Ivanpah SEGS, the most powerful concentrated solar plant with central receiver, 377 MW, in Primm, California.

2 311,5 MWe

The CSP plant generation capacity in the EU at the end of 2013

SOLAR THERMAL AND CONCENTRATED SOLAR POWER BAROMETER

A study carred out by EurObserv'ER.

EurObserv'ER

The European concentrated solar plant market is set to mark time for a year following efforts to complete construction on 350 MW of CSP capacity in Spain in 2013. The spotlight has switched to Italy which could re-launch the European market within a couple of years. The European solar thermal market for heat and hot water production and space heating, is shrinking all the time. EurObserv'ER reports that the market is in its fifth successive year of contraction in the European Union. It now posts a 10.5% decline on its 2012 performance having struggled to install just over 3 million m² of collectors in 2013.

3 million m²

The solar thermal panel surface area installed during 2013

2 Mtoe

The heat production from solar thermal industry in the European Union during 2013

This barometer reviews the concentrated solar power technology developments basically geared to generating electricity as well as developments in solar thermal technologies… primarily those that use glazed (flat-plate and vacuum tube collectors) and unglazed collectors.

CONCENTRATED SOLAR POWER

Concentrated solar power covers all the technologies harnessed to transform the energy radiated by the sun into very high temperature heat. This thermal energy can be used to produce electricity, by thermodynamic cycles or to supply industrial processes that require high temperature levels (up to 250°C). Concentrated solar power systems implement optical concentration devices that convert the sun's direct radiation.

The four main technologies are tower plants and Dish-Stirling engines, concentrating the radiation on a given spot, and parabolic trough collectors and Compact Linear Fresnel Reflector (CLFR) technology concentrating the radiation on a linear receptor (a tube containing heat transfer fluid).

One of the particular advantages of concentrated solar power is that it passes through a heat production stage prior to being converted into electricity, which means it can be combined with other renewable energies such as biomass and waste, and also with conventional sources such as natural gas and coal. The other advantage is that the energy can be stored as heat using various processes such as molten salts – hence the plants can operate outside of sunshine periods and during peak consumption periods at the end of the day.

MORE THAN 3 700 MW OF CAPACITY INSTALLED WORLDWIDE

The technology's main limitation is that it requires optimum sunshine conditions (ideally with direct sunshine in excess of 1 900 kWh per m² per annum) – which restricts its potential deployment in Europe to Mediterranean areas (Spain, Southern Italy, the South of France, Sardinia, Sicily, Corsica, Greece, Cyprus and Malta). As a result, its highest growth potential is outside Europe, in the United States, India, the MENA region (Middle-East and North Africa) countries, South Africa, China, Australia, and South America. The sector's information website, www.csp-world.com, has published data claiming that 3.7 GW of CSP plant capacity is currently in service across the world, and that roughly 2 GW is under construction, 4.8 GW at development stage and another 3.3 GW planned.

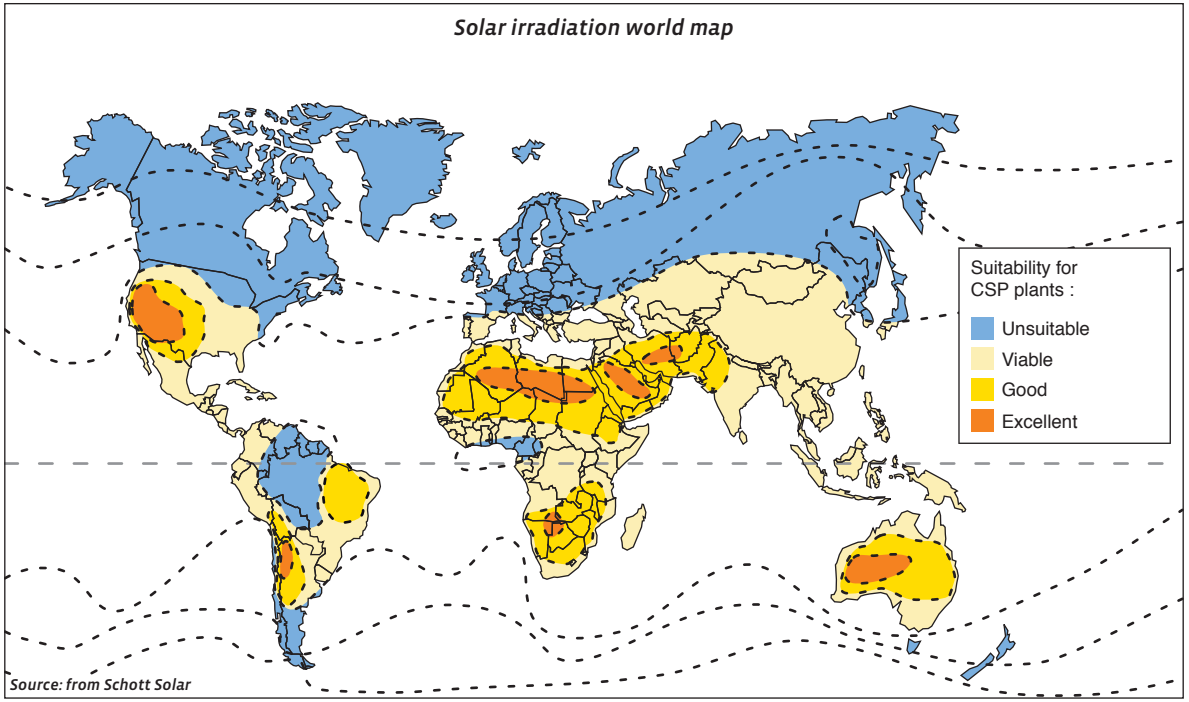
The sector is already a commercial reality in 19 countries

While Spain (2 303.9 MW) and the United States (765.3 MW) currently hold most of the installed power, more countries have decided to develop this electricity-generating technology, which should soon roll out at a faster pace (see insert on the International Energy Agency's forecasts). At the end of 2013, 19 countries had commercial-size plants in service or under construction (Spain, the United States, India, Morocco, Algeria, Egypt, the United Arab Emirates, Oman, Iran, Thailand, Japan, Australia, Chile, Mexico, France, Italy, China, Canada and Papua New Guinea), not to mention the countries running research and demonstration plants.

Saudi Arabia has by far the highest potential and intends to install 25 GW of concentrated solar power plant capacity by 2032, which is enough to generate 75–110 TWh. In February 2013, the agency responsible for implementing the country's renewable energy programme (K.A.CARE – King Abdullah City for Atomic and Renewable Energy) announced it was launching its first call for tender for 900 MW. At the end of the day, it decided to postpone it while it conducts a major measuring campaign (Renewable Resource Monitoring and Mapping Program) to produce a renewable energy atlas. Under the terms of the programme, 75 solar radiation measuring stations have been set up across the kingdom to identify the best possible installation sites and give future developers the maximum number of details before making their bids. A possible reason for taking this precaution may be that it wants to avoid a repeat of its neighbour's solar energy estimating problems for the Shams 1 (100 MW) plant 120 km south west of Abu Dhabi (capital of the United Arab Emirates), and the first plant to be inaugurated in a Persian Gulf state. When construction of the plant was completed, the output delivered was about 20% less than estimated (primarily because of the presence of sand in the atmosphere), which therefore had to be made up by resorting to gas.

The situation for the concentrated solar power sector in India is a little less promising since the government diverted some of the planned funding to the photovoltaic sector by

Solar irradiation world map



Source: from Schott Solar

implementing the JNNSM (Jawaharlal Nehru National Solar Mission) that aims to deploy 20 GW of solar power by 2022 (CSP and PV). Only two of the seven concentrated solar power projects approved in 2010 in the programme's first phase met the construction deadlines (Godawari, 50-MW parabolic trough plant commissioned in June 2013, and the 100-MW Fresnel-type Rajasthan Sun Technique plant commissioned in March 2014, see next paragraph). Construction on a third project, Megha Engineering, is currently underway. The four other projects developed by Lanko Solar (100 MW), KVK Energy (100 MW), Corporat Ispat (50 MW) and Aurum Renewables (20 MW) have been delayed and may even risk being cancelled.

The situation is slightly better in South Africa, where four plants are under construction (Bokpoort, Kaxu Solar One, Khi Solar One and Xina Solar One) that have an aggregate capacity of 300 MW of capacity. China is also constructing 4 commercial-size plants (CPI Golmud Solar Thermal Power Plant, Delingha Supcon Tower Plant, HelioFocus China Orion Project, and Ningxia ISCC) with 302 MW of capacity in all.

Plant capacity keeps on rising continuously

One of the main sector trends across all the major CSP technologies is the significant increase in project size to reduce production costs. The biggest tower plant complex is Ivanpah SEGS (377 MW) at Primm in California, owned by BrightSource Energy. The project has been fully operational since September 2013, and comprises three tower plants, two 123-MW plants and one 130-MW plant with 1 079 GWh of combined output. The Solana parabolic trough plant in Arizona (280 MW), owned by Abengoa Solar, entered its testing phase in September 2013. It has two 140-MW turbines that can generate 944 GWh electricity during a year and is also equipped with a "molten salt" storage system that provides it with six hours of reserve electricity generating capacity. Areva has developed the biggest plant so far using (CLFR) technology and it was commissioned in March 2014, in India in Rajasthan State. The Rajasthan Sun Technique project, as it is called, owned by Reliance Power, has 100 MW of capacity, and higher-capacity projects are currently being developed. BrightSource Energy is already working on two new 500-MW tower plant complexes (the Palen SEGS and Hidden Hills SEGS projects), while Ibereolica is developing a 360-MW parabolic trough plant in Chile (Planta Termosolar Pedro de Valdivia project).

