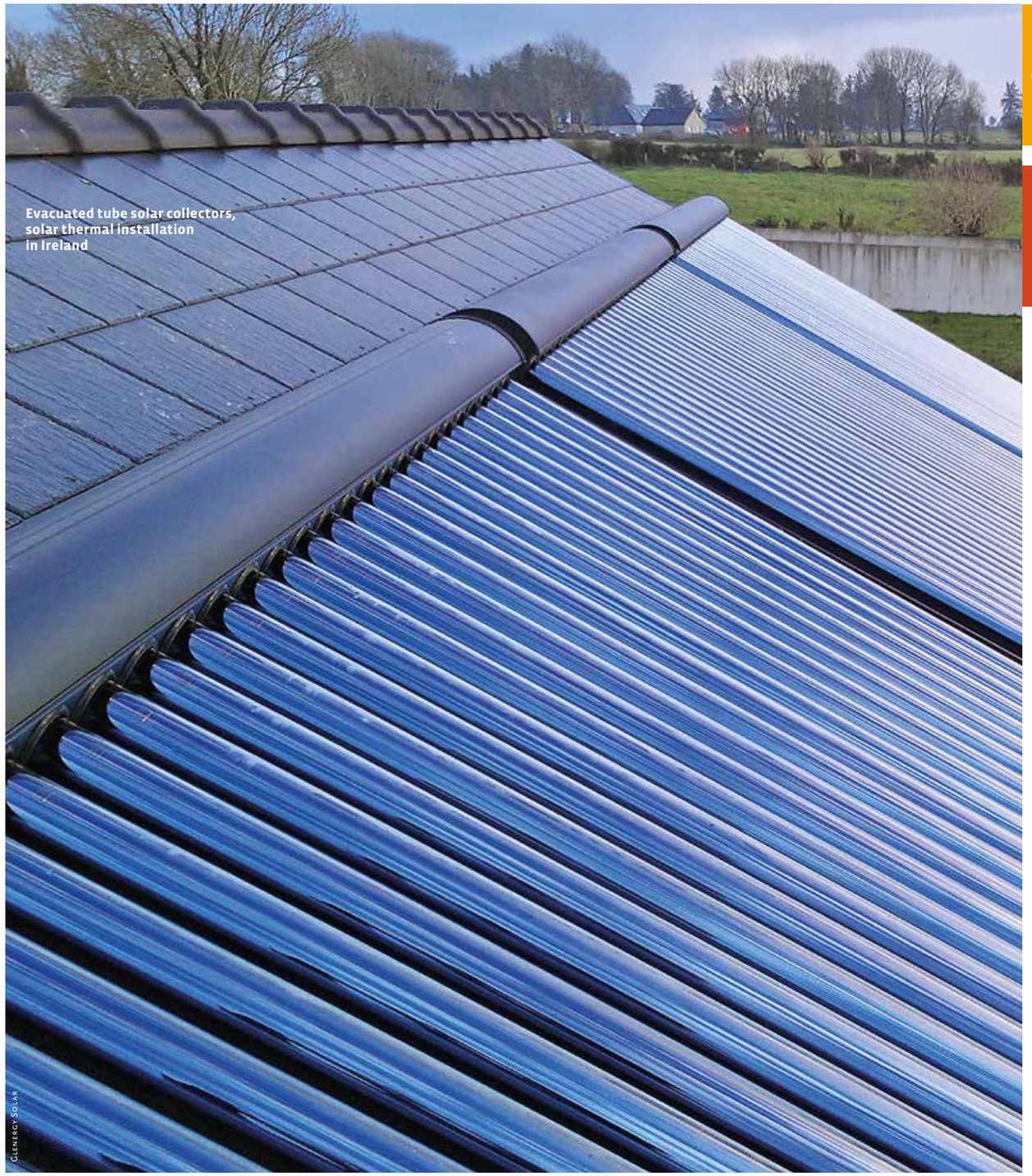


Evacuated tube solar collectors, solar thermal installation in Ireland

- 4.6%

The decrease of the solar thermal market in the European Union in 2016

SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETERS

A study carried out by EurObserv'ER.

The European solar thermal market is still losing pace. According to the preliminary estimates from EurObserv'ER, the solar thermal segment dedicated to heat production (domestic hot water, heating and heating networks) contracted by a further 4.6% in 2016 down to 2.6 million m². The sector is pinning its hopes on the development of the collective solar segment that includes industrial solar heat and solar district heating to offset the under-performing individual home segment.

Since 2014 European concentrated solar power capacity for producing electricity has been more or less stable. New project constructions have been a long time coming, but this could change at the end of 2017 and in 2018 essentially in Italy.

51 millions m²

The cumulated surfaces of solar thermal in operation in the European Union in 2016

2 313.7 MWth

Total CSP capacity in operation in the European Union in 2016

SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETERS – **EUROBSERV'ER** – JUIN 2017

The world largest solar thermal district heating solution - Silkeborg, Denmark (in operation end 2016)

The European solar thermal market's foundations are being increasingly eroded, as the European Union market now stands at 2.6 million m², which is 2 million m² less than it was in the reference year, 2008 (4.6 million m²) **(graph 1)**. EurObserv'ER puts the thermal capacity of newly-installed solar thermal facilities at 1 823 MWth in 2016, which is 4.6% less than in 2015 **(tables 2 and 3)**. Flat plate collectors still account for most of the installed surface area (93.4%), followed by vacuum collectors (5.3%) and unglazed collectors (1.3%). Since 2009, the European Union's solar thermal market has been contracting by an annual average of 6.9%.

The total surface area of the European Union's solar thermal base was about 51 million m² (35 713 MWth), which is 3.8% more than in 2015 **(table 4)**. This estimate includes the three main solar thermal technologies (flat plate collectors, vacuum collectors and unglazed collectors) and factors in the decommissioning assumptions made by the experts contacted during the study and Eurostat data for year N-1. In the absence of official data, EurObserv'ER relies on the market data it has gathered and applies a 20 year decommissioning assumption for glazed collectors and 12 years for unglazed collectors.

The underlying reasons for the trend decline are constant. The solar thermal market is directly hit by the low price of natural gas that affects solar heat's ability to compete by giving the advantage to the condensing gas boiler market. The stop-start, degressive subsidy policies operating in some countries have also hit solar thermal's momentum in the residential sector segment. Solar thermal also competes badly with other easier-to-install, renewable solutions whose purchase price is lower, such as thermodynamic hot water heaters and AGHP. This has created a downward spiral in the number of installations as heating network installation engineers now specify fewer solar thermal solutions in the residential sector, which has weakened the sector's structure (drop in the number of installers, poorer skills).

PV's continuing appeal to private homeowners and investors also stands in the way of solar thermal's development. Even if PV technology is not in head-on competition for hot water production in the residential segment, silicon panels are generally prescribed especially since self-production of electricity became profitable. The sector's prospects have also dwindled in markets such as Spain and Italy, where solar thermal is a priority energy source in new build, because of the construction slump.

While the outlook is grim, it is not disastrous, for while the individual home segment cannot deliver to expectations, the growth prospects for solar thermal in the collective housing hot water production, industrial heat production and district heating are much more promising. In fact they are underpinned by stricter European regulations and the offer of suitable equipment by the manufacturers to slash production costs (large collectors, suitable technologies). The solar thermal heating network segment that calls for large areas of collectors has proven how relevant it is and has been championed by pro-active policies pursued by a number of countries. Denmark leads the way in solar heating networks just as it did for wind energy in the early 80s (see below).

Market forces are roughly the same as they were last year. The German market is still well placed in European solar thermal market; as yet again it accommodates almost 30% of the newly-installed collector area in the European Union. However it has failed to stem its own domestic market's decline. Denmark, which promotes the construction of vast collector fields to supply heating networks, is clearly relishing its momentum. The main change with regard to last year has been felt in the Polish market, which having grown 2015, took a nose dive in 2016. The state of play in France is now causing great concern, where as a result of the policy of promoting condensing boilers and electrical hot water production systems (such as thermodynamic hot water heaters), solar thermal has become a niche market for domestic hot-water production or solar heating. The decline is not so pronounced in the Italian and Spanish markets, but the momentum is still negative. Only Greece is a safe bet and can be trusted to maintain a 270 000 m² installation level from year to year, partly as it needs to replace existing equipment.

