The biggest solar thermal plant in France was inaugurated in June 2019. It supplies hot water to the Lecta paper mill at Condat-sur-Vézère (Dordogne) thanks to its 4 200 m² collector area.

NEWHEAT

**+1.5 %**

**The increase of the solar thermal market in the EU 28 in 2019**

# SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETERS

*A study carried out by EurObserv'ER.*

**The European Union solar thermal market for heat, heating, and domestic hot water production held up well in 2019. Initial estimates put the total installed collector area at just under 2.3 million m², which is a slight increase (1.5%) on its 2018 level. However, individual country situations vary, and the sector still has to reinvent itself to meet the huge challenge of climate neutrality.**

**The term Concentrated Solar Power (CSP) covers all the technologies that aim to transform solar radiation energy into very high temperature heat to convert it into electricity. Most of the current CSP development is going on in countries and regions that offer suitably conducive sunlight conditions, such as China, India, Australia, South Africa, the Middle East, and the Maghreb. The European Union's new CSP plant installation pace slowed down considerably after an initial flurry concentrated in Spain between 2007 and 2014. In 2019, the European Union gauge moved up slightly to 2 323 MW when the eLLO project in the Pyrénées-Orientales, France, officially came on stream.**

**54 millions m²**

*The cumulated surfaces of solar thermal in operation in the EU 28 in 2019*

**2 323 MWe**

*Total CSP capacity in operation in the the EU 28 in 2019*





SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETERS – **EUROBSERV'ER** – JUNE 2020

The solar thermal sector, all market segments taken together, having rallied in 2018, managed to sustain its overall new collector installation performance in 2019. Still, the various market situations contrast considerably. New downturns were observed in some major historical markets (primarily Germany, Austria and Italy) but in proportions that have been compensated for by renewed activity in the solar heating network market in Denmark, the thermosyphon system segment in Greece and Cyprus and by solar heat for industrial processes in the Netherlands.

Uncertainty hangs over 2020, for like many other sectors of activity, the many weeks of the COVID-19 pandemic have slowed down the European market. The Polish market should also be adversely hit by the end of its municipal solar thermal tendering programme. What is more, the 2020 solar heating network installation level will not be as high as it was in 2019 when it was buoyed by Denmark's efforts (almost 200 000 m²). This is because Danish heat suppliers were allowed to offset their energy consumption reduction obligations by using solar heat in their heating networks, but this measure ended in the middle of 2019. On the bright side, we can report that after a disappointing year, the French system suppliers' order books are starting to swell.

## ALMOST 2.3 MILLION M² INSTALLED IN THE EU OF 28 IN 2019

According to EurObserv'ER, just under 2.3 million m² of solar thermal collectors were installed during 2019 in the EU of 28. This figure equates to 1 594.8 MWth of capacity and amounts to an increase of about 1.5% over the twelve-month period.

This market data includes systems that use glazed flat plate collectors and vacuum tube collectors – the technologies designed to produce domestic hot water and heating in the residential sector – and those that produce heat and hot water for heating networks and industrial use. The data also includes unglazed collectors that are generally used for heating pools.

## MOMENTUM IS STRONGER IN SOUTHERN EUROPE

Although the European solar thermal market has not contracted for 2 years, the main market trends prevail with positive momentum from the Greek and Cypriot markets (10% and 23.7% year-on-year increases respectively). These two markets are somewhat special because they are largely based on thermosyphon systems (see note).

Market momentum in the Netherlands was also upbeat (rising by 48% in 2019), i.e. 53 443 m² installed, according to Statistics Netherlands data. Part of the reason for this strong growth is that a huge industrial installation was commissioned (see below). The Spanish market, which has some of Europe's most solar thermal-friendly regulations for the new build sector, managed to hold its ground. Its Ministry for Ecological Transition data shows that 204 150 m² of collectors were installed in 2019 (193 650 m² of glazed flat plate collectors, 7 600 m² of vacuum collectors and 2 900 m² of unglazed collectors). The ministry points out that about 3 000 m² of hybrid PVT collectors were also installed in 2019.

Nonetheless, the solar thermal market is still having a tough time in the historically important markets. According to AGEE-Stat, the German market contracted again (falling 10.9% between 2018 and 2019) to 511 000 m². The Austrian market also fell sharply, passing below the 100 000-m² threshold (90 810 m² in 2019 according Statistics Austria). Momentum also dried up in Poland. According to the SPIUG, the sector shrank by 15% on its 2018 level (with 263 000 m² installed in 2019). In Italy, according to Assotermica, both the glazed flat plate collector and vacuum tube collector market segments receded by about 8%. In France, according to Uniclima, the mainland market also shrank (by 15%), primarily in the collective residential segment. If we include the French overseas departments market, which had a very good year in 2018 the drop was even more severe as these territories marked time in 2019 (see below).

The reasons for the contracting volume of activity in these markets are the same as those given in previous years. Individual solar thermal or small collective systems (hotels, multi-occupancy buildings, etc.), often compete with the very buoyant photovoltaic self-consumption market for available roof space. Likewise, residential systems that combine hot water and heating, are rarely found outside Germany, and have to face off strong competition from reversible air-to-air heat pumps. Solar thermal is still plagued by poor communication with the general public and political decision-makers, and the dearth of recommendation by heating installers, who tend to come up with faster-to-install solutions such as thermodynamic water heaters when they are pressed for time. Technology switching is particularly common when the heating system replacement is not programmed for the middle of the heating season. In that case, replacement is often made using a similar, but more powerful type of system (e.g.: a gas boiler is replaced with a condensing gas boiler).

*Note: In solar thermal thermosyphon systems, the hot water tank is placed above the collector and functions without an electric pump. When the carrier fluid in the solar collectors heats up, it dilates. As it is not as dense as the cold fluid it naturally rises from the collectors to the storage tank while and the cold (heavier) carrier fluid in the tank returns to the collectors by gravity. On cloudy days, a heating resistor can be used to supplement the system. The thermosyphon systems market essentially exists in countries and regions with Mediterranean climates. In more temperate climate areas (ocean and continental climates), most of the sales are for more sophisticated systems equipped with a small pump that sends the heat carrier fluid to the hot water tank. These are known as forced circulation systems.*






Compact thermosyphon solar water heater – Cyprus

## THE SDH MARKET SHIFTS TO CENTRAL EUROPE

Heating networks with a solar thermal contribution, more commonly known as solar heating networks or Solar District Heating (SDH), are garnering growing interest as part of urban policies. Today Denmark is the global leader on this issue. According to the Danish consultancy PlanEnergi, the country's installed base passed the symbolic one-GW threshold in 2019 (more than 1.1 GWth identified in June 2019). That amounts to the equivalent of 1.6 million m² of collectors supplying at least 120 district heating networks. The consultancy claims that in 2019 alone, almost 191 310 m² of solar collectors were connected to heating networks –roughly ten new networks equipped and 5 extensions to already existing collectors fields. Incidentally, these installations were all carried out in the first half of the year. Thus, the installation level is much higher than in 2018, when 65 879 m² of collectors were connected. The biggest of the new systems include the Ringe solar district heating network (31 224 m²), Hadsten (24 517 m²) and Høng (20 160 m²). Likewise, the extensions to Sæby where 25 313 m² were added to the existing 11 921 m² and Grenaa (20 673 m² added to the existing 12 096 m²). The country's biggest solar district heating network is Silkeborg. It has 110 MW of solar capacity that equates to a collector area of 156 000 m² (imagine 60 football pitches). The success of Denmark's heating network can be ascribed to an agreement between the State and the Danish energy suppliers that imposed consumption reduction constraints on heating networks. These reductions could be replaced by an injection of solar heat into these same networks. The regulation was initially due to end in 2016 but a new agreement, signed on 16 December 2016, extended the mechanism until the end of June 2019. The upshot is that the SDH installation rate soared during the first half of last year. This application accounts for most of Denmark's solar thermal market. By way of comparison, PlanEnergi puts the 2019 individual solar systems market at 3 000 m².

In 2019, according to the annual IEA (International Energy Agency) SHC programme survey Solar Heat Worldwide, at least 22 solar thermal collector fields were connected to district heating networks in Europe. In addition to the 15 sited in Denmark, six went on stream in Germany to supply the towns of Liggeringen, Gutleutmatten, Moosach, Potsdam, Halle-Saale, and Erfurt (14 700 m² in all) and one in Latvia to supply the town of Salaspils (21 700 m²). This last project, that was completed in six months, required 7 million euros of investment, 2.73 millions of which was stumped up by the European Union Cohesion fund. The total area of collectors connected to heating networks within the EU of 28 in 2019 came to about 227 710 m² or 10% of the total newly-installed area.