There is a growing trend for the concentrated solar power projects under construction to include storage systems, which will be the norm for this type of project in the future. Examples are the American Crescent Dunes plant (110 MW, owned by SolarReserve), a tower plant equipped with a molten salt storage system to drive the turbines at night or during peak demand times for 10 hours, the South African Bokpoort parabolic trough plant (50 MW) that will have 9 hours' storage capacity and Noor 1 in Morocco (160 MW, owned by ACWA, Aries and TSK), a 160-MW parabolic trough plant whose storage system will give it 3 hours' reserve capacity.

2 311.5 MW IN THE EUROPEAN UNION

Spain loses its lead

For the time being, Spain is the only European country to have deve-

A scenario of 250 GW in 2050

Cédric Philibert, the solar power expert at the International Energy Agency (IEA), reports that the short-term outlook for growth in the CSP sector is a far cry from what he predicted several years ago, but is still very promising in the long term. The IEA's Renewable Energy Medium Term Market Report 2013 forecasts that global installed capacity will be around 12.4 GW in 2018, giving 34 TWh of generating capacity. By the 2030 timeline, there will be new scenarios to tackle climate change defined by the Agency that range from 150 to 250 GW and from 650 to 950 GW in for 2050, which would equate to a 7–11% share of global electricity production. IEA Energy Technology Perspectives 2014, report published in May 2014, presents more detailed growth scenarios. They point to strong development of the concentrated solar power sector based on the technologies offering major opportunities to store energy, primarily to make up for saturation of electricity demand during the day, mainly due to the wide-scale development of photovoltaic power. The scenarios also show that in the future, the two solar sectors will complement each other well.

A small-scale commercial helicopter, holding a specialized camera which allows researchers to find flaws in parabolic trough mirrors, in Nevada Solar One Concentrating Solar Power plant, outside of Las Vegas.

BENJAMIN IHAS/NREL

loped a commercial concentrated solar power generating sector, but unfortunately it has no other project under construction or at an advanced stage of development at this point of time. Spain's last seven scheduled plants, (Termosol 1, Termosol 2, Solaben 1, Casablanca, Enerstar, Solaben 6 and Arenales all each 50 MW) all 50 MW each were completed and commissioned in 2013. They take total installed Spanish CSP capacity to date to 2 303.9 MW **(table 1)**, i.e. 99.7% of the total installed capacity in the European Union **(graph 1)**. It will be years before this figure moves up, according to Luis Crespo, the Secretary General of Protermosolar, the Spanish concentrated solar power industry association, and Chairman of Estela, the European Solar Thermal Electricity Association.

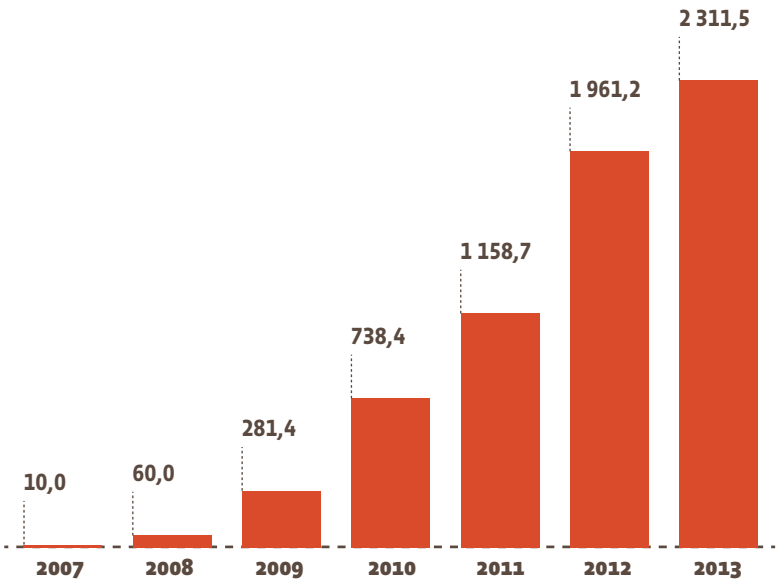
Table n° 1

Concentrated solar power plants in operation at the end of 2013 (Source: EurObserv'ER 2014)

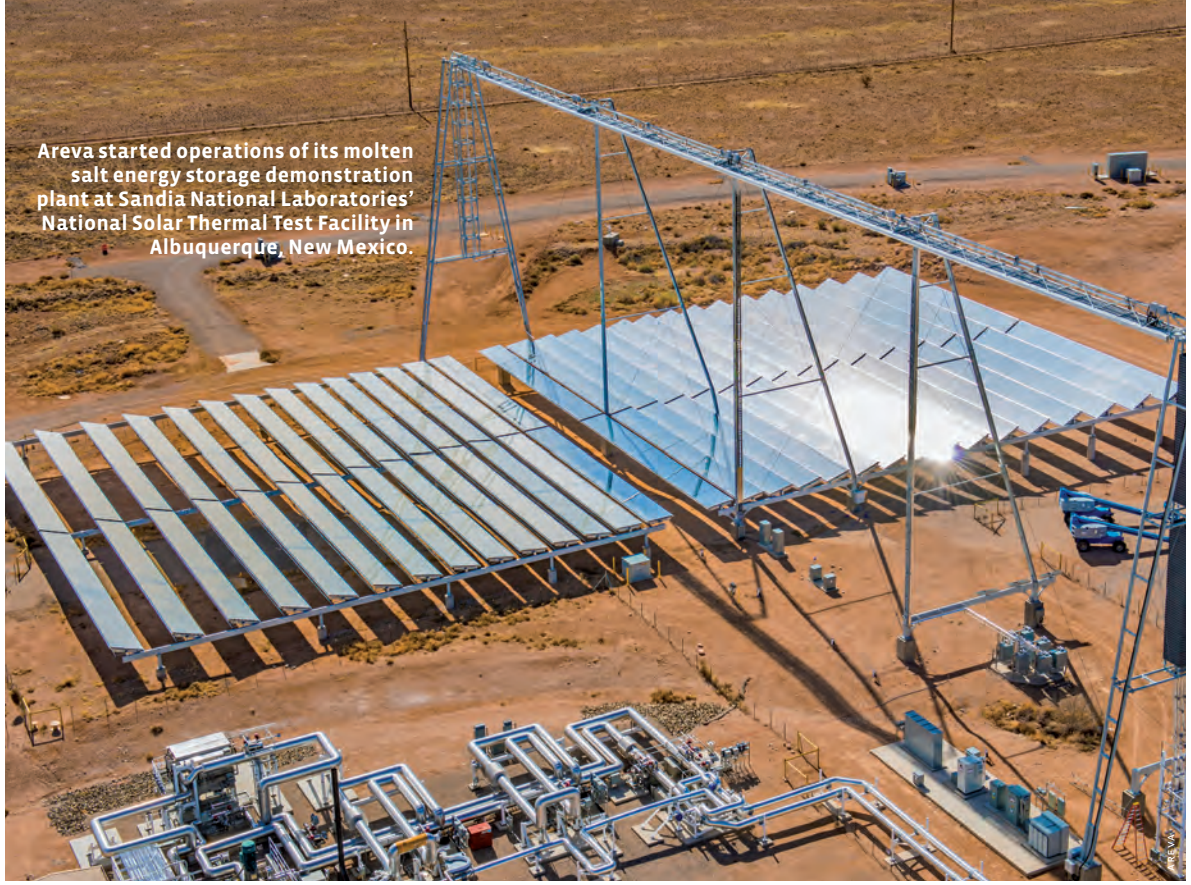
Project	Technology	Capacity	Commisionning date
Spain			
Planta Solar 10	Central receiver	10	2006
Andasol-1	Parabolic trough	50	2008
Planta Solar 20	Central receiver	20	2009
Ibersol Ciudad Real (Puertollano)	Parabolic trough	50	2009
Puerto Errado 1 (prototype)	Linear Fresnel	1.4	2009
Alvarado I La Risca	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 + Hybrid biomass	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
Total Italy		**5.35**	
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		**2 311.5**	

Graph n° 1

European Union concentrated solar power capacity trend (MWe)



Source: EurObserv'ER 2014



Areva started operations of its molten salt energy storage demonstration plant at Sandia National Laboratories' National Solar Thermal Test Facility in Albuquerque, New Mexico.

Luis Crespo explains that the new law enacted by the Spanish government will radically change the payment system for the existing CSP plants. The FiT and market price plus premium systems have effectively been abolished retroactively and replaced by a sum to be allocated based on the plant's installed capacity to compensate for investment-related financial outlay. Luis Crespo points out that the government will calculate this compensation directly to arrive at a theoretical 7.4% return on project investment. The incentive will be bound to a minimum plant operating period. The final legislation is due to be published imminently. Luis Crespo doubts that it will undermine plant operation. However a number of investors may have difficulty repaying their bank loans, because the new, less generous system is likely to endanger the financing package of some CSP plants. They may be subject to negotiations with the banks with the result that some plants may change hands.

The CSP plants are now part and parcel of the Spanish electricity mix and generated 4.4 TWh (4 422 GWh) in 2013. From 2014 onwards, output should rise to around 5 TWh as the last seven plants have come on stream.

