

## Summary

This report gives an overall overview of the global solar thermal market development in 2019. In addition, general trends are described and detailed 2019 data on successful applications, such as solar assisted district heating, solar heat for industrial processes and hybrid photovoltaic-thermal systems, are documented. A special chapter in this year's edition deals with thermosiphon systems, which have found widespread use worldwide, especially in social housing programs.

The second part of the report presents detailed market figures for the year 2018 from the 68 surveyed countries. In addition to the installed collector areas, this includes the distribution of the collectors across various systems and applications, as well as the solar yields and avoided emissions.

### Global solar thermal market developments in 2019

The cumulated solar thermal capacity in operation at the end of 2019 was 479 GW<sub>th</sub> (684 million square meters). The corresponding annual solar thermal energy yield amounted to 389 TWh, which correlates to savings of 41.9 million tons of oil and 135.1 million tons of CO<sub>2</sub>.

The market for new installations once again varied by country, with shrinking markets in large markets like China, USA, Germany and Australia, stable markets in Mexico and Turkey, and growing markets in Denmark, Cyprus, South Africa and Greece. Driven by the decline in new collector installations of about 8% in China, the worldwide market shrank approximately 6% in 2019 compared to 2018.

As the past few years have shown, the solar thermal market is experiencing challenging times. This is especially evident in the large markets in China and Europe, where the traditional mass markets for small-scale solar water heating systems for single-family houses and apartment buildings are under market pressure from heat pumps and photovoltaic systems. However, what is often overlooked is the fact that around 60% of the solar thermal systems installed worldwide are still small-scale thermosiphon systems. Some countries such as Greece, South Africa and some countries in Latin America, have strong markets in this area due to government support programs.

An area with consistent growth is in the number of megawatt-scale systems for district heating and industrial applications. In Denmark, the market grew at about 170% in 2019 because of the installation of a couple of large-scale plants this year.

By the end of 2019, about 400 large-scale solar thermal systems (>350 kW<sub>th</sub>; 500 m<sup>2</sup>) connected to district heating networks and in residential buildings were in operation. The total installed capacity of these systems equaled 1,612 MW<sub>th</sub> (2.3 million m<sup>2</sup>), excluding concentrating systems that added 162,784 m<sup>2</sup>. Denmark remains the leading European country for large-scale district heating systems, adding 36% of the newly installed collector area worldwide (excluding parabolic trough collectors). And outside of Europe, China added 97% of the installed collector area for large-scale systems in 2019.

Twenty-three large-scale solar thermal systems with about 228,900 m<sup>2</sup> (160 MW<sub>th</sub>) were installed in Europe in 2019. Of these installations, 15 were in Denmark (191,300 m<sup>2</sup>) including five extensions of existing systems, six in Germany (14,700 m<sup>2</sup>), one in Latvia (21,700 m<sup>2</sup>) and one in Austria (1,200 m<sup>2</sup>).

Outside Europe, 218 MW<sub>th</sub> (311,700 m<sup>2</sup>) were installed, excluding one concentrating system installed in Mexico and four concentrating systems in China that would add 5,300 m<sup>2</sup> to the total above.

In China, 47 systems for district heating and large buildings were installed in 2019 (307,000 m<sup>2</sup>). The largest district heating system installed in China in 2019 was in Zhongba, with a collector area of 35,000 m<sup>2</sup>. The largest system installed in Europe in 2019, besides the systems installed in Denmark, was in Latvia, with a collector area of 21,700 m<sup>2</sup>.

Worldwide interest in solar thermal systems for industrial processes has grown steadily over the past several years. A number of promising projects implemented range from small-scale demonstration plants to very large systems in the 100 MW<sub>th</sub> sector. At least 800 solar process heat systems, totaling 1 million m<sup>2</sup> collector area (700 MW<sub>th</sub>), were in operation at the end of 2019.

The world's largest solar process heat plant Miraah in Oman was enlarged by roughly 200 MW<sub>th</sub> in 2019 and now has an installed capacity of 300 MW<sub>th</sub>. The solar produced steam is used for enhanced oil recovery.

In addition to the more traditional industrial sectors like the food, beverage and mining industry, in which solar thermal systems are used, there are two new applications, in which a number of systems have been built. One application developed in recent years is to supply solar heat to greenhouses for flower and vegetable cultivation. The second application relates to the heating of gas pressure control systems, an interesting application implemented in several systems in Germany.

Photovoltaic Thermal (PVT) collectors and systems are included for the second time in the Solar Heat Worldwide report. This market developed very well in 2019 and saw significant global growth of +9%. This trend was also seen in the European market with a growth rate of 14%, which corresponds to an increase of the yearly new installed capacity of 40.8 MW<sub>th</sub> and 13,3 MW<sub>peak</sub><sup>1</sup>. By the end of 2019, the total installed PVT collector area was 1,166,888 m<sup>2</sup> (606 MW<sub>th</sub>, 208 MW<sub>peak</sub>), and 58% of this collector area was in Europe.

## Market status worldwide in 2018

By the end of 2018, an installed capacity of 483 GW<sub>th</sub>, corresponding to a total of 690 million m<sup>2</sup> of collector area was in operation in the recorded 68 countries. These figures include unglazed water collectors, flat plate collectors, evacuated tube collectors, and unglazed and glazed air collectors.