## INNOVATIVE SOLAR INDUSTRIAL PROCESS HEAT PROJECTS

The solar industrial process heat and cooling market segment is gradually shaping up with systems with several hundreds to thousands of m² of collectors in sectors as varied as the food-processing industry, papermaking, vehicle washing stations and greenhouse heating. According to the Solar Payback SHIP supplier Surveys 2018 and 2019, Germany commissioned nine industrial solar thermal installations in 2018 (1 589 m²) and 11 in 2019 (1 470 m²). Spain commissioned three installations in 2018 (1 218 m²) and a further three in 2019 (386 m²). In June 2019, a 4 200-m² solar thermal unit came on stream to supply hot water to the Condat-sur-Vézère paper mill in France. Another example, at Merville in the Nord department of France, is a 1 270-m² installation that produces hot water for a road haulier's vehicle washing station. In the Netherlands, a 9 300-m² installation of glazed flat plate solar thermal collectors was inaugurated in 2019 to supply a greenhouse with hot water and heat (Tesselaar Freesias Greenhouse) dedicated to producing freesias and bulbs, with heating capacity equivalent to the annual consumption of more than 400 000 m3 of natural gas. The pre-heated water is stored in a 1 300-m3 storage tank to keep the greenhouses warm overnight with the heat generated during the day. Excess heat is stored in the ground by a heat and cold storage system. When days are particularly hot, the system pumps cold water to cool down the plants. In winter, hot water is pumped and the cooled water expelled into the ground to maintain the balance.

## Tabl. n° 1

*Annually installed surfaces in 2018 per type of collectors (in m²) and capacity equivalent (in MWth)*

| Country | Glazed collectors | | Unglazed collectors | Total (m²) | Equivalent power (MWth) |
|---|---|---|---|---|---|
| | Flat plate collectors | Vacuum collectors | | | |
| Germany | 505 000 | 68 500 | | 573 500 | 401.5 |
| Greece | 328 500 | | | 328 500 | 230.0 |
| Poland | 300 000 | 10 000 | | 310 000 | 217.0 |
| Spain | 191 966 | 9 698 | 3 866 | 205 530 | 143.9 |
| Italy | 157 900 | 21 500 | | 179 400 | 125.6 |
| France* | 146 639 | | | 146 639 | 102.6 |
| Austria | 99 734 | 1 038 | 617 | 101 389 | 71.0 |
| Denmark | 71 879 | | | 71 879 | 50.3 |
| Portugal | 56 000 | 1 000 | | 57 000 | 39.9 |
| Cyprus | 56 552 | | | 56 552 | 39.6 |
| Netherlands | 28 089 | 5 409 | 2 621 | 36 119 | 25.3 |
| Belgium | 25 000 | 4 900 | | 29 900 | 20.9 |
| Czech Republic | 16 500 | 7 500 | | 24 000 | 16.8 |
| Bulgaria | 23 498 | | | 23 498 | 16.4 |
| Hungary | 16 000 | 5 000 | | 21 000 | 14.7 |
| Croatia | 18 850 | 592 | | 19 442 | 13.6 |
| Romania | 7 200 | 9 600 | | 16 800 | 11.8 |
| Ireland | 13 041 | | | 13 041 | 9.1 |
| United Kingdom | 7 038 | | | 7 038 | 4.9 |
| Finland | 5 000 | 1 000 | | 6 000 | 4.2 |
| Slovakia | 5 000 | | | 5 000 | 3.5 |
| Luxembourg | 3 418 | | | 3 418 | 2.4 |
| Lithuania | 750 | 1 250 | | 2 000 | 1.4 |
| Sweden | 1 755 | 167 | | 1 922 | 1.3 |
| Latvia | 1 350 | 250 | | 1 600 | 1.1 |
| Slovenia | 1 300 | 250 | | 1 550 | 1.1 |
| Estonia | 900 | 600 | | 1 500 | 1.1 |
| Malta | 486 | 122 | | 608 | 0.4 |
| Total EU 28 | 2 089 345 | 148 376 | 7 104 | 2 244 825 | 1 571.4 |
| Total EU 27 | 2 082 307 | 148 376 | 7 104 | 2 237 787 | 1 566.5 |

** including 97 139 m2 in the overseas departments* **Source: EurObserv'ER 2020.**

### THE SOLAR THERMAL COLLECTOR BASE STOOD AT 54 MILLION M² AT THE END OF 2019

According to EurObserv'ER, the total area of the European Union collector base stands at 54 million m² (37 813 MWth), which is a 2.5% rise on its 2018 level (table 4) and translates into more than 10 million installed systems. This estimate covers the three main solar thermal technologies (glazed flat plate collectors, vacuum tube collectors and unglazed collectors) and allows for the decommissioning of the oldest installations included by the experts contacted for the study and Eurostat's N-1 data. Whenever there was no official data, EurObserv'ER turned to market data collected and applied a decommissioning assumption of 20 years for glazed collectors and 12 years for unglazed collectors. In 2019, the total area only increased by 1.3 million m²,, which means that about 1 million m² of systems were decommissioned.





### NEWS FROM THE MAIN EUROPEAN MARKETS

#### GERMANY'S SOLAR HEAT CONTRIBUTION FALLS

Germany is Europe's leading market, yet it contracted again. The AGEE-Stat data puts it at 511 000 m² in 2019 (441 000 m² of glazed flat plate collectors and 70 000 m² of vacuum collectors), a 10.9% drop on its 2018 level. Incidentally, this market level is very close to the decommissioned collector area that AGEE-Stat puts at 454 700 m² in 2019 (449 700 m² of glazed and 5 000 m² of unglazed collectors). These decommissioning figures explain why the total German base only increased by 56 790 m² in 2019 from 19.27 to 19.33 million m². Furthermore, as sunshine levels were poorer in 2019, the contribution made by solar thermal primary energy production fell from 31 950 TJ in 2018 (763.1 ktoe) to 30 539 TJ in 2019 (729.4 ktoe).

The solar thermal market's difficulties in the residential segment are primarily caused by the relentless competition from photovoltaic systems and heat pumps in the heating segment. Yet Germany has been making inroads into the solar heat and industrial heating network segments. In 2019, the solar thermal collector area connected to heating network rose sharply. According to a study by the Solites - Steinbeis Research Institute, Germany installed as much as 35 000 m², which raised its solar heating network capacity by about 50%, although some of them were due to be commissioned at the start of 2020. By Solites' reckoning, 38 solar heating networks were up and running in February 2020, i.e., approximately 75 057 m², a further six are planned for a collector area of 29 879 m², while 37 are in the preparatory study phase for a collector area of 142 533 m². The biggest solar heating network commissioned in Q1 of 2020, is at Ludwigsburg with a 14 800-m² collector field. Solites reports that the ramp-up of solar district heating networks is based on mature technology. The encouraging operating performance of the first commercial projects has won over the public energy services. The downside, namely high investment costs, has been resolved and been subject to sound state support programmes. The SDH sector's growth prospects look interesting, given its low operating costs and the price per tonne of carbon.

