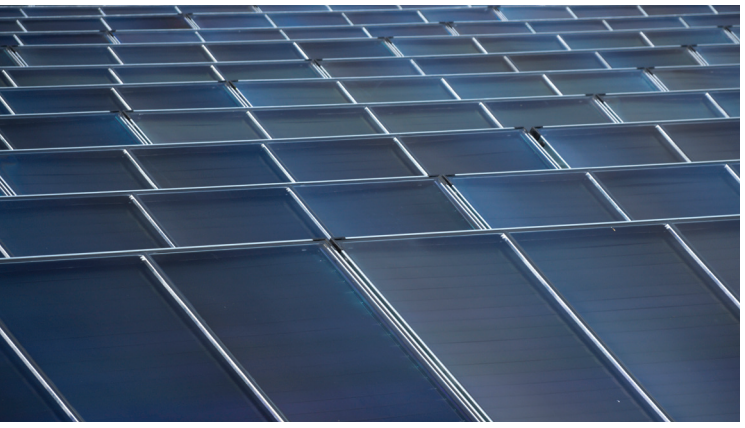
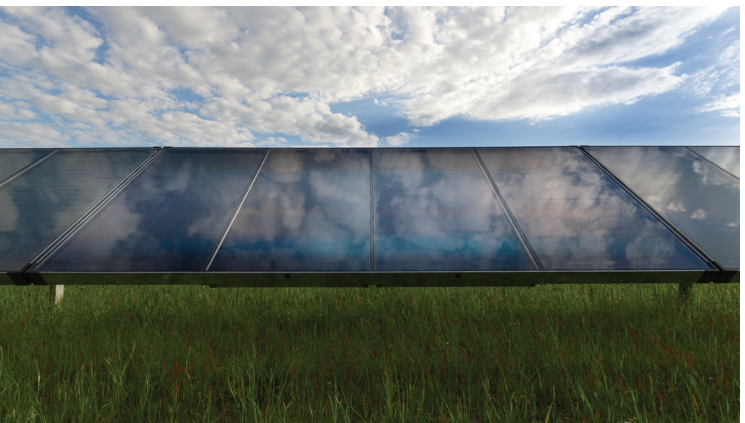
Solar Heat Europe
ESTIF

Solar Heat Markets in Europe

Trends and Market Statistics 2018

Summary (November 2019)





Data Highlights of 2018

Total installed capacity in operation:
36.1 GW_{th}

Total installed capacity in 2018:
1.5 GW_{th}

Annual energy generation (estimated):
25.6 TWh_{th}

(Estimated) sector turnover
1.85 EUR billion

Numbers of jobs (estimated):
18 800

Estimated
6.8 Mt CO_2
emission savings

Estimated number of solar thermal systems in operation:
10.1 million

(estimated) Energy storage capacity:
180 GWh
(connected with solar thermal systems)

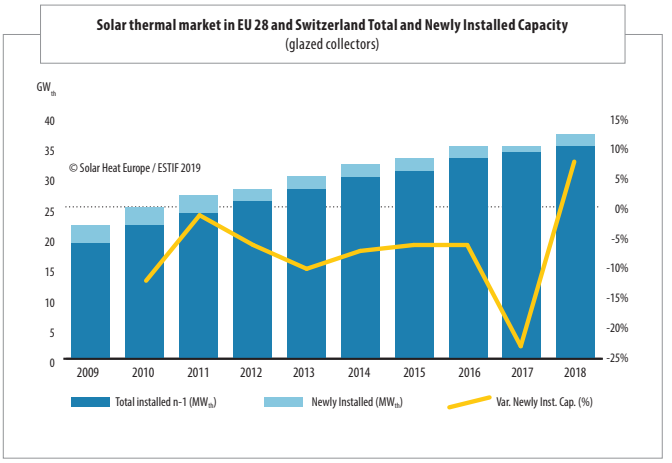
Sunshine after rain:
European Solar Heating and Cooling market grows by 8% in 2018

In 2018, the European solar heat market has grown by 7.8%, reverting the trend of previous years. The annual sales surpassed 1.5 GW_{th}, bringing the total installed capacity in Europe above the 36 GW_{th} mark. This represents an increase of 2.4% of the European solar thermal capacity, leading to an estimated heat generation of 25.6 TWh_{th}. Each solar thermal system incorporates a storage unit by default. As a result, the total solar thermal energy storage capacity available amounts to 180 GWh_{th}. Two years ahead of the 2020 milestone, with an estimated 10.1 million installed systems, solar thermal contributes to make millions of Europeans heat prosumers active in the energy transition.

