

GSS-VET Workshop

Athens, February 13th 2020

**Greek Solar Thermal Market
(status – outlook and training needs)**

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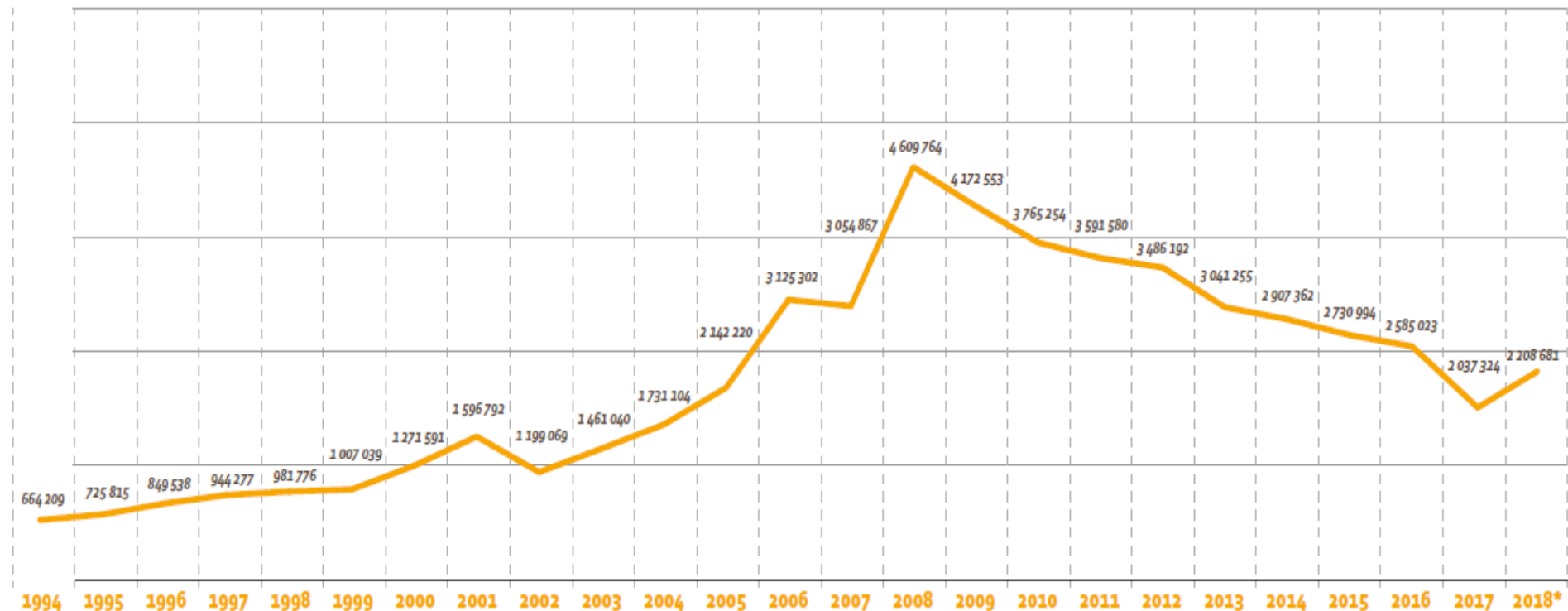
2018 - A year of EU solar thermal market recovery

- ▶ As climate warming's repercussions become increasingly evident, solar thermal technology, which harnesses the sun's rays to convert it directly into heat, is finally generating interest.
- ▶ The European market, which has been dwindling since 2009, picked up in 2018 as it grew from 2 to 2.2 million m² (8.4% year-on-year growth).
- ▶ The market data covers systems that use flat plate collectors, vacuum collectors and unglazed collectors.
 - These technologies are designed to produce domestic hot water, heating, and to produce heat and hot water for district heating networks and industry.
- ▶ In contrast, hybrid PV/T collectors capable of producing electricity and heat simultaneously and concentrating solar collectors (Fresnel mirrors and parabolic trough collectors) for producing heat (industrial or heating networks) are not included.

Source: EurObserv'ER (*Solar thermal and concentrated solar power barometer 2019*)

2018 - A year of EU solar thermal market recovery

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



Member states included at the date of their accession. * Estimations. Source: EurObserv'ER 2019.

2018 - A year of EU solar thermal market recovery

- ▶ While EU-wide market growth is positive, piecemeal development characterises the national markets:
 - Poland put in the best performance in 2018. Its sector, which took advantage of the implementation of municipal tenders, made a 180% leap to 310,000 m².
 - The Greek market grew by 4% in 2018 to 328,500 m², having already significantly increased by 16.2% between years 2016 and 2017 (from 272,000 to 316,000 m²).
 - Spain's market picked up slightly (by 2%) confirming the previous year's turnaround when its market decline was limited to 5% between 2016 and 2017.

Source: EurObserv'ER (*Solar thermal and concentrated solar power barometer 2019*)

2018 - A year of EU solar thermal market recovery

- ▶ On the downside, some former market drivers continued to slide:
 - A case in point is the German market. While it leads the EU market rankings with 573 500 m² installed in 2018, it has been unable to stabilise and posted a new 11.8% contraction on its 2017 performance that can mainly be ascribed to declining interest in combined solar systems (that supply both heating and hot water).
 - Likewise, the Italian market has been unable to stabilise and had to contend with a 7.9% decline in 2018 of about 139,000 m² (excluding thermosyphon systems). It is particularly affected by competition from photovoltaic.
 - In metropolitan France, the sector grew overall in 2018 despite the struggle of its individual hot water heater market to beat off competition from thermodynamic water heaters. The French overseas territories, with targeted incentives and substantial state support, are enjoying more momentum.

