



SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Solar Heat Worldwide Edition 2023



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Global Market Development
and Trends 2022
Detailed Market Figures 2021



SOLAR HEAT WORLD WIDE

Edition 2023

 Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Global solar thermal capacity in operation and annual energy yields 2000-2022

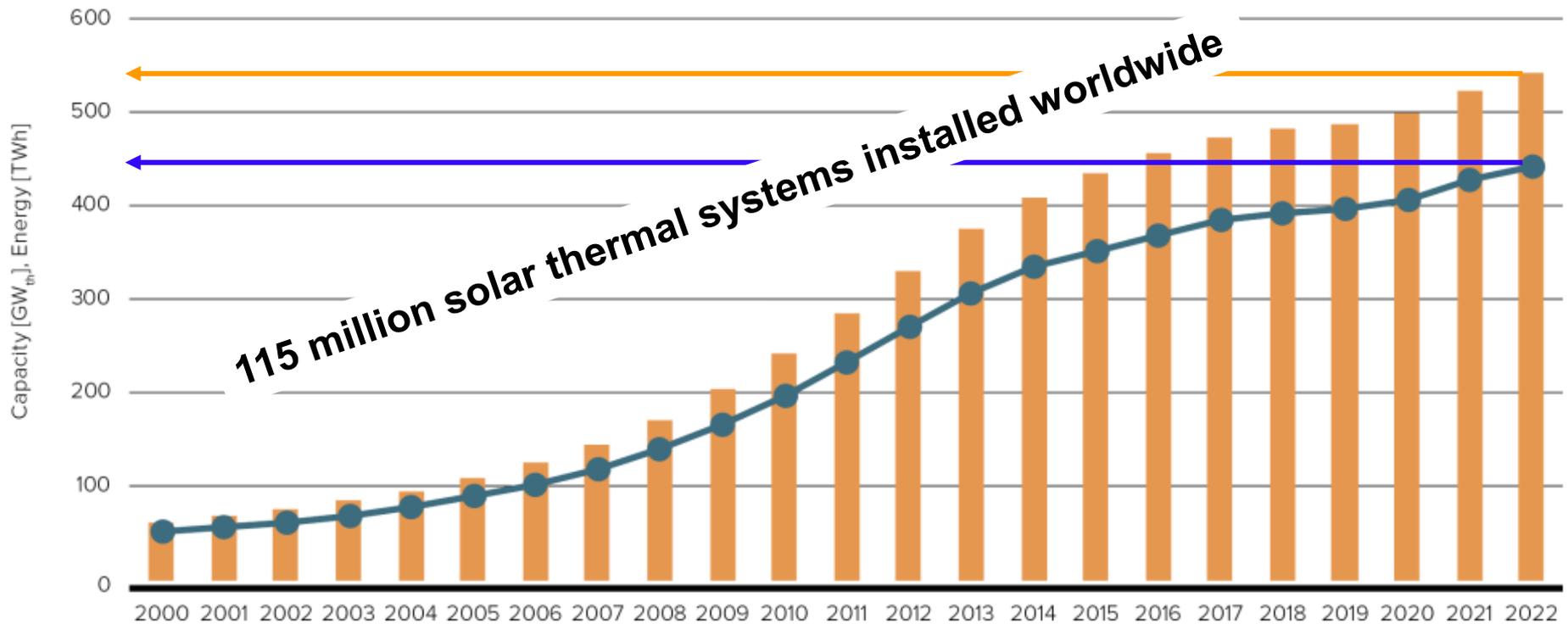


Figure 2: Global solar thermal capacity in operation and annual energy yield 2000-2022

- Global solar thermal capacity in operation [GW_{th}]
- Global solar thermal energy yield [TWh]

