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# Cost Reduction Potential of Polymeric Collectors

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**TASK 54**

Michaela Meir

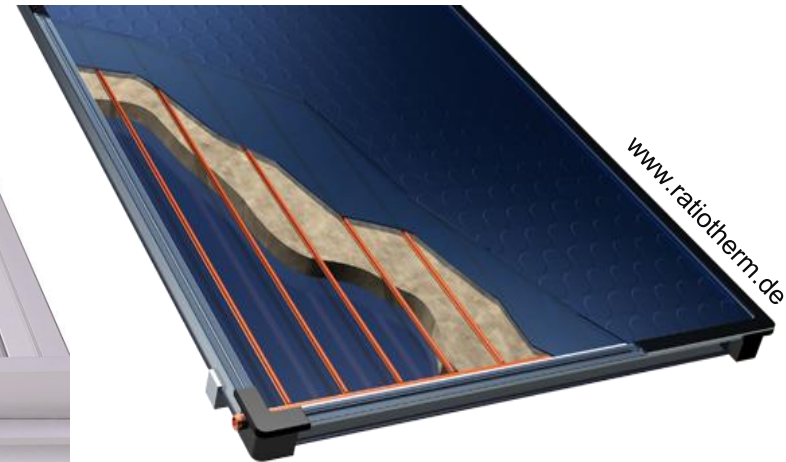
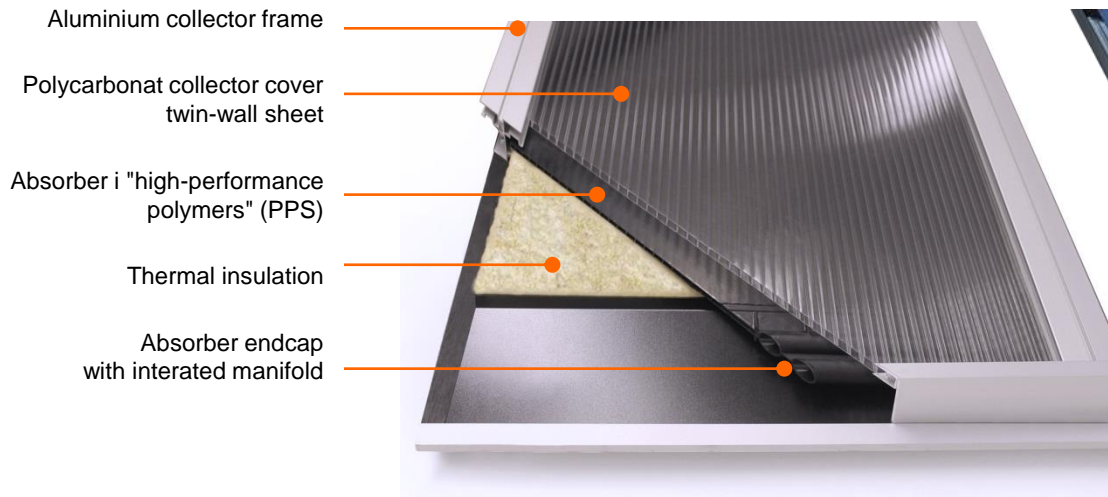
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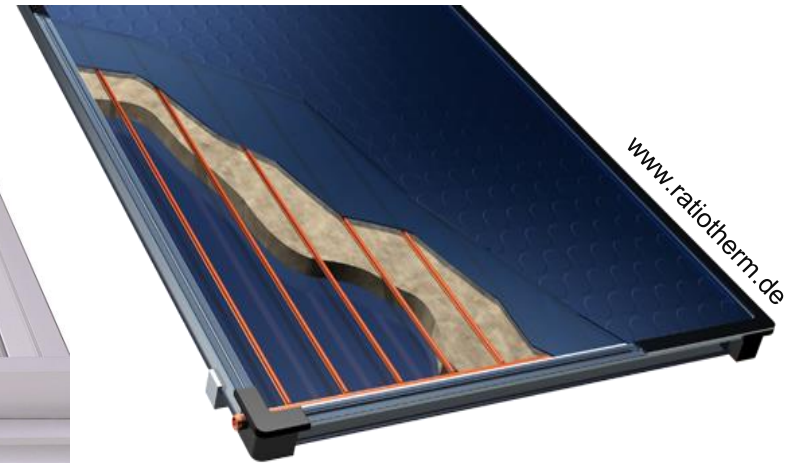
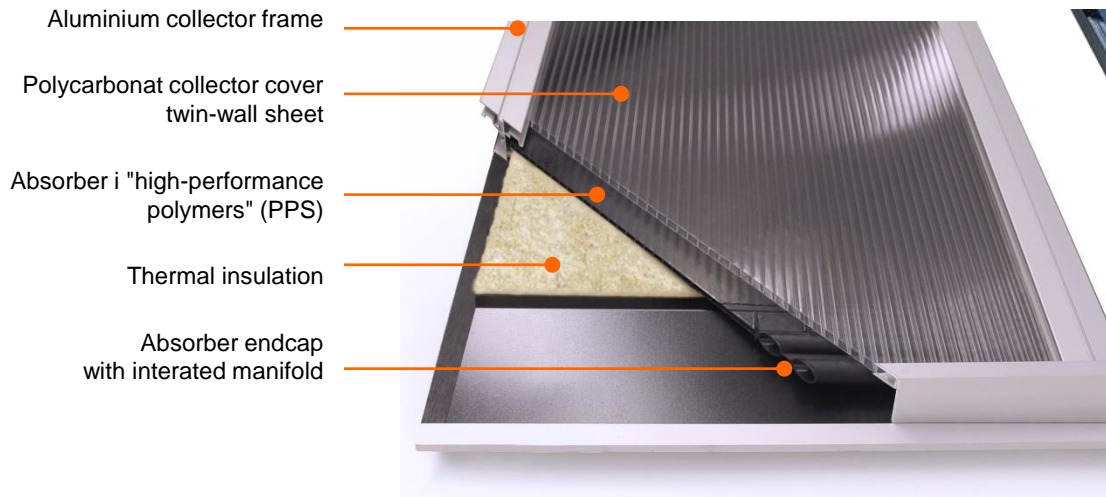
Sophia Antipolis, France