Solar heating and cooling market in 2018

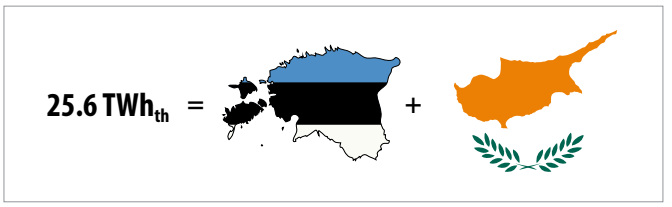
A growing market

2018 brought again the European solar heating and cooling sector back to the growth path, with a 7.8% increase of year-on-year sales, taking as reference the solar collector area or the equivalent nominal power of the installed systems. The installed capacity during 2018 accounted for 1. 5 GW_{th}, corresponding to 2.15 million square meters of solar thermal collectors. The cumulated capacity reached 36 075 MW_{th}, showing an increase of 2.4% in comparison with the previous year.



A relevant market

The estimated total thermal energy generation of solar heating and cooling systems operating in Europe corresponds to 25.6 TWh_{th}. This is equivalent to 92.1 PJ or 2.2 Mtoe of energy, an amount that would be enough to supply the entire annual heating demand of both Cyprus and Estonia together[1].



Nevertheless, this level of energy generation falls short of the 78 TWh_{th} which represents the indicative target for solar heating and cooling by 2020, foreseen in the National Renewable Energy Action Plans adopted by the EU member states at the beginning of the decade. Solar thermal is part of the solution to tackle the climate crisis, reducing the use of fossil fuels for heating and cooling, avoiding, during 2018 alone, an equivalent of 6.8 Mt CO_2 emissions. Furthermore, it is probably the most environmentally friendly renewable solution, considering the full product lifecycle, from manufacturing to decommissioning and recycling.

In what concerns economic aspects, the solar heating and cooling sector achieved a combined turnover of 1.85 billion Euros in 2018, employing approximately 18 800 people.

A diverse market

The evolution of the installed capacity was rather heterogeneous across countries and market segments.

The most impressive development was observed in Poland, given the success of programs addressing air quality in cities and supporting the reduction of harmful emissions. Consequently, the polish market reached 217 MW_{th}, growing by a staggering 179% in 2018.

Another market with double digit growth was Denmark (+77%). The fact that the Danish government resumed the support framework (that had expired by the end of 2016) meant that ten large solar district heating projects (new or extensions) were finalised already during 2018, with a combined capacity close to 40 MW_{th}.

Regarding the residential sector, it can be observed that countries whose systems combined space and water heating capabilities (solar combi-systems) represent a large share of the market. Mostly, central European countries (Germany, Switzerland), have been facing steeper decreases in sales.

The German market has been affected by different factors, such as persistent low fossil fuel prices, lack of impulses from subsidies or political measures and increasing competition from other renewable technologies. However, it is still the largest market in Europe, representing 26.7% of the total market. This number is nevertheless down from 33% in 2013 or 44% one decade ago.

In contrast, southern European countries, where the domestic hot water systems represent most of the market, have shown growth once again. Countries such as Greece, Spain or Portugal grew between 2 and 4% while Cyprus led the way with 14% increase. Cyprus is also the foremost country in terms of total installed capacity per capita, with 0.6 kW_{th} installed per Cypriot, corresponding to approximately 0.85 m^2 of collector area.

In terms of consistent market growth, the biggest accolade goes to Greece, which grew for the 9th year in a row. This is also due to an increased competition among the Greek solar thermal manufacturers and the capacity to reduce product costs. In this market, solar water heaters can reach prices as low as €285/kW_{th} (including energy storage) in retailers.

The large-scale solar segment has been increasing considerably in relevance, even if it still represents a relatively small portion of the total European market. As referred above, Denmark continues to be the front runner in terms of solar district heating (SDH) systems, though the number and regional distribution of SDH systems in Europe has been increasing in recent years.

