Chapter:	Preliminary investigations
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Description:	Description of the location and orientation options for placement of solar collectors for district heating. Pictures are shown for the different examples.
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Introduction

As a main rule the area for solar collectors for district heating can be found on the ground, on roofs, as shadowing over park places, on noise protection walls etc. It is “only” a question of price and esthetical demand where to place the solar collectors.

Ground mounted collectors

Ground mounted collector areas for district heating are seen in e.g. Sweden, Denmark, Austria and Holland. They are oriented towards south and the distance between the solar collector rows and the angle from horizontal is optimised for each place and collector type.

Normally large collectors (10-15 m^2) placed in parallel rows of up to 20 collectors are used. For 1 m^2 solar collector 3-4 m^2 land is needed.

If the collector type, field design, the distance between the collectors, in- and outlet temperatures from district heating, consumption, cost of land area, storage capacity and heat exchangers are known the optimal slope of collectors can be found by calculating the output in for instance TRNSYS (computer software).

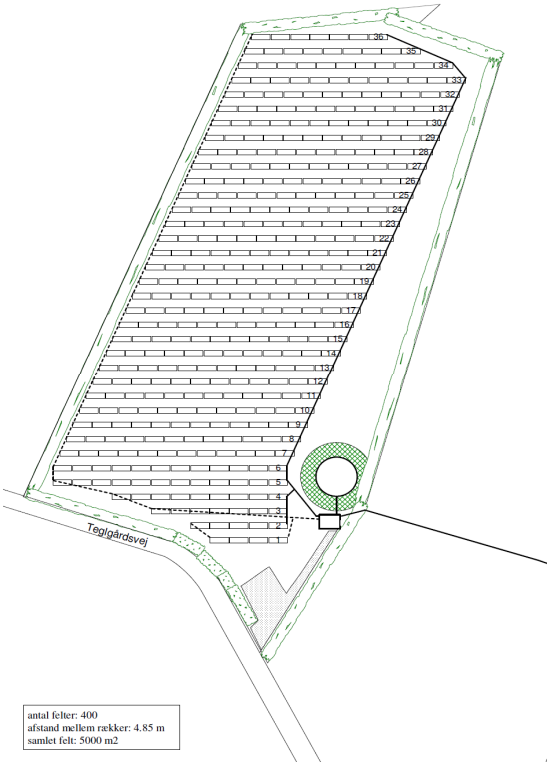

Fig.2.2.1. Example of field design for 5000 m^2 solar collectors including accumulation tank, Ulsted, DK. (Source: PlanEnergi)

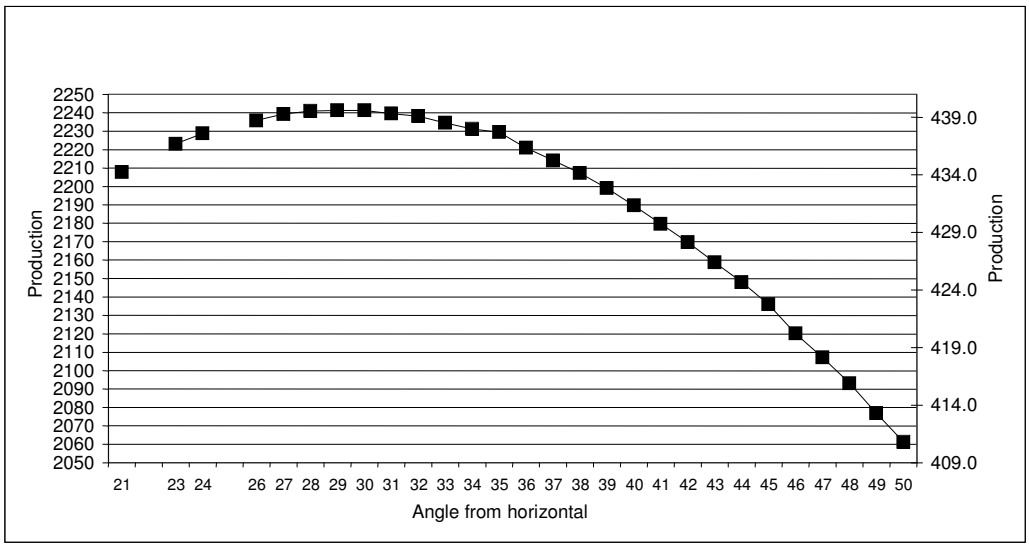

Fig.2.2.2. Example of calculation of output for the 5000 m^2 solar collectors shown in Fig. 2.2.1. The production is calculated for different angles from horizontal, Ulsted, DK. (Source: PlanEnergi)

The distance between the solar collector rows is normally at least 4.5 m (depending on the collector height) – measuring from the front of a collector row to the front of the next row – allowing people to move around between the rows. Larger distances give higher production because of less shadowing but also higher costs for ground and piping.

