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Position in the heating grid

If the position of the solar thermal plant is decentralized, thorough analysis of the district heating (DH) grid has to be performed in advance. Decentralized means that the solar thermal plant is not close located to another major heat generator like a biomass or fossil fuel fired plant. A central feed-in point can also be a transfer station from a connection line to a remote power or heat plant.

With decentralized integration, a solar thermal plant can feed either towards the central heating plant or towards the end of the branch (Fig. 6.2.1.).

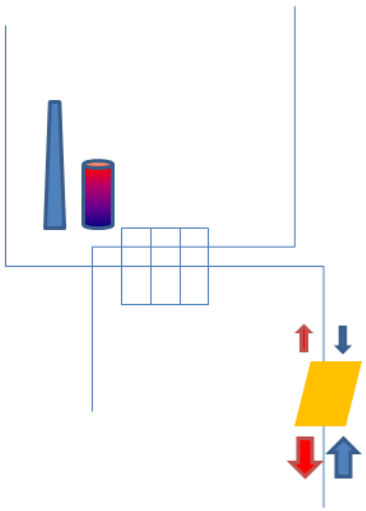

Fig. 6.2.1. Solar thermal plant in heating grid, feed-in directions

Feed-in principles

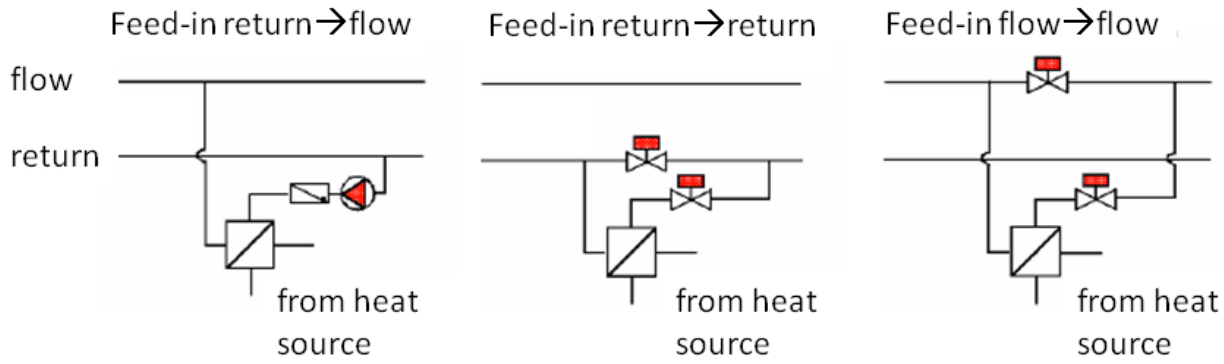

Fig. 5.2.2. hydraulic integration of solar thermal feed-in (source: Streicher)

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Feed-in directions

Below is described the influence of feed-in directions for the most common case of feed-in from return to flow.

Feed-in towards end of the branch

The advantage of this feed-in direction is that the pumps don't need to work against water flow direction from the central heating plant.

The feed-in capacity towards the end of the branch can be limited, please find indications below.

Feed-in towards central heating plant

This feed-in directions strongly depends on the pressure level in the district heating grid. The higher the pressure level, the higher the pump electricity and this can deteriorate economics of the solar thermal plant. In cases where feed-in towards the central heating plant is planned, possibilities of lowering the pressure from central pumps during feed-in of the solar thermal plant have to checked.

Feed-in capacities

For decision about installing and sizing a heat storage at the solar plant, it is important to know the heat demand of the feed-in area during peak irradiation times. Overheating or stagnation of the solar plant is to avoid for both technical and economical reasons (see factsheet XX.XX).

Yield from solar plant: as a rule of thumb, 3 kWh/m² collector area during 6 hours (9-15h) can be assumed. The exact value depends on collector tilt angle, orientation, temperature levels etc.

Summer months operation

As the majority of solar irradiation is in most regions not during heating season (see factsheet XX.XX), summer time operation is crucial for economics of a solar thermal plant.

Heat demand (9-15h) in the feed-in area (to be examined for summer days, when no room heating is required):

- domestic hot water consumption in supplied buildings
- hot water consumption of large consumers (industry, hospitals etc.); to be checked also for weekends and holidays
- circulation losses in supplied buildings
- heat losses in district heating grid (can be significant in summer months)
- if possible, using the district heating grid as heat storage.

When using the district heating grid as heat storage, also the return flow heats up during plant operation. For effective and safe solar plant operation, return temperature should be as low as possible. Thus when heating up the DH grid, return temperature should be as low as possible in the morning before start of feed-in from solar plant.
The yield of the solar plant decreases when return temperature rises. This is important in late afternoon, when return temperature increases and irradiation decreases. In this case the solar plant has to be switched off earlier in the afternoon than with constant return temperature. The resulting loss of operation time impairs the economics of the solar plant.

For evaluating the heat demand between 9 and 15 o'clock in summer months in a certain part of the heating grid, a profound analysis is necessary and in most cases also measurements.

Winter months operation

In winter months, the minimum feed-in temperature of the flow can go beyond 90 or 100 degrees, depending on the operation parameters determined by the DH grid operator.

It is possible to generate these temperatures with solar thermal also in winter. For economical and technical reasons, maximum temperatures of 60 to 80 degrees are more favourable for winter time operations. If heat can't be fed in at these temperatures to the grid, the solar plant can supply other buildings directly. As heat demand is mainly early in the morning, a heat storage needs to be integrated.

Also a heat pump can be integrated in the solar circuit or the heat storage for increasing the efficiency at low temperature operation time.

Heat storage

For increasing the flexibility in operation of the solar plant, a heat storage can be useful (see factsheet XX.XX).

The heat storage should be used both for the solar thermal plant and for load management of the DH grid. It is hardly feasible to finance a large heat storage by solar-only use.

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References

[1] Wolfgang Streicher, Gleisdorf Solar 2006

[2] XX

[...] XX

The SDH fact sheets addresses both technical and non-technical issues, and provide state-of-the-art industry guidelines to which utilities can refer when considering/realizing SDH plants. For further information on Solar District Heating and the SDHtake-off project please visit www.solar-district-heating.eu.

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