26 April 2018

# Main differences to solar heating systems with conventional flat plate collectors



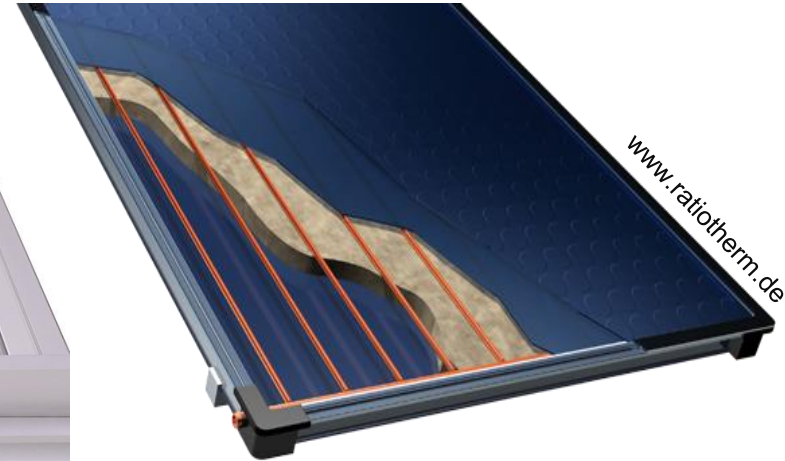
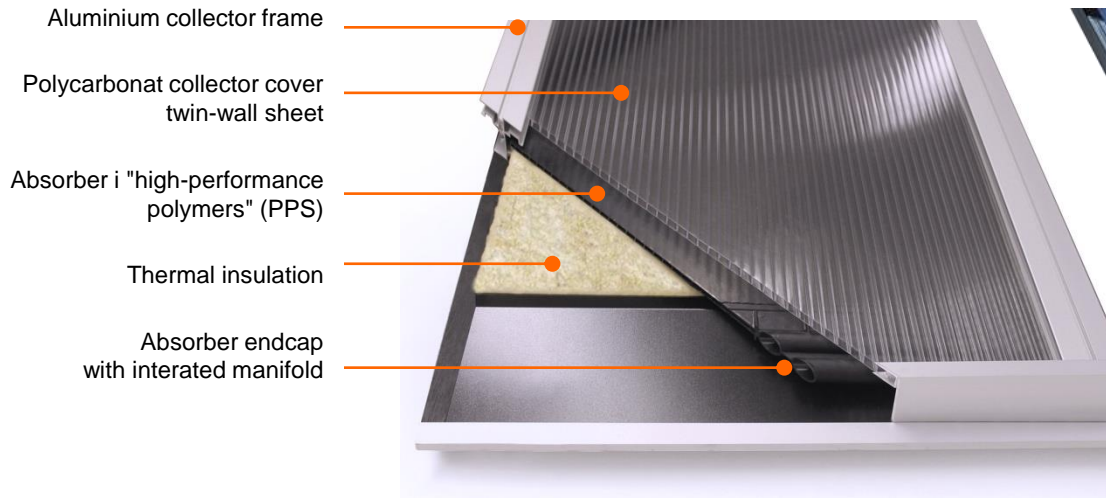
# Main differences to solar heating systems with conventional flat plate collectors