Outside of the European borders, solar thermal is skyrocketing thanks to the Chinese market. The country may have installed 28 000 MWth in 2016 for an overall capacity of 337 GWth, which is ten times bigger than the UE capacity. The second market in the worldwide ranking is far away, as it is Turkey, with 1 467 MWth installed in 2016. **(table 1)**.

Tabl. n° 1

Main solar thermal markets outside European Union

	Annual Installed capacity (in MWth)		Total cumulative capacity in operation (in MWth)	
	2015	2016	2015	2016
China	30 500	27 664	309 500	337 164
United States	760	682	17 300	17 982
Turkey	1 500	1 467	13 600	15 067
India	770	894	6 300	7 194
Japan	100	50	2 400	2 450
Rest of the world	6 740	6 797	90 944	97 728
Total world	39 640	36 660	434 700	471 360

Source: EurObserv'ER 2017

NEWS FROM AROUND THE MAIN MARKETS

Solar heat warms up Danish networks

Denmark had an exceptional year in 2016. According to Jan Erik Nielsen of PlanEnergi, the country installed about 500 000 m² of collectors, 99% of which were intended to supply heating networks while the remaining one percent was for individual domestic hot water production. This newly-installed area is almost double the previous year's figure (264 564 m²).

Denmark has built 31 new solar heating networks and extended the collector field to 5 other networks. It had already built 15 heating networks and extended 3 networks the previous year. According to PlanEnergi calculations there are 104 olar heating networks in Denmark supplied by 1 301 000 m² of collectors. The town of Silkeborg holds the record for the biggest solar heating network in the country (and the world) since December 2016. With a collector area of 156 694 m² (110 MW), i.e. 12 536 collectors with a surface area of 12.6 m² (manufactured by the Danish company Arcon-Sunmark), solar energy is capable of covering 20% of the annual heating requirements for 21 000 users. Silkeborg has effectively toppled the previous record held by the town of Vojens that has a 70 000 m² (48.9 MWth) solar heating network.

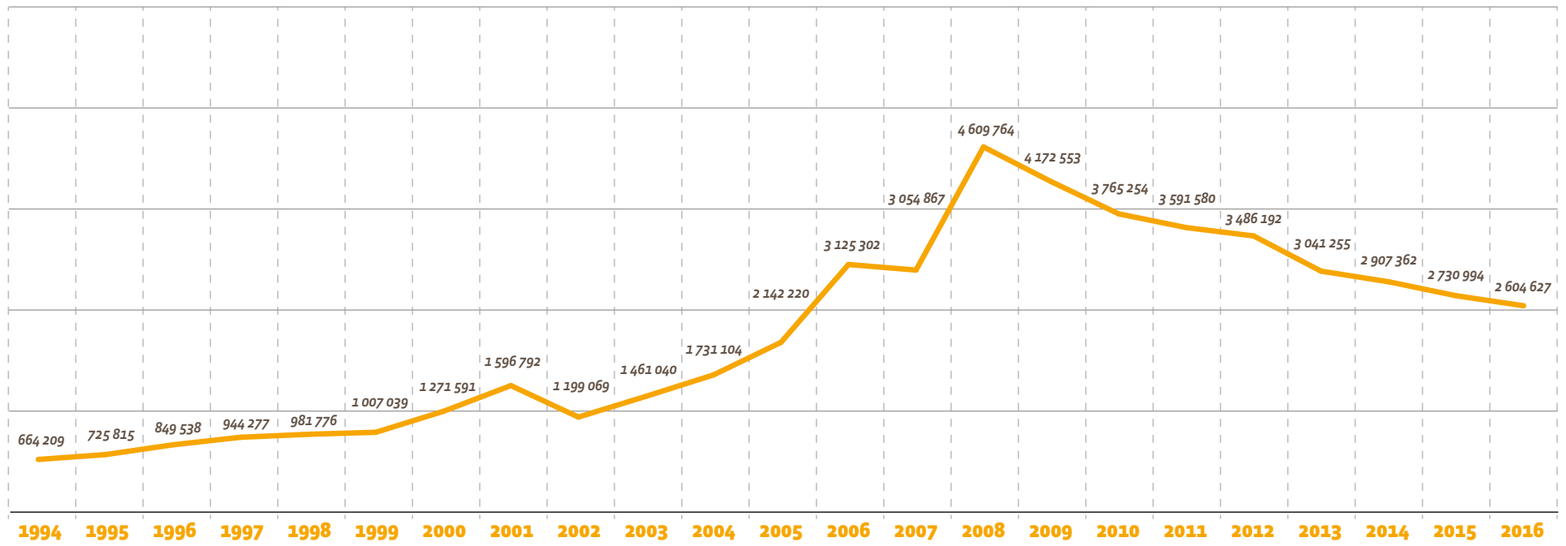
The solar heating network installation peak has been precipitated by the end of the Energy Saving agreement scheduled for December 2016 that was signed in 2012 between the Danish energy operators and the Danish Energy Ministry. The utilities effectively brought forward the completion of their installations to avoid paying penalties and also because of uncer-

Alongside the Danes who are pioneers in this technology, not to mention the Swedes, Germans and Austrians, there are new countries showing interest in converting their own heating networks. In the Netherlands, solar heating networks of 140 kWth and over are eligible for the Feed-in Tariff incentive system known as the SDE+, that finances the kWh of thermal energy produced. This system enables energy service operators to take up an incentive that compensates for the difference between the market price and the production. The system became more generous in 2016 as the drop in the mean price for solar heat increased the amount to be made up by subsidies, a rise in the budget allocated to SDE+ and the exclusion of biomass co-combustion plants from the list of eligible technologies. Thus in 2016, the SDE+ system approved funding for about 62 MWth of solar thermal plants, essentially for greenhouse heating projects. According to the solar expert Lex Bosselar, implementation of these projects will depend on the proven efficiency of the first systems installed. France has also announced its ambitious to develop solar heating networks. In January 2017, construction work began on one of the biggest projects... the Chateaubriant solar heating network in Loire-Atlantique (2 300 m² of collectors). It is expected to produce 900 MWh per annum. It follows the 2016 construction of the Chasseneuil-du-Poitou solar plant (1 470 m², i.e. 1 MWth of capacity).
According to Jan-Olof Dalenback, of Chalmers University of Technology in Sweden, there were 290 large-dimension solar thermal installations in Europe at the end of 2016, including solar heating networks and industrial and cooling installations for a collector area of 1.57 million m² in all.

tainties surrounding the inclusion of solar heating in the next round of the Energy Saving agreement.
In the end, the new agreement between the utilities and the Danish Energy Ministry signed on 16 December 2016, confirmed that solar heating would be included in the calculations for energy-saving goals. It plans for 3.18% of energy savings on final energy consumption in the heating network field between 2016 and 2020. A point to bear in mind is that article 3.8 stipulates that solar hear injected into the heating network cannot be added to the energy saving targets unless the field of collectors enters its programming phase prior to 30 June 2018 and is installed before 30 June 2019. Therefore the article provides the municipal energy service companies with a strong incentive to plan for constructing new solar heating networks (or their extensions) before the middle of 2018 to meet their obligation.