The spotlight has switched to Italy

The creation of an Italian concentrated solar power sector with commercially operational plants is firming up now that the introduction of an incentive framework has enabled many projects to take off the ground. The Feed-in Tariff system in place since 31 December 2012, involves banding by total receiver surface, around the 2 500-m² threshold and the amount of electricity from non-solar sources required to integrate the solar output. The FiT for large plants (>2 500 m²) is € 0.32/kWh where the solar fraction is over 85%, € 0.30/kWh from 50 to 85%, and € 0.27€/kWh where is it less than 50%. The Feed-in Tariff will be paid for 25 years and drop by 5% from 2016 onwards and by a further 5% from 2017 onwards. The Feed-in Tariffs for small plants (<2 500 m²) adopt the same solar fraction rules and are € 0.36/kWh, € 0.32/kWh and € 0.30/kWh respectively and apply the same sliding scale rules. Plants with more than 10 000 m² of receivers will be required to have an energy storage system.

Paolo Pasini, the Secretary General of ANEST (the Italian Association for Solar Thermal Energy), reckons that 392 MW of projects are now at development stage **(table 2)**, mainly for sites in Sardinia and Sicily. At least five Fresnel technology projects could be on stream by 2015, including Calliope, Zeronovantuno 2, Jacomelli, Porthos and Stromboli Solar, all sited at Trapani in Sicily. Larger-scale parabolic trough and tower plant projects will be up and running in 2016 and 2017 including Flumini Mannu (50 MW, Villasor-Decimoputzu, Sardinia) Gonnosfanadiga – Guspini (50 MW, Gonnosfanadiga, Sardinia), and Mazara Solar (50 MW, Trapani, Sicily). According to ANEST, total installed concentrated

solar power capacity could be 600 MW by 2020 in Italy.

The French sector on hold pending the next tender

The only two plants being developed in France that successfully bid for the first CRE (Energy Regulatory Authority) solar tender were mentioned in the last two editions of this barometer. SolarEuromed says that work on the Fresnel-type 12-MW Alba Nova plant at Ghisonaccia in Corsica should finally kick off this month. As for the Llo plant project (the 9-MW eLLo project in the Pyrénées-Orientales), which has also obtained a guaranteed Feed-in Tariff (€ 0.34.9/kWh during 20 years) under the terms of the same tender, it is still at the administrative licensing stage. The licences should come through by the end of the year and permit construction work to start at the beginning of 2015.

The sector's immediate future on French soil will largely depend on the CRE's third solar tender that is due to be launched shortly. SolarEuromed and CNIM hope that it will include a specific CSP section to broaden the technology showcase, which is essential if France is to gain market shares abroad.

Table n° 2

Concentrated solar power plants under developement at the beginning of the year 2014

Project	Location	Capacity (MW)	Technology	Commercial date of operation
Italy				
Archetype SW550	Passo Martino, Catania, Sicily	30	Parabolic trough	n.a.
Campu Giavesu	Cossoine, Sassari, Sardinia	30	Parabolic trough	n.a.
Flumini Mannu	Villasor-Decimoputzu, Cagliari, Sardinia	50	Parabolic trough	2016
Gonnosfanadiga – Guspini	Gonnosfanadiga, Medio Campidano, Sardinia	50	Parabolic trough	2017
Bonorva	Giave and Bonorva, Sassari, Sardinia	50	Parabolic trough	n.a.
Repower Reflex	Gela, Sicily	12	Parabolic trough	n.a.
Banzi	Banzi, Basilicate	50	Parabolic trough	n.a.
Lentini	Lentini, Siracusa, Sicily	50	Parabolic trough	n.a.
Calliope	Trapani, Sicily	4	Linear Fresnel	2015
Zeronovantuno 2	Trapani, Sicily	4	Linear Fresnel	2015
Jacomelli	Trapani, Sicily	4	Linear Fresnel	2015
Porthos	Trapani, Sicily	4	Linear Fresnel	2015
Sromboli Solar	Trapani, Sicily	4	Linear Fresnel	2015
Mazara Solar	Trapani, Sicily	50	Central receiver	2017
Total Italy		392		
France				
Alba Nova 1	Ghisonaccia, Corsica	12	Linear Fresnel	2015
eLLo	Llo, Pyrénées-Orientales	9	Linear Fresnel	2015
Total France		21		
Cyprus				
Helios Power	Larnaca	50.8	Dish Stirling	2016
Total Cyprus		50.8		
Greece				
Maximus Dish project	Flórina	75	Dish Stirling	n.a.
MINOS CSP tower	Crete	50	Central receiver (power tower)	n.a.
Total Greece		125		
Spain				
PTC50 Alvarado	Alvarado, Badajoz	50	Central receiver (power tower) - Biomass	n.a.
Total Spain		50		
Total European Union		638.8		

Source: EurObserv'ER 2014

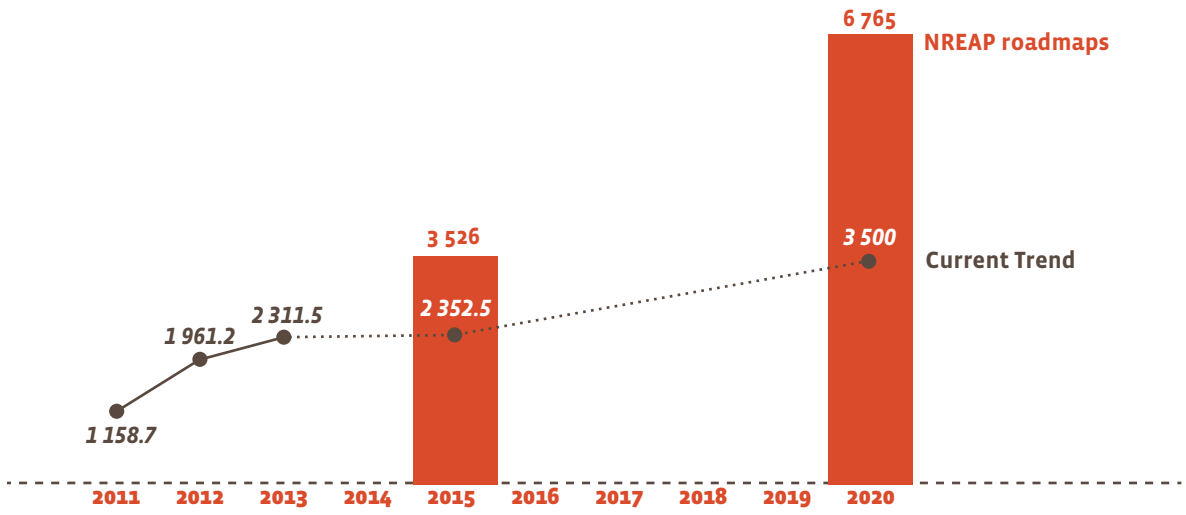
RESTRUCTURING OF EUROPE'S INDUSTRY CONTINUES

Towards the end of the 2000s, the concentrated solar power industry entered a new phase when the pioneering firms were bought out by players with more financial clout or were consolidated with the arrival of new shareholders. Here we mention just a few of them. Abengoa bought out Solúcar Energía in 2007 and became Abengoa Solar; Areva Solar was created by the acquisition of Ausra in 2010. BrightSource Energy, created in 2004, managed to gather more than 615 million dollars (449 million euros) of business funding from financial and strategic investors including Alstom which holds 20% of the capital, but also Google and the VantagePoint Venture Partners investment fund.

However for two years the incentive systems have been called into

Graph n° 2

Comparison of the current trend against the NREAP (National Renewable Energy Action Plans) roadmaps (en MW)



Source: EurObserv'ER 2014

question because of the recession. Moreover the extra time taken setting up a number of concentrated solar power programmes has curbed the sector's immediate growth prospects. Consequently, some of the players have changed strategy or restructured. The high-profile failure of the German developer Solar Millenium announced at the end of 2011 and Siemens' October 2012 decision to pull out of this energy sector, three years after acquiring the Israeli firm Solel Solar Systems, signalled the starting point for restructuring Solel.

In September 2013 Siemens' CSP assets were acquired by Abengoa (the parent company of Abengoa Solar) the CSP sector's global leader, via its Rioglass Solar subsidiary that specialises in manufacturing parabolic mirrors. According to Rioglass Solar CEO, Jose Villanueva, "The acquisition provided Rioglass Solar with a one-off opportunity for to diversify its portfolio and consolidate its presence in the CSP market."

Due to the last Spanish government's policy, Abengoa Solar has a head start on the rest of the world for completed projects, with plants on all continents. The company works actively in the tower plant, parabolic trough plant, thermal storage and photovoltaic concentrator segments. In its home country, Abengoa Solar has developed five large solar complexes, Solucar (183 MW), the biggest in Spain that comprises the PS10, PS20 tower plants and the Solnova parabolic trough plant, as well as Ecija Solar (comprising Helioenergy 1 and 2, 50 MW each), El Carpio Solar (comprising Solacor 1 and 2, 50 MW each), Castilla-La Mancha Solar (comprising Helios 1 and 2, 50 MW each) and Extremadura Solar (comprising Solaben 1, 2, 3 and 6, 50 MW each). Abengoa Solar has also commissioned projects in the United States with Solana, currently the world's highest-capacity parabolic trough plant, in the United Arab Emirates with Shams 1 (100 MW), the Middle-East's first CSP plant, and also in Algeria with the Hassi R'Mel hybrid solar-gas plant (150 MW including 20 MW of solar). Abengoa is currently constructing two plants in South Africa (Khi Solar One, 50 MW and Kaxu Solar One, 100 MW) and has announced the development of a third plant, Xina Solar One (100 MW). It is constructing another plant in the United States (the 280-MW Mojave project in California) and is co-contractor on a 14-MW project in Mexico.