## Collector

- High-temperature performance polymers
- Flexible lengths
- Light-weight building modules (8 kg/m<sup>2</sup>)
- Replacing conventional building envelopes (roofs & facades)

# Main differences to solar heating systems with conventional flat plate collectors



## Collector

- High-temperature performance polymers
- Flexible lengths
- Light-weight building modules (8 kg/m<sup>2</sup>)
- Replacing conventional building envelopes (roofs & facades)

## System

- Water as heat carrier
- High-flow system
- Drain-back technology
- Non-pressurized collector loop (installation)

# Major Production Steps

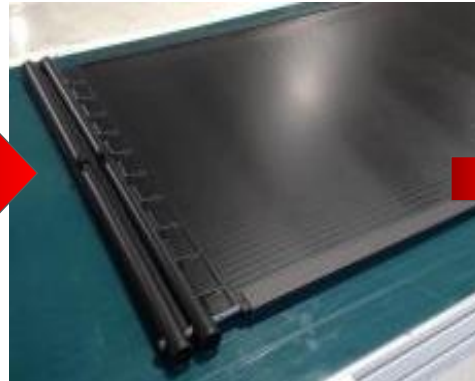
Structured sheet extrusion



- The number of production steps is significantly reduced compared to conventional solar collector production.



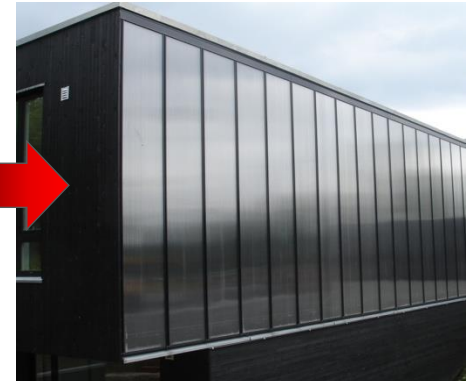
Cutting



End-cap assembly and coating



Cutting of other sub-components



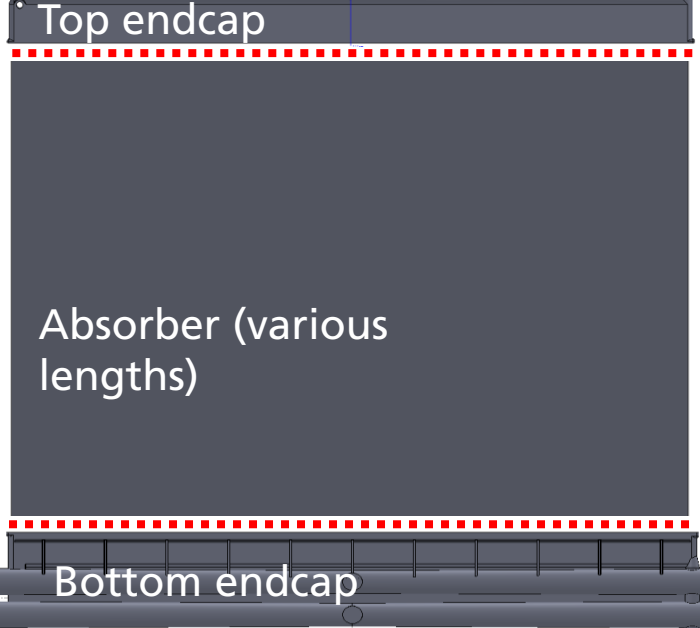
Transport & installation

# Absorber production

- Highly-industrialised processing
- Very few production steps
- Low production costs with high volume
- Integrated design



