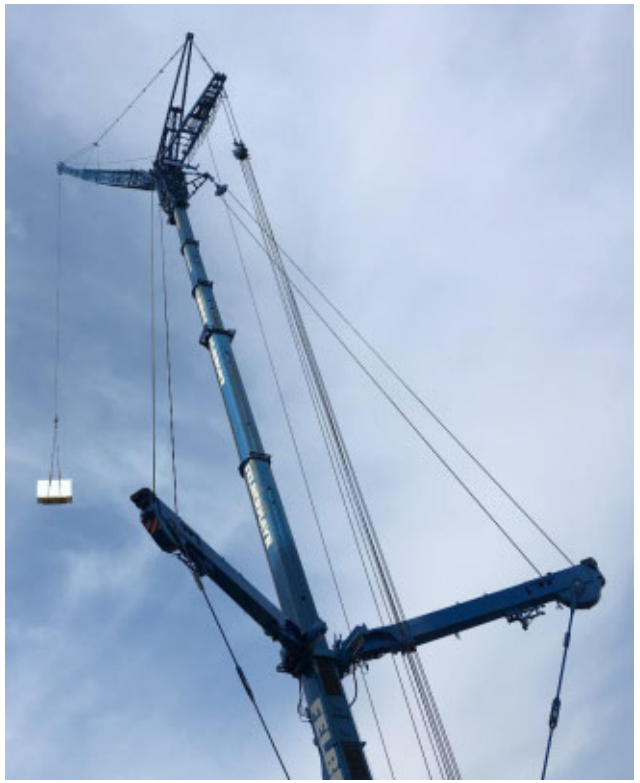

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Sub-construction of the collector field

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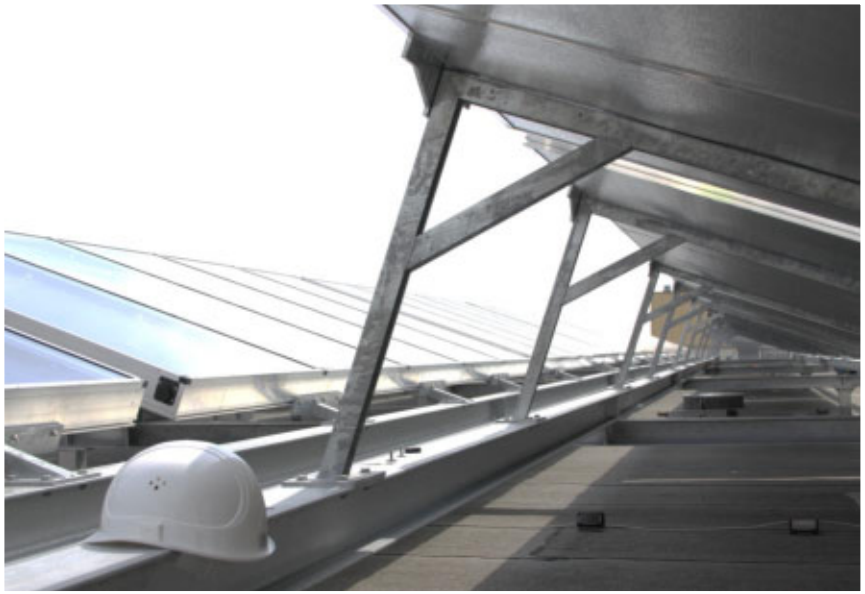

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Installation collector field

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Collector field

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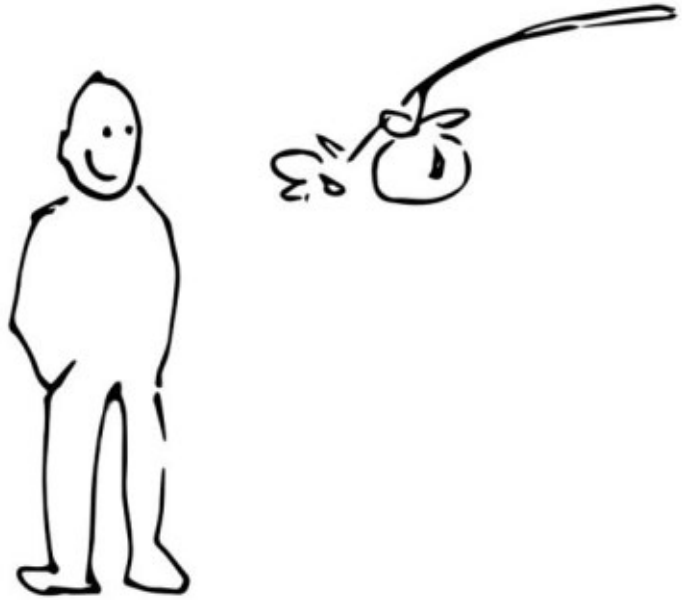
CONCLUSION

- Project shows that solar heat is competitive
  - … even in urban areas
  - … for 20 - 40 €/MWh
- Potential for similar applications
  e.g. pre-heating, low-temperature processes in different industries
- Comparable economic outcome for lower solar output but lower investment costs



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Thank you for your attention!

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