In what concerns solar heat for industrial processes (SHIP), the focus goes to France, with several new projects being developed. Among them, ranks the largest SHIP system in Europe, 3.4 MW_{th} (4 213 m^2) supplying heat to a paper mill owned by the Lecta Group and based in Condat, in the southwest of France. It should be noted that several SHIP projects are under development, some of which in record sizes.

The diversity of the solar thermal sector can also be observed in terms of the maturity of the market. Countries such as Cyprus, Greece, Germany, Switzerland or Austria, already had large markets 20 years ago and have now a relevant replacement market. In spite of this fact, these markets keep growing in terms of total installed capacity between 1 and 2% per year. The exception is Austria which reduced its total installed capacity during 2018 by 1.7%. Newer markets observe much higher growth rates in the total installed capacity, with the leading place being again occupied by Poland, with an increase of 13.8% in the total installed capacity over 2018, followed by Croatia with 8.5% growth.

A competitive market

Solar Heating and Cooling provides competitive solutions for rather different applications in diverse locations, ranging, for instance, from a small, low-cost thermosiphon system (2.8 kW_{th}) with diurnal thermal storage (12.7 kWh_{th}) that provides domestic hot water in a Mediterranean country for less than 2 €-cents per kWh, to a large solar district heating system (35 MW_{th}) with seasonal thermal storage (142 MWh_{th}) in Denmark and an energy generation cost below 3.5 €-cents per kWh.

[1] According to Eurostat (SHARES), the gross final consumption of energy for heating and cooling ("All fuel consumed for heating and cooling") in 2017 was 1.54 Mtoe for Estonia and 0.469 Mtoe for Cyprus.

Market size in terms of Solar Thermal Capacity (KW_{th}) and in terms of Collector Area (m^2)