Annually installed capacity and NET additions 2001-2022

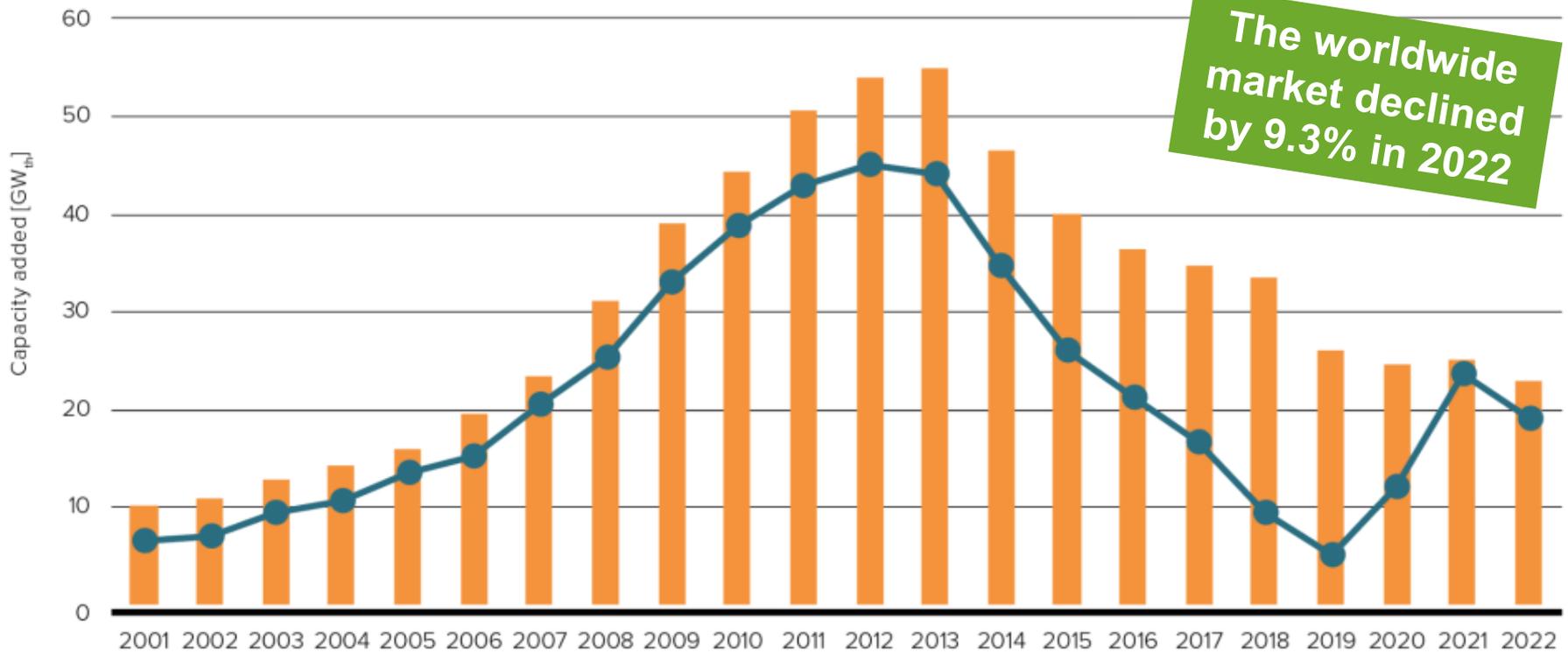


Figure 3: Annual installed collector capacity and net additions

- Annually installed capacity of water collectors [GW_{th}]
- Water collectors NET additions [GW_{th}]



The decline is justified by a market slump in China of 12.4% and India saw a drop in their solar thermal market from 16% growth in 2021 to -21% in 2022