Graph. n° 1

Evolution of annually installed surfaces in the European Union since 1994 (in m²)



Member states included at the date of their accession. **Source: EurObserv'ER 2017.**

The German market continues to slide

Despite the efforts made to prop up the sector, the solar thermal market's downward trend could not be stemmed. According to AGEE-Stat, the Working Group on Renewable Energy-Statistics, 766 000 m² (including 22 000 m² unglazed) of collectors were installed in Germany in 2016, compared to 831 000 m² in 2015 (including 25 000 m² of unglazed collectors), which equates to a 7.8% decline. The full raft of aids targeting the residential, collective segments and industrial heating were to no avail. BAFA (the Federal Office for Economic Affairs and Export Control) ascribes the solar thermal market contraction to low heating oil and gas prices which erode the competitiveness of solar thermal solutions.
In Germany, the Federal Ministry for Economic Affairs and Energy awards annual subsidies worth 300 million euros to the renewable energy heating system through the MAP programme.
The government raised the level of aid awarded under its market incentive programme (MAP, Marktanreizprogramm) from 1 April 2015 to increase the renewable energy share of heat supply in order to reverse the market downturn, (see the 2015 solar thermal barometer for details of the aids or the note).
Since 1 January 2016, the government has added new measures via a new energy efficiency stimulation programme, the "Anreizprogramm Energieeffizienz (APEE)". Its purpose is to help finance the replacement or modernisation of existing heating systems with the proviso that they are more efficient. This optimization can only be achieved by replacing an oil- or gas-fired heating system (condensing boilers are excluded from the measure) with a heating system that either runs on biomass, or a heat pump, or a combined solar thermal system (hot water + heating). If solar thermal panels are installed to boost the efficiency of the existing heating system, then the incentive can also be awarded. The amount of the APEE top-up grant equals 20% of the MAP subsidy awarded, however this package cannot be combined with the MAP programme's optimization bonus. An additional 600 euro premium is also awarded for any investment that increases the energy efficiency of an existing heating system.
The German government is also encouraging the development of process heating (for industrial or commercial use) by introducing attractive incentive conditions. BAFA promotes industrial heating for solar thermal installations with collector surfaces of at least 20 m², by financing up to 50% of the net investment costs (including engineering studies, installation and measurement and data device acquisition). Investors can also apply for a low-interest rate loan from the KfW Bank that will be combined with a non-refundable 50% subsidy on the net investment. The third option is to apply for a performance-based incentive, which will factor in the annual performance indicated on the corresponding Solar Keymark certificate. If the latter is more advantageous than the 50% rule, BAFA will recommend it to the applicant.

The Polish market plummets in the absence of incentives

Although the Polish solar thermal market was resilient in 2015, expanding by 6.5% to 277 000 m², it took a nose dive in 2016 plummeting to 115 400 m² according to data released by SPIUG (Association of Manufacturers and Importers of Heating Appliances).
The market was expected to decline but on a much smaller scale. The reason for this fall is that the subsidies awarded to solar thermal under the "transient" national Prosument programme were discontinued in the summer of 2016. The remaining funds of the NFOSiGW (National Fund for Environmental Protection and Water management) residential subsidy programme that formed the basis of the Prosument programme were transferred to regional funds responsible for setting up this policy. Since then, customers and industry alike have been waiting for a new regional subsidy system to be set up, but there was no news of it in May 2017. The BSRI consultancy analysts claim that another reason for disenchantment with solar thermal in Poland is the stability of gas prices, which has encouraged sales of gas-fired boilers. Despite high electricity prices in Poland, solar thermal has also been hit by competition from thermodynamic hot water heaters, which cost less and are easier to install than a solar thermal system. What concerns the sector even more is that according to SPIUG, many solar thermal solution suppliers are abandoning the business to specialize in the more buoyant heat pump and PV markets, thus breaking up the solar thermal installation network.

The French solar thermal market in distress

The French solar thermal market is clearly in distress and will be hard pressed to recover from past policy directions (failure to take proper account of solar heat in the 2012 RT thermal regulations, right to over-consume in multi-occupancy housing, standardization of the Tax Credit aids for energy transition).
According to Uniclima (the air-handling, cooling, heating and refrigeration

industry association) data, the mainland solar thermal market posted a further 35% year-on-year decline with a collector installation figure of 65 900 m² in 2016 compared to 101 400 m² in 2015. The newly-installer collector area in the collective segment, which accounts for 55.7% of the installed area was put at 36 700 m² – a 38% fall. The overseas territories market is more active and is put at 47 082 m² in 2016 (41 248 m² in 2015), which equates to a 14.1% increase.

In mainland France, the solar thermal market is to all intents and purposes a niche market. The number of individual solar water heaters has dropped from 10 900 units in 2015 to 7 500 in 2016, with an average of 3.3 m² of collectors per system. As for combined solar systems, 300 were installed in 2016 compared to 400 in 2015 (averaging 11.3 m² per system). Uniclima claims that "individual solar water heaters are unable to establish a foothold in new build as they face fierce competition from both thermodynamic water heaters that are cheaper to purchase and easier to install, and from PV, a new RES competitor" and "in renovation, the Tax Credit for energy transition scheme cannot support individual solar devices in the context of "low-cost" fossil energy". "The 2012 thermal regulation (RT 2012), with its authorization to overconsume for multi-occupancy dwellings (57.5 kWh/m²p.a. annum as opposed to 50 kWh/m² p.a.) and the absence of any requirement for renewable energy, has excluded renewable heat and collective solar heat in particular, from new build."

On the contrary, condensing gas- and oil-fired boilers – still eligible for installation grants under the Tax Credit for energy transition scheme (i.e. 30%, in the same way as systems using

Hot solar water storage tanks of the Maison de l'Ile-de-France

Tabl. n° 2

Annual installed surfaces in 2015 per type of collectors (in m²) and power equivalent (in MWth)

Country	Glazed collectors		Unglazed collectors	Total (m²)	Equivalent power (MWth)
	Flat plate collectors	Vacuum collectors			
Germany	729 000	77 000	25 000	831 000	581.7
Poland	225 000	52 000		277 000	193.9
Greece	271 000	600		271 600	190.1
Denmark	264 565			264 565	185.2
Spain	226 138	11 121	3 375	240 634	168.4
Italy	201 810	27 520		229 330	160.5
France*	142 648		6 000	148 648	104.1
Austria	134 260	2 320	890	137 470	96.2
Czech Republic	22 000	9 000	30 000	61 000	42.7
Portugal	45 304	830		46 134	32.3
Belgium	38 250	6 750		45 000	31.5
Netherlands	17 548	3 971	2 621	24 140	16.9
Ireland	12 720	9 953		22 673	15.9
Croatia	19 000	2 500		21 500	15.1
United Kingdom	16 935	3 306		20 241	14.2
Cyprus	18 000	600		18 600	13.0
Romania	6 800	11 000		17 800	12.5
Hungary	10 080	5 570	1 250	16 900	11.8
Sweden	4 928	1 643		6 571	4.6
Bulgaria	5 100	500		5 600	3.9
Luxembourg	4 700	750		5 450	3.8
Slovakia	4 500	800		5 300	3.7
Finland	3 000	1 000		4 000	2.8
Slovenia	2 200	600		2 800	2.0
Lithuania	800	1 400		2 200	1.5
Estonia	1 000	1 000		2 000	1.4
Latvia	1 580	330		1 910	1.3
Malta	742	186		928	0.6
Total EU 28	2 429 608	232 250	69 136	2 730 994	1 911.7

** including 41 248 m² in overseas departments.* ***Source: EurObserv'ER 2017.***

Tabl. n° 3

*Annual installed surfaces in 2016** per type of collectors (in m²) and power equivalent (in MWth)*

Country	Glazed collectors		Unglazed collectors	Total (m²)	Equivalent power (MWth)
	Flat plate collectors	Vacuum collectors			
Germany	677 000	67 000	22 000	766 000	536.2
Denmark	500 000			500 000	350.0
Greece	270 000			270 000	189.0
Spain	201 793	7 076	3 321	212 190	148.5
Italy	210 000			210 000	147.0
France***	112 982		5 500	118 482	82.9
Poland	111 700	3 700		115 400	80.8
Austria	109 600	1 440	760	111 800	78.3
Portugal	54 000	1 000		55 000	38.5
Belgium	39 000	7 500		46 500	32.6
Czech Republic	22 000	9 000	n.a.	31 000	21.7
Netherlands	20 137	5 179	2 621	27 937	19.6
Croatia*	19 000	2 500		21 500	15.1
Ireland	11 204	8 564		19 768	13.8
Hungary	13 050	5 592	188	18 830	13.2
Cyprus	18 000	600		18 600	13.0
Romania*	6 800	11 000		17 800	12.5
United Kingdom	9 100	2 509		11 609	8.1
Slovakia	6 000			6 000	4.2
Bulgaria	5 100	500		5 600	3.9
Finland*	3 000	1 000		4 000	2.8
Luxembourg	3 759			3 759	2.6
Sweden	2 763	336	75	3 174	2.2
Slovenia*	2 200	600		2 800	2.0
Lithuania*	800	1 400		2 200	1.5
Estonia*	1 000	1 000		2 000	1.4
Latvia*	1 580	330		1 910	1.3
Malta	614	154		768	0.5
Total EU 28	2 432 182	137 980	34 465	2 604 627	1 823.2

** No data available, estimation based on the 2015 ESTIF market. ** Estimate (latest available information at the end of May 2017). *** including 47082 m² in overseas departments.* ***Source: EurObserv'ER 2017.***

renewable energies) – have a high take-up rate in France with 454 000 units sold in 2016 up from 396 000 units in 2015 (a 15% rise). The market is taking full advantage of the new eco-design regulations for heating and hot water appliances.