### *The PVT market starts to take shape*

*For the first time, this barometer presents a specific indicator for water-based hybrid photovoltaic thermal collector technology (water-based PVT). These collectors are capable of simultaneously producing electricity and heat (domestic hot water and heating). Water-based PVT panels use the heat given off by the photovoltaic cells to heat a water-based carrier fluid, which improves the yield of the PV cells while recovering the solar heat that is useful for domestic hot water or heating. These collectors can be unglazed or glazed. In the latter case, an additional glass plate is superimposed over the photovoltaic module. Another hybrid PVT collector technology uses air as the heat carrier. The process, (also known as the aerovoltaic system), is used to contribute to space heating.*

*With sometimes conflicting estimates coming from different sources, it is hard to produce a precise picture of Europe's solar hybrid PVT market segment. Official bodies, such as the national statistics offices contacted during the EurObserv'ER study, that keep track of this market segment are few and far between, or it may be that the rules apply to statistical secrecy (implemented when the volumes are too low), preclude the release of their data. The industrialists working in this market segment are reluctant to disclose their business data publicly in the interests of maintaining their market shares and limiting access to the market by new entrants.*

*The 2020 edition of the Solar Heat Worldwide Annual report produced by the International Energy Agency's Solar Heating and Cooling programme in partnership with the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology and published in May 2020, gives indications on the global and European markets for the first time. The collector capacity data presented in this report take up a study carried out by the IEA SHC TASK 60 programme published by the Austrian research association AEE Intec, supplemented by capacity data for 2019 by the same association.*

*If we narrow our focus to the water-based PVT market segment and take together the unglazed and glazed PVT collectors, the available data for the European Union countries indicates 188 542 m² of collectors at the end of 2019 compared to 152 422 m² in 2018... an increase of 36 120 m². This equates to thermal capacity of 94.8 MWth across the European Union base coupled with 34.3 MW of electrical capacity. The countries involved are Germany with a total area of 112 074 m² in service (56.2 MWth, 20.7 MWe), followed by the Netherlands (with 30 543 m², i.e. 15.2 MWth and 5.6 MWe), Italy (with 15 501 m², 7.8 MWth and 2.8 MWe), Spain (with 12 902 m², 6.7 MWth and 2 MWe) and France (with 12 687 m², 6.4 MWth and 2.3 MWe). According to Spain's Ministry of Ecological Transition, the total area of (water-based) PVT collectors in service installed at the end of 2019 was about 63 000 m2 greater than the SHC estimate, which leaves 3 000 m2 newly-installed in 2019.*

*The SHC report also presents data on the other PVT collector bases... of the air-based, and the less widespread vacuum tube or concentrating mirror types. As it stands, air-based PVT is almost exclusively found in France where at the end of 2019 it occupied an area of 471 900 m2 (257.2 MWth and 80.2 MWe). In the EU of 28, several hundred m² have also been identified in the UK (348 m²), Belgium (290 m²), Luxembourg (145 m²) and Germany (85 m²).*

## DESPITE THE ECONOMIC CRISIS THE GREEK MARKET IS FLOURISHING

Greece, with 0.454 m² per capita, along with Austria, is a mature solar thermal market. Its industry has been growing since the mid-Seventies and it has a large renewal market. Solar thermal technology is fully established in the country and is mainly based on individual thermosyphon systems. A typical system comprises a 150 to 300-litre hot water storage system directly coupled to a 2 to 4-m² glazed flat plate collector.

According to EBHE (the Greek solar industry association), the 2019 market outstripped expectations growing by 10% to 361 500 m². It credits this to a politically conducive context suffused with optimism rising from the formation of a new government. Encouraged by supportive legislation, the market also gained renewed momentum for new build and renovation work. For example, thermal regulations for energy efficiency in buildings make solar hot water provision obligatory to meet at least 60% of demand. Solar thermal also benefits from grants under the "Saving at Home" programme that can cover up to 70% of the investment. Lastly, roof-mounted residential photovoltaic systems are only allowed if a solar hot water production system is already in place.

## THE POLISH MARKET FACED WITH THE END OF MUNICIPAL TENDERING

SPiUG, the Polish Association of Manufacturers and Importers of Heating Appliances says that Poland's solar thermal market contracted by 15% in 2019, despite a very good first half-year when growth was twice that recorded in 2018. Plummeting sales in the second half-year reflected the end of its three-year support programme for clean heating projects in its municipalities. Yet the sales level in absolute value for 2019 is still high (263 000 m²), resulting from municipal tenders finalized in 2018 and 2019.

The Association is concerned that the solar thermal market may have become over-dependent on municipal tenders, which they believe have prevented the national market from structuring. SPiUG claims that the suppliers have opted for the shortest possible distribution chain to slash prices and thus bid successfully. Thus, despite the major installation volumes involved, the device has not led to organizing a sustainable market. The current retail sales circuit only accounts for 20% of the market, as against 80% via the tendering distribution circuit. According to SPiUG, this has resulted in some specialist solar thermal installers refocussing their activity on installing roof-mounted photovoltaic systems. Nonetheless, the association singles out a positive element – the inclusion from 2020 onwards of solar collector systems in the group of equipment eligible for the Clean Air programme driven by the NFOŚiGW. As for market structuring, individual solar thermal hot-water heaters make up the bulk of sales (74%) ahead of large 50–500-m² installations (13%), combined systems (9%) and very big installations in excess of 500 m² (2%) and pool heating systems (2%). As for market trends, SPiUG notes the growing demand for systems in new build and more marked interest in industrial applications.

## IS FRANCE COMING OUT OF THE WOODS?

Uniclima, the union for heating, cooling, and ventilation reports that with a total installed collector area of 42 500 m² in 2019, the mainland solar thermal market posted a new 15% downturn in activity compared to 49 500 m² in 2018. After a year of respite, the market suffered a further double-digit fall, incurred by contraction in the collective segment (from 30 000 to 23 900 m²) although the individual system segment fared better (falling from 19 000 to 18 600 m²). Individual solar water heater deliveries stood at 4 500 units in 2019 as against 4 400 in 2018, which is a 2% rise. The sector welcomed this stabilisation after 10 consecutive years of sector contraction.

However, the total installed collector area attributable to these hot water heaters is falling. This can be ascribed to the reduction in the average area per unit, which has stabilized at 3 m². As for combined solar systems, Uniclima identified 370 units for 2019 up from 340 in 2018 (9% rise). This renovation market-driven segment benefits from the Coup de Pouce Rénovation Chaudière aid mechanism that grants a premium ranging from 2 500 to 4 000 euros (depending on income) for the installation of a combined solar system to replace an old gas-, coal- or oil-fired boiler. According to Observ'ER, the French overseas territories' market (Reunion Island, Guyana, Martinique, Guadeloupe, and Mayotte) that was very active in 2018 also plummeted. It was put at 75 364 m² in 2019, having fallen from 97 139 m² in 2018. This sharp decline can mainly be ascribed to the two major markets – Reunion Island (a 17.2% fall) and Guadeloupe (a 35% fall). They were partly caused by administrative difficulties and delays in pay-outs from incentive programmes such as the AGIR PLUS d'EDF programme (victims of their own success). The French market

### *Heat storage – a crucial development priority*

*In its "Solar heat markets in Europe" publication of November 2019, the Solar Heat Europe association argues that given the urgent action required to decarbonize our energy system at breakneck speed, we must acknowledge and make the most of the exceptional energy storage capacity offered by solar thermal. The association reckons that the potential for storing thermal energy is often overlooked despite the fact that it is the cheapest of all the available storage solutions. Heat storage is highly adaptable and flexible, as it can be integrated into a number of renewable heat and refrigeration production solutions (solar thermal, biomass, ambient energy, and geothermal energy). Likewise, heat can be a storage vector for a volume of electricity originating from a variable renewable sector such as photovoltaic or wind energy. According to Didier Guillot, of the Engie Group, one of today's major challenges for heat storage is the convergence between electricity and heat through the notion of the "smart thermal grid". Solar district heating networks are very flexible, and this flexibility can be used in association with electricity grids. A prime example of this is found in Denmark whose renewable energy integration challenges no longer lie in primary energy flexibility but in energy conversion flexibility. Accordingly, heat will increasingly be both a useful energy regardless of whether it is renewably or otherwise produced, and a storage vector that will be subsequently used on the basis of how the requirements curve develops. There are specific thermal storage solutions to meet different needs, be they on a small scale (individual hot water tanks) or a broad scale, inter-seasonal storage (in the form of storage in aquifers, underground caves or surface wells) to supply heating networks at the scale of a city or district. There are also industrial uses, such as the Freesia flower production greenhouse (the Netherlands) mentioned above. Harnessing of new technical facilities that increase consumption of renewably-sourced heat and refrigeration will be called for to achieve carbon neutrality. Additional investments in research and innovation such as those in electrochemical storage should accelerate the development of new thermal energy storage applications. The solar thermal sector is only just starting to reinvent itself to rise to the formidable challenge of combating climate change.*