145%
market growth
in Lebanon
2022

Countries with Largest Solar Thermal Market Growth in 2022

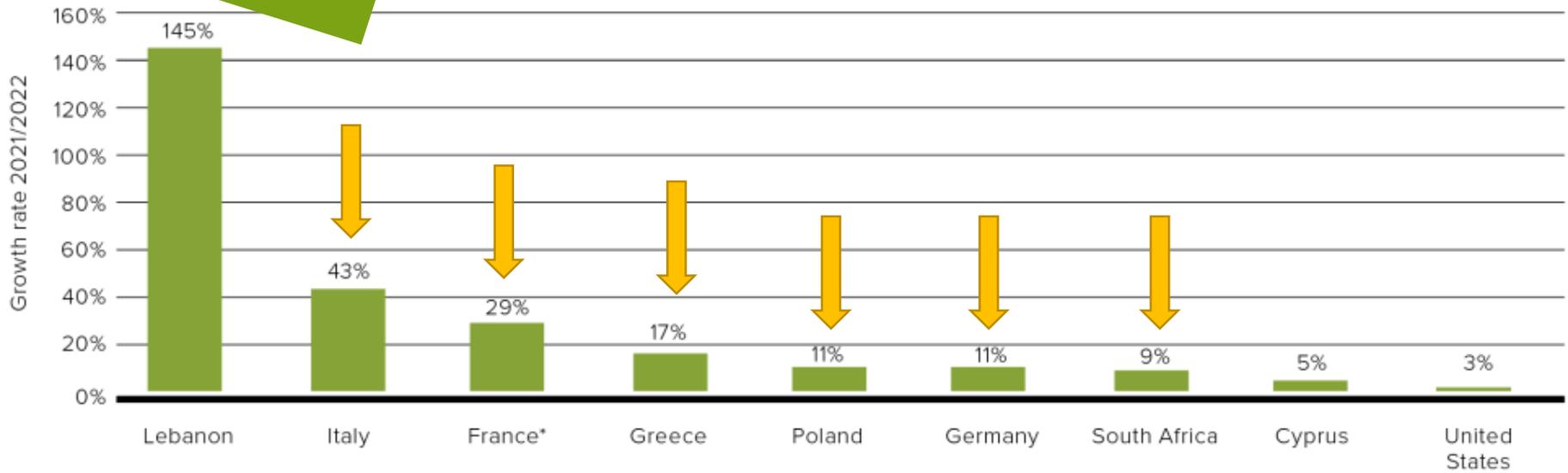


Figure 6: Reporting countries with the highest growth rates in 2022

* preliminary data based on Uniclimate Report

Large-scale solar thermal heating systems



Photo: Absolicon Solar Collector AB, Sweden

Large-scale systems for district heating and for large residential, commercial and public buildings
Annual installed systems and cumulated area in operation