Absorber of extruded structured sheets



IR welding

IR welding

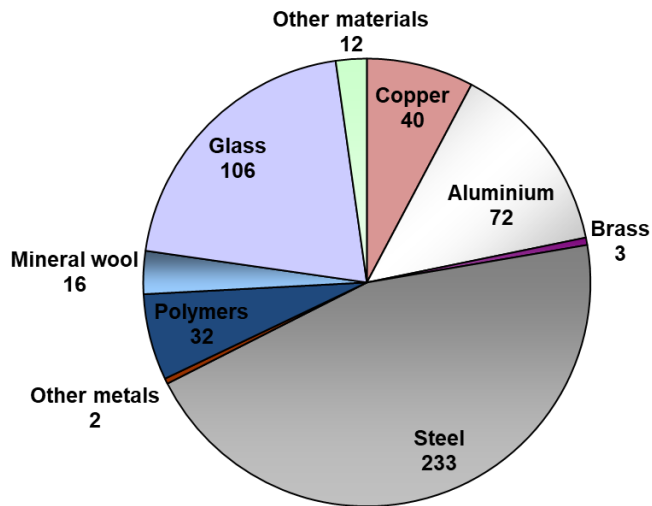


Standardized PEX-piping (floor heating)

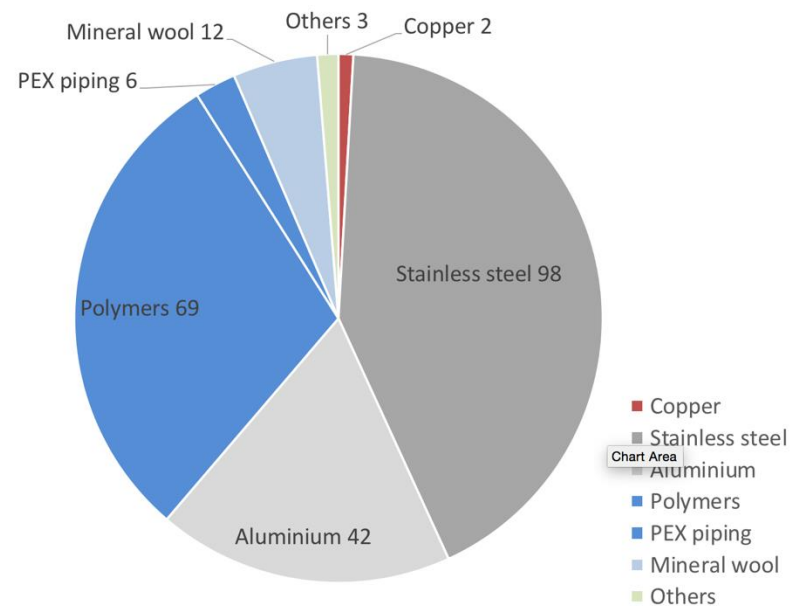


# Weight of components, Solar combisystem

Average value of material (kg)  
"Combisystems 2008" with  
**Conventional flat-plate collector**

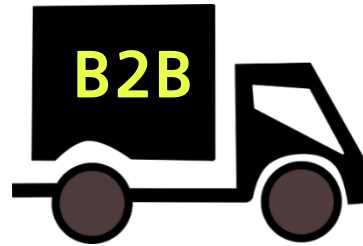


Material weight comparison (in kg)  
Combisystem, Housing Estate Oslo:  
**Polymeric AventaSolar collector**