Table n° 3

Main european CSP project developpers in 2013

Company	Country	Activity	MW developed or under construction	Turnover	Employees
Ibereolica	Spain	Engineering - EPC - O&M - Project developer	960	n.a.	n.a.
Abengoa	Spain	Promoter - Project developer - EPC - Engineering - O&M - Components	631	7 089	22 261
Magtel Renewables	Spain	Promoter - Project developer - EPC - O&M - Engineering - Consulting	600	n.a.	n.a.
ARIES ingenieria y sistemas	Spain	Promoter - Project developer - EPC - O&M - Engineering - Consulting	500	n.a.	n.a.
Cobra	Spain	Promoter - Project developer - EPC - Engineering - O&M	500	4 000	28 000
Acciona Energy	Spain	EPC - Project developer - Promoter	314	2 107	2 500
Torresol Energy	Spain	Promoter - Project developer - O&M - Engineering	119	n.a.	n.a.
FCC Energia /Enerstar	Spain	Promoter - Project developer	100	n.a.	n.a.
Hyperion	Spain	Promoter - Project developer - O&M	100	n.a.	n.a.
Samca	Spain	Promoter - Project developer - O&M	100	850	3 500
Sener	Spain	Components - Engineering - Project developer	100	n.a.	n.a.

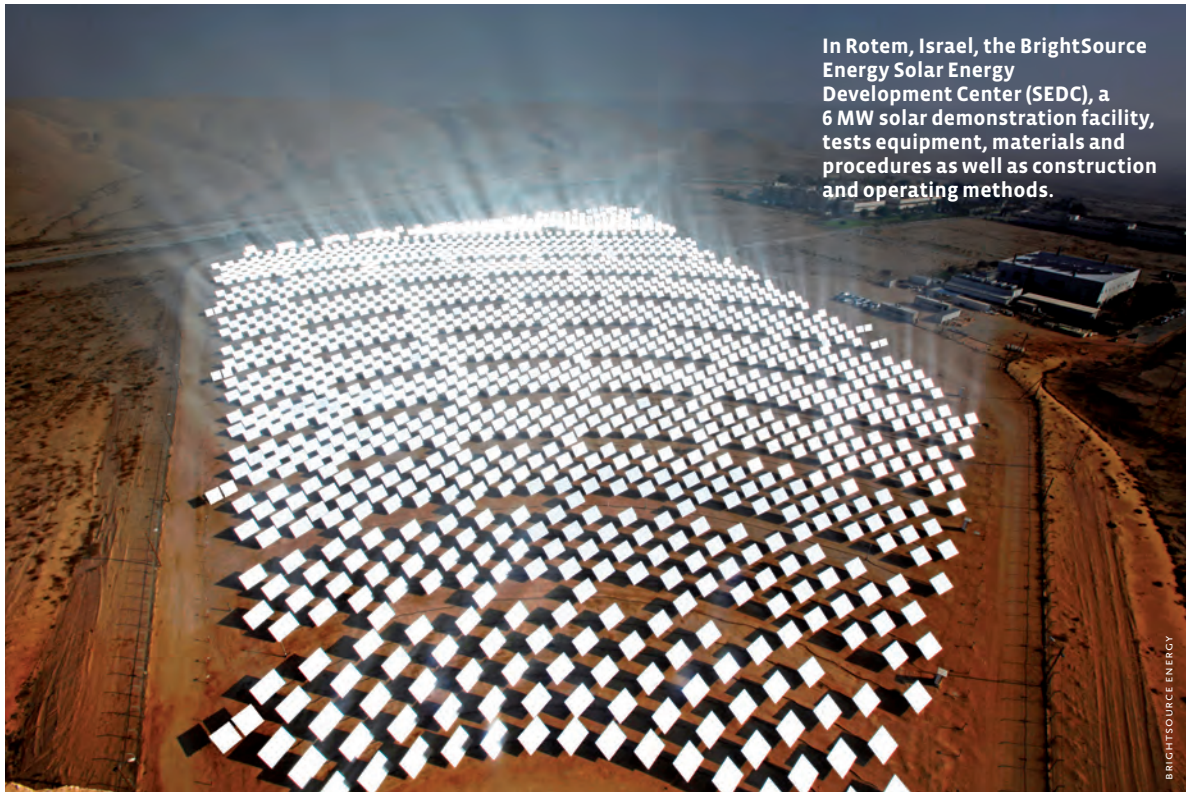
Source: EurObserv'ER 2014 (based on company information and CSP-World)

At the end of 2013, sector restructuring continued when the Spanish engineering firm TSK purchased the assets of the German firm Flagsol, which specializes in parabolic trough plant design and construction. Flagsol's main achievements are the Andasol plant and Egypt's Kuraymat hybrid plant. TSK is currently involved in constructing the Ouarzazate plant in Morocco and the Bokpoort plant in South Africa.

Turning to technology, the German manufacturer Schott Solar is the world's leading receiver manufacturer (the central tube where the heat transfer fluid circulates in both parabolic trough and Fresnel plants). The group claims it has already supplied more than 50 solar thermal power plants across the world, for 3 GW (out of a total 4 GW) of installed capacity which equates to having manufactured more than one million receivers. The group is now producing the fourth generation of its PTR 70 receiver that comes in three versions. The first two use oil as the heat transfer fluid, the first being the standard product, while the second is a premium product that incorporates a noble gas capsule to increase the receiver's service life. The third is a technological breakthrough that uses molten salts as the heat transfer fluid, which enables the temperature to be increased by 400–550°C. Schott Solar and Enel, the owner of Italy's Archimede plant, are working on implementing this new technology in the European Archetype project, a 30-MW commercial CSP plant. Molten salts offer another advantage. They can be stored in a tank to produce electricity if the sky clouds over and during the evening or night.

It should be noted that Italy's Archimede Solar Energy (ASE) was the first company to have developed receivers using molten salts as their heat transfer fluid. It claims that the arrival of new players emphasizes the developers' interest in this technology. ASE has announced that it has negotiated exclusive supplier status for the receivers of many plants under development in Italy, in addition to projects in Egypt and China for 300 MW of capacity. In December 2013, ASE, which is a subsidiary of the Angelantoni industrial group, sold an equity interest to the Saudi multinational FAL Holding, for about 20 million euros, equating to 34% of its share capital. ASE thus hopes this will smooth access to the Saudi market and its ambitious K.A.Care programme. In October 2012, the Japanese company Chiyoda took a 15% stake in ASE in a partnership that led to the construction of the Archimede-Chiyoda Molten Salt Test Loop (350 kW) demonstration plant.

Another innovation – energy storage using molten salts – has also been adapted to CLFR plant technology. In May 2014 Areva announced it had commissioned its molten salt storage demonstrator at Albuquerque, New Mexico (United States). The equipment is being developed under partnership with Sandia National Laboratories. CNIM, another French manufacturer specializing in this type of plant, has announced that it will start construction on eCARE, a 230-kW demonstrator this summer. It will have 10 hours of



In Rotem, Israel, the BrightSource Energy Solar Energy Development Center (SEDC), a 6 MW solar demonstration facility, tests equipment, materials and procedures as well as construction and operating methods.

Costs dependent on radiation

A study published by Irena (International Renewable Energy Agency) in 2013 on renewable electricity's Levelized Costs of Energy (LCOE) in 2012 claimed that the costs incurred by parabolic trough and Fresnel technologies without a storage system ranged from $ 0.19 to $ 0.38/kWh, assuming $ 3 400–4 600/kW of capital costs and a load factor of 20–27%. The low range applies to very competitive projects (outside the OECD countries) with very high load factors. When a 6-hour storage system is included, the electricity output of parabolic trough and Fresnel systems drops slightly to range from $ 0.17 to $ 0.37/kWh (i.e. a drop of up to 10%). The study states that tower plant technology is significantly less mature than parabolic trough technology. Nonetheless tower plants already offer similar production costs ranging from $ 0.20 to $ 0.29/kWh when equipped with 6 to 7½-hr storage systems. If storage time is increased to 12 to 15 hours, tower plant production costs can be reduced to $ 0.17–0.24/kWh (i.e. a drop of up to 17%). The LCOE cost of CSP plants is closely tied to the sunshine rate. If annual direct normal irradiance (DNI) of 2 100 kWh per m2 is taken as the base (the typical value for Spain), the estimated LCOE cost of a plant of this type falls by about 4.5% for each 100 kWh per m2 per annum once the DNI rises over 2 100. These costs are assumed at 2012 prices and should continue to fall as the technology improves and economies of scale are made.

These solar power collection dishes at Sandia's National Solar Thermal Test Facility are called SunCatchers.

RANDY MONTOYA/SANDIA LABS

storage capacity using steam accumulator technology for storage. The demonstrator, which was Ademe's winning AMI project (Investments for the future programme of calls for expressions of interest) will be constructed at Llo, in the Pyrénées-Orientales, on the same site as the forthcoming 9-MW commercial plant (eLLo project).

WHICH TECHNOLOGIES WILL EUROPE BE SHOWCASING IN 2020?

Many countries on all continents are very interested in concentrated solar power energy storing technology possibilities. They have already expressed their interest by constructing the first commercial-size plants on their territory. However development on a very large-scale, as experienced by the PV and wind energy sectors has yet to commence. The sector is still commercially validating the various solar thermal processes. The technologies are still competing with one another and it is very hard to predict which technology will come out on top, especially as the sector needs financial support through the implementation of ambitious installation capacity and research and development programmes. The installation of new plants in the European Union market is only a preliminary stage and will enable the European players to demonstrate their capacity to export their technology to secure their share in the global market's growth. This is where the NREAP roadmap for concentrated solar power makes perfect sense as it forecasts that installed capacity in the European Union by the 2020 timeline will stand at 6 765 MW (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), equating to 20 TWh of output.

Today the economic and political environment has cast doubt on this roadmap. Most of the countries that set objectives are way off target, and if no significant political change is announced within the next two to three years, the sector will have difficulty passing the 3 500 MW mark in 2020. Furthermore this scenario presumes the return to a new installation programme in Spain at the very least, which is not yet on the agenda. In the interim, to test their technology, European manufacturers will have to rely increasingly on international programmes.

