SOLARGE

Enlarging Solar Thermal Systems in Multi-Family-Houses, Hotels, Public and Social Buildings in Europe

# Project summary

## EWG Pankow
## Berlin
## Germany

### Description

In 2006 the EWG Berlin-Pankow, a building association located in north-east Berlin, started comprehensive modernisation and reconstruction measures on seven multi-family buildings of one building type. By centralisation of heating and hot water generation the most important condition for solar thermal were created. In five of the buildings also other boundary conditions (direction of the roofs) fit well for the integration of a solar thermal plant.
Task for the planner was to create a system that realises solar thermal by reasonable costs and light constructional changes on the buildings. It was also predetermined, that the compact heating stations should not be changed due to solar thermal installation. Under these circumstances it has been decided to build a direct-feed-in system.

### Building

| | |
|---|---|
| Type of building | Multi-family house |
| Number of users / dwellings, floors | 300 users<br>148 dwellings<br>4 floors |
| Year of construction | 1959 |
| Total effective area (heated) | 7,634 $m^2$ |
| Hot tap water consumption (calculted) | n. a. $m^3$/a, |
| Whole energy consumption for heating purpose after CSTS implementation | 852,000 kWh/a |

### System engineering

| | |
|---|---|
| Year of construction of CSTS | 2006 |
| Type of collectors | Flat plate collectors |
| Thermal power | 100 $kW_{therm}$ |
| Aperture area of collectors*) | 146 $m^2$ |
| Buffer storage | ./. $m^3$ |
| Hot tap water storage | 1.7 $m^3$ |
| Total capacity of boilers (natural gas) | 140 kW |
| Type of hot tap water heating | Centralised |
| Type of heating system | Centralised |

### Costs

| | |
|---|---|
| Total cost solar system | 106.400 Euro |
| Cost of CSTS / gross area of collectors | 626 Euro/$m^2$ |
| Subsidies | 0 % |

### Output

| | |
|---|---|
| Output of solar heat**) | 73.100 kWh/a |
| Reduction of final energy***) | 59,900 kWh/a |
| $CO_2$-emissions avoided | 15.4 t $CO_2$/a |
| Solar performance guarantee | No |

*) Aperture area = light transmitting area of the front glass
**) measured, between storage and piping to taps (solar system output)
***) related to the measured output mentioned before

### Owner

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### Operator

See owner

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# Technical description

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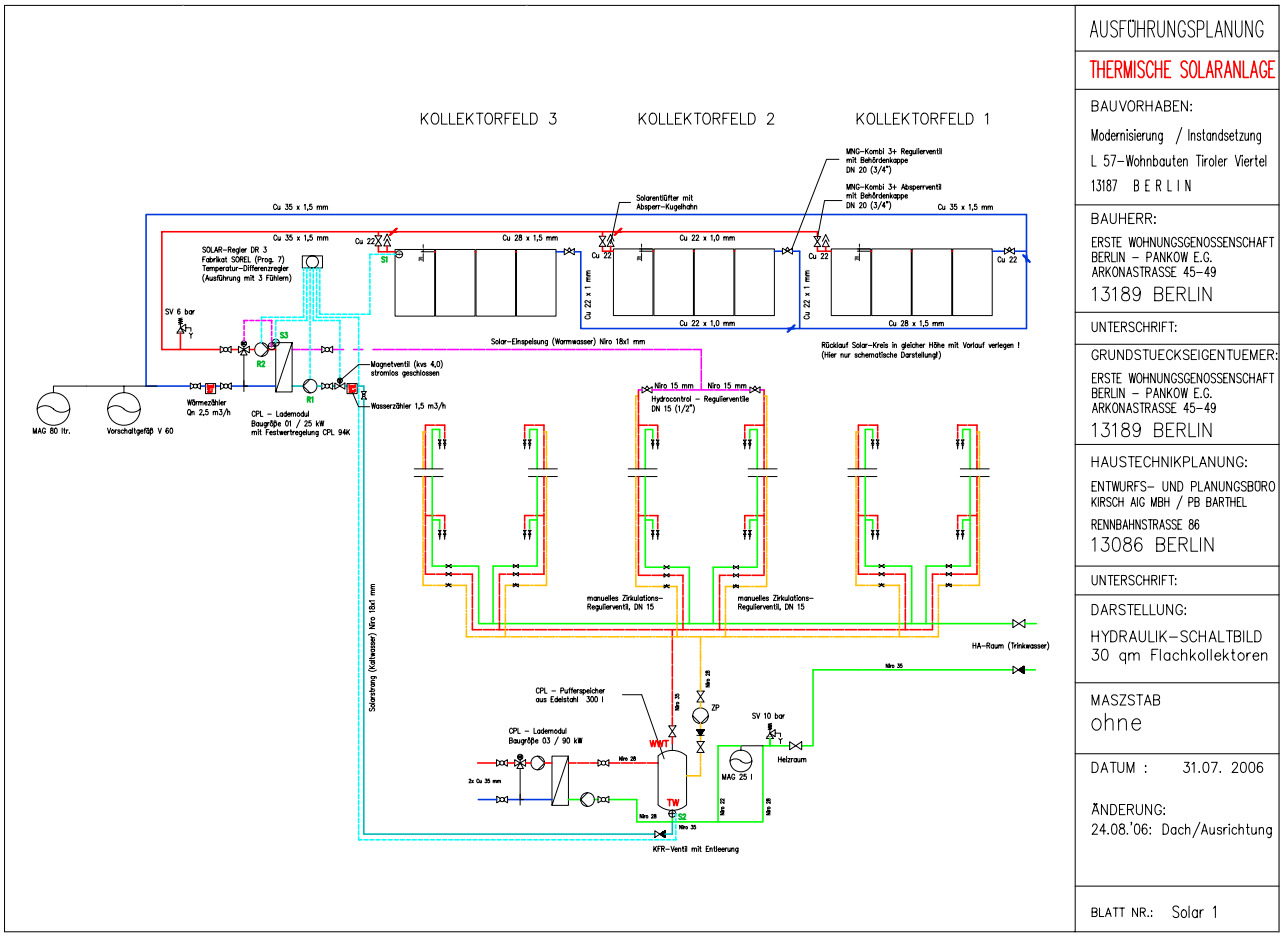