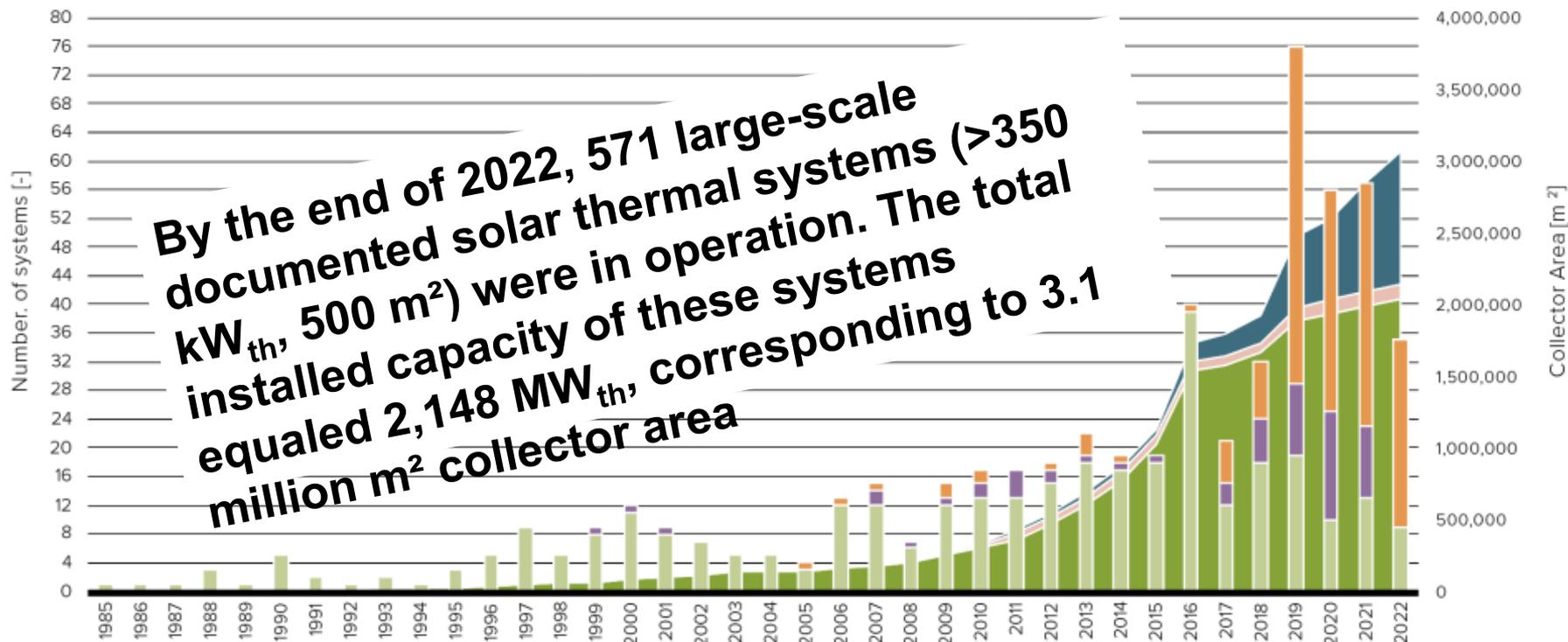


Figure 8: Large-scale systems for solar district heating and large residential, commercial and public buildings worldwide – annual installations and cumulated area in operation in 2022

Data sources: Daniel Trier - PlanEnergi, DK, Jan-Olof Dalenbäck - Chalmers University of Technology, SE, Sabine Putz - IEA SHC Task 55, AT, Bärbel Epp - solrico.com/, DE, AEE INTEC, AT, Janusz Starościk – SPIUG, PL, Zheng Ruicheng, China Academy of Building Research, CHN.

- Cumulated collector area in operation in Europe [m²]
- Cumulated collector area in operation in China [m²]
- Number of systems installed in "Other countries" [m²]
- Cumulated collector area in operation "Other countries" [m²]
- Number of systems installed in Europe [-]
- Number of systems installed in China [-]

* Other countries:

MENA countries: Dubai, Jordan, Kuwait, Morocco, Saudi Arabia, Tunisia, UAE

Latin America: Brazil, Colombia, Mexico

Asia excl. China: Cambodia, Japan, Kyrgyzstan, India, Russia, South Korea, Thailand, Turkey

Plus: Australia, Canada, South Africa, USA

Large-scale systems for solar district heating
Collector area, capacities installed and number of systems by country (2022)