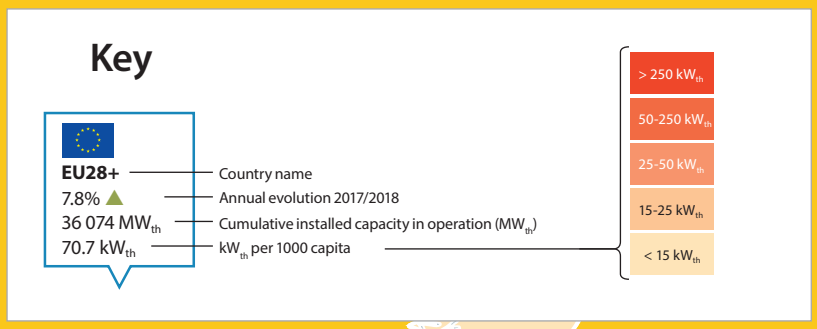
	Market (=Newly Installed)							In Operation[2]		
	2016	2017	2018				Annual Evolution of the Market	2018		Annual Evolution of the Total Installed Capacity
	Total Glazed	Total Glazed	Flat Plate	Vacuum Collectors	Total Glazed		Total Glazed	Total Glazed		Total Glazed
	m^2	m^2	m^2	m^2	m^2	kW_{th}[1]	%	m^2	kW_{th}	%
Austria	111 040	100 830	97 775	1 039	98 813	**69 169**	-2.0%	3 980 660	**2 786 462**	-1.7%
Belgium	46 500	35 400	25 000	4 900	29 900	**20 930**	-15.5%	645 517	**451 862**	4.6%
Bulgaria *	5 600	5 050	4 600	450	5 050	**3 535**	-	142 600	**99 820**	-
Croatia	21 011	21 472	18 850	592	19 442	**13 609**	-	229 567	**160 697**	8.5%
Cyprus	39 598	36 218	40 812	0	40 812	**28 568**	12.7%	737 076	**515 953**	1.5%
Czech Republic +	31 000	24 000	16 500	7 500	24 000	**16 800**	0.0%	600 251	**420 176**	3.3%
Denmark	478 297	31 500	55 808	0	55 808	**39 066**	77.2%	1 658 275	**1 160 793**	2.4%
Estonia *	2 000	1 500	900	600	1 500	**1 050**	-	17 520	**12 264**	-
Finland *	4 000	3 600	2 700	900	3 600	**2 520**	-	56 523	**39 566**	-
France[3]	61 300	54 300	52 600	2 600	55 200	**38 640**	1.7%	2 687 376	**1 881 163**	2.1%
Germany	744 000	630 000	505 000	68 500	573 500	**401 450**	-9.0%	19 298 500	**13 508 950**	1.2%
Greece	272 000	316 000	327 800	700	328 500	**229 950**	4.0%	4 689 700	**3 282 790**	2.1%
Hungary +	16 570	17 000	12 000	5 000	17 000	**11 900**	-	320 034	**224 024**	-
Ireland +	19 750	20 303	13 041	0	13 041	**9 129**	-35.8%	396 931	**277 851**	3.3%
Italy	208 690	195 000	157 900	21 500	179 400	**125 580**	-8.0%	4 677 114	**3 273 980**	3.2%
Latvia +	1 800	1 600	1 350	250	1 600	**1 120**	-	15 432	**10 802**	-
Lithuania *	2 200	2 000	750	1 250	2 000	**1 400**	-	18 700	**13 090**	-
Luxembourg +	4 459	3 600	3 418	0	3 418	**2 393**	-5.1%	65 363	**45 754**	4.3%
Malta +	800	648	486	122	608	**426**	-6.2%	54 826	**38 378**	0.2%
Netherlands	27 937	31 004	28 895	7 224	36 119	**25 283**	16.5%	598 467	**418 927**	1.9%
Poland	115 400	111 100	300 000	10 000	310 000	**217 000**	179.0%	2 558 413	**1 790 889**	13.8%
Portugal	46 100	46 100	46 000	1 000	47 000	**32 900**	2.0%	1 098 552	**768 986**	3.9%
Romania *	17 800	16 800	7 200	9 600	16 800	**11 760**	-	204 350	**143 045**	-
Slovakia +	9 600	9 600	8 000	1 600	9 600	**6 720**	0.0%	171 200	**119 840**	3.3%
Slovenia *	2 700	1 550	1 300	250	1 550	**1 085**	-	134 900	**94 430**	-
Spain	208 869	197 853	191 966	9 698	201 664	**141 165**	1.9%	3 848 603	**2 694 022**	5.1%
Sweden	3 099	3 208	1 755	167	1 922	**1 345**	-40.1%	312 756	**218 929**	-1.7%
Switzerland	61 045	64 400	53 429	5 078	58 507	**40 955**	-9.2%	1 514 905	**1 060 433**	1.7%
United Kingdom *	13 910	9 938	9 938	0	9 938	**6 957**	-	800 873	**560 611**	-
EU28 + Switzerland	2 577 075	1 991 574	-	-	2 146 292	**1 502 405**	7.8%	51 534 984	**36 074 489**	2.4%

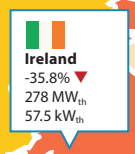
Solar Heat Europe/ESTIF would like to thank the solar thermal associations and other national sources for providing the data for these statistics, in particular: AEE Intec; Asociación Solar de la Industria Térmica (ASIT); Associação Portuguesa da Indústria Solar (Apisolar); Association pour Techniques Thermiques de Belgique (ATTB/Belsolar); Assotermica; Bundesverband Solarwirtschaft (BSW-Solar); Cyprus Union of Solar Thermal Industrialists (EBHEK); Energy Institute Hrvoje Požar; Greek Solar Industry Association (EBHE); Holland Solar; Polish Association of Manufacturers and Importers of Heating Appliances (SPIUG); Solar Key/Planenergi; Svensk solenergi/Chalmers University of Technology; Swissolar; Syndicat des professionnels de l'énergie solaire (ENERPLAN).

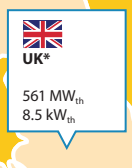
Figures for countries marked with an * are Solar Heat Europe/ESTIF estimations and, therefore, these are not sufficiently accurate to be used for percentual change reference in these markets. For some of the cases, the total sales or distribution between collector type combines historical data and information received regarding the market evolution. In the case of countries marked with an +, the 2018 figures are based on the EurObserv'ER "Solar thermal and CSP Barometer" (2019).