**Description of the CSTS**

| | |
|---|---|
| Year of construction of CSTS | 2006 |
| Thermal power | 100 $kW_{therm.}$ |
| Gross area of collectors | 170 $m^2$ |
| Aperture area of collectors | 146 $m^2$ |
| Type of collectors | Flat plate collectors |
| Type of assembly | Roof top |
| Orientation of collectors | South (0°) |
| Inclination angle to horizon | 37° |
| Freezing protection | Glycol |
| Overheating protection | Expansion vessel |
| Operation mode | Variable |
| Use of CSTS for | Hot tap water heating |
| Buffer storage | no buffer storage, direct feed-in |
| Hot tap water storage | 1,7 $m^3$: 5 storage tanks: 4 × 300 l, 1 × 500 l |
| Control of backup-system / CSTS | Separated control |

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# Technical description (2)

## EWG Pankow
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| | |
|---|---|
| **Hot tap water system** | |
| Type of hot water heating | Centralised |
| Recirculation system | Yes |
| For decentralised systems: The installation on the consumer site | ./. |
| Size of storage for hot tap water | 1.7 m³ |
| Specification | ./. |
| **Space heating system** | |
| Type of heating system | Centralised |
| Number of boilers | 2 |
| Total capacity (power output) of boilers | 140 kW |
| Capacity of each boiler and the year of construction | No. 1: 70 kW (2006)<br>No. 2: 70 kW (2006) |
| Energy source | Natural gas |
| Type of boiler system | Condensing |
| **Type of operation** | |
| Operator of the CSTS system | Self-operation |
| CSTS monitoring | No |
| Data accessible via internet | No |
| Scientific monitoring / follow up | Yes |
| Maintenance contract | Yes: twice a year |
| Visualisation of the solar heat output | No |
| **Yield of CSTS plant** | |
| Output of solar heat | 73,100 kWh/a |
| Origin of data | prognosis |
| Measuring point | between collector and storage |
| Reduction of final energy | 59,900 kWh/a |
| Origin of data | prognosis |
| Solar performance guarantee | No |
| **Heat consumption** | |
| Whole energy consumption for heating purposes *after* CSTS implementation | 852,000 kWh/a |
| Origin of data | estimated |
| Energy used for | Hot tap water heating, space heating |
| Whole energy consumption for heating purposes *before* CSTS implementation | not to determine (single flat heating and hot water generation) |
| Total tap water consumption | 3,400 m³/a |
| Hot tap water consumption | n. a. m³/a, |
| Hot tap water temperature | 60 °C |
| Cold water temperature | 10 °C |


**Summary**

Collectors with each 10 m² area have been mounted on the roof top. The pipes of the solar circle lead to a heat exchanger located in a garret. The secondary side of the exchanger (a new installed pipe from cellar to roof) is used as a second load circle starting before cold water entry of the hot water storage and feeding in two legs of the circulation system, that were extended to the top floor.

Solar regulation and load regulation for the hot water storage (heat up by the condensing boiler) work separated but balanced in the operational parameters.



**Planning/Engineering**

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# Financing & Investment

## EWG Pankow
## Berlin
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Collector field

**Introduction**

Definite evaluation will be possible after an operational phase of at least one year (also regarding climate influences). A second important factor for the economic valuation is the further development of energy prices. In general, the investor appreciates the installation of solar thermal as an investment in the future.

| | |
|---|---|
| **Financing of CSTS** | |
| Form of financing | Purchase |
| Distribution in percentage | 0 % |
| **Costs of solar materials** | |
| Total cost of solar system | 106,400 Euro |
| Detailed costs for | |
| Collectors | n. a. Euro |
| Elevation / mounting structure | n. a. Euro |
| Storage / heat exchanger | n. a. Euro |
| Backup heater | n. a. Euro |
| Control | n. a. Euro |
| Installation | n. a. Euro |
| Planning / Engineering | 15,000 Euro |
| Others: | n. a. Euro |
| **Operation costs of heating system** | |
| Power cost for pumping | n. a. Euro/a |
| Maintenance cost | n. a. Euro/a |
| Monitoring cost | n. a. Euro/a |
| Other operation cost | n. a. Euro/a |
| Total operation cost | n. a. Euro/a |
| **Or**: Increase of operation cost after CSTS implementation | has not yet been observed |

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# Development & Experiences

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**Qualitative aspects**

At the beginning there has been the plan to realise a plant referring to the "Schweizer Modell" (Swiss model). That was not possible due to delivery problems with the compact module of Circo Solar. Therefore another type of direct feed-in system has been developed and implemented.

**Experiences management**

| | |
|---|---|
| Experience problems or failures? | No: In the first two month after installation optimisations on the plants were done, an interruption of operation did not take place. |
| Find solutions to these problems or failures? | ./. |

**Financial effects / project performance**

| | |
|---|---|
| Project economically efficient? | Yes |
| Fiscal or other financial effects? | Yes: running costs for heating have been reduced |
| Effects on rental fees? | Yes: costs for solar thermal system are shared by rent increase (allocation of refurbishment costs) |

**Experiences technical staff**

| | |
|---|---|
| Experience problems or failures? | n. a. |
| Find solutions to these problems or failures? | n. a. |