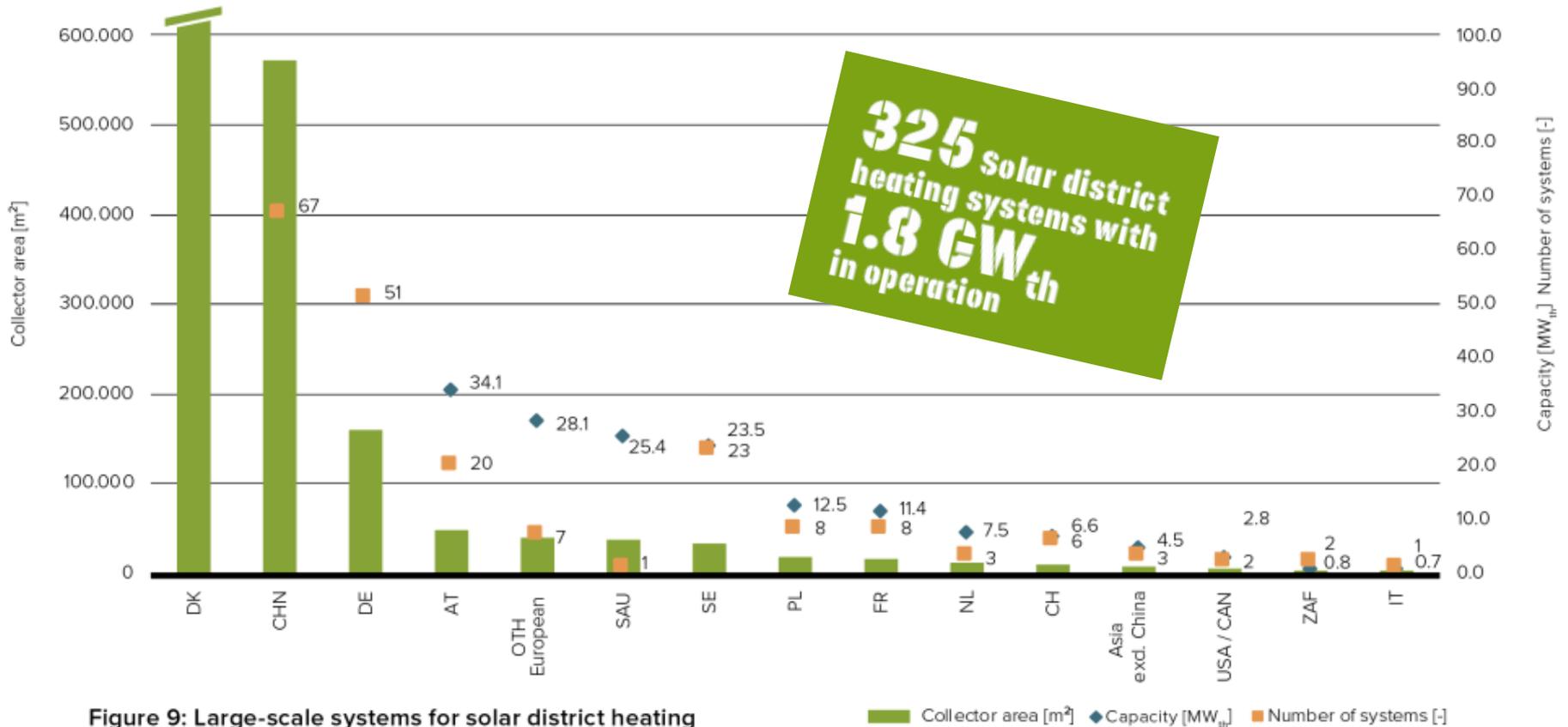


Figure 9: Large-scale systems for solar district heating – capacities and collector area installed and number of systems by the end of 2022

Data sources: Daniel Trier - PlanEnergi, DK, Jan-Olof Dalenbäck - Chalmers University of Technology, SE, Sabine Putz - IEA SHC Task 55, AT, Bärbel Epp - solrico.com, DE⁹.

DK: Collector area: 1,606,591 m² Capacity: 1,124 MW_{th} Number of systems: 123
CHN: Collector area: 571,464 m² Capacity: 400 MW_{th} Number of systems: 67

⁹ Usually, countries report single systems that are documented regarding project name, country and installed collector size. In 2021 and 2022 China reported total collector area and average system size for solar district heating systems.