## Tabl. n° 2

*Annually installed surfaces in 2019 per type of collectors (in m²) and capacity equivalent (in MWth)*

| Country | Glazed collectors | | Unglazed collectors | Total (m²) | Capacity equivalent (MWth) |
|---|---|---|---|---|---|
| | Flat plate collectors | Vacuum collectors | | | |
| Germany | 441 000 | 70 000 | | 511 000 | 357.7 |
| Greece | 361 500 | | | 361 500 | 253.1 |
| Poland | 257 200 | 5 800 | | 263 000 | 184.1 |
| Spain | 193 650 | 7 600 | 2 900 | 204 150 | 142.9 |
| Denmark | 194 310 | | | 194 310 | 136.0 |
| Italy | 145 300 | 20 000 | | 165 300 | 115.7 |
| France | 117 864 | | | 117 864 | 82.5 |
| Austria | 90 040 | 310 | 460 | 90 810 | 63.6 |
| Cyprus | 69 945 | | | 69 945 | 49.0 |
| Portugal | 59 850 | | | 59 850 | 41.9 |
| Netherlands | 23 456 | 27 366 | 2 621 | 53 443 | 37.4 |
| Belgium | 23 500 | 4 300 | | 27 800 | 19.5 |
| Bulgaria+ | 23 500 | | | 23 500 | 16.5 |
| Czechia | 16 000 | 7 000 | | 23 000 | 16.1 |
| Latvia | 21 700 | | | 21 700 | 15.2 |
| Hungary+ | 16 000 | 5 000 | | 21 000 | 14.7 |
| Croatia+ | 18 800 | 600 | | 19 400 | 13.6 |
| Romania+ | 7 200 | 9 600 | | 16 800 | 11.8 |
| Ireland | 7 143 | | | 7 143 | 5.0 |
| Finland+ | 5 000 | 1 000 | | 6 000 | 4.2 |
| United Kingdom | 5 482 | | | 5 482 | 3.8 |
| Slovakia+ | 5 000 | | | 5 000 | 3.5 |
| Luxembourg | 2 900 | | | 2 900 | 2.0 |
| Lithuania+ | 750 | 1 250 | | 2 000 | 1.4 |
| Sweden | 1 084 | 76 | 522 | 1 682 | 1.2 |
| Slovenia+ | 1 300 | 250 | | 1 550 | 1.1 |
| Estonia+ | 900 | 600 | | 1 500 | 1.1 |
| Malta | 521 | 130 | | 651 | 0.5 |
| **Total EU 28** | **2 110 895** | **160 882** | **6 503** | **2 278 280** | **1 594.8** |
| **Total EU 27** | **2 105 413** | **160 882** | **6 503** | **2 272 798** | **1 591.0** |

** Estimation. + EurObserv'ER estimation based on Eurostat database or ESTIF last market survey. ** including 75 364 m2 in the overseas departments.*
***Source: EurObserv'ER 2020.***


**In the Netherlands, 9 300 m² of glazed flat plate solar thermal collectors were inaugurated in 2019 to supply a greenhouse with hot water and heat (Tesselaar Freesias Greenhouse) dedicated to growing flowers.**

taken together (mainland and overseas territories) contracted by 21.7% settling at 117 864 m².

The French market's growth prospects for 2020 are better. A new incentive system, MaPrimeRénov, aimed at low- and middle-income households in force since 8 January 2020 promises faster financial aid and appears to be bearing fruit. The first market indications from active manufacturers and suppliers show a clear recovery in demand, which points to growth for 2020. In the collective segment, hopes are pinned on development in new build provided that the demand for renewable heat is retained in the forthcoming RE2020 regulations. Major solar thermal hot water production installations (domestic, technical and process) in areas as varied as district heating networks, the food-processing industry, hospitals, etc. are supported in France by specific ADEME finance packages through tenders.

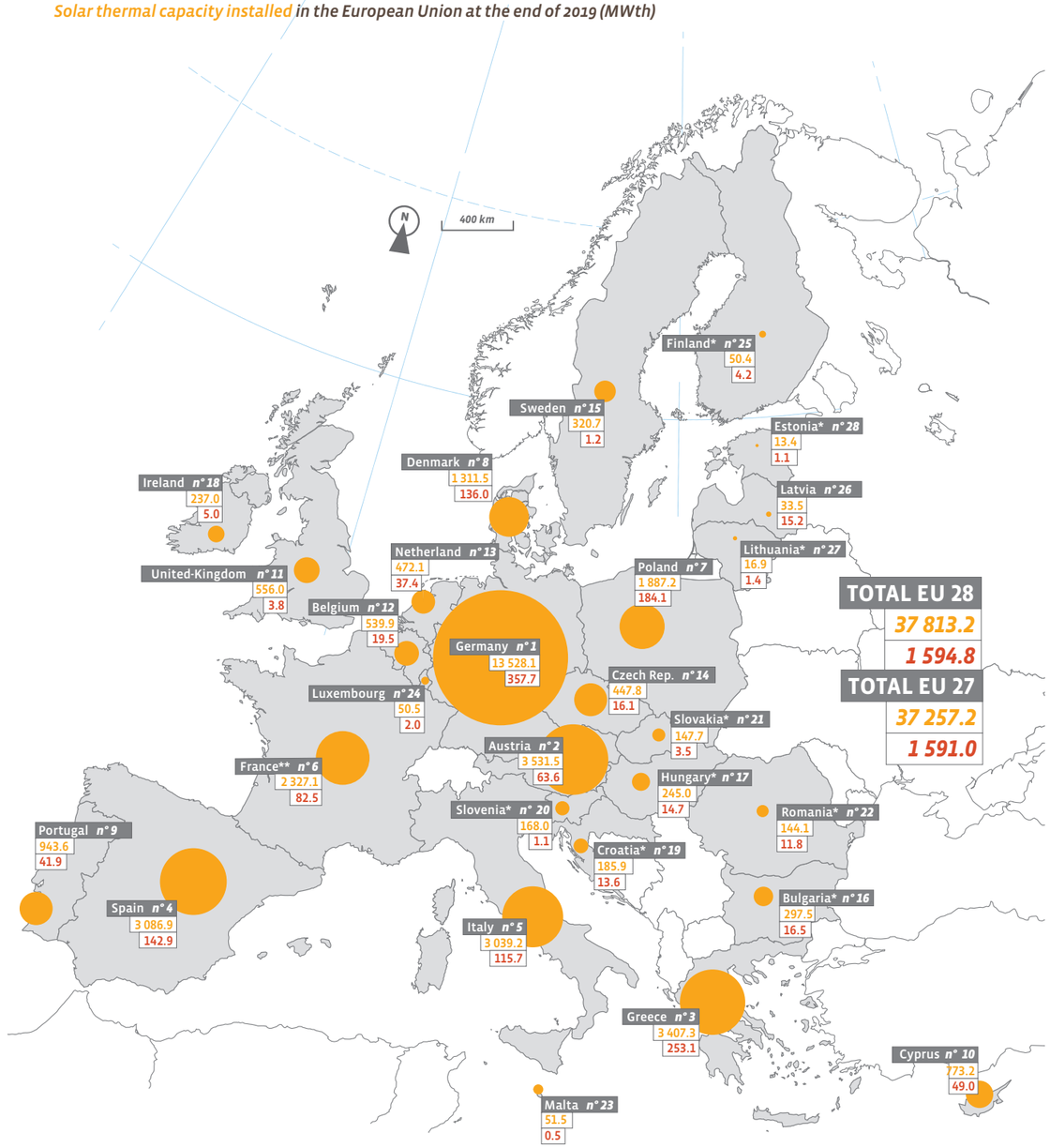
## A NEW CONSOLIDATION PHASE FOR EUROPE'S INDUSTRY

The Solrico consultancy that specializes in solar energy, conducts an annual satisfaction survey on the global solar thermal industry to shed light on market dynamics and rank the biggest global manufacturers of glazed flat plate collectors. While the Solrico ranking presents the manufacturers' activity comparatively using a common scale, it does not release their sales figures because some respondents are reluctant to disclose them. The biggest industrial players operate on a global scale with the top companies based in China such as Solareast (Sunrain and Micoe brands), Haier, Jinheng solar (BTE brand) and Linuo Paradigma. Solrico reports that the major Chinese companies consolidated their market positions in 2019, and that the six that took part in the survey in 2018 and 2019 have increased production by about 21%. Some of them have taken advantage of the greater demand for flat plate collectors in high-rise buildings. However, this trend does not apply to the activity level of Austria's GREENoneTEC, in which the Chinese group Haier has held a 51% holding since 2017. The European solar thermal industry's assessment is mixed, reflecting the momentum of the markets where it is positioned. The output of the major manufacturers based in Central Europe, namely Bosch Thermotechnik, GREENoneTEC, Thermosolar and Viessmann declined by about 8% in their local markets in 2019. Nonetheless, some of them, for example Bosch Thermotechnik, claim that their sales have more or less held up with higher sales outside Europe, and compensated for the decline of the European market because of its electrification. Incidentally, the manufacturer has recently decided to concentrate its collector manufacturing in Germany and





*Solar thermal capacity installed* **in the European Union at the end of 2019 (MWth)**




*Key*

37 813.2 *Total solar thermal capacity* ***installed at the end of 2019 (MWth)***

1 594.8 *Solar thermal capacity* ***installed during the year 2019 (in MWth)***

** EurObserv'ER estimation based on Eurostat database or ESTIF last market survey.*
*** Overseas departments included.*
***Source: EurObserv'ER 2020.***

Brazil and is gradually abandoning its manufacturing facilities in Portugal, India, and China. The Polish market leader Hewalex has had to cope with a double-digit drop in sales since the end of the three-year support programme for clean heating projects in municipalities and has slid in the rankings from 10th to 16th place.