SOLAR THERMAL

The European Union solar thermal sector for hot water and heat production has been suffering from development problems for several years. In 2013, the market slipped for the fifth time in a row, with installed collector surface down to just 3 027 532 m² (equating to 2 119.3 MWth of capacity), i.e. 13.2% less than in 2012 **(tables 4 and 5)**. The EurObserv'ER survey finds that in

2013 flat-plate collectors accounted for almost 90% of the glazed collectors (89.3% to be precise), completely outstripping vacuum tube collectors. The flexible collector (unglazed) market is basically geared to heating local authority and private swimming pools, but is under-represented because the market is not so closely monitored.

The 2013 installation figures for solar thermal collectors now resemble those of 2007 **(graph 3)**, and are drifting further away from the annual installation record set in 2008 when more than 4.6 million m² were installed. However these figures are not strictly comparable, as improved efficiency has brought down the mean collector surface area. In France for example, the mean surface area of an individual hot-water heater for a family of four has dropped from 4.6 m² in 2007 to 4 m² in 2013, which is 13% less.

Despite this mitigating detail, the solar thermal market contraction in 2013 was worse than in 2012, and 2013 the sector will look back on it as an abysmal year. The slowdowns were particularly serious in the key European markets – France, Germany, Austria, Italy, Portugal and for the first time Greece, which is unprecedented. The reason for the sharp contraction in the UK is the delay in implementing the RHI (Renewable Heat Incentive) for homeowners.

While this trend has been observed across all the heat production sectors, solar thermal is particularly hard hit; it needs to be viewed against the underlying context of weak economic growth and a moribund construction market, compounded by other, more policy-related factors. The solar thermal industry complains that the sector's image has been shrouded in controversy and media hype about the costs of renewable energy incentives and their impact on national budgets. The general public's view of renewable energies has also been tarnished by the miscalculation of incentives awarded to the photovoltaic sector, which in some countries hit consumers' electricity bills much more than expected. Some solar thermal players feel that competition from solar PV has also turned a section of private householders away from investing in solar thermal, because the sales pitch for photovoltaic panels has tended to highlight their investment potential only. Furthermore solar thermal technology

Table n° 4

Annual installed solar thermal surfaces in 2012 per type of collectors (in m²) and power equivalent (in MWth)

Pays	Glazed collectors		Unglazed collectors	Total (m²)	Equivalent power (MWth)
	Flat plate collectors	Vacuum collectors			
Germany	977 500	172 500	20 000	1 170 000	819,0
Italy	290 400	39 600		330 000	231,0
Poland	216 168	85 906		302 074	211,5
France*	268 236	8 150	6 000	282 386	197,7
Greece	241 500	1 500		243 000	170,1
Spain	213 060	12 623	3 591	229 274	160,5
Austria	200 800	5 590	2 410	208 800	146,2
Denmark	133 122		0	133 122	93,2
Czech Republic	37 000	13 000	50 000	100 000	70,0
Portugal	90 896			90 896	63,6
Netherlands	42 470		26 000	68 470	47,9
Belgium	50 500	11 500	0	62 000	43,4
United Kingdom	47 893	11 382		59 275	41,5
Hungary	44 200	5 800	1 650	51 650	36,2
Ireland	18 803	8 284	0	27 087	19,0
Cyprus	22 373	1 544	166	24 083	16,9
Romania	20 000			20 000	14,0
Croatia	17 000	2 000		19 000	13,3
Slovenia	10 596	2 897	0	13 493	9,4
Sweden	8 251	3 006	910	12 167	8,5
Slovakia	6 500	1 000	500	8 000	5,6
Bulgaria	8 000			8 000	5,6
Luxembourg	6 835			6 835	4,8
Malta	5 980			5 980	4,2
Finland	3 000	1 000		4 000	2,8
Latvia	3 000			3 000	2,1
Lithuania	600	1 200		1 800	1,3
Estonia	900	900		1 800	1,3
Total European Union 28	2 985 583	389 382	111 227	3 486 192	2 440,3

** Overseas department includeds.* ***Source: EurObserv'ER 2014***

has become less fashionable because its return on investment time is seen to compare very unfavourably with that of photovoltaic. The sector does not blame the Feed-in Tariff system, because it has turned out to be really efficient at developing industrial sectors. The fatal flaw is the abuse of the mechanism, which has created speculative movements and incurred avoidable surcharges through mishandling. According to the industry, the recently introduced UK Feed-in Tariff system for heat production will be one of the main sector development drivers.

Another grumble is that the public information and recommendation campaigns on renewable heating and hot water production systems are not high on the public agenda. The public authorities' role has always been vital in guiding consumer choice, so consumers have clearly interpreted the lack of visibility as reflecting the authorities' lukewarm endorsement of solar thermal.

Table n° 5

Annual installed solar thermal surfaces in 2013 per type of collectors (in m²) and power equivalent (in MWth)*

	Glazed collectors				
Pays	Flat plate collectors	Vacuum collectors	Unglazed collectors	Total (m²)	Equivalent power (MWth)
Germany	907 800	112 200	20 000	1 040 000	728,0
Italy	267 000	30 000		297 000	207,9
Poland	199 100	75 000		274 100	191,9
Spain	222 552	6 169	3 794	232 515	162,8
France**	216 185	6 300	6 000	228 485	159,9
Greece	210 000	1 000		211 000	147,7
Austria	175 140	4 040	1 460	180 640	126,4
Denmark	104 000			104 000	72,8
Czech Republic	32 306	12 225	35 000	79 531	55,7
Netherlands	30 054	2 694	27 396	60 144	42,1
Belgium	48 500	10 500		59 000	41,3
Portugal	57 234			57 234	40,1
United Kingdom	36 000	9 000		45 000	31,5
Ireland	17 022	10 679		27 701	19,4
Romania	9 000	14 850	180	24 030	16,8
Croatia	21 000	2 500		23 500	16,5
Hungary	10 580	7 170	250	18 000	12,6
Cyprus	16 652	472	34	17 158	12,0
Slovenia	7 089	1 949		9 038	6,3
Sweden	6 124	2 487	351	8 962	6,3
Slovakia	5 200	1 000	500	6 700	4,7
Luxembourg	6 179			6 179	4,3
Bulgaria	5 600			5 600	3,9
Finland	3 000	1 000		4 000	2,8
Latvia	2 700			2 700	1,9
Lithuania	600	1 200		1 800	1,3
Estonia	900	900		1 800	1,3
Malta	1 223	493		1 715	1,2
Total European Union 28	2 618 740	313 828	94 965	3 027 532	2 119,3

Estimate. ** Overseas department includeds.* ***Source: EurObserv'ER 2014*

FOCUS ON SOME KEY EUROPEAN UNION COUNTRIES

The German market sliding except in new build

Despite a slight surge in 2011, the German solar thermal market is still sliding. According to AGEE-Stat it managed to stay above the one million square-metre mark (at 1 040 000 m²) in 2013, which is 130 000 m² less than in 2012. BSW Solar (the German solar industry association) feels the situation is not alarming, as it is shifting. The proportion of new builds equipped with solar systems is tending to rise, as the new build market picks up thanks to low interest rates. The BSW explains that solar thermal's poorer performance in hybrid appliances used in the heating appliance replacement market is responsible for this drop.

In May 2014 Germany enacted new legislation on energy savings (the EnEV law), which stipulates that from 2015 onwards, oil- and gas-fired heating systems over 30 years old must be replaced by new systems. The law is likely to increase solar system sales, because the new fossil-fuel heating systems tend to be sold coupled to solar thermal collectors, to improve system performance and efficiency.