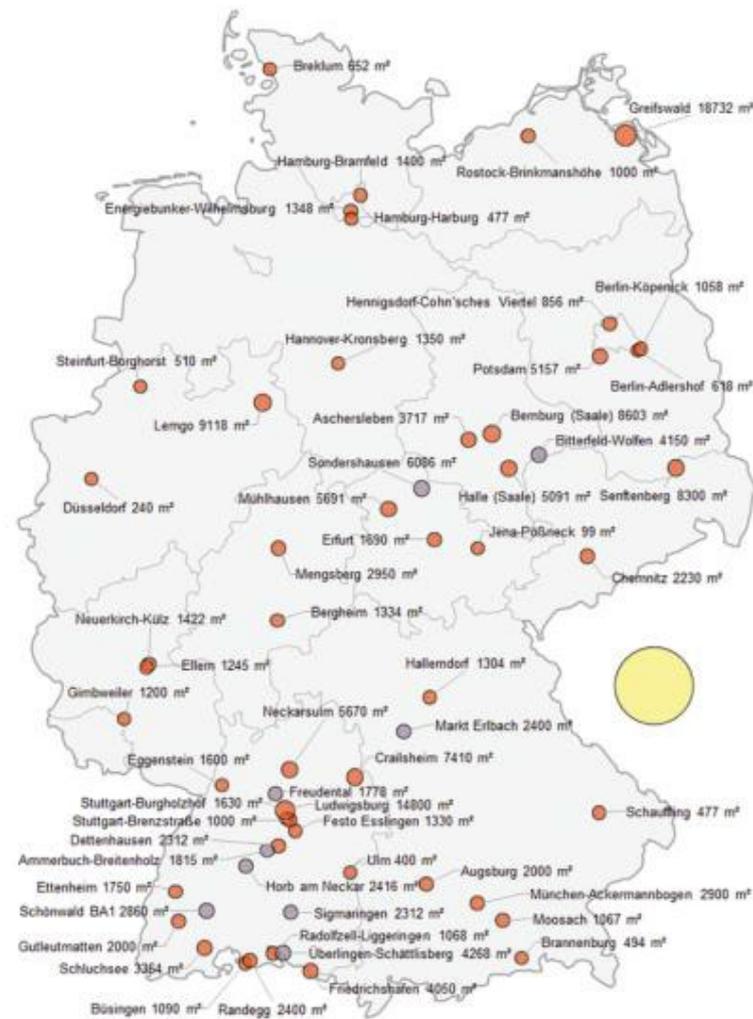
Highlights

Solar District Heating 2020

China reported the installation of 171,068 m² collectors for district heating and 25 other large-scale systems, with an average of 6,945 m² per plant, corresponding to about 25 installed systems in 2022.

In Germany, eight systems were installed with a total collector area of 44,923 m², primarily for solar district heating systems

2022 was a record year for solar district heating networks in Germany



- In operation, 49 systems with a collector area of about 146,204 m²
- Planned, 9 systems with a collector area of about 28,085 m²
- In preparation, 66 systems with a collector area of about 454,550 m²

Figure 7: In Germany, 49 solar district heating networks with 146,204 m² in operation in March 2023
Source: Steinbeis Research Institute Solites

Solar district heating plant in Lemgo, Germany, consists of 9,181 m² vacuum tube collectors



Photo: Stadtwerke Lemgo GmbH / Viessmann

At least 1,089 SHIP systems^{*)} with 1.22 million m² collector area related to a capacity of 856 MW_{th} are in operation worldwide.

It should be noted in addition to the number of SHIP plants reported, a larger number of SHIP plants have been built in China, but there is no detailed data available.

For 494 of the 1,089 systems detailed information is available in a SHIP database. This database is an online portal operated by AEE INTEC.

Link: <http://ship-plants.info/>

These 494 SHIP systems account for a total collector area of 1,071,706 m² and a thermal capacity of 645 MW_{th}. Only the data of these 494 SHIP systems are presented in the following figures.

^{*)}Source: Solrico

In 2022, at least 114 new SHIP systems^{*)}
with a capacity of 30 MW_{th} were installed worldwide



Photo: SOLID Solar Energy Systems, Austria

^{*)}Source: Solrico



1.5 million m²
PVT collector
area installed
worldwide

PVT - Photovoltaic-Thermal Systems

PVT system integrated into a flat roof of a detached house in Germany
Photo: EVO Deutschland GmbH

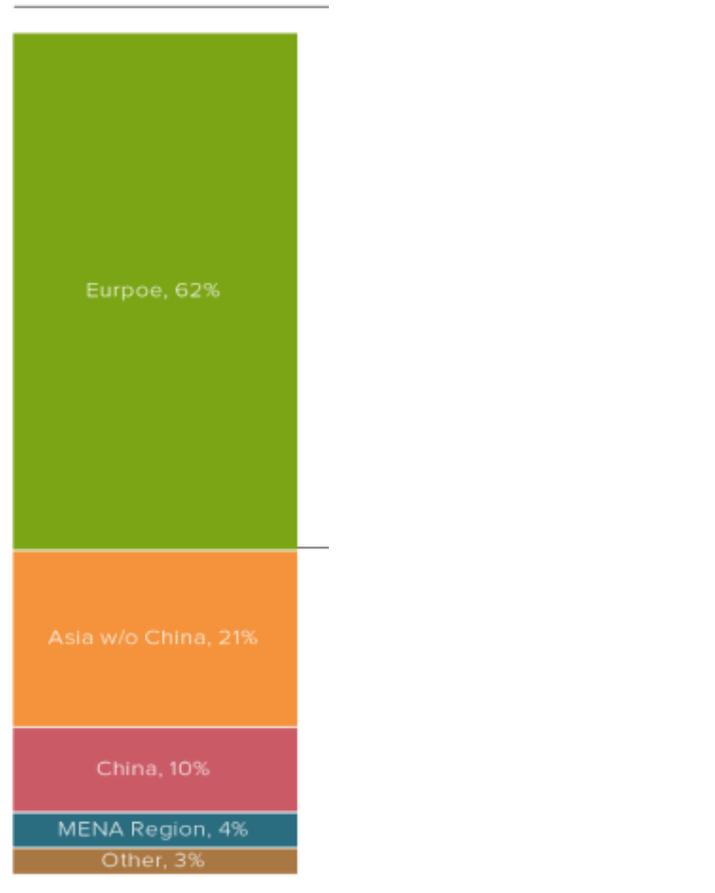


Figure 16: Distribution of the total installed collector area by economic region in 2022
Source: AEE INTEC