The vast majority of the total capacity in operation was installed in China (337.6 GW<sub>th</sub>) and Europe (56.8 GW<sub>th</sub>), which together accounted for 81.8% of the total. The remaining installed capacity was shared between the United States and Canada (18.6 GW<sub>th</sub>), Asia excluding China (14.7 GW<sub>th</sub>), Latin America (14.8 GW<sub>th</sub>), the MENA<sup>2</sup> countries (Israel, Jordan, Lebanon, Morocco, the Palestinian Territories and Tunisia) (7.1 GW<sub>th</sub>), Australia and New Zealand (6.6 GW<sub>th</sub>), and Sub-Sahara African countries<sup>3</sup> (1.7 GW<sub>th</sub>). The market volume in the 68 documented countries is estimated to represent 95% of the solar thermal market worldwide. With a global share of about 70%, evacuated tube collectors were the predominant solar thermal collector technology followed by flat plate collectors with about 23%, unglazed water collectors with about 6% and glazed and unglazed air collectors with 0.2%.

---

<sup>1</sup> Megawatt peak describes the maximum possible power of a photovoltaic generator under standard test conditions

<sup>2</sup> Middle East and North Africa

<sup>3</sup> Botswana, Burkina Faso, Cape Verde, Ghana, Lesotho, Mauritius, Mozambique, Namibia, Nigeria, Senegal, South Africa and Zimbabwe

The top 10 markets in 2018 in terms of total installations were China, the United States, Turkey, Germany, Brazil, India, Australia, Austria, Israel and Italy.

The leading countries for cumulated glazed and unglazed water collector capacity in operation in 2018 per 1,000 inhabitants were Barbados (565 kW<sub>th</sub>/1,000 inhabitants), Cyprus (446 kW<sub>th</sub>/1,000 inhabitants), Austria (408 kW<sub>th</sub>/1,000 inhabitants), Israel (398 kW<sub>th</sub>/1,000 inhabitants), Greece (309 kW<sub>th</sub>/1,000 inhabitants), the Palestinian Territories (271 kW<sub>th</sub>/1,000 inhabitants), Australia (260 kW<sub>th</sub>/1,000 inhabitants), China (243 kW<sub>th</sub>/1,000 inhabitants), Turkey (217 kW<sub>th</sub>/1,000 inhabitants) and Denmark (202 kW<sub>th</sub>/1,000 inhabitants).

### **Newly installed capacity worldwide in 2018**

In 2018 a capacity of 33.5 GW<sub>th</sub>, corresponding to 47.9 million m<sup>2</sup> of solar collectors, were installed worldwide. The main markets in 2018 were China (24.8 GW<sub>th</sub>) and Europe (2.9 GW<sub>th</sub>), which together accounted for about 83% of the overall new collector installations. The rest of the market was shared between Latin America (1.2 GW<sub>th</sub>), Asia excluding China (1.4 GW<sub>th</sub>), the United States and Canada (0.6 GW<sub>th</sub>), the MENA countries (0.4 GW<sub>th</sub>), Australia (0.4 GW<sub>th</sub>), and the Sub-Sahara African countries (0.1 GW<sub>th</sub>). The market volume of “all other countries” is estimated to be 5% of the new installations (1.7 GW<sub>th</sub>).

Remarkable market growth was reported from Denmark (170%), Cyprus (24%), South Africa (20%), Greece (10%), Tunisia (7%) and Brazil (6%).

With a share of 71.3% of the newly installed capacity in 2018, evacuated tube collectors are still by far the most important solar thermal collector technology worldwide. In a global context, this breakdown is mainly driven by the dominance of the Chinese market where around 83.1% of all newly installed collectors in 2018 were evacuated tube collectors.

Nevertheless, it is notable that the share of evacuated tube collectors on the worldwide scale decreased from about 82% in 2011 to 71.3% in 2018, and in the same time frame flat plate collectors increased their share from 14.7% to 24.2%.

In Europe, the situation is almost the opposite of that in China with 71.9% of all solar thermal systems installed in 2018 being flat plate collectors. In the medium-term perspective, the share of flat plate collectors, however, has decreased in Europe from 81.5% in 2011 to 71.9% in 2018 due to growth of the evacuated tube collector markets in Turkey, Poland, Switzerland and Germany. Overall, the share of evacuated tube collectors in Europe has increased between 2011 and 2018 from 15.6% to 26.6%.

In terms of newly installed solar thermal capacity per 1,000 inhabitants in 2018, the top 10 ranking of countries over the past few years has remained the same, except for Austria slipping from eighth to ninth place. Israel is the leader followed by Cyprus, Barbados, Greece, China, Australia, Turkey, Denmark, Austria and the Palestinian Territories.

### **Distribution by system type and application**

The thermal use of the sun’s energy varies greatly from region to region and can be roughly distinguished by the type of solar thermal collector used, the type of system operation (pumped solar thermal systems, thermosiphon systems) and the main type of application (swimming pool heating, domestic hot water preparation, space heating, other such as industrial processes heat, solar district heating and solar thermal cooling).

Worldwide, 58% of all solar thermal systems installed are thermosiphon systems, and the rest are pumped solar heating systems.

The calculated number of water-based solar thermal systems in operation was approximately 105 million by the end of 2018. The breakdown is 53% used for domestic hot water preparation in single-family houses and 37% attached to larger domestic hot water systems for multifamily houses, hotels, hospitals, schools, etc., and 6% used for swimming pool heating. Around 2% of the global installed capacity is used in solar combi-systems that supply heat for both domestic hot water and space heating. The remaining systems accounted for around 2% and delivered heat to other applications, including district heating networks, industrial processes and thermally driven solar cooling applications.

### **Employment and turnover**

Based on a comprehensive literature survey and data collected from detailed country reports, the number of jobs in the fields of production, installation and maintenance of solar thermal systems is estimated to be 650,000 worldwide in 2018.<sup>4</sup>

The worldwide turnover of the solar thermal industry in 2018 is estimated at € 15.4 billion (US\$ 16.9 billion).

---

<sup>4</sup> Background information on the methodology used can be found in the Appendix, Chapter **Error! Reference source not found.**