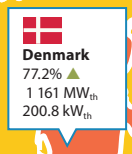
1) The relation between collector area and capacity is $1m^2 = 0.7kW_{th}$ (kilowatt-thermal)
2) Capacity "in operation" refers to the solar thermal capacity built in the past and deemed to be still in use. Solar Heat Europe/ESTIF assumes a 20 year product life for all systems installed since 1990. Most products today would last considerably longer, but they often cease to be used earlier, e.g. because the building was demolished, or there has been a change of building use.
3) The figures shown here relate to Metropolitan France (mainland). As a reference, in 2010 the overseas departments amounted to 49 MW_{th} (70 000 m^2).

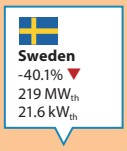
Solar Thermal Markets in Europe
Data for 2018

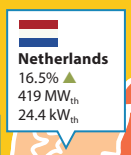


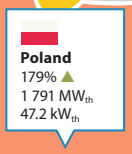


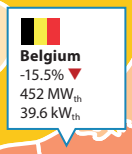


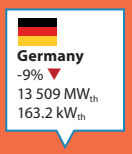


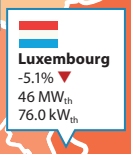


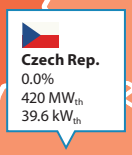


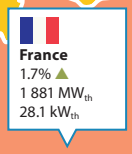


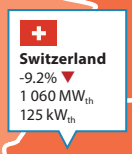


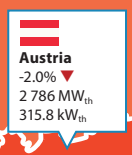


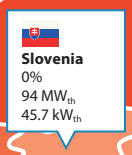


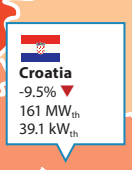


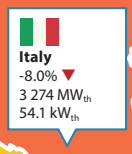


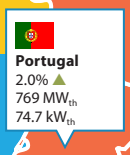


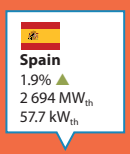


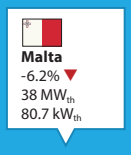


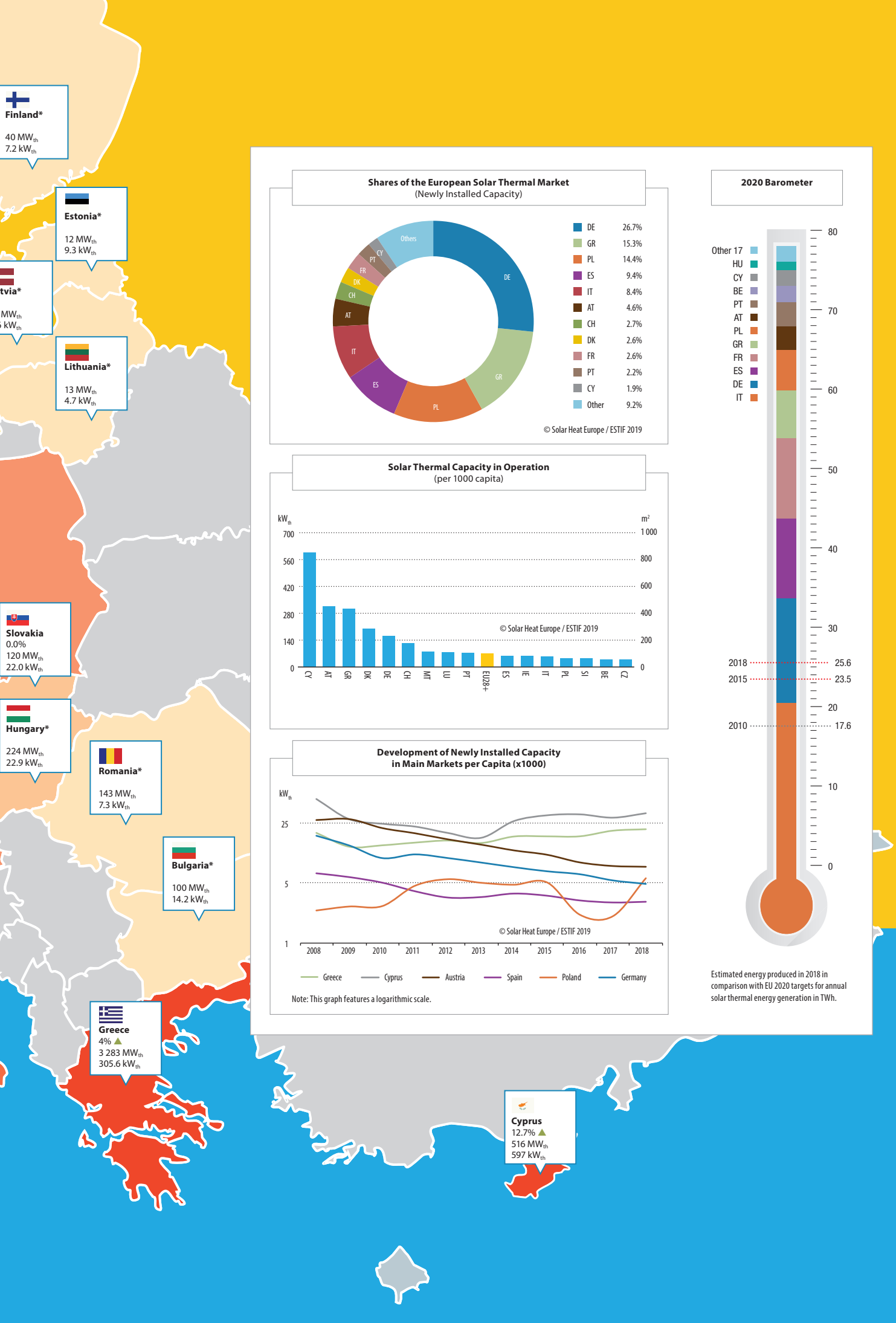








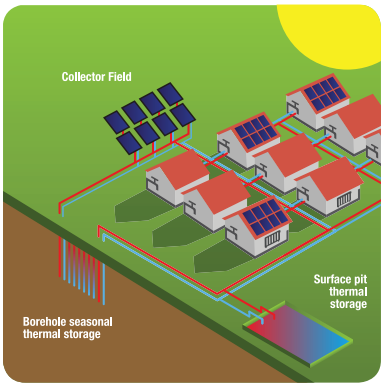



Finland*
40 MWth
7.2 kWth
Estonia*
12 MWth
9.3 kWth
tvia*
MWth
kWth
Lithuania*
13 MWth
4.7 kWth
Slovakia
0.0%
120 MWth
22.0 kWth
Hungary*
224 MWth
22.9 kWth
Romania*
143 MWth
7.3 kWth
Bulgaria*
100 MWth
14.2 kWth
Greece
4% ▲
3 283 MWth
305.6 kWth
Cyprus
12.7% ▲
516 MWth
597 kWth
Shares of the European Solar Thermal Market
(Newly Installed Capacity)
DE 26.7%
GR 15.3%
PL 14.4%
ES 9.4%
IT 8.4%
AT 4.6%
CH 2.7%