In contrast, the manufacturers specializing in thermosyphon systems are enjoying the growth of their local markets and also outside Europe in sun-drenched regions. For example, the Greek company Dimas, ranked 7th by Solrico, has pointed to growing demand from the United Arab Emirates as one of the main reasons for its rising sales in 2019. The Danish manufacturer Arcon-Sunmark, No. 1 in the solar heating networks sector has been shaken by major fluctuations in its activity level for several years, reflecting demand in its national market. It enjoyed an upturn in 2019 by completing 10 new SDH projects in Denmark and three abroad (Tibet, Latvia, and Germany), which took it to the top 10 of the rankings (jumping from 18th to 9th place).

Arcon-Sunmark hit the headlines early in April 2020, when it announced by press release that GREENoneTEC, the biggest European collector manufacturer had acquired its key assets and that the Chinese company Solareast, the world's biggest glazed flat plate collector manufacturer had bought up their shares of their joint subsidiary Solareast Arcon-Sunmark Large Scale Solar System Solar integration (which had recently inaugurated two large solar heating networks in Tibet).

This acquisition is the result of several months' negotiations between GREENoneTEC's CEO, Robert Kanduth and Torben Sorensen, Director-General of the business group VKR Holding, that owns Arcon-Sunmark. The sell-off was caused by swingeing price cuts encountered by the suppliers of large solar fields and market fluctuations that have led to Arcon-Sunmark making considerable losses in recent years. GREENoneTEC plans to integrate the fully-automated production line for large collectors in its Austrian plant and retain most of Arcon-Sunmark's project development and sales team. Robert Kanduth also asserted that he wanted to concentrate on sales and project development in Europe and North America and had no plans for the Asian market. That is the rationale for splitting and selling off Arcon-Sunmark's assets in Asia, including a plant in Vietnam, and selling them to the Solareast group. EurObserv'ER forecasts a wave of new consolidations and asset shedding in Europe's industry and that this will increase the biggest players' market shares. Additionally, some of the generalist heating players are keen to focus on more buoyant markets, such as thermodynamic water heaters and HPs.

## Tabl. n° 3

*Cumulated capacity of thermal solar collectors* installed in the European Union in 2018 and 2019**(in m² and in MWth)*

| | 2018 | | 2019 | |
|---|---|---|---|---|
| | m² | MWth | m² | MWth |
| Germany | 19 269 490 | 13 488.6 | 19 325 790 | 13 528.1 |
| Austria | 5 118 625 | 3 583.0 | 5 044 954 | 3 531.5 |
| Greece | 4 691 000 | 3 283.7 | 4 867 500 | 3 407.3 |
| Spain | 4 202 770 | 2 941.9 | 4 409 920 | 3 086.9 |
| Italy | 4 196 376 | 2 937.5 | 4 341 676 | 3 039.2 |
| France | 3 218 301 | 2 252.8 | 3 324 400 | 2 327.1 |
| Poland | 2 433 000 | 1 703.1 | 2 696 000 | 1 887.2 |
| Denmark | 1 703 495 | 1 192.4 | 1 873 631 | 1 311.5 |
| Portugal | 1 288 104 | 901.7 | 1 347 955 | 943.6 |
| Cyprus | 1 064 662 | 745.3 | 1 104 607 | 773.2 |
| United Kingdom** | 797 973 | 558.6 | 794 275 | 556.0 |
| Belgium | 748 300 | 523.8 | 771 318 | 539.9 |
| Netherlands | 656 934 | 459.9 | 674 448 | 472.1 |
| Czechia*** | 616 643 | 431.7 | 639 643 | 447.8 |
| Sweden | 477 113 | 334.0 | 458 184 | 320.7 |
| Bulgaria | 401 498 | 281.0 | 424 998 | 297.5 |
| Hungary | 329 000 | 230.3 | 350 000 | 245.0 |
| Ireland | 331 409 | 232.0 | 338 552 | 237.0 |
| Croatia | 246 100 | 172.3 | 265 500 | 185.9 |
| Slovenia | 238 467 | 166.9 | 240 017 | 168.0 |
| Slovakia | 206 000 | 144.2 | 211 000 | 147.7 |
| Romania | 189 000 | 132.3 | 205 800 | 144.1 |
| Malta | 72 858 | 51.0 | 73 509 | 51.5 |
| Luxembourg | 69 200 | 48.4 | 72 100 | 50.5 |
| Finland | 66 000 | 46.2 | 72 000 | 50.4 |
| Latvia | 26 120 | 18.3 | 47 820 | 33.5 |
| Lithuania | 22 150 | 15.5 | 24 150 | 16.9 |
| Estonia | 17 620 | 12.3 | 19 120 | 13.4 |
| **Total EU 28** | 52 698 208 | 36 888.7 | 54 018 867 | 37 813.2 |
| **Total EU 27** | 51 900 235 | 36 330.2 | 53 224 592 | 37 257.2 |

** All technologies included unglazed collectors. ** The solar thermal area in operation in the United Kingdom has been revised downwards due to a persistent discrepancy between the available market data and the total solar thermal surface area data in operation published by Eurostat. *** Unglazed collectors are not included in official statistics in the Czech Republic.* ***Source: EurObserv'ER 2020.***

## Tabl. n° 4

*Solar thermal capacity* in operation per capita (m²/inhab. and kWh/inhab.) in 2019***

| Country | m²/inhab. | kWth/inhab. |
|---|---|---|
| Cyprus | 1.261 | 0.883 |
| Austria | 0.569 | 0.399 |
| Greece | 0.454 | 0.318 |
| Denmark | 0.323 | 0.226 |
| Germany | 0.233 | 0.163 |
| Malta | 0.149 | 0.104 |
| Portugal | 0.131 | 0.092 |
| Luxembourg | 0.117 | 0.082 |
| Slovenia | 0.115 | 0.081 |
| Spain | 0.094 | 0.066 |
| Italy | 0.072 | 0.050 |
| Poland | 0.071 | 0.050 |
| Ireland | 0.069 | 0.048 |
| Belgium | 0.067 | 0.047 |
| Croatia | 0.065 | 0.046 |
| Bulgaria | 0.061 | 0.042 |
| Czechia | 0.060 | 0.042 |
| France*** | 0.050 | 0.035 |
| Sweden | 0.045 | 0.031 |
| Netherlands | 0.039 | 0.027 |
| Slovakia | 0.039 | 0.027 |
| Hungary | 0.036 | 0.025 |
| Latvia | 0.025 | 0.017 |
| Estonia | 0.014 | 0.010 |
| Finland | 0.013 | 0.009 |
| United Kingdom | 0.012 | 0.008 |
| Romania | 0.011 | 0.007 |
| Lithuania | 0.009 | 0.006 |
| **Total EU 28** | 0.105 | 0.074 |
| **Total EU 27** | 0.119 | 0.083 |

** All technologies, including unglazed collectors. ** Estimate. *** Overseas departments included.*
***Source: EurObserv'ER 2020***

### A CHANGE OF GEAR IS VITAL

With less than a year to go to meeting the European Union's 2020 targets, we should be forgiven for being negative about the solar thermal sector's contribution. According to data published by Eurostat, final solar thermal energy consumption added to derived heat (essentially from district heating networks) was about 2.5 Mtoe in 2018, and according to EurObserv'ER should settle somewhere between 2.6 and 2.7 Mtoe in 2019. This is far short of the combined national renewable energy action plan (NREAP) targets of Member States of about 6.5 Mtoe in 2020. Another observation is that the solar thermal sector currently contributes very little to the EU of 28's increased renewable heat and refrigeration consumption. More generally, the substitution of "fossil" heat (and refrigeration) by renewable heat (and refrigeration) has been lower than anticipated in many European countries.