Global market development of PVT collectors 2017 - 2022

Global market development of cumulated PVT collector area

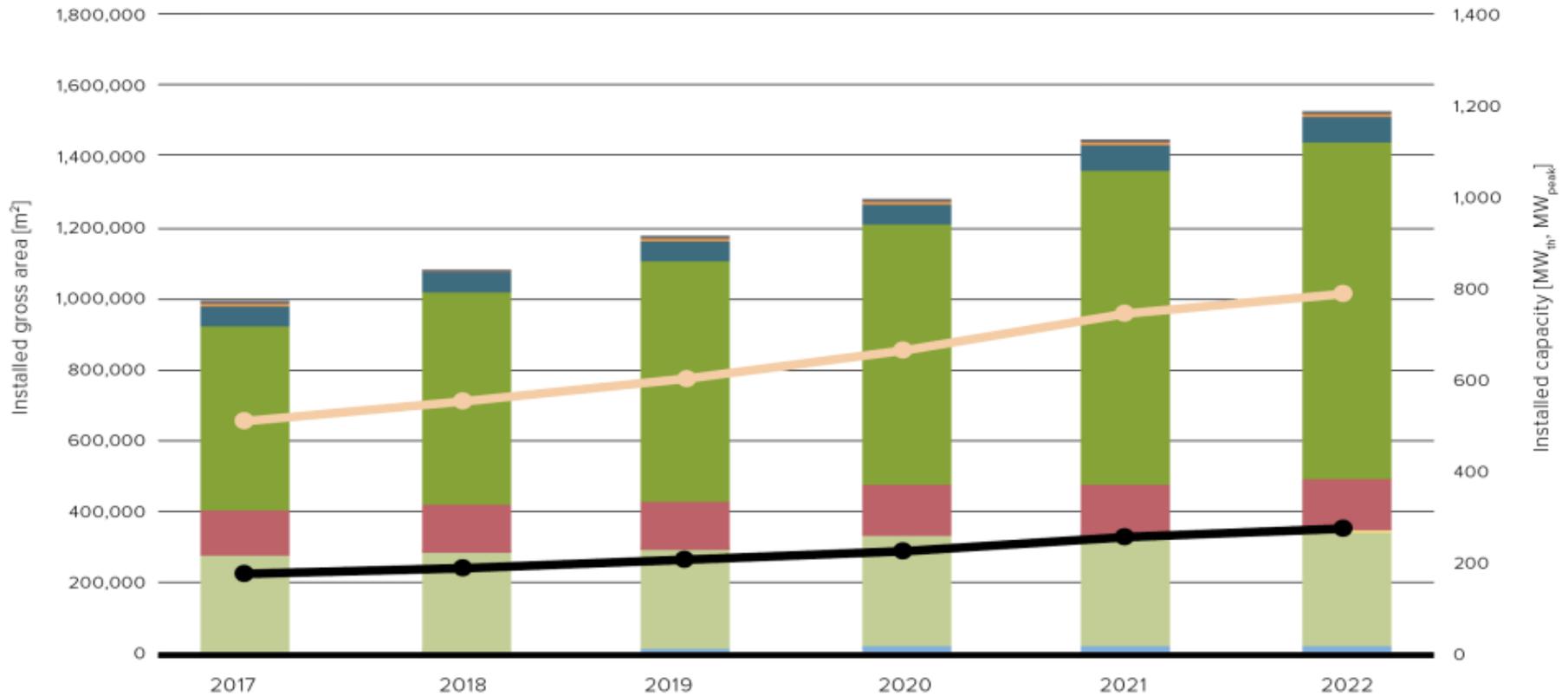


Figure 17: Global market development of PVT-collectors from 2017 to 2022

Source: AEE INTEC

- Other countries
- Europe
- Australia
- thermal capacity
- USA / Canada
- China
- Asia w/o China
- electrical capacity
- MENA region
- Latin America
- Sub-Sahara Africa