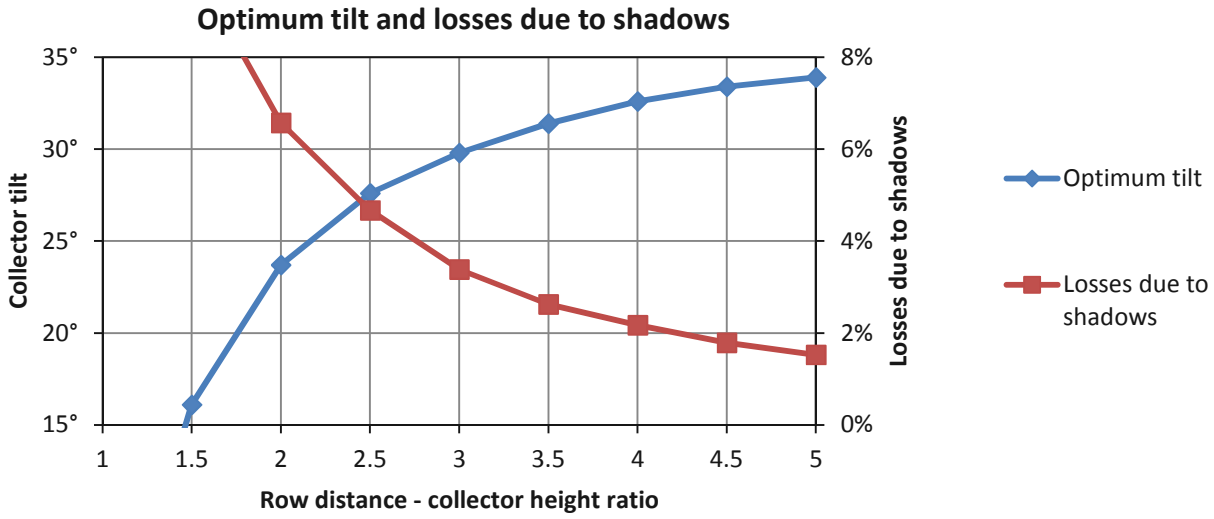

Fig. 2.2.3. Optimum tilt and losses due to shadows as function of the ratio between row distance and collector height. In the example a SDH plant in Tørring, Denmark is used. (Source: PlanEnergi)

Ground mounted collectors are normally the cheapest solution and it can be used as an aesthetic element in the landscape.

Fig. 2.2.4. "Collector Island" (SUNMARK), Almere, Holland [1].

Compared with other types of land use the gain/area is high. Using a rough estimate, solar thermal can be compared with other types of renewable energy in terms of annual yield per land area.

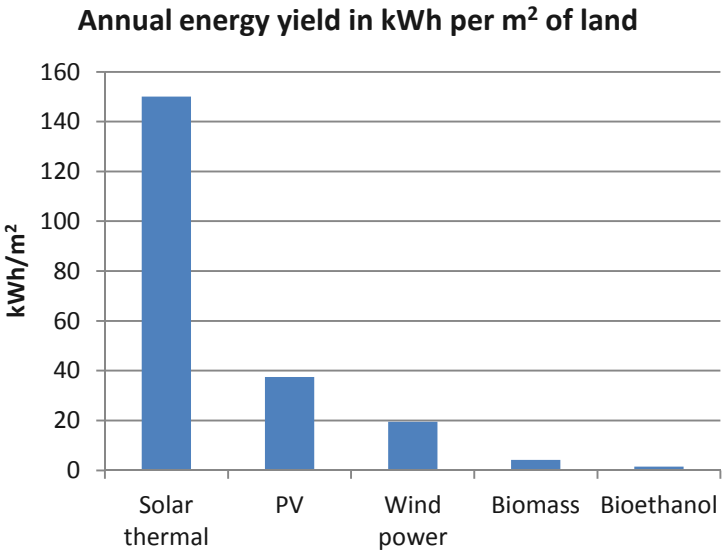

Fig. 2.2.5. Annual yield per m^2 of land used for different renewable energies in Northern Europe.[*]

[*] *Assumptions: Output from an SDH plant: 15 % of the total solar irradiation. Photovoltaics (PV): ¼ of solar thermal. Wind turbines: 8 MW/km2 in 2400 full load hours per year. Biomass: 1000 tonnes/km2 (calorific value: 15 GJ/tonne). Bioethanol: ¼ liters per kg of biomass (calorific value: 22 MJ/liter).*

Roof mounted collectors

For large flat roofs the rules mentioned above for ground mounted collectors can be used.

For roofs with slope there are the following possibilities:

- Roof modules
- Roof integrated solar panels
- Solar panels on the roof

Roof modules and roof integrated solar panels can be used in new buildings and if a roof has to be refurbished. Solar panels on the roof can also be used on existing roofs.

Fig. 2.2.6. Implementation of roof modules (Wagner), Marstal, Denmark [2].

Fig. 2.2.7. Roof integration (Sonnenkraft), Austria [3].

Fig. 2.2.8. Collectors on the roof (ARCON), Denmark [4].

Other possibilities

Fig. 2.2.9. On the wall (Wagner), Germany [5].

Fig. 2.2.10. As shadowing for cars (ARCON), Neckarsulm, Germany [6].

Fig. 2.2.11. On a slope (Schüco), Crailsheim, Germany (by Stadtwerke Crailsheim GMBH) [7]. *Notice the size compared to the car on top and the man in the background.*

References

[1] Photo: Sunmark

[2] Photo: Marstal Fjernvarme

[3] Photo: Knud Erik Nielsen, Arcon Solar

[4] Photo: Arcon Solar

[5] Photo: Wagner homepage, www.wagner-solar.com

[6] Photo: Arcon Solar

[7] Stadtwerke Crailsheim GMBH homepage, www.stw-crailsheim.de

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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