Eurostat reports that the additional contribution by solar thermal was only 230 ktoe between 2016 and 2018… a far cry from heat pump performance over the same period (1 347 ktoe). While HP market momentum is very positive, partly because of growing summer comfort needs (which boosts the reversible HP market segment), the gap between HP and solar thermal is heightened by the increase in decommissioned areas of solar thermal collectors (after twenty years or so in service). This trend will worsen in the next few years as the areas installed in the middle of the 2000's become obsolete. At the time, the market was flourishing and in 2008 the collector base stood at almost 5 million m². Decommissioning will soon raise the issue of how to maintain solar heat's contribution to the European Union's renewable targets in 2030.

Given the scale of the need to decarbonize heat and refrigeration to achieve carbon neutrality, this situation may come as a paradox, all the more so as solar thermal is one of the most relevant solutions to explore in Europe for increasing its renewable heat share. This is demonstrated in many baseline reports such as "Renewable energy prospects for the European Union", published by IRENA (International Renewable Energy Agency) in 2018 produced in conjunction with the European Commission (see the 2018 solar thermal barometer).

At the start of 2020, the European Commission proposed the launch of a "Green Deal" resulting in a higher contribution by the Member States to combat climate change and turn this change into an economic opportunity for Europe's economy. The solar thermal sector ticks

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## Tabl. n° 5

*Total installed PV-T water collector* area in European Union in 2018 and 2019 (m2) and corresponding thermal (in MWth) and electric capacity (in MWp) for the year 2019*

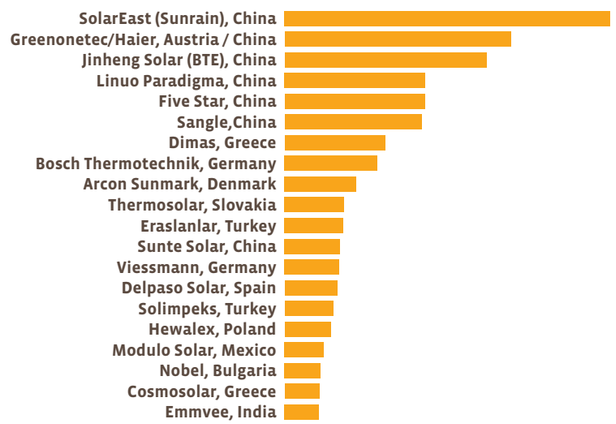
| | Total 2018 PV-T Water collector (m²) | Total 2019 PV-T Water collector (m²) | Total 2019 PV-T (MWth) | Total 2019 PV-T (MWp) |
|---|---|---|---|---|
| Germany | 109 159 | 112 074 | 56.160 | 20.659 |
| Netherlands | 13 167 | 30 353 | 15.200 | 5.607 |
| Italy | 15 438 | 15 501 | 7.816 | 2.798 |
| Spain | 3 334 | 12 902 | 6.739 | 2.043 |
| France | 9 204 | 12 687 | 6.355 | 2.341 |
| Austria | 873 | 1 517 | 0.782 | 0.253 |
| United Kingdom | 53 | 1 392 | 0.687 | 0.230 |
| Belgium | 524 | 728 | 0.364 | 0.134 |
| Luxembourg | 635 | 635 | 0.318 | 0.117 |
| Hungary | 0 | 578 | 0.291 | 0.105 |
| Portugal | 0 | 335 | 0.168 | 0.062 |
| Denmark | 73 | 85 | 0.043 | 0.016 |
| Total ** | **152 460** | **188 787** | **94.923** | **34.365** |
| Total without UK | **152 407** | **187 395** | **94.236** | **34.135** |

*Detailed information by technology available in the Solar Heat Worldwide Report. Edition 2020 - SHC Programme IEA and SHC Task 60/Report A1. *Covered. uncovered and evacuated tube collectors. ** The total is indicative of the countries of the European Union detailed in the report. Of the 2019 total. uncovered PV-T hybrid collectors represented 91.2% of the total installed collector area. covered PV-T collectors 8.6% and vacuum collectors at 0.1%. Source of data: IEA SHC Task 60 survey. AEE INTEC. EurObserv'ER Note: The estimate of the area of PV-T water collectors in Spain from the Spanish Ministry of Ecological Transition is higher than that noted in the SHC study. i.e. 63.032 m2 at the end of 2019 (for approximately 3.000 m2 installed during the year 2019). Also. the estimate of the area of PV-T water collectors in Austria from Statistics Austria is 1 179 m2 at the end of 2019 (for approximately 306 m2 installed during the year 2019).*

all the right boxes. From a physical perspective, solar thermal is surely the ultimate form of the various heat production sectors for transferring heat to water without any greenhouse gas or polluting emissions. The collectors and systems installed in Europe are manufactured in European plants, the sector still holds global technological leadership in large-scale systems and the collectors are composed of fully recyclable elements (glass, copper, and aluminium). Over a few months, the COVID-19 crisis has increased the urgency for dramatic action. Europe's decision makers are now called on to get going and transform this urgency into an opportunity. □

## Graph. n° 1

*Ranking of the largest flat plate collector manufacturers worldwide (Collector area produced in 2019 in m²)*




*Source : Manufacturers' information market survey by solrico in February/March 2020, www.solrico.com*

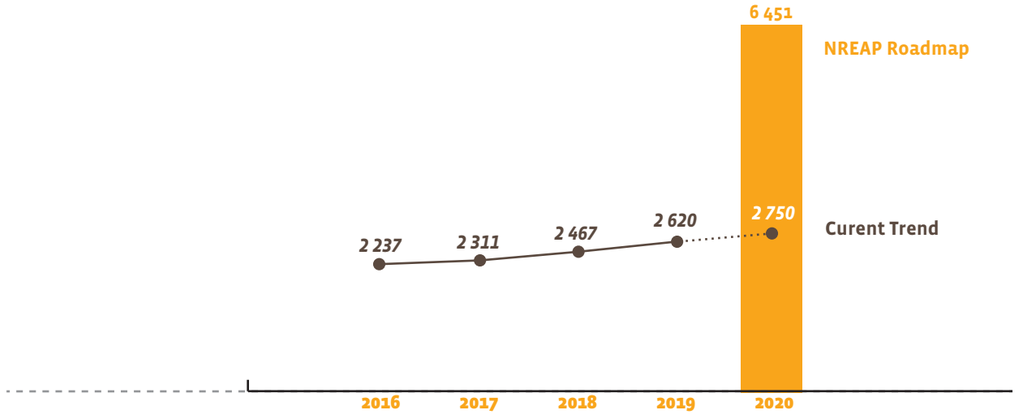




The biggest solar thermal plant in France was inaugurated in June 2019. It supplies hot water to the Lecta paper mill at Condat-sur-Vézère (Dordogne) thanks to its 4 200 m² collector area.

## Graph. n° 2

*Comparison of the current trend against the NREAP (National Renewable Energy Action Plans) roadmap (in ktoe)*




*Source: EurObserv'ER 2020*

## CONCENTRATED SOLAR POWER

The term Concentrated Solar Power (CSP) covers all the technologies that aim to transform solar radiation energy into very high temperature heat to convert it into electricity. There are tower plants, whose heliostat fields (devices fitted with reflectors to track the sun) concentrate the sunlight onto a receiver at the top of a tower, parabolic trough plants comprising parallel line-ups of long half-cylindrical reflectors that revolve around a horizontal axis to track the sun and concentrate its rays on a horizontal tube. There are also Fresnel type plants comprising rows of flat reflectors that pivot tracking the sun to redirect and concentrate the sun's rays permanently on an absorbing tube, and less widespread, parabolic plants where a parabolic reflector reflects the sun's rays onto a convergence point, as the reflector's base is automatically orientated opposite the sun to track it.

The Noor Ouarzazate CSP-PV solar complex in Morocco (580 MW including 72 MW of photovoltaic) has been fully operational since 2018.