Nonetheless collective solar thermal should gradually witness an upturn in its development conditions, for after a four-year struggle, the sector was granted more equitable treatment for solar heat in October 2016 in the RT 2012 computation engine, which lowered its primary energy consumption by 20% in relation to the previous calculation formulae. The end of the waiver on overconsumption in new multi-occupancy housing, scheduled for 31 December 2017, is now within sight. Furthermore, since June 2016, local authorities have been able to award a 30% constructability bonus for exemplary buildings whose energy performance betters RT 2012 by 20%. These buildings will also be eligible for Heat Fund incentives for collective housing that demand RT 2012 regulations to be bettered by 15%.

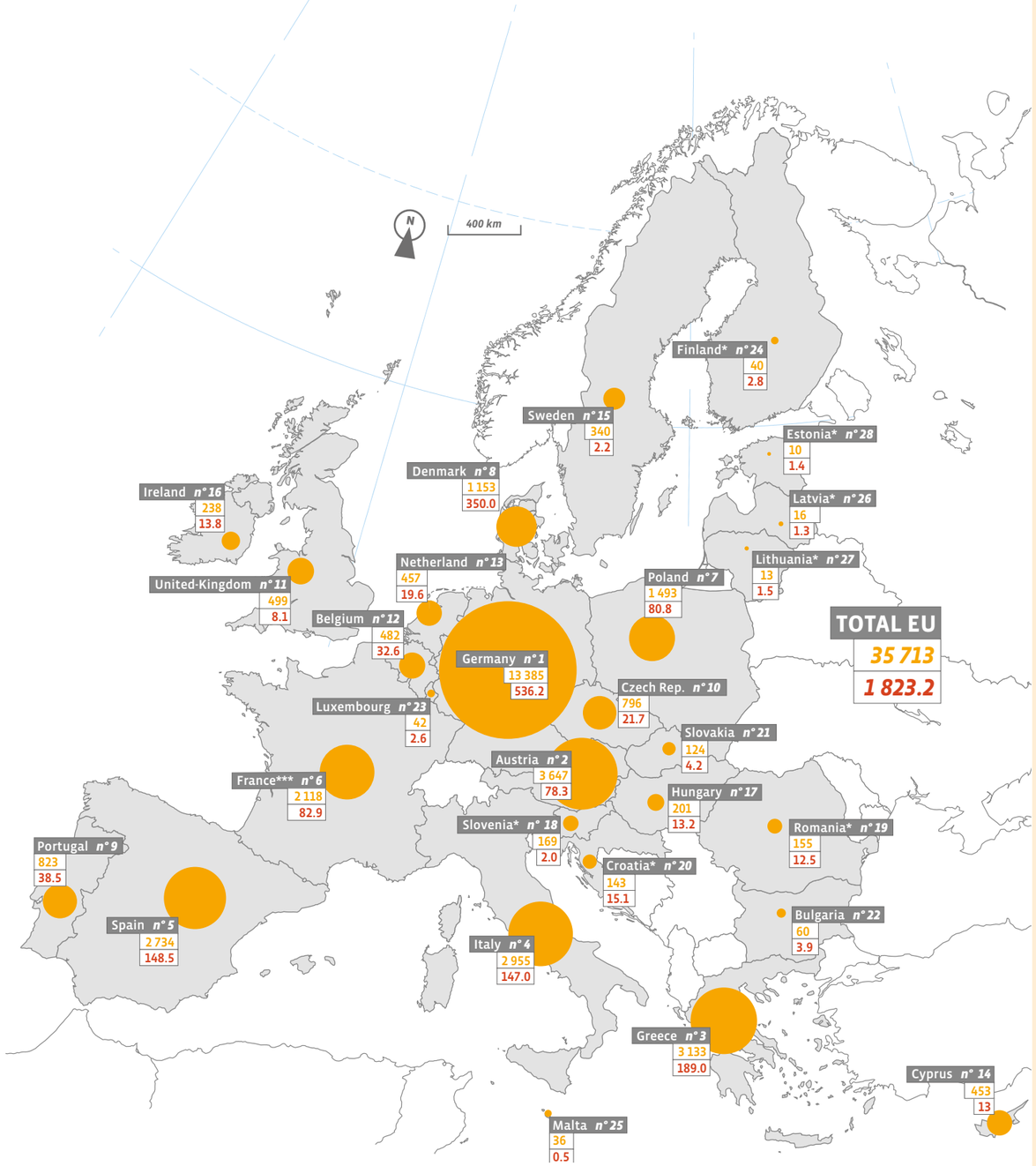
Spain's market looks forward to better times

The Spanish solar thermal market performed below expectations in 2016 as it contracted for the second year running. ASIT, the solar thermal industry association, claims that Spain installed 212 290 m² of collectors, which is a 12% decrease on 2015 (the drop was 6.5% between 2014 and 2015). Most of the collectors installed were flat plate and dedicated to collective applications (53.9%, i.e. 114 515 m²), ahead of individual installations (44.5%, i.e. 94 354 m²) and unglazed collectors for pool heating (1.6%, i.e. 3 321 m²).

The industry ascribes these losses to similar factors to those of 2015 – namely, sluggish property construction and the discontinuance of regional subsidy programmes – especially those granted in Andalusia (Prosol programme). Another factor is the upswing in heat pump installations, which according to the country's technical building code (CTE) are now eligible as an alternative to solar thermal for the renewable energy production of domestic hot water.

ASIT expects the situation to turn around

***Solar thermal power capacity installed** in the European Union at the end of 2016** (MWth)*



Key

35 713 *Total solar therma capacity installed at the end of 2016* (MWth)*

1 823.2 *Solar thermal capacity installed during the year 2016** (in MWth)*

** No data available, estimation based on the 2015 ESTIF market figure. ** Estimate (latest available information at the end of May 2017).*
**** included 47 082m² in overseas departments.*
Source: EurObserv'ER 2017.

in 2017. A new sustainable energy development incentive programme commenced on 15 May 2017 in Andalusia from 2017–2020, with a budget of 163 million euros. Its funds range from 20–85% in the area of sustainable building, renovation, heating, cooling and lighting.
Solar thermal is one of the eligible technologies in the budget line for sustainable building. In the case of major installations (collector areas in excess of 25 m²), the basic grant scheme is 40% and may rise up to 85% for redevelopment of social housing projects. As for small areas, the basic scheme comprises a grant to cover 30% of the costs and can also rise to 85% for redevelopment of social housing projects. Solar heating networks are excluded from the mechanism.

Another positive factor is that new build has returned to steady growth, and this should benefit the market in 2017, not to mention an increase in the systems sold that are ineligible for any grant, which account for about 20% in the market 2016 compared to 15% in 2015.

The Italian market drops out of double digits

Preliminary estimates of the Italian solar thermal market provided by Assotermica indicate a new 9% drop between 2015 and 2016 (210 000 m2), after dropping 14.5% between 2014 and 2015. This comes in a context where the level of grants is high… a 65% tax reduction for small systems and the introduction of the new Conto Termico 2.0 scheme at the beginning of 2016 that supports installations of up to 2 500 m² with a financing rate of 40–60% of investment costs. Small installations can also take up Conto Termico 2.0, with a number of advantages such as the grant payment in one lump sum rather than in instalments over two years.
Assotermica explains that despite very attractive financing terms for medium and large areas, this segment is struggling to develop because of the lack of demand from potential users and low specification levels. The lack of market structure is to blame, as the market is dominated by small residential systems. Other reasons put forward are the construction sector crisis that limits opportunities and the lack of advertising on the new labels that limit the consumers' visibility of new, high performance integrated solutions (A+++ label).