DK 2.6%
FR 2.6%
PT 2.2%
CY 1.9%
Other 9.2%
© Solar Heat Europe / ESTIF 2019
Solar Thermal Capacity in Operation
(per 1000 capita)
kWth
m²
© Solar Heat Europe / ESTIF 2019
CY AT GR DK DE CH MT LU PT EU28+ ES IE IT PL SI BE CZ
Development of Newly Installed Capacity
in Main Markets per Capita (x1000)
kWth
© Solar Heat Europe / ESTIF 2019
Greece Cyprus Austria Spain Poland Germany
Note: This graph features a logarithmic scale.
2020 Barometer
Other 17
HU
CY
BE
PT
AT
PL
GR
FR
ES
DE
IT
2018 25.6
2015 23.5
2010 17.6
Estimated energy produced in 2018 in comparison with EU 2020 targets for annual solar thermal energy generation in TWh.

Thermal energy storage:
a technology and policy enabler

The total solar thermal energy storage capacity available at the end of 2018 amounted to 180 GWh_{th}. Given its flexibility, this technology can easily integrate different renewables solutions, and empowers the development and improvement of policy measures. Thermal energy storage's potential is often overlooked even though it is cheaper than other available storage solutions. Additional investments in research and innovation could boost a greater development in new thermal energy storage applications.

Technology enabler



From a technical perspective, thermal energy storage (TES) is a technology enabler since it allows the integration of different solutions, such as renewable heating technologies (solar thermal, bioenergy, geothermal, ambient heat) and sector coupling, by facilitating the integration of heat produced from variable power sources.
Thermal energy storage allows the balancing of thermal supply and demand, as the variations are handled by the storage unit. This means that thermal storage can play a role in managing the variability of the solar resource or can increase system efficiency by enabling heat pumps to operate at their maximum efficiency level (regular supply rate).