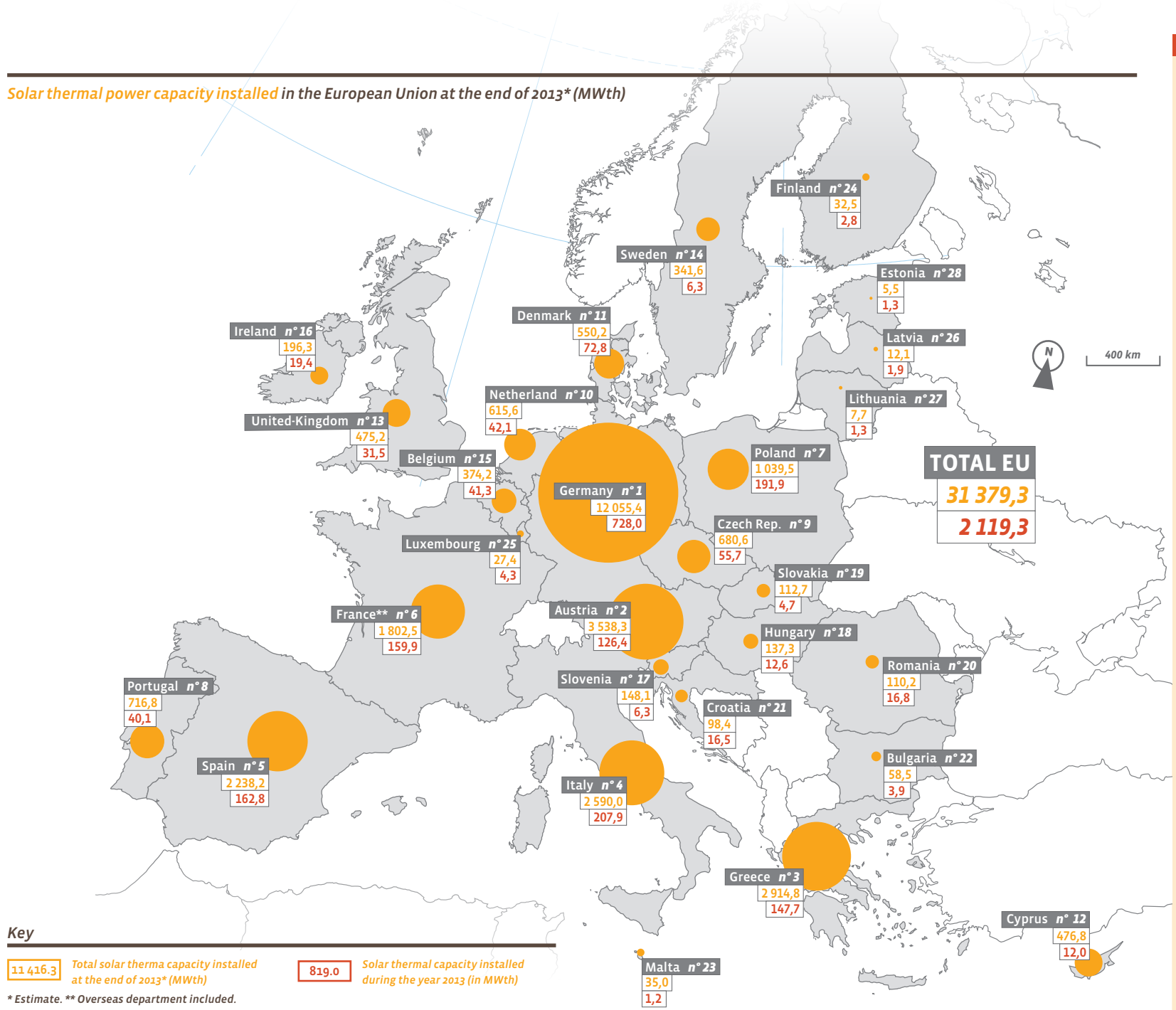
UK... the domestic RHI is now in place

The Renewable Heat Incentives programme for homeowners (Domestic

RHI scheme) finally kicked into play on 9 April 2014, after a series of false starts and three years after the RHI was rolled out for the other sectors (industry, businesses and the public sector). The "domestic" RHI is the world's first long-term financial incentive support programme for renewable heat production that targets householders. It covers solar thermal technologies, heat pumps and biomass boilers installed since 1 July 2009, provided certain energy efficiency criteria are met. In the case of solar thermal, the incentive amounts to 19.2p/kWh (€ 0.23/kWh), paid quarterly for seven years. The incentive aims to bridge the cost gap compared to a 100% fossil-fuel heating system. The production incentive applies to both, solar thermal hot water production systems and combined hot water and heating systems.

Once the seven-year term has expired, no further production incentive will be paid out to the family but they will benefit from the savings made by the installation throughout its lifetime (put at 25 years). The government and the Solar Trade association (STA) aim to install a million solar roofs by 2015. According to the STA, there are already more than 200 000 solar thermal systems installed in the UK. An STA survey indicates that solar thermal system prices could come down by 29.2% if the market takes off, noting that the current mean price of a solar hot water heater for a 4-bedroom house is about £ 4 500 (€ 5 500).

Solar thermal power capacity installed in the European Union at the end of 2013 (MWth)*



Key

11 416.3 — *Total solar therma capacity installed at the end of 2013* (MWth)*

819.0 — *Solar thermal capacity installed during the year 2013 (in MWth)*

** Estimate. ** Overseas department included.*

The Italian Feed-in Tariff is a smokescreen

Italy is one of Europe's leading solar thermal technology markets, although the recession has taken some of the steam out of it. The solar thermal association, Assolterm, puts market volume at around 297 000 m2 in 2013 (330 000 m² in 2012), taking Italy's total solar thermal installed base to about 3.7 million m².

The legal framework setting a Feed-in Tariff for heat production has been in place since the law of 2 January 2013 (law no. 28, art. 28). However it has yet to materialize because the Italians have failed to reach consensus on how to measure solar yield. In the meantime, the law has led to the implementation of the Conto Termico, which is simply a dressed-up installation subsidy system. Solar thermal installations (hot water-only or combined systems) of less than 50 m² are eligible for € 170/m² of aid per annum for two years. When combined with a cooling system, the incentive rises to € 255/m² for two years. Systems with more than 50 m² of collectors are eligible for € 55/m² of aid per annum for 5 years and when combined with a solar-powered cooling system € 83/m² is payable. Every installation has to go through an authorization procedure with GSE (Gestore dei Servizi Energetici).

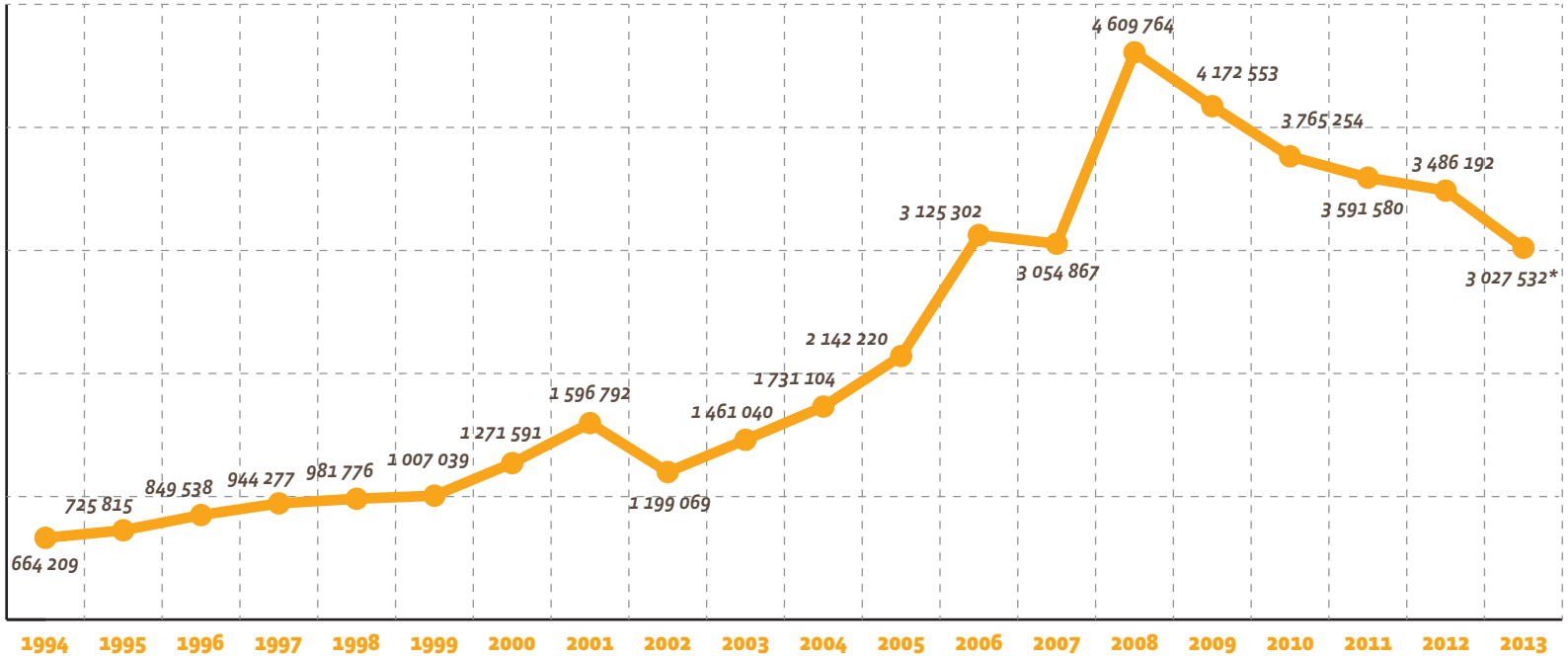
Italy has two other solar thermal installation financing possibilities (that cannot be piggy-backed to the Conto Termico) – a 65% tax deduction for energy efficiency investments in buildings or a 50% tax deduction for renovating buildings and installation subsidies that can both be used over a ten-year period. Assolterm claims that the Conto Termico system is best for the consumer, but that "excessive bureaucracy" is still limiting the number of projects. During the mechanism's first year it applied to only 3 000 of the systems installed. Thus it follows that the Italian market will return to growth when the efficiency of this incentive system improves.

The Polish market's coffers run dry

After two years of high growth in 2011 and 2012, the Polish market lost impetus in 2013. The Polish Institute for Renewable Energy (IEO) reports that 274 100 m² of collectors were installed in 2013 compared to 302 074 m² in 2012. There are several reasons for this reversal. Firstly, the rules for obtaining funding from the subsidy programme, the National Fund for Environmental Protection and Water Management (NFOSiGW), changed in September 2013, which penalized the vacuum tube manufacturers and importers. The introduction of new provisions also coincided with the financial resources allotted to the programme running out. As it hap-

Graph n° 3

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



*Member states included at the date of their accession. * Estimate* **Source: EurObserv'ER 2014**

VELUX/ESTIF

Velux, a roof windows specialist, announced end of 2013 its exit from the solar thermal market.

pens, many banks involved in its funding stopped approving subsidy demands once their budget targets were met. The programme managers confirm these hitches, but claim that new budgets have been allocated to the banks which should enable them to meet subsidy demands until at least the end of the first six months of 2014. In the second half of the year a new programme, called Prosument, should take over, which is considered less advantageous for the solar thermal market, because lower amounts of subsidies are allocated per year (150 million EUR in total for small installations for the 2014-2020 period) and other RES technologies compete with solar thermal.