Richard Allaya

### 6 055 MW OF CSP CAPACITY WORLDWIDE AT THE END OF 2019

Most of the current CSP development is going on in countries and regions that offer suitably conducive sunlight conditions, such as China, India, Australia, South Africa, the Middle East, and the Maghreb. The Protermosolar (Spanish Solar Thermal industry Association) website puts the global capacity of CSP plants at 6 055.4 MW at the end of 2019 (5 663 MW at the end of 2018, consolidated figure). Five CSP installations were commissioned during 2019 including 2 projects in the Negev Desert, Israel. The first is Ashalim 1 (a 121-MW tower plant) dimensioned to supply 121 000 homes with electricity (321 GW per annum) and equipped with a molten salt storage system that enables it to continue operating 4½ hours after sundown. The second is Ashalim 2, a parabolic trough plant that also has 121 MW of capacity (but no storage system). It will supply electricity to 70 000 homes, or just under 1% of the Israel's electricity demand, for an investment of 1.13 billion dollars. Remaining in the Middle East, Saudi Arabia commissioned the ISCC Duba plant, a 50-MW parabolic trough plant without a storage system.

The two remaining projects were commissioned in China, namely Qinghai Gonghe, a 50-MW tower plant equipped with a 6-hour storage system and the Fresnel-type 50-MW Dacheng Dunhuang plant that has a 13-hour storage system. The French SUNCMIM plant of the eLLO project also came on stream in 2019, even if it has been running since the end of 2018 and was included in Protermosolar's figures for last year.

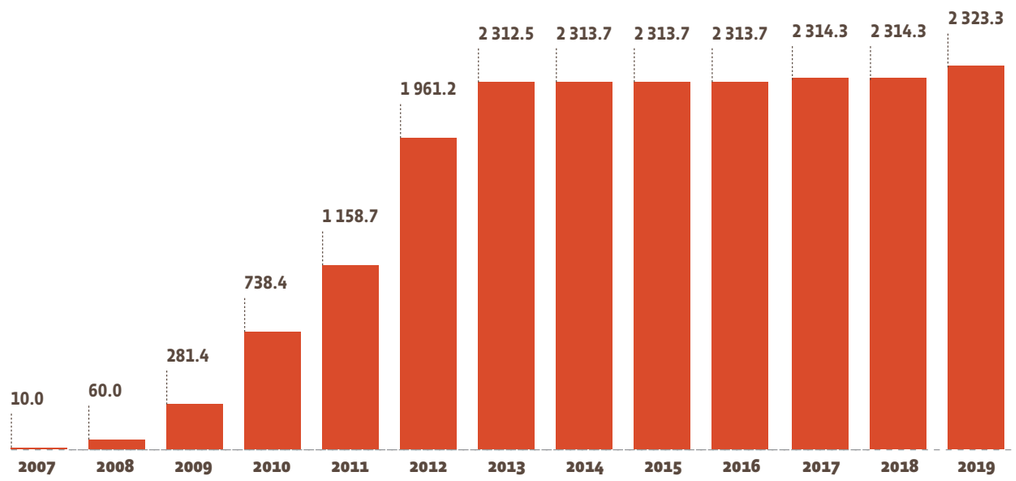
According to Protermosolar, on 1 January 2020, construction was underway on 11 CSP plant projects with combined capacity of 1 324 MW (all equipped with storage systems), and five of them are due to come on stream in 2020. They are the Chinese Urat Middle Banner (100 MW), Yumen Xinneng (50 MW), Jinfan Akesai (50 MW), Shangyi (50 MW) plants and the Chilian Cerro Dominador Atacama 1 plant, a 100-MW tower plant, which as its name suggests, will be installed in the Atacama Desert. What is unusual about this project, is that it will be equipped with a 17½-hour molten salt storage system – the longest-lasting storage capacity of any CSP so far.

Of the six projects planned for 2021, four are in China and two in Dubai, namely the Noor Energy 1 tower plant (100 MW) and the Noor Energy 2 parabolic trough plant (600 MW) which will be the world's biggest CSP plant with a 15-hour storage system enabling it to function round the clock. The Noor Energy project is a hybrid CSP-PV project, developed by ACWA Power, that will also include a 250-MW photovoltaic plant. Its cost is put at 3.9 billion dollars and is subject to a Power Purchase agreement (PPA) of 7.3 US ¢ per kWh (6.5 euro cents per kWh) with DEWA (the Dubai Electricity and Water Authority) planned to last 35 years. The project should not be confused with the Noor Ouarzazate CSP-PV solar complex in Morocco (580 MW including 72 MW of photovoltaic), which has been fully operational since 2018.

The IRENA (International Renewable Energy Agency) report on renewable energy claims that in 2019, production costs, technology improvements, economies of scale, supply chain competitivity and the growing experience of developers over the past decade led to a sharp drop in the cost of

**Graph. n° 3**

*European Union concentrated solar power capacity trend (MWe)*




*Source: EurObserv'ER 2020.*



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renewably-sourced electricity. Its data shows that in the case of CSP, costs fell by 47% between 2010 and 2019 (cf. drops of 82% for photovoltaic, 39% for onshore wind energy and 29% for offshore wind energy). Between 2018 and 2019, CSP production costs fell by 1% to 0.182 USD per kWh (0.162 EUR per kWh). Load factors have improved 30–45% over the past decade as new CSP plants have been built on better sites and in countries with better sunshine conditions. As for auctions and PPAs, IRENA asserts that CSP projects should change drastically, with average global auction prices falling by 59% from their 2019 levels to 7.5 dollar cents per kWh in 2021 (6.7 euro cents per kWh). This price level is consistent with the PPA announced for the Noor Energy solar project in Dubai.

## 2 323 MW IN THE EUROPEAN UNION

The European Union's new CSP plant installation pace slowed down considerably after an initial flurry concentrated in Spain between 2007 and 2014. In 2019, the European Union gauge moved up slightly to 2 323 MW when the eLLO project in the Pyrénées-Orientales, France, officially came on stream. This 9-MW Fresnel plant has a 4-hour storage system at full capacity thanks to nine 120-m3 hot water steam tanks. Its output is estimated at 20 GWh which equates to the mean electricity consumption of 6 000 French households. Spain with its capacity of 2.3 GW is really the only European Union country to have developed a commercially viable sector. According to RED Eléctrica de España, the country's 50 plants generated 5 116 GWh in 2019, which is a year-on-year increase of 16.8% attributable to better sunshine conditions.

Cyprus could be the next EU country to have a commercially sized CSP plant. On its fourth attempt in February 2020, the government managed to get its parliament to guarantee 60.2 million euros worth of funding for a European NER 300 innovative technology project, EOS Green Energy. It is a heliostat CSP plant that uses technology supplied by the Australian company Solastor Pty Ltd. For its part, Alfa Mediterranean Enterprises Ltd. is about to finance the CSP installation with a European Investment Bank loan. The project's investment costs are put at 175 million euros and the facility is scheduled to start operating in 2020. Annual output is set to reach 172 GWh.