Solar thermal finds redemption in the UK

Data released by STA (the Solar Trade Association) shows that the UK solar thermal market had difficulty making the figure of 11 609 m² in 2016, which amounts to a new 43% (or 20 241 m²) drop on its 2015 level… a far cry from its 2010 market level of 88 379 m². Nonetheless the sector has scored a victory. After several months' consultation on a government project to exclude solar thermal from the RHI (Renewable Heat Incentives) system from 2017 onwards, the government conceded on 14 December 2016, announcing that solar thermal would be retained after all. Hence the incentive level is pegged at its current levels for households at 19.74 p per kWh payed over 7 years and at 10.28 p per kWh for the "non-residential" category for 20 years. On the downside, solar heating is still ineligible for the incentive systems. Although the first quarter figures for 2017 indicate a further drop in sales, the manufacturers hope for a gradual increase from 2017 onwards, resulting from a number of primarily collective segment projects that have been on the back burner, finally kicking off. They also expect positive impacts from the enactment of new eco-design regulations for heating and hot water production appliances. Another development that could potentially bring cheer to the solar thermal sector is that the UK's Feed-in Tariff for PV has been drastically slashed… and that could create more room in the market for solar thermal.

THE INDUSTRY SEEKS TO RECOVER ITS MOMENTUM BY BREAKING INTO THE COLLECTIVE SECTOR

The solar thermal market took a dip that forced a number of European solar thermal-focused companies into bankruptcy in 2013 and 2014. Manufacturers such as Bosch Thermotechnik, Viessmann and the Vaillant group that are also in the heating solution business found it easier to stay afloat. Nonetheless the global solar thermal industry leader with the highest manufacturing capacity – 1 600 000 m² in 2017 – is GREENoneTEC of Austria, whose business is totally centred on this market. The group sells whole range of collectors to the other market players: vacuum collectors, flat plate collectors and thermosiphon collectors. Other solar thermal market players have made good headway recently, such as Arcon Sunmark, which is now one of the top 10 European manufacturers **(see table 6).**
The industry is turning away from individual housing to large-scale projects as the former cannot sustain the market growth. Its first foray involves the construction of solar fields for district heating networks. Arcon Sunmark can put its growth down to this sector. As it is Danish, it has seized the opportunity afforded by its home market's efforts and has, for example, constructed a 70 000 m² plant with a capacity of 28 000 MWh in the town of Vojens, that covers 50% of its heating requirements. It has also been selected for the Big Solar project in Graz, Austria, for a capacity of 250 MWth that should come on stream in 2020. The company also claims to have completed the world's biggest solar thermal heating plant for the mining industry. The 43 920 m²collector field in Chile covers 80% of the mine's annual heating requirements, namely about 80 000 MWh.

Tabl. n°4

Cumulated capacity of thermal solar collectors installed in the European Union in 2015 and 2016**(in m² and in MWth)*

	2015		2016	
	m²	MWth	m²	MWth
Germany	18 625 000	13 038	19 121 000	13 385
Austria	5 221 342	3 655	5 210 202	3 647
Greece	4 390 375	3 073	4 475 375	3 133
Italy	4 011 069	2 808	4 221 069	2 955
Spain	3 693 638	2 586	3 905 928	2 734
France***	2 942 000	2 059	3 025 500	2 118
Poland	2 017 337	1 412	2 132 467	1 493
Danemark	1 179 000	825	1 647 000	1 153
Portugal	1 121 104	785	1 176 104	823
Czech Republic	1 106 542	775	1 137 542	796
United Kingdom	702 342	492	712 951	499
Belgium	661 000	463	688 937	482
Netherlands	647 397	453	652 205	457
Cyprus	659 224	461	647 824	453
Sweden	488 000	342	485 000	340
Ireland	319 880	224	339 648	238
Hungary	269 000	188	287 296	201
Slovenia	238 800	167	241 974	169
Romania	203 670	143	221 470	155
Croatia	183 000	128	204 500	143
Slovakia	171 420	120	177 420	124
Bulgaria	84 800	59	85 000	60
Luxembourg	55 590	39	59 349	42
Finland	53 513	37	56 913	40
Malta	50 904	36	51 671	36
Latvia	20 920	15	22 830	16
Lithuania	15 750	11	17 950	13
Estonia	12 120	8	14 120	10
Total EU 28	49 144 737	34 401	51 019 245	35 713

*All technologies including unglazed collectors. ** Estimate. *** Overseas department included . Source: EurObserv'ER 2017.*

Tabl. n° 5

Solar thermal capacities in operation per capita (m²/inhab. and kWh/inhab.) in 2016***

Country	m²/inhab.	kWth/inhab.
Cyprus	0.764	0.535
Austria	0.600	0.420
Greece	0.415	0.291
Danemark	0.289	0.202
Germany	0.233	0.163
Malta	0.119	0.083
Slovenia	0.117	0.082
Portugal	0.114	0.080
Czech Republic	0.108	0.075
Luxembourg	0.103	0.072
Spain	0.084	0.059
Ireland	0.072	0.050
Italy	0.070	0.049
Belgium	0.061	0.043
Poland	0.056	0.039
Sweden	0.049	0.034
Croatia	0.049	0.034
France***	0.045	0.032
Netherlands	0.038	0.027
Slovakia	0.033	0.023
Hungary	0.029	0.020
Bulgaria	0.012	0.008
Latvia	0.012	0.008
Romania	0.011	0.008
United Kingdom	0.011	0.008
Estonia	0.011	0.008
Finland	0.010	0.007
Lithuania	0.006	0.004
Total EU 28	0.100	0.070

** All technologies included unglazed collectors. ** Estimate. *** Overseas departments included.*
Source: EurObserv'ER 2017.

Tabl. n° 6

Representative European solar thermal collector manufacturers

Company	Country	Activity	Solar collectors production 2015* (in m²)
GREENoneTEC *	Austria	Flat plate and vacuum tube collectors	540 000
Bosch Thermotechnik *	Germany	Heating equipment supplier/ Flat plate collector manufacturer	280 000
Arcon-Sunmark	Denmark	Flat plate collectors manufacturer for large plants	215 000
Viessmann *	Germany	Heating equipment/ solar thermal	190 000
Hewalex	Poland	Flat plate and vacuum tube collectors	140 000
Dimas *	Greece	Flat plate collectors manufacturer	140 000
Thermosolar	Germany	Flat plate and vacuum tube collectors	130 000
Vaillant Group *	Germany	Heating equipment supplier/ solar thermal	120 000
Nobel	Bulgaria	Flat plate collectors manufacturer	110 000
Delpaso Solar	Spain	Flat plate collectors manufacturer	80 000
Wolf *	Germany	Flat plate and vacuum tube collectors manufacturer and heating equipment supplier	80 000
Cosmosolar *	Greece	Flat plate collectors manufacturer and heating equipment supplier	80 000

** Estimations based on company information and Solrico (Worldwide: Flat Plate Collector Manufacturer Ranking). Note: These figures must be used as evaluation more than accurate production data.* ***Source: EurObserv'ER 2017.***

Another growth driver is solar thermal integrated into industrial processes. A basic international shift is underway effectively redirecting the solar thermal industry to this market segment. Increasing numbers of industries, that require heat for specific points in their production lines could call on solar energy to produce heat at time T, with temperatures rising to hundreds of degrees. GREENoneTEC now sells large collectors ripe for the purpose, in dimensions ranging from 8–13 m² that bear witness to this segment boom. Institutional decision makers have also taken up this issue as through the Horizon 2020 programme, the European Commission, is financing the three-year Solar Payback research project that kicked off at the end of 2016 and is analysing this market across the world. The preliminary project findings point to 71 companies that offer to integrate solar thermal in industrial processes, and 525 installations that have already come into being. Half of the system integrators manufacture the equipment to be integrated into the industrial process themselves. Two-thirds of the installers are also facility operators and will carry out installation maintenance work. The food-processing industry, the commercial and services sector and the textile industry are the sectors most interested in using solar thermal energy in their processes.

SOLAR THERMAL IS LOSING GROUND

The downward trend of the market witnessed since 2009 has seen the gap with the National Renewable Energy Action Plan (NREAP) trajectory open up. What is of even more concern, is that in a number of countries (Austria, Swede and Cyprus) the area of collectors in service is tending to contract as their newly-installed areas do not make up for the areas that have been decommissioned. The capacity and surface area of decommissioned installations tends to rise every year, because the solar thermal market built up gradually in the second half of the 1990s, peaking at about one million m² of newly-installed collectors per annum. As the service life of these collectors ends and if market recovery does not come about, growth in the contribution of solar heat can only decline.