# Solar Thermal Value Chain

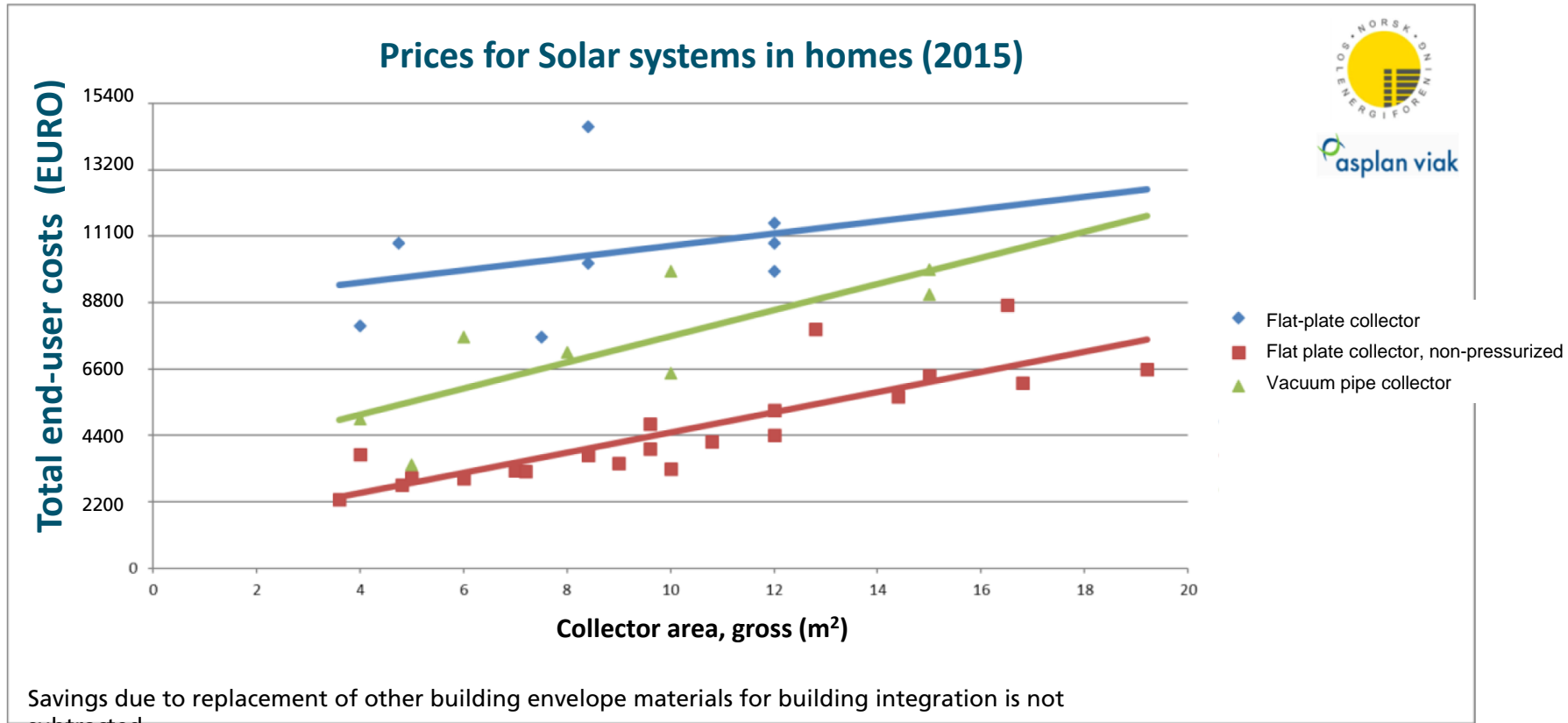
No wholesaler / distributor!





# Prices of solar heating systems in private homes

- Total end-user costs incl. solar collector system and heat store, reported by the customers, include installation, but exclude VAT and subsidies.



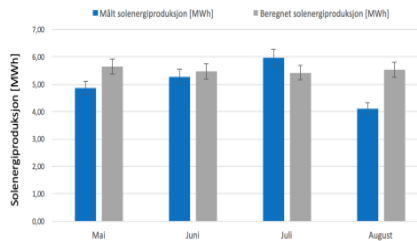
# Cost examples: Medium-sized projects (1)

## Ilseeng State Prison

### Costs:

Solar collector, heat store, pumps, control system, pipes, removal of tiles, installation, engineering and administration.