Furthermore, there are specific thermal storage solutions tailored to address different needs. TES can highly change depending on time span or size, from small diurnal storage units with 10 kWh energy capacity (0.15 m^3) with an acquisition cost below €60/kWh to large seasonal storage installations, that can reach over 12 GWh (200 000 m^3), at an investment cost below €500/MWh of energy storage capacity (reference price for larger systems, above 100 000 m^3).

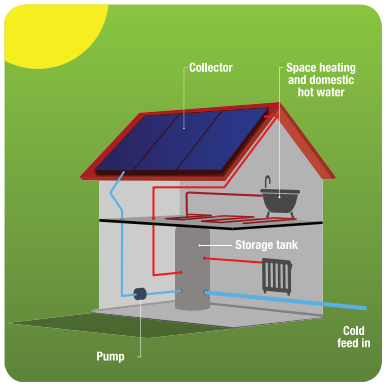
Policy enabler

Likewise, thermal energy storage plays a role as policy enabler, because it allows policy measures to evolve and improve over time. This is possible given the possibility to integrate different technologies, which can be connected to the thermal storage, while older solutions are disconnected. In this regard, it is possible to connect a heat pump and a solar thermal system to the same storage unit and later on decide to integrate other solutions, like an electric heating element to use variable renewable electricity resource. Therefore, promoting a stronger uptake of thermal energy storage capacity, in buildings, industry or cities (through district heating), will allow a progressive adaptation to new renewable and energy efficient solutions, and foster a demand change towards renewables and energy efficiency.

It should be made clear that, while such possibility exists in the market, not every thermal storage unit is designed to permit such variety of connections. On one side, the storage units need to cope with the same temperature and pressure levels of those used for solar thermal. On the other hand, they need to include different connections designed for inletting different temperature levels and flow rates.

[2] European Association for Storage of Energy: http://ease-storage.eu/
[3] http://ease-storage.eu/category/publications/emmes/

Technological advances



A significant amount of public investment in building industrial capacity and competitiveness in Europe can be observed regarding power storage or even other measures that shall allow for an improved flexibility of the power grid. Thermal energy storage is a low-hanging fruit, widespread around Europe, providing decentralised or utility scale solutions, covering diurnal or seasonal energy storage needs.

The potential of thermal storage needs to be acknowledged, in terms of what it represents already today in the market and in terms of the potential for further deployment, considering it has incomparably lower costs than any of the power storage options available. Furthermore, greater improvements could be achieved with additional investment in research and innovation, developing new long-term storage options, compact storage solutions, using phase-change materials or other options.

Installed thermal energy storage capacity (related to solar heating)

Solar heating systems always include thermal energy storage units. These units are essential to effectively manage the variability of the solar resource. As an example, a rooftop solar heater (thermosiphon system) of 1.5 kW_{th} power capacity (2.1 m^2 of collector area) can integrate a storage unit with10 kWh energy capacity (150 lts) or more. Likewise, a solar space and water heating system (combi system) of 10 kW_{th} power (14 m^2 of collector area) can include a unit with 35 kWh (0,5 m^3) of thermal energy storage.

The thermal energy storage capacity of a small-scale solar thermal system varies between 5 and 8 kWh per kW_{th} of solar collectors installed. This also translates to 70 to 107 litres of volume per each kW_{th} of solar thermal installed or 50 to 75 litres per m^2 of solar collector area.

Total Installed Capacity Solar Heating	Storage Capacity: Volume (m^3)	Storage Capacity: Energy (GWh_{th})
51.5 million m^2	2 576 700	180.3
36.1 GW_{th}		

Currently, the thermal energy storage capability integrated in solar heating systems in Europe ranges between 180 and 290 GWh. As a reference, the electrical energy storage cumulative capacity foreseen in 2020 by EASE [2] amounts to 5,5 GWh[3].

Considering the urgency to act in order to decarbonise our energy system at an unprecedented pace, we need to acknowledge and make the best use of this exceptional thermal energy storage capacity at our disposal.

Solar Heat Europe Members