The French market in a very bad way

French solar thermal market took a nose dive in 2013. First EurObserv'ER estimates put the solar thermal collector market at 228 485 m² in 2013 (including 41 687 m² in its overseas territories) down from 282 386 m² (and 43 686 m² respectively) in 2012, i.e. 19.1%. The institutional market also plummeted (by 21.7%, with 98 676 m² in 2013 down from 126 036 m² in 2012). Uniclima (the union for the heating, cooling and ventilation industry) says that steady growth in the multi-occupancy market since 2006 has gone into reverse because the RT 2012 thermal regulation for new build has been implemented, which penalizes the multi-occupancy solar thermal segment.

To head off this situation, the solar thermal industry joined forces with their heat pump and biomass counterparts last year and appealed to the authorities. They call themselves Alliance chaleur renouvelable [Renewable heat alliance] to give formal expression to the specific issues affecting renewable heat in the national debate on energy transition. One of the special measures the Alliance would like to see rolled out is the establishment of a renewable energy obligation in the Energy Refurbishment Plan for Housing (PREH) that has set an annual renova-

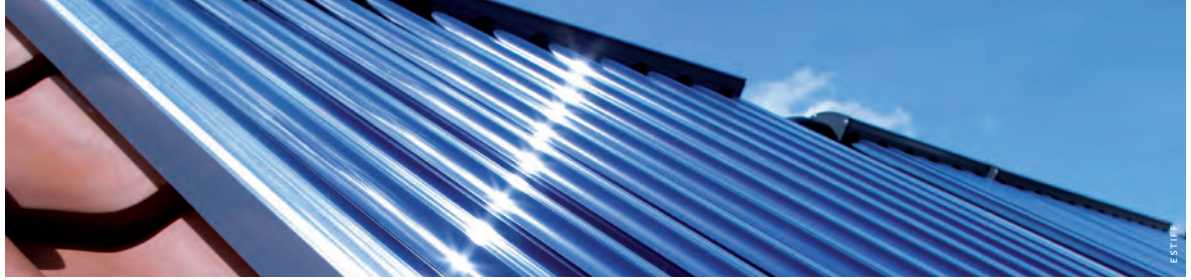


Table n° 6

Cumulated capacity of thermal solar collectors installed in the European Union in 2012 and 2013** (in m² and in MWth)*

	2012		2013	
	m²	MWth	m²	MWth
Germany	16 309 000	11 416,3	17 222 000	12055,4
Austria	4 926 348	3 448,4	5 054 698	3538,3
Greece	4 121 025	2 884,7	4 164 025	2914,8
Italy	3 400 000	2 380,0	3 700 000	2590,0
Spain	2 964 864	2 075,4	3 197 379	2238,2
France***	2 415 000	1 690,5	2 575 000	1802,5
Poland	1 211 500	848,1	1 485 000	1039,5
Portugal	966 770	676,7	1 024 004	716,8
Czech Republic	892 768	624,9	972 299	680,6
Netherlands	864 641	605,2	879 423	615,6
Danemark	712 823	499,0	786 000	550,2
Cyprus	693 999	485,8	681 157	476,8
United Kingdom	650 497	455,3	678 897	475,2
Sweden	482 000	337,4	488 000	341,6
Belgium	477 115	334,0	534 628	374,2
Ireland	252 677	176,9	280 379	196,3
Slovenia	202 537	141,8	211 574	148,1
Hungary	178 974	125,3	196 109	137,3
Slovakia	154 350	108,0	161 050	112,7
Romania	133 355	93,3	157 385	110,2
Croatia	119 600	83,7	140 600	98,4
Bulgaria	83 000	58,1	83 600	58,5
Malta	48 293	33,8	50 008	35,0
Finland	42 713	29,9	46 413	32,5
Luxembourg	32 952	23,1	39 131	27,4
Latvia	14 650	10,3	17 350	12,1
Lithuania	9 150	6,4	10 950	7,7
Estonia	6 120	4,3	7 920	5,5
Total European Union 28	**42 366 721**	**29 657**	**44 844 979**	**31 391,5**

** All technologies included unglazed collectors. ** Estimate. *** Overseas department included.* ***Source: EurObserv'ER 2014***

Solar thermal roof plant in Frankfurt, Germany.

Methodology note

As every year part of the installation base is decommissioned or replaced by new systems, estimating the total installed solar thermal collector surface area in the European Union poses a quandary, and therefore EurObserv'ER relies on the decommissioning assumptions of the national experts contacted during its survey to assess the collector surface area. In the absence of national statistics it applies a 20-year service life to glazed collectors and 12 years to unglazed collectors.

tion rate target 500 000 dwellings per annum through to 2017. The plan has been up and running since September 2013 and grants householders means-tested subsidies. For the lowest earners, an enhanced subsidy is awarded (covering up to 50% of the cost of the work, compared to the previous 35%) along with a 3 000-euro bonus. According to the French government, 46% of the population are eligible for this aid. Middle-class households could be awarded a new premium worth 1 350 euros. The Sustainable Development Tax Credit (CIDD, see www.energies-renouvelables.org) and the zero-rated green loan (éco-PTZ) are now the two main incentive mechanisms for undertaking energy refurbishment work in private housing. In 2014, the CIDD mechanism put solar thermal at a significant disadvantage as it is now 15% for expenses incurred in a single operation (as against 32% in 2013) and 25% for expenses incurred as part of a work package (as against 40% in 2013). A website has also been set up to inform private householders: www.renovation-info-service.gouv.fr.

Delays getting solar district heating networks up and running in Denmark

The growth of the Danish market is carried by the government's policy to develop district heating networks supplied by the solar thermal collector fields. By way of illustration, the 33 000 m² of solar thermal collectors supply the urban heating network of Marstal, on the Danish island of Ærø, that covers 55% of the heating requirements of its 1 500 customers. A 75 000 m³ storage tank ensures that 100% of the heating requirements are covered 6–7 months of the year. PlanEnergi, the Danish solar thermal consultancy says that delays in completing a number of installations resulted in much weaker growth than expected in 2013 (namely 93 000 m² connected to heating networks in 2013), but it forecasts that the collector connection figure for 2014 could rise to 242 000 m². PlanEnergi also gives installation figures for the other types of system (individual hot water heaters etc.) of 8 000 m² in 2013 and 10 000 m² in 2014.

A COLLECTOR BASE OF 44.8 MILLION SQUARE METRES IN 2013

According to EurObserv'ER, the solar thermal collector surface area in service in the European Union was about 44.8 million square metres at the end of 2013, equating to 31.4 GWth of capacity **(table 6)**. The top three countries remain unchanged, namely Germany, Austria and Greece. If we look at the per capita surface indicator, Cyprus is still the European pack leader with 0.787 m²/p.c. **(table 7)** ahead of Austria (0.598 m²/ p.c.) and Greece (0.376 m²/p.c.).

THE INDUSTRY TRIES TO WEATHER THE RECESSION

The industry was persuaded to invest heavily in production capacity and automated facilities on the basis of the solar thermal market's steady, regular growth until 2008 and repeated European ambitions to promote renewable heat as outlined in the NREAP roadmaps published in 2010. For the reasons explained above, installation levels have been much lower than predicted for a number of years, which has forced the European industry to consolidate and restructure.
Looking at the major company changes, in September 2013 the

Velux Group, the roof window specialist, announced its withdrawal from the solar thermal market and the end of production at its Hungarian plant. The difficult solar thermal market conditions are to blame for Velux' decision, as its sales were much lower than expected. Astrid Unger, the Group's spokesperson was categorical when she explained that solar thermal had become a niche product for the roof market and that installers dominated most of the business. Another major departure came from the Austrian group, Greiner, which in the middle of June 2013 announced that it was closing the solar thermal business of its Greiner Renewable Energy subsidiary that had acquired Sun Master's collector manufacturing plant early in 2011. The group blames the tough economic climate, the unpredictability of support policies and market slowdown for dashing its expectations.

The smallest players such as the Spanish manufacturers Soliker, 9REN, Energia Eólica y Solar and Geotec, the Austrian collector manufacturer are being pushed out by the price war currently being waged by the manufacturers because of low demand, and competition from imports of Chinese-made vacuum tube collectors. Other solar system manufacturers, such as the Czech Solar Plus and TZB Svoboda, have had to abandon in-situ flat collector manufacturing and have resorted to purchasing vacuum tubes from China.

Company buyouts are another sign of consolidation. For example, in October 2013 Viessmann bought out the French vacuum tube manufacturer, SAED that went out of business in April. Austrian manufacturer, Ökotech also filed for bankruptcy in the spring of 2013 and was bought out and rebranded as Asgard Solarkollektoren by a private investor that manufactures collectors.

At the start of 2014, one of the main European solar thermal system suppliers, General Solar Systems (GSS), owner of the Sonnenkraft trade name, changed hands (the disposal came into force on 1 January). The Solar Cap Group, that has full or part holding of some of the main "solar" company names such as the Austrian GreenOneTec (50%), the Danish Arcon Solar (100%), the American Heliodyne (100%) and the Indian Emmvee Solar Systems (50%), decided to dispose of GSS for an undisclosed amount to a group of Austrian investors, headed up by the GSS Group's former Finance Director, Primus Spitzer. GSS, which

Europe's dependence on Russian gas

In an open letter dated 19 March 2014 to the Member States and governments, on the occasion of the European Council meeting held on 20 and 21 March 2014 that was convened to discuss the European Commission's proposals for the second climate-energy package, the European representatives of the solar thermal (Estif), geothermal (EGEC) and biomass (AEBIOM) sectors, noted that investing in renewable heat and cooling technologies would contribute to securing energy supplies. They emphasized that if the member states adhered to the roadmaps set out in their National Renewable Energy Action Plans (NREAP), imports of natural gas from third-party countries could be reduced by about 35 million tonnes oil equivalent (toe) from 2020 onwards.