Source: EurObserv'ER (*Solar thermal and concentrated solar power barometer 2019*)

2018 - A year of EU solar thermal market recovery

- ▶ The European solar (district) heating network and industrial solar heat markets are gradually making ground with new systems identified in Denmark, Germany, Austria, Spain and France.
- ▶ The latest IEA SHC Solar Heat Worldwide 2019 report, puts the collector surface connected in 2018 to European solar (tele-) heating networks at 83,760 m² (58.6 MW_{th}).
- The report identifies 15 new solar thermal collector fields (>500 m²) connected to a heating network, six in Denmark (of 66,800 m², including two extensions to existing networks), six in Germany (9,380 m²), two in Austria (3,010 m²) and one in Turkey (4,575 m²).
- The biggest heating network system was installed in the Danish city of Aabybro with 26,195 m² (18.3 MW_{th}) of collector surface.

Source: EurObserv'ER (Solar thermal and concentrated solar power barometer 2019)

2018 - A year of EU solar thermal market recovery

- ▶ The total surface of the European Union collector base consolidated at about 53.5 million m² (37,418 MW_{th}) at the end of 2018, i.e. a 2.4% increase on its 2017 level.
- ▶ This estimate includes the three main solar thermal technologies (flat-plate collectors, vacuum collectors and unglazed collectors) and factors in decommissioning hypotheses for the oldest installations (e.g. 20 years for flat-plate collectors and 12 years for unglazed collectors) made by the experts contacted when gathering data for the purposes of this study (ministries, statistics offices, engineering & design departments, heating manufacturers' associations).
- ▶ Note: The decommissioning phenomenon will accelerate in the next few years due to the growth in installations during the 2000s that culminated to 4,6 m² of collectors in 2008. In a few years' time this trend will raise the issue of maintaining the EU solar heat contribution target levels, if the market fails to recover significantly and be sustained.

Source: EurObserv'ER (*Solar thermal and concentrated solar power barometer 2019*)

2018 - A year of EU solar thermal market recovery

Annually installed surfaces in 2018 per type of collectors (in m²) and capacity equivalent (in MW_{th})

Country	Glazed collectors			Total (m ²)	Capacity equivalent (MW _{th})
	Flat plate collectors	Vacuum collectors	Unglazed collectors		
Germany	505 000	68 500		573 500	401,5
Greece	328 500			328 500	230,0
Poland	300 000	10 000		310 000	217,0
Spain	191 966	9 698	3 866	205 530	143,9
France**	150 622		5 500	156 122	109,3
Italy	139 000			139 000	97,3
Austria	99 734	1 038	617	101 389	71,0
Denmark	61 000			61 000	42,7
Cyprus*	56 404			56 404	39,5
Portugal*	55 000			55 000	38,5
Netherlands	28 089	5 409	2 621	36 119	25,3
Belgium	25 000	4 900		29 900	20,9
Czechia	16 500	7 500		24 000	16,8
Slovakia*	24 000			24 000	16,8
Croatia*	22 700			22 700	15,9
Bulgaria*	20 000			20 000	14,0
Romania*	7 200	9 600		16 800	11,8
Hungary*	12 000	4 000		16 000	11,2
Ireland	13 041			13 041	9,1
United Kingdom*	5 300	1 700		7 000	4,9
Finland*	4 000			4 000	2,8
Luxembourg	3 418			3 418	2,4
Sweden*	2 800	300		3 100	2,2
Slovenia*	1 300	250		1 550	1,1
Malta	486	122		608	0,4
Lithuania*	n.a.	n.a.		0	0,0
Estonia*	n.a.	n.a.		0	0,0
Latvia*	n.a.	n.a.		0	0,0
Total EU 28	2 073 060	123 017	12 604	2 208 681	1 546,1

*EurObserv'ER estimation. ** included 95 418 m² in overseas departments.
Source: EurObserv'ER 2019.

Note:
1 m² of solar collector
= 0.7 kW_{th}

2018 - A year of EU solar thermal market recovery

Cumulated capacity of thermal solar collectors* installed in the European Union in 2017 and 2018**(in m² and in MWth)

	2017		2018	
	m ²	MWth	m ²	MWth
Germany	19 091 390	13 364	19 269 490	13 489
Austria	5 168 157	3 618	5 105 155	3 574
Greece	4 595 900	3 217	4 691 000	3 284
Spain	4 106 950	2 875	4 312 450	3 019
Italy	4 050 666	2 835	4 185 946	2 930
France***	3 094 442	2 166	3 225 000	2 258
Poland	2 248 300	1 574	2 558 300	1 791
Denmark	1 542 384	1 080	1 579 324	1 106
United Kingdom	1 428 000	1 000	1 435 000	1 005
Portugal	1 231 105	862	1 286 105	900
Cyprus	1 043 860	731	1 070 264	749
Belgium	750 600	525	769 956	539
Netherlands	650 271	455	652 218	457
Czechia	593 442	415	617 442	432
Sweden	472 000	330	454 415	318
Bulgaria	378 000	265	398 000	279
Ireland	322 616	226	335 657	235
Hungary	308 000	216	324