**SUM: 433 €/m<sup>2</sup> collector area**



SDHW-system with 237 m<sup>2</sup> solar collectors



# Cost examples: Medium-sized projects (2)

## *Bjørkelangen Elementary School*

Solar heating system for domestic hot water preparation.  
105 m<sup>2</sup> facade integrated solar collectors  
5.6 m<sup>3</sup> heat buffer store

### Costs

Solar collector, heat store, pipes and controller, incl. installation: **SUM: 370 €/m<sup>2</sup> collector area**

Savings due to replacement of other materials/components are not included.





# Cost examples: Solar combisystem (3)

## *Housing Estate Oslo with 34 passive houses*



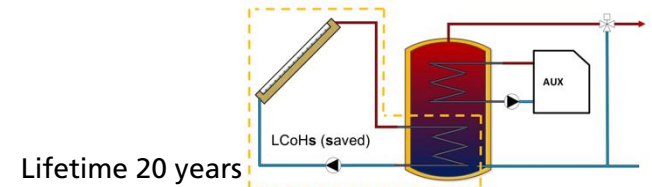
34 houses with totally 480 m<sup>2</sup> roof integrated solar collectors, decentralized with 0.8 m<sup>3</sup> heat stores, incl. 100 liters DHW preheater and piping, operation control of the auxiliary heat supply and solar heating system, installation- and start-up support.

### Costs

**SUM: 370 €/m<sup>2</sup> collector area**



# Examples, Norway



## Ilseng State Prison

Retrofit, DHW preparation  
 237 m<sup>2</sup> Collector area  
 8.4 m<sup>3</sup> Heat store  
 1100 kWh/(m<sup>2</sup> a) solar irradiance\*



## Bjørkelangen Elementary School

New-built, DHW preparation  
 105 m<sup>2</sup> Collector area  
 5.6 m<sup>3</sup> Heat store  
 889 kWh/(m<sup>2</sup> a) solar irradiance\*

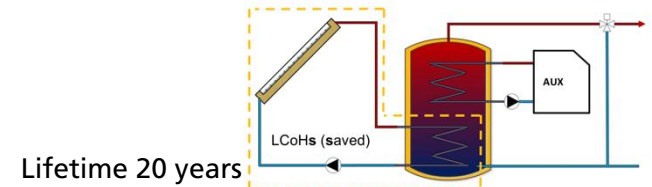


## Housing Estate Oslo, 34 passive houses

New-built, Solar combisystems with each  
 14 m<sup>2</sup> Collector area  
 0.8 m<sup>3</sup> Heat store  
 1210 kWh/(m<sup>2</sup> a) solar irradiance\*

\* Solar irradiance on tilted collector surface.

# Examples, Norway



## Ilseng State Prison

Retrofit, DHW preparation  
 237 m<sup>2</sup> Collector area  
 8.4 m<sup>3</sup> Heat store  
 1100 kWh/(m<sup>2</sup> a) solar irradiance\*

LCoHs\_retrofit = 0.099 €/kWh  
 LCoHs\_new built = 0.073 €/kWh



## Bjørkelangen Elementary School

New-built, DHW preparation  
 105 m<sup>2</sup> Collector area  
 5.6 m<sup>3</sup> Heat store  
 889 kWh/(m<sup>2</sup> a) solar irradiance\*

LCoHs = 0.035 €/kWh



## Housing Estate Oslo, 34 passive houses

New-built, Solar combisystems with each  
 14 m<sup>2</sup> Collector area  
 0.8 m<sup>3</sup> Heat store  
 1210 kWh/(m<sup>2</sup> a) solar irradiance\*

LCoHs = 0.082 €/kWh

Electricity costs = 0.115 €/kWh

### Comments:

- Retrofit: roof tiles had to be removed
- Building is oriented towards east
- High solar fraction

### Comments:

- Good planning, infrastructure

### Comments:

- Passive houses: designed for high solar fraction
- Installation partly included



# Thank you for your attention!

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