

# Developments in solar heat from concentrating solar systems

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## 1. Introduction

Industrial heat applications are a significant market for concentrating solar technologies. Currently, concentrating collector technologies are offered by a number of suppliers. This publication gives an overview on the installations which have been built recently in terms of capacity, application and country as well as on the potential heat market and specific market conditions.

## 2. Global industrial heat demand

A significant part of the final energy consumption comprises of industrial heat demand. It is even higher than the electrical consumption. Although the temperature requirements are for some part above the capabilities of solar systems and many sites do not have the required space available, the market for solar process heat is large from a technical point of view.

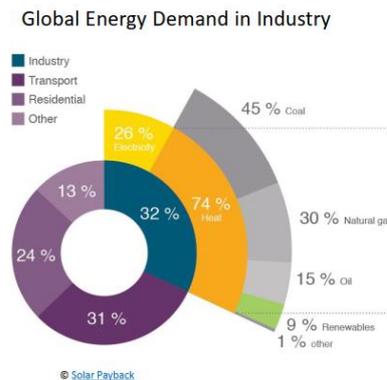


Fig. 1: Distribution of global energy demand in industry in 2014 [1]

## 3. Status of concentrating collectors in operation and in progress

A total of 792,046 m<sup>2</sup> of concentrating collectors for heat production are in operation according to annual surveys among SHIP (Solar heat for industrial processes) suppliers worldwide within the Solar Payback project. The highest number of installations has been erected by the company Inventive Power by now about 100 installations.

The most popular sort of solar concentrating technology was again parabolic trough collectors, used in 12 projects in 2019 aside from Miraah in Oman, a parabolic trough plant in greenhouses which added 257,143 m<sup>2</sup> (180 MW) to the new installed collector are in 2019. However, sales in that market sector fell slightly from 11,096 m<sup>2</sup> in 2018 to 7,542 m<sup>2</sup> in 2019. Solar dishes were put up by only two companies, Megawatt Solutions and Quadsun, both based in India. Likewise, linear Fresnel remained a niche technology installed by Belgian-based Rioglass and Spanish-based Solatom during four projects in 2019 (Figure 2). Non-SHIP (SHIP - Solar Heat for Industrial Processes) applications in the table refer to hotels, swimming pools or cooking. The thermal power is related with factor 0.7 to the aperture area.

Xuchen Energy has placed the largest concentrating heat producing plant after Miraah with 71,000 m<sup>2</sup> parabolic trough collectors on the ground and 22,000 m<sup>2</sup> of Fresnel collectors on a single roof in Hongqingde Village, Inner Mongolia.

	Application	Newly installed collector area 2018 [m <sup>2</sup> aperture]	Newly installed collector area 2019 [m <sup>2</sup> aperture]	Newly installed thermal power 2018 [MW]	Newly installed thermal power 2019 [MW]
Parabolic trough	SHIP applications	11,367	7,539	8.0	5.3
	NON-SHIP applications	21,220	4,051	14.9	2.8
	Glasspoint (Miraah)	0	257,143	0	180
	<b>Total</b>	<b>32,587</b>	<b>268,733</b>	<b>22.8</b>	<b>188.1</b>
Dish	SHIP applications	1,075	1,962	0.8	1.4
	Commercial cooking	1,576	160	1.1	0.1
	<b>Total</b>	<b>2,651</b>	<b>2,122</b>	<b>1.9</b>	<b>1.5</b>
Linear Fresnel	SHIP applications	360	636	0.25	0.45
	<b>Total</b>	<b>360</b>	<b>636</b>	<b>0.25</b>	<b>0.45</b>
<b>Total across all three technologies</b>		<b>35,598</b>	<b>271,491</b>	<b>24.9</b>	<b>190</b>

Fig. 2: New collector installations in the years 2018 and 2019 [2]

Since the Sundrop farm project in Australia commissioning in 2016, solar tower projects for heat applications have not been realised. Within the European project HiFlex the installation of a solar tower supplying heat to a pasta factory is being planned to be built in 2021.

Although most suppliers offer their product internationally the choice of technologies relates very much with the producers technology in the same country. In Spain, 3 of 4 installations have been realised with Fresnel systems and the three Spanish concentrating collector suppliers Solatom, Rioglass Solar and Covalersa all produce Fresnel collectors. In Mexico all installations are built with parabolic trough technology from Inventive Power as the only supplier so far. All commercial projects with dishes other than the Scheffler construction are situated in India, where Megawatt Solutions and Quadsun are based.

Besides different technologies, the construction principles differ significantly. Parabolic trough collectors especially for small sizes can contain components as aluminum mirrors, receivers without vacuum and antireflex coating. These reduce the thermal output, but offer freedom in the choice of form and sizes and better availability. Going to larger collectors glass silver mirrors and vacuum receivers with antireflex coating are more established.

Heat supply contracts have come up in recent solar thermal projects with stationary collectors. Azteq, Belgium, has started as an ESCO (Energy service company) with two trough plants of 1,100 m<sup>2</sup> of aperture area at chemical production and storage facilities with Solarlite, Germany, as EPC contractor. These plants have been erected in Belgium. Other suppliers of concentrating collectors have plans to add solar heat contracts to their portfolio.

The market introduction of concentrating solar collectors is assisted by the new IEA Task SHC Task 64/SolarPACES Task IV on “Solar Process Heat” which has started beginning of the year 2020. It includes the subtasks Integrated energy systems, Modularisation, Simulation and design tools, Standardisation/ Certification and Guideline to market. The goal of the proposed task is to help solar technologies be and also be recognized as a reliable part of the heat supply of industry.

## References

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- [2] SHIP Supplier Surveys 2018 and 2019 carried out by solrico within the Project Solar Payback, <https://www.solarthermalworld.org/keyword/solarpayback>