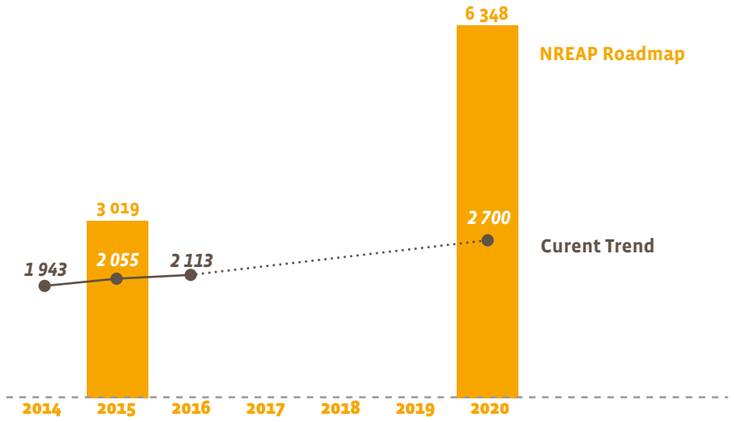
The intermediate trajectory of the NREAP plans was set at 3 Mtoe for solar heat in 2015, yet it only scraped past the 2.1 Mtoe mark in 2016. EurObserv'ER reckons that if nothing is done to reverse the trend quickly, the difference between reality and the targets could be much wider than previously feared, and could even fall below 50% of the NREAP commitments for 2020 **(graph 2).**

Although solar heat is still losing ground, the European Union is working on the new climate and energy framework for 2030 and on 30 November 2016 presented the new Clean Energy Package. In its draft renewable energy directive, the European Commission reiterates that heating and cooling amount to 50% of the EU's energy demand and that 75% of this demand is met by fossil fuel, and also accounts for 68% of Europe's natural gas imports (costing 44 billion euros). It also observes that the lack of coordinated renewable heating and cooling policy has resulted in highly fragmented markets and curbed investor confidence. Yet at the same time renewable heat has significantly reduced its costs in several urban district heating and cooling systems. The European Commission's revised draft directive proposes to introduce a new dedicated tool to stimulate the deployment of renewable heat technologies such as solar thermal energy. Article 23 of the revised directive proposes that each Member State should try to increase the share of the energy produced from renewable sources for heating and cooling purposes by at least one percentage point (of the national final energy consumption share) every year until 2030. Article 24 opens rights of access to local heating networks and cooling systems to renewable energy producers– which opens up significant development prospects for solar district heating.

The sector has given a warm welcome to this legislative roadmap that puts renewable heat back into the centre of the new renewable energy directive's proposal. However its players are waiting for the practical implementation of regulatory and subsidy measures that will give solar thermal a second chance. Implementation could be very quick if the Danish government's initiative to oblige energy service companies to make significant energy efficiency savings by resorting to solar district heating is taken up elsewhere. □

Graph. n° 2

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



Source: EurObserv'ER 2017

Sources: AGEE-Stat (Germany), AEE INTEC (Austria), Assotermica (Italy), EBHE (Greece), SPIUG (Poland), ASIT (Spain), Uniclima (France), Observ'ER (France), PlanEnergi (Denmark), Ministry of Industry and Trade (Czech Republic), Statistics Netherlands, ATTB (Belgium), STA (United Kingdom), SEAI (Ireland Republic), STATEC (Luxembourg), NSO (Malta), University of Miskolc (Hungary), Solar Energy Association of Sweden, REN 21, solarthermalworld.org, Solar Thermal Federation of India, Observ'ER (Others).)

SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETERS – **EUROBSERV'ER** – JUIN 2017

Noor 1 Parabolic Through thermosolar plant (Ouarzazate, Marocco)

PART 2: CONCENTRATED SOLAR POWER

The global concentrated solar power market has slowed down after enjoying an installation peak of 1 267 MW in 2013. It has been hit by the keen competition coming from PV, supported by countries looking to make fast improvements to their efficiency levels while reducing costs. Nonetheless the number of CSP installations is set to rise from 2018 onwards, when many projects currently under construction in Morocco, South Africa, China and the Middle East will be commissioned.

According to EurObserv'ER calculations that are partly based on work carried out by IRENA, the International Renewable Energy Agency and SolarPACES, an International Energy Agency programme, installed CSP capacity across the world in 2016 stood at about 4 889 MW, boosted by 273 MW of newly-connected capacity. Installed capacity remained unchanged in Europe (2 313.7 MW including pilot facilities), North America (1 758 MW) and the Middle East (123 MW). Most of the new capacity was installed in Africa and increased from 169 MW in 2015 to 429 MW in 2016 (260 MW added). In Asia 10 MW of capacity was connected (268 MW total in 2016) and a little less than 3 MW in Australia (the pilot Jemalong and Sundrop tower plants) which took on-grid capacity in Australia and Oceania to 6 MW.

AFRICA'S TURN

In 2016 the continent of Africa was the most active for CSP plant installation. On 4 February 2016 Morocco switched on the Noor 1 plant (160 MW) near the city of Ouarzazate. Noor 1 became the world's seventh most powerful CSP plant after the five American plant complexes of Ivanpah (392 MW), SEGS (354 MW), Solana (280 MW), Mojave (250 MW), Genesis (250 MW) and Spain's Solaben complex (200 MW).

Noor 1 is the first tranche of a complex with a design capacity of 580 MW. The parabolic trough plant will supply electricity to some 650 000 people from dawn to sundown and then for another 3 hours using "molten salt" storage technology. Construction work on the second tranche was started on the same day as Noor 1 was commissioned, to construct Noor 2, a 200 MW parabolic trough plant and Noor 3, a 150 MW tower plant. Each will have 8 hours' storage capacity and the two should come on stream in 2018. The last phase, Noor 4, will use PV technology (70 MW). At COP21, the Kingdom of Morocco announced that it planned on achieving a 52 % renewable electricity share by 2030 (as against its previous target of 42 % by 2020).

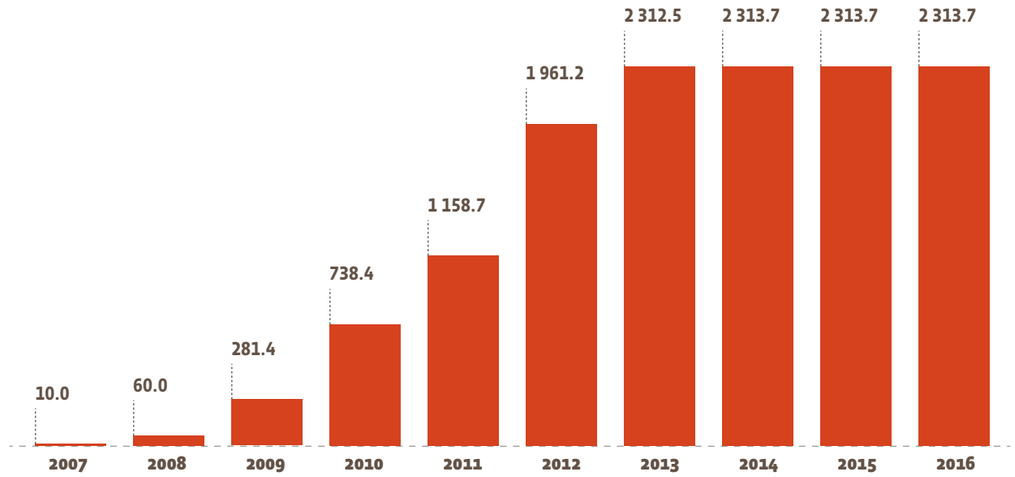
The following day, on 5 February 2016, the Khi Solar One plant, a 50 MW tower plant, went on stream in South Africa, near the town of Upington, Northern Cape Province. The plant's annual output is expected to be 180 000 MWh, using a "saturated steam" system that stores the heat generated for 2 hours. The country then commissioned the Bokpoort (50 MW) parabolic trough plant on 14 March 2016, near the town of Groblershoop, in the same province. Here, annual output is expected to be 230 000 MWh using "molten salt" storage technology to cover more than 9 hours. South Africa has more CSP plants under construction – the Xina Solar One (100 MW) parabolic trough plant that should come on stream in 2017, the Kathu Solar Park (100 MW) parabolic trough plant and the Redstone (100 MW) tower plant that should be up and running in 2018. South Africa kicked off its concentrated solar power sector in 2015 when it hooked up the KaXu Solar (100 MW) parabolic trough plant.