The Ukrainian crisis has shifted the European Council discussions' centre of gravity to drawing up a common strategy to reduce the EU's dependence on energy supplies. The meeting provided an opportunity to highlight the heavy dependency of a number of EU countries on Russian gas. According to the Europaforum website, "thirteen Member States depend on Russia for more than 50% of their gas supplies, including six that are 100% dependent (Finland, Slovakia, Bulgaria and the three Baltic States). Germany imports 34% of its gas from Russia. If EU leaders didn't act now, by 2035 the Union would be dependent on foreign exports for up to 80% of its oil and gas."

Naturally the European Council has recommended the development of renewable energy sources and energy efficiency as a way to reduce this dependence. The Council invited the European Commission "to conduct an in-depth study of EU energy security and present its proposals by June 2014". Referring to the recommendation, the European Council President, Herman Van Rompuy declared: "Today we sent a clear signal that Europe is stepping up a gear to reduce energy dependency, especially with Russia".

Table n° 7

Solar thermal capacities in operation per capita (m²/inhab. and kWh/inhab.) in 2013***

Country	m²/inhab.	kWth/inhab.
Cyprus	0,787	0,551
Austria	0,598	0,419
Greece	0,376	0,263
Germany	0,214	0,150
Denmark	0,154	0,108
Malta	0,119	0,083
Slovenia	0,103	0,072
Portugal	0,098	0,068
Czech Republic	0,092	0,065
Luxembourg	0,073	0,051
Spain	0,068	0,048
Italy	0,062	0,043
Ireland	0,061	0,043
Netherlands	0,052	0,037
Sweden	0,051	0,036
Belgium	0,048	0,034
Poland	0,039	0,027
France***	0,038	0,027
Croatia	0,033	0,023
Slovakia	0,030	0,021
Hungary	0,020	0,014
Bulgaria	0,011	0,008
United Kingdom	0,011	0,007
Latvia	0,009	0,006
Finland	0,009	0,006
Romania	0,008	0,006
Estonia	0,006	0,004
Lithuania	0,004	0,003
Total European Union 28	0,089	0,062

** All technologies included unglazed collectors. ** Estimate. *** Overseas departments included.*
Source: EurObserv'ER 2014

The 3.5 MW ground mounted solar thermal plant in Ulsted, Denmark, distributes heat through a heating network to 1,000 people. ARCON SOLAR

Table n° 8

Representative European solar thermal collector manufacturers

Company	Country	Activity	Production 2012/2013 (collector area in m²)	Turnover 2013 (in M€)	Employees 2013
GreenOneTEC	Austria	Flat plate and vacuum tube collector	651 000	90	310
Bosch Thermotechnik *	Germany	Flat plate collector manufacturer	430 000	3 120	13 500
Viessmann *	Germany	Heating equipment / solar thermal	300 000	2 100	11 400
Vaillant Group *	Germany	Heating equipment supplier / solar thermal	200 000	2 330	12 100
BDR Thermea Group *	Netherlands	Heating equipment supplier / solar thermal	175 000	1 800	6 400
Wolf *	Germany	Heating equipment supplier	160 000	322	1 300
Riposol	Austria	Flat plate collector manufacturer	125 000	n.a.	n.a.
Dimas	Greece	Flat plate collector manufacturer	120 000	n.a.	n.a.
Nobel Xilinakis	Greece	Flat plate collector manufacturer	100 000	n.a.	n.a.
Wagner & Co *	Germany	Flat plate collector manufacturer	90 000	n.a.	150

** Estimation based on Sun and Wind Energy 11+12/2013 (Solrico Study Solar Thermal World Map 2013).* **Source: EurObserv'ER 2014**

employs 150 people and had a sales turnover of 45 million euros in 2013, is now owned by PS Helios, an Austrian company whose head office is at Saint Veit.

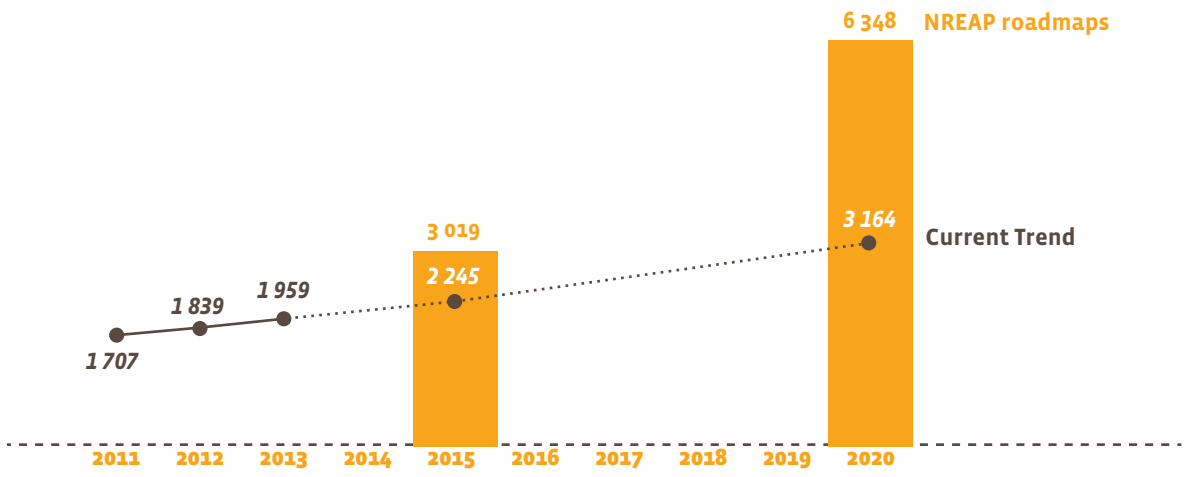
Some companies are holding up well despite the overall slump, such as Austria's GreenOneTec (held in equal parts by Solar Cap and Kioto Group) that announced it had picked up market share in 2013 as some of its competitors left the running. The company says that its manufacturing level is slightly down on 2012 (it produced 651 000 m² of collectors in 2013), and that its share of the European market is over 25%. The company posted sales of 90 million euros in 2013 (100 million euros in 2012) and is still investing. According to its website, its investment volume rose to 2 million euros in 2013 and should reach 2.5 million euros in 2014. One of the company's main research priorities is the development of a new type of high-temperature collector combined with a seasonal storage system, capable of storing 6–8 times more heat than a conventional solar thermal system. This system under development requires a collector surface of 25 to 30 m² combined with a seasonal storage system 6–8 m³ to be used during the year for space heating.

A QUESTION OF POLITICAL CHOICE FOR 2020 AND 2030

The solar thermal sector seems to be in the throes of another crisis and it is hard to imagine the sector finding the path to strong, sustainable growth if it has to rely solely on its

Graph n° 4

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



Source: EurObserv'ER 2014

Source table 4 et 5 : AGEE-Stat (Germany), The Institute for Renewable Energy (Poland), Assolterm (Italy), ASIT (Spain), Observ'ER (France), AEE Intec (Austria), Planenergi (Denmark), Ministry of Industry and Trade (Czech Republic), Apisolar (Portugal), CBS (Netherlands), ATTB (Belgium), University of Miskolc (Hungary), Cyprus Institute of Energy, SEAI (Ireland Republic), Econet Romania, Jozef Stefan Institut (Slovenia), Svensk solenergi (Sweden), Energy Center Bratislava (Slovakia), APEE (Bulgaria), Statec (Luxembourg), Malta Ressource Authority, University of Zagreb FER (Croatia), ESTIF.

own financial resources. The bloodletting should end this year. The sector's new-year forecasts indicated that it expected the 2014 market to stabilize or show a slight upswing. But it is clear that full-blown solar thermal market recovery will be contingent on an all-out renewable heat development policy that combines incentives to produce with promotional campaigning. The Ukrainian crisis, that has alerted the public and politicians of how dependent the European Union is on energy supplies from outside, could help shift policy lines **(see box p. 16)**. At the same time, 11 European associations that represent renewable heat have joined forces in a Heat Coalition to urge the European institutions to apply remedial measures to put heat production back at the top of the agenda and revive the negotiation framework surrounding the adoption of the second climate and energy package. The message has already struck a chord with the European Parliament, which reminded the Commission of the importance of heat and cooling in a report on the 2030 framework on energy and climate policies published on 5 February 2014 that reasserts the importance of setting binding renewable energy targets.

It would be unfair to claim that the European Commission has been inactive. On 6 September 2013, the regulation on the eco-design requirements of boilers and hot water heaters was published in the Official Journal of the European Union. From September 2015 onwards these appliances will be allocated energy labels to enable consumers to gauge the energy efficiency and consumption differences between the various systems. The label will indicate an energy category ranging from A+++ to F, where the best score will be awarded to… solar thermal systems that benefit from the only technology eligible for category A+++! Category G will be abolished to withdraw the worst-performing appliances from the market. The system will naturally benefit sales of renewable energy-fuelled appliances.

While the implementation of specific, bold measures reaffirmed by the national and European decision-makers is awaited, EurObserv'ER reckons that the European Union will achieve half of its combined NREAP targets **(graph 4)**. According to EurObserv'ER, heat production from the solar thermal sector reached 2 Mtoe in 2013, i.e. 30.8% of the NREAP 2020 target. □

The topic of the next barometer will be biofuels.

Download

EurObserv'ER is posting an interactive database of the barometer indicators on the www.energies-renouvelables.org (French-language) and www.eurobserv-er.org (English-language) sites. Click the "Interactive EurObserv'ER Database" banner to download the barometer data in Excel format.

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