

Popular science summary of the PhD thesis

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Title of the PhD thesis	Solar heating plants with flat plate collectors and parabolic trough collectors
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Science summary

Denmark is the frontrunner country worldwide on installed capacity and numbers of large solar district heating plants. By the end of 2017, more than 1.3 million m² solar collector fields are in operation in Danish solar heating plants. Denmark is also the first and only country with a mature-commercial market in the world. Most collectors used in the solar district heating plants in Denmark are flat plate collectors.

As most collectors in solar heating plants are mass produced flat plate collectors after development during many years, parabolic trough collectors were not considered as a suitable solar collector type for solar district heating plants in the current market, particularly at high latitudes. However, with the rapid development of parabolic trough collectors, reliable tracking accuracy and high efficiency at high temperatures, parabolic trough collectors can be cost-effective today. Parabolic trough collectors are more and more interesting for the solar thermal market, especially in series with flat plate collectors.

Denmark is located at high latitudes and has relatively low average solar radiation compared to many other regions. Given that the most successful market worldwide for large solar district heating plants with flat plate collectors is Denmark, it is interesting to analyze the potential of parabolic trough collectors in solar district heating plants in Denmark.

The aim of this PhD study is to investigate the technical-economic feasibility of solar heating plants with both types of collectors in Denmark. A new design concept for large solar district heating plants with flat plate collectors and parabolic trough collectors in series is introduced in the study. The whole chain of “Solar radiation-thermal performance-economy” has been investigated in the study. The results show that parabolic trough collectors can be feasible in hybrid solar heating plants, if the plant is designed in the optimal way.