However, hope is running out for the construction of the Italian projects

## Tabl. n° 6

*Concentrated solar power plants in operation at the end of 2019.*

| Project | Technology | Capacity (MW) | Commisionning date |
|---|---|---|---|
| **Spain** | | | |
| Planta Solar 10 | Central receiver | 10 | 2007 |
| Andasol-1 | Parabolic trough | 50 | 2008 |
| Planta Solar 20 | Central receiver | 20 | 2009 |
| Ibersol Ciudad Real (Puertollano) | Parabolic trough | 50 | 2009 |
| Puerto Errado 1 (prototype) | Linear Fresnel | 1.4 | 2009 |
| Alvarado I La Risca | Parabolic trough | 50 | 2009 |
| Andasol-2 | Parabolic trough | 50 | 2009 |
| Extresol-1 | Parabolic trough | 50 | 2009 |
| Extresol-2 | Parabolic trough | 50 | 2010 |
| Solnova 1 | Parabolic trough | 50 | 2010 |
| Solnova 3 | Parabolic trough | 50 | 2010 |
| Solnova 4 | Parabolic trough | 50 | 2010 |
| La Florida | Parabolic trough | 50 | 2010 |
| Majadas | Parabolic trough | 50 | 2010 |
| La Dehesa | Parabolic trough | 50 | 2010 |
| Palma del Río II | Parabolic trough | 50 | 2010 |
| Manchasol 1 | Parabolic trough | 50 | 2010 |
| Manchasol 2 | Parabolic trough | 50 | 2011 |
| Gemasolar | Central receiver | 20 | 2011 |
| Palma del Río I | Parabolic trough | 50 | 2011 |
| Lebrija 1 | Parabolic trough | 50 | 2011 |
| Andasol-3 | Parabolic trough | 50 | 2011 |
| Helioenergy 1 | Parabolic trough | 50 | 2011 |
| Astexol II | Parabolic trough | 50 | 2011 |
| Arcosol-50 | Parabolic trough | 50 | 2011 |
| Termesol-50 | Parabolic trough | 50 | 2011 |
| Aste 1A | Parabolic trough | 50 | 2012 |
| Aste 1B | Parabolic trough | 50 | 2012 |
| Helioenergy 2 | Parabolic trough | 50 | 2012 |
| Puerto Errado II | Linear Fresnel | 30 | 2012 |
| Solacor 1 | Parabolic trough | 50 | 2012 |
| Solacor 2 | Parabolic trough | 50 | 2012 |
| Helios 1 | Parabolic trough | 50 | 2012 |
| Moron | Parabolic trough | 50 | 2012 |
| Solaben 3 | Parabolic trough | 50 | 2012 |
| Guzman | Parabolic trough | 50 | 2012 |
| La Africana | Parabolic trough | 50 | 2012 |
| Olivenza 1 | Parabolic trough | 50 | 2012 |
| Helios 2 | Parabolic trough | 50 | 2012 |
| Orellana | Parabolic trough | 50 | 2012 |
| Extresol-3 | Parabolic trough | 50 | 2012 |
| Solaben 2 | Parabolic trough | 50 | 2012 |
| Termosolar Borges | Parabolic trough + HB | 22.5 | 2012 |
| Termosol 1 | Parabolic trough | 50 | 2013 |
| Termosol 2 | Parabolic trough | 50 | 2013 |
| Solaben 1 | Parabolic trough | 50 | 2013 |
| Casablanca | Parabolic trough | 50 | 2013 |
| Enerstar | Parabolic trough | 50 | 2013 |
| Solaben 6 | Parabolic trough | 50 | 2013 |
| Arenales | Parabolic trough | 50 | 2013 |
| Total Spain | | 2 303.90 | |
| **Italy** | | | |
| Archimede (prototype) | Parabolic trough | 5 | 2010 |
| Archimede-Chiyoda Molten Salt Test Loop | Parabolic trough | 0.35 | 2013 |
| Freesun | Linear Fresnel | 1 | 2013 |
| Zasoli | Linear Fresnel + HB | 0.2 | 2014 |
| Rende | Linear Fresnel + HB | 1 | 2014 |
| Ottana | Linear Fresnel | 0.6 | 2017 |
| Total Italy | | 8.15 | |
| **Germany** | | | |
| Jülich | Central receiver | 1.5 | 2010 |
| Total Germany | | 1.5 | |
| **France** | | | |
| La Seyne sur mer (prototype) | Linear Fresnel | 0.5 | 2010 |
| Augustin Fresnel 1 (prototype) | Linear Fresnel | 0.25 | 2011 |
| SUNCNIM | Linear Fresnel | 9 | 2019 |
| Total France | | 9.75 | |
| **Total European Union** | | 2 323.30 | |

*HB (Hybrid Biomass).* ***Source: EurObserv'ER 2020***


**The Ashalim 1 CSP tower plant (121 MW) dimensioned to supply 121 000 homes with electricity (321 GW per annum) and equipped with a molten salt storage system that enables it to continue operating for 4½ hours after sundown – Negev Desert, Israel**

announced several years ago in Sardinia and Sicily, as there is no sign of the decree (FER 2) endorsing these projects. The CSP situation in Italy has reached such a low point that ANEST, the Italian National Association of Thermodynamic Solar Energy was dissolved early in February 2020. Gianluigi Angelantoni, the chairman of ANEST and CEO of the Angelantoni Group that controls Archimede Solar Energy, says it is now too late to save these projects and that keeping the association going no longer made any sense. He also explains that the fact that Italy has only constructed small-scale plants for research and testing purposes, rather than commercially-sized plants has inhibited Italian companies from competing in international tenders such as for the 600-MW parabolic trough plant in Dubai. He claims that about 300 million euros have been poured into the Italian CSP sector and will not be recovered.

## AMBITIOUS NECPS THAT HAVE YET TO BE CONFIRMED

The European Commission has published almost all the final versions of the National Energy and Climate Plans (NECP), submitted by the Member States, setting out their ambitions for combatting climate change and their roadmaps for doing so. In Spain, the Secretary-General of Protermosolar, Gonzalo Martin, feels that the publication of the national NECP is a very good first step. This is because the Target Scenario plans for a combined capacity of 7 303 MW by the end of 2030 (i.e. 5 000 MW more than today) with an intermediate target of 4 803 MW by the end of 2025. The scenario also provides for this additional capacity to be equipped with storage systems equivalent to 9 hours of production. However, he points out that the NECP merely defines long-term targets, without providing any legal framework to regulate these projects.

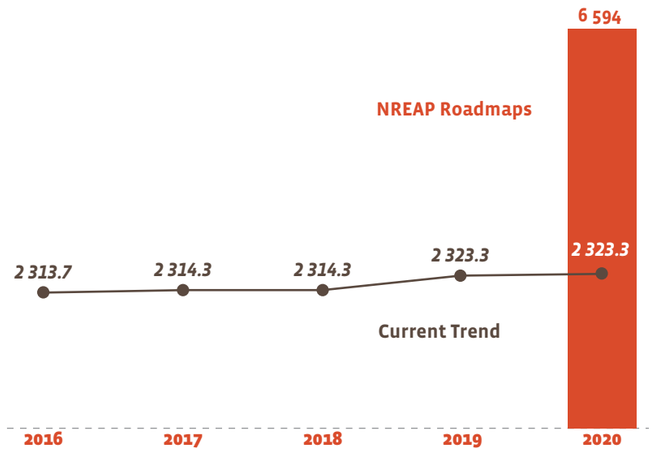
The Spanish government is in the process of drawing up the legal framework that will be essential for new CSP projects in Spain. Thus, there will be a new climate change law that is currently at the approval stage to regulate all the actions to meet the NECP, and in particular future tendering conditions. Gonzalo Martin claimed to be optimistic in the middle of June although he had no word of any new projects.

As regards the other European countries, Portugal seems to be showing increasing interest in CSP technology with an NECP that provides for 300 MW by 2030. Despite the fallout from the current projects, when the Italian NECP was officially published, it provided for 880 MW to be developed by 2030. In contrast, Cyprus' CSP capacity should not change from 2022 to 2030, namely after the above-mentioned heliostat CSP project is commissioned, but it could reach 500 MW in 2040 as part of the PPM (Planned Policies and Measures) scenario. Turning to the other countries with suitable sunshine conditions for CSP technologies, Greece has a project that at 70 MW is dwarfed by the others. The sector's maturity and scale effects due to its globalization give reason to hope that these plans will indeed be implemented, unlike the previous directive's national renewable energy action plans. □

*Sources: AGEE Stat (Germany), EBHE (Greece), SPUiG (Poland), Ministry for the Ecological Transition (Spain), REE (Spain), Planenergi (Denmark), Assotermica (Italy), Observ'ER (France), Uniclima (France), Statistics Austria, EBHK (Cyprus), DGEG (Portugal), Statistics Netherlands, ATTB (Belgium), Ministry of industry and trade (Czechia), SEAI (Ireland Pep), Solar trade Association (United Kingdom), RISE Research Institutes of Sweden, STATEC (Luxembourg), NSO (Malta), Protermosolar, IEA SHC 2020 report, EurObserv'ER estimation based on Eurostat database or ESTIF last market survey (november 2019).*

## Graph. n° 4

*Comparison of the current trend against the NREAP (National Renewable Energy Action Plans) roadmap (in MW)*




*Source: EurObserv'ER 2020*

*The next barometer will cover biofuels.*

Funded by the European Commission

*This barometer was prepared by Observ'ER in the scope of the EurObserv'ER project, which groups together Observ'ER (FR), TNO Energy Transition (NL),, RENAC (DE), Frankfurt School of Finance and Management (DE), Fraunhofer ISI (DE) and Statistics Netherlands (NL).*
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