PVT Market development in 2022

The global
PVT market
shrank by
520%
in 2022

France -90%

Netherlands -43%

Italy +414% (2,568 m²)

Germany +126% (19,089 m²)

Switzerland +103% (4,840 m²)

Spain +52% (5,862 m²)

Sion, Switzerland. 41 PVT collectors on a building in the city center (sustainable building with Minergie label) Photo: DualSun, Switzerland

Distribution of newly installed PVT collector area worldwide by collector type



Figure 18: Distribution of newly installed PVT collector area worldwide by collector type in 2021 (left) 2022 (right)

Source: AEE INTEC

Outlook 2023 and beyond



Photo: ALT ENER PRO PTY LTD, South Africa

Increased demand in solar district heating

Solar thermal energy offers a cost-effective way to make urban district heating systems CO₂ neutral. As shown by plants already installed, solar heat can be provided at costs between 20 and 50 €/MWh under favorable conditions. This is significantly lower than the prices end customers currently pay for district heating.

Solar district heating projects
in the pipeline range from
400 - 500 MW_{th}

Increased demand is expected in solar district heating



Germany

Nine solar district systems representing (19.6 MW_{th}) are under construction or in an advanced planning stage. **Another 66** systems with a collector area of 454,550 m² (318 MW_{th}) are under concrete discussion.

Netherlands

A large-scale solar district heating system with 48,000 m² (33.6 MW_{th} capacity) will be completed in 2023 in the city of Groningen.

Western Balkan countries Serbia and Kosovo.

A solar plant with a 58,000 m² collector area (40.6 MW_{th} capacity) and a 408,000 m³ seasonal storage are planned for the district heating of Pristina, the capital city of Kosovo.

Two district heating plants are planned for Serbia. The feasibility study for a 35,000 m² (24.5 MW_{th} capacity) plant in the city of Pancevo is completed. And a solar district heating plant in the range of 45 to 136 MW_{th} is planned for the city of Novi

Sad, in combination with a seasonal storage.

A new dimension is opening up in China

Handan Bay Water World Resort

The 114,000 m² (79.8 MW_{th}) parabolic trough collector system supplies the hotel's HVAC and hot water systems, indoor swimming pool, and ice and snowmaking system for an indoor ski slope. Commissioning is scheduled for the end of the second quarter of 2023.



Positive outlook also for SHIP plants

The multi-MW plants in the EU

currently under construction and whose commissioning is planned for 2023 promise a sevenfold increase*

These include the chemical site in Turnhout, **Belgium**, with 2.5 MW_{th} capacity, and two systems at breweries in **Spain** with 28.5 MW_{th} and 4 MW_{th}, respectively.

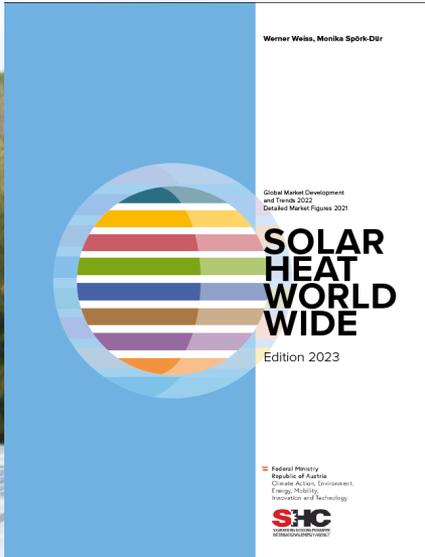
A solar plant for a malting plant with 23,400 m² flat plate collectors in combination with a 5,000 m³ hot water storage tank is being implemented in **Croatia** with the support of the European Innovation Fund. Commissioning is

*) Source: <https://solarthermalworld.org/news/high-level-of-dynamism-on-theship-world-market-in-2022/>

The first GW-scale SHIP plant

By far, the largest solar process heat plant is in the planning stage in Saudi Arabia.

1.5 GW_{th}
solar steam
project for an
alumina refinery



<https://www.iea-shc.org/solar-heat-worldwide>

www.iea-shc.org



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