China will soon become the new CSP stronghold. At the end of 2016 Phase I of the SunCan Dunhuang plant went on stream with a 5 800-tonne "molten salt" storage facility that gives it theoretically 15 hours of energy storage with the intention of ensuring that the plants works round the clock. Construction of Phase II, a 100 MW tower plant is underway. It is just one of 20 pilot plant projects (for a total of 1.4 GW) selected by the National Energy Administration (NEA). The plants will be sited in the provinces that enjoy the best exposure to the sun, namely Qinghai, Gansu, Hebei, Inner Mongolia and Xinjiang, and comprise 9 tower plants, 7 parabolic trough plants and 4 linear Fresnel plants. The plants will be eligible for a Feed-in Tariff of 1.15 RMB/kWh (€ 0.015/kWh) until 2018, which will be adjusted after 2019.

The Middle East has no intention of standing idle. Saudi Arabia should commission its Duba 1 ISCC (43 MW) parabolic trough plant in 2017 and the Waad Al Shamal ISCC (50 MW) parabolic trough plant in 2018. Israel is currently constructing the Ashalim power station (121 MW) in the Negev Desert that is scheduled to come on stream in 2018. It will be the world's tallest tower plant (250 metres) and receive light reflected by 29.2 m² mirrors, 50 600 of them. Another 110 MW CSP plant will be added as well as a PV plant of about 30 MW in capacity in 2018, to raise the site's capacity to 310 MW, i.e. 1.6% of Israel's electricity demand. In June 2016, Dubai launched a tender for a 200 MW plant to cover the first phase of a 1 GW capacity construction programme in the Mohammed bin Rashid al-Maktoum Solar Park. The specifications sti-

Graph. n° 1

European Union concentrated solar power capacity trend (MWe)



Source: EurObserv'ER 2017

pulate that tower plant technology must be used in tandem with an 8–12 hour storage facility, with commissioning to take place in April 2021.

THE EUROPEAN MARKET ASPIRES TO BETTER DAYS

Despite its advantages that primarily stem from storage and network stability, the European CSP sector is no longer making headway. According to EurObserv'ER, the European Union's concentrated solar power capacity meter has been stuck at 2 313.7 MW (including prototype projects) since 2014, while Eurostat's official survey of installed CSP capacity has been stable since 2013 **(table 1 and Graph 1),** at 2 302 MW (2 300 MW in Spain and 2 MW in Germany).
As it stands, Spain is the only European Union country to have developed a commercially viable concentrated solar power sector. However no additional capacity has been installed since 2013 and there are has no new projects in the offing despite the fact that the sector produces electricity reliably. Spain's electricity network operator Red Eléctrica de España, claims that net output injected into the grid has been around the 5-TWh mark since 2014 (4 959 GWh in 2014, 5 085 Wh in 2015 and 5 060 GWh in 2016).
Moreover the Spanish government is embroiled in litigation started by groups of investors in Spanish CSP plants. Four international investors, Masdar, Abu Dhabi's leading clean energy company, the German institutional asset management organization Deutsche Asset & Wealth Management, the British investment fund Eiser Infrastructure, (formerly RREEF Infrastructure) and Antin Infrastructure Partners of BNP Paribas, France have filed claims against Spain at the World Bank international Centre for Settlement of Investment Disputes (ICSID), for loss of earnings caused by policy changes affecting the profitability of their investments. These claims were filed following a series of decisions made by the Spanish government in 2012 and 2013, confirmed in 2014, to retroactively alter the remuneration system for Spanish CSP plants, with the result that revenues were slashed by a third. The solar thermal sector had initially negotiated an agreement to keep revenues stable for already-constructed plants by conceding a one-year delay to the original schedule for starting up their plants and thus receiving remuneration (market price + premium system). Although the sector stuck scrupulously to its commitments (and effectively turned its back on revenues worth 1.4 billion euros), the Spanish government breached its obligations by retroactively changing the law and introducing a much less profitable remuneration system. In May 2017, the ICSID published its first arbitration that was partly favourable to the British investment fund Eiser and ordered the Spanish state to pay up 128 million euros plus interest. It appears that the Spanish government is now calling on the European authorities to challenge the legitimacy of this judgement on the basis that the initial support system flouted European law in the area of state aid and claims that the Energy Charter Treaty underlying the arbitration does not apply between EU member states.
New project construction in Italy has been delayed, primarily because the developers consider the payment terms

Tabl. n° 1

Concentrated solar power plant in operation at the end of 2016. ***(Source: EurObserv'ER 2017)***

Project	Technology	Capacity (MW)	Commisionning date
Spain			
Planta Solar 10	Central receiver	10	2006
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		2 303.9	
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
Total Italy		7.55	
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
Total France		0.75	
Total European Union		2 313.7	

SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETERS – **EUROBSERV'ER** – JUIN 2017

too low. According to ANEST (the Italian concentrated solar power association), the latest ministerial decree published on 29 June 2016 governing subsidies for renewable energy plants (excluding PV) was encouraging for <5 MW CSP installations but unpersuasive for medium sized plants. At the end of November 2016, the GSE (Gestore dei Servizi Energetici) published a list of eight successful bids for <5 MW (with combined capacity of 20 MW) that were registered as eligible for a production subsidy. In contrast, not a single >5 MW project, dependent on GSE tenders was mentioned. ANEST believes a new decree may be published in 2017, which is likely to fund medium sized facilities and hopes that this

Tabl. n° 2

Concentrated solar power plants under developement at the beginning of the year 2017

Project	Project's holders	Location	Capacity [MW]	Technology	Commercial date of operation expected
Italy					
Flumini Mannu	Flumini Mannu Ltd	Villasor (Sardinia)	55	Parabolic Through	2018
Gonnosfanadiga	Gonnosfanadiga Ltd	Gonnosfanadiga (Sardinia)	55	Parabolic Through	2018
CSP San Quirico	San Quirico Solar Power	San Quirico (Sardinia)	10.8	Parabolic Through (hybride)	2018
Not known	Enas	Noragugume (Sardinia)	0.7	Not known	2018
Lentini	Lentini Ltd	Carlentini. Melilli (Sicily)	55	Parabolic Through	2018
Reflex Solar Power	Reflex solar power	Gela (Sicily)	12.5	Parabolic Through	2018
Solecaldo	MF Energy	Aidone (Sicily)	41	Linear Fresnel	2018
Archimede	Archimede SRL	Melilli (Sicily)	1	Parabolic Through	2018
Bilancia 1	Trinacria Solar Power	Palermo (Sicily)	4	Linear Fresnel	2018
Calliope	Trinacria Solar Power	Trapani (Sicily)	4	Linear Fresnel	2018
Stromboli Solar	Trinacria Solar Power	Trapani (Sicily)	4	Linear Fresnel	2018
Not known	Sol.In.Par	Partanna (Sicily)	4.2	Not known	2018
Not known	Essecv SRL	Francofonte (Sicily)	1	Not known	2018
Not known	Solar Energy	Belpasso (Sicily)	1.2	Not known	2018
San Severo	3SP	San Severo (Puglia)	10	Central receiver	2018
Total Italy			259.4		
France					
Alba Nova 1	Solar Euromed *	Ghisonaccia (Corsica)	12	Linear Fresnel	n.a
eLLo	Suncnim	Llo (Pyrenees)	9	Linear Fresnel	2018
Total France			21		
Cyprus					
Helios Power	Infinia	Larnaca	50.8	Dish Stirling	n.a.
Total Cyprus			50.8		
Greece					
Maximus Dish project	Infinia	Florina	75	Dish Stirling	n.a.
MINOS CSP tower	Nur Energy	Crete	50	Central receiver	n.a.
Total Greece			125		
Spain					
PTC50 Alvarado	Acciona Energia	Alvarado. Badajoz	50	Central receiver (power tower) - Hybride	n.a.
Total Spain			50		
Total European Union			506.2		

Company in liquidation. ***Source: EurObserv'ER 2017.***

Noor 2 Parabolic Through thermosolar plant (Ouarzazate, Marocco)

will result in the construction of several plants before the end of 2017. The association reports that at least fifteen projects have construction permits for a total of 259.4 MW **(table 2)**, including Lentini (55 MW, parabolic trough), Flumini Mannu (55 MW, parabolic trough), Gonnosfanadiga (55 W, parabolic trough), Solecaldo (41 MW, Fresnel), Reflex Solar Power (12.5 MW, parabolic trough), CSP San Quirico (10.8 MW, hybrid parabolic trough) and San Severo (10 MW, tower plant).

The first two plant projects to be accepted in France as part of the 1st CRE call for tenders (CRE 1) in 2012 that were scheduled to start up at the end of 2015 are plagued by delays. Solar Euromed, the Alba Nova 1 (12 MW) project bearer, was put into liquidation on 6 September 2016, effectively project completion is now contingent on a hypothetical transfer of assets. On the bright side, Suncnim (a subsidiary of the CNIM group and Bpifrance) leading the Llo project

Tabl. n° 3

Main European CSP project developers

Company	Country	Activity	MW developed or under construction (2016)
Ibereolica	Spain	Engineering - EPC - O&M - Project developer	1 256
Abengoa	Spain	Promoter - Project developer - EPC - Engineering - O&M - Components	651
Magtel Renewables	Spain	Promoter - Project developer - EPC - O&M - Engineering - Consulting	1 050
Cobra	Spain	Promoter - Project developer - EPC - Engineering - O&M	567
Acciona Energy	Spain	EPC - Project developer - Promoter	314
Torresol Energy	Spain	Promoter - Project developer - O&M - Engineering	119
FCC Energia /Enerstar	Spain	Promoter - Project developer	100
Hyperion	Spain	Promoter - Project developer - O&M	103
Samca	Spain	Promoter - Project developer - O&M	100

Source: EurObserv'ER 2017 (based on company information and CSP-World) http://www.csp-world.com/guide

Linear Fresnel plant on the Nuova Sarda Industria Casearia SRL (Cheese) in Sardinia

in the Eastern Pyrenees (9 MW) finally kicked off construction work at the end of December 2016 and plans to go on stream in February 2018. This 9 MW plant will have four hours of heat storage on full load. The sector's players hope that the realization of this project will lead another tender. The sector expressed its incredulity at the fact that the new PPE (multi-annual energy programme) published in October 2016 set no concentrated solar power sector target whereas previous targets were set at 540 MW by the end of 2020.

INTERNATIONALLY ACCLAIMED SOPHISTICATED KNOW-HOW

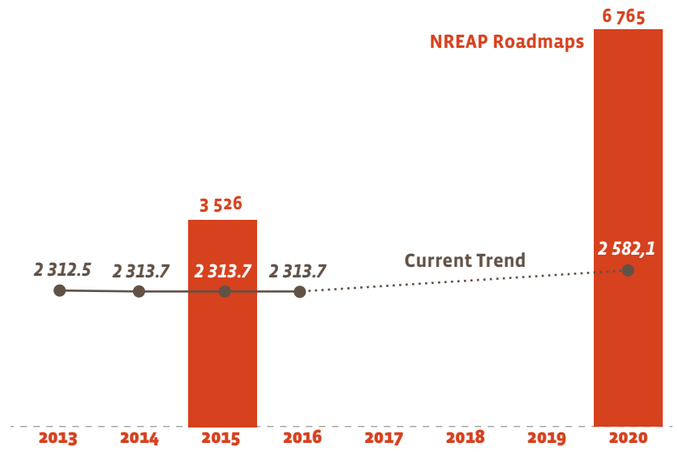
As Spain was the first European CSP market, many Spanish companies have positioned themselves in this technology. A number of them are paying the price for the market slowdown and national setbacks. Ibereolica, one of the main European CSP project developers is a case in point **(table 3)**. It was weakened by the Spanish renewable energy sector reform that featured a sudden drop in Feed-in Tariffs. At the end of 2016, the company had to file for suspension of payments by 7 of its 11 subsidiaries, all of which were CSP-centred: Ibereolica Solar, Ibereolica Solar Badajoz 2, Ibereolica Solar Medellin, Ibereolica Solar Santa Amalia, Ibereolica Solar Puebla 1, Ibereolica Solar Puebla 2 and Planta Termos Valdetorres. The plants' future still hangs in the balance. The project companies had a total of 100 MW of capacity running and a project portfolio of 860 MW.
Likewise the multi-energy group Abengoa had a brush with disaster and avoided the inglorious title of the "biggest ever Spanish company failure". After being declared insolvent and thrown into crisis, the group managed to come to an agreement with its creditors in the middle of 2016. In order to do so, not only was it forced to let its director go and allow its creditors (including Banco Santander and Banco Popular Español) to take control, but it also had to sell off many assets. While the group has primarily offloaded its biofuel market projects, all its branches have been hit. Hence, Abengoa has sold off its shares in the Shams Solar Park in the United Arab Emirates… a project that had been co-developed with Total and Masdar. Despite this, European companies are still stakeholders in the global CSP market, primarily specializing in engineering, construction and steam turbine manufacturing. The Spanish company Sener is the leading project constructor in the world. It has completed 29 CSP plants with 2 000 MW of capacity all told across the globe, with sites in Spain, South Africa, Morocco and the United States. Sener is one of the construction companies working on the Noor project in Morocco that we referred to earlier. The project is split into four tranches and a consortium whose members are Sener (Spain), Acciona (Spain), TSK (Germany) and Acwa Power (Saudi Arabia) has been awarded the construction work package. The project is an industrial demonstrator if ever there was one, which emphasizes the manufacturers' know-how, as each tranche has its own specific technology. Sener and Acciona have also started construction work on the turnkey project for South Africa's Kathu (100 MW) plant at a cost of 500 million euros, as part of a consortium led by Engie and South African partners. The two Spanish companies together with Germany's TSK also completed construction of South Africa's Bokpoort (50 MW) plant and Sener will be responsible for construction work on the Ilanga 1 (100 MW) plant. India's Dadri (14 MW) plant, to be constructed in Uttar Pradesh will be equipped with flat Fresnel mirrors to be supplied by the German company Frenell, through its Novatec Solar España subsidiary. Frenell has also been awarded the contract for the turnkey construction of the solar park scheduled for 2017.
The CSP market also provides opportunities for European steam turbine manufacturers. In particular Siemens delivered all the turbines for the Noor I, II and III projects. A Siemens SST-500/SST-800 turbine with double casing will be employed in the Noor II plant. The turbine was built on Siemens' Görlitz site in Germany. The Noor III tower plant will be equipped with SST-700 and SST-900 steam turbines. The list is not exhaustive, but Siemens has also delivered the turbines for the South African CSP parks of Bokpoort, KaXu Solar One and Xina Sola One. Siemens SPPA-T3000 turbines were ordered to complete the Ivanpah park in California by BrightSource Energy Inc. in 2016.

CONCENTRATED SOLAR POWER'S POTENTIAL STORAGE ADVANTAGE

The National Renewable Energy Action Plans defined under the European directive planned for 6 765 MW of capacity by the 2020 timeline **(graph 2)** – 4 800 MW in Spain, 600 MW in Italy, 540 MW in France, 500 MW in Portugal, 250 MW in Greece and 75 MW in Cyprus), which equates to 20 TWh of production capacity. It is now clear that these targets cannot be met by the deadline, as the countries most concerned have decided to limit the financial impact incurred by developing this new production sector by halting or downsizing their programmes and directing their funds towards more mature renewable technologies whose costs are under control.
Notwithstanding, the sector players, including the European Solar Thermal Electricity Association (Estela), have emphasized that development on European soil has eloquently proven its efficiency, citing Spain with its exemplary results. They are also at pains to point out that the concentrated solar power sector's storage capacities get around grid management problems.
In the view of the European association, CSP plants must be widely deployed on European soil as a pre-requisite for lowering production costs. This deployment is seen as important to protect the European industry's leadership from erosion in the global market. It puts forward another final priority… that of developing cooperation mechanisms between European countries to enhance the mobility of solar thermal power between the best production sites and the main consumption regions. □

Graph. n° 2

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



Source: EurObserv'ER 2017

Sources: Protermosolar (Spain), REE (Spain), ANEST (Italy), IRENA, AIE, SolarPaces.

Le prochain baromètre traitera des biocarburants.

This project is funded by the European Union under contract n° ENER/C2/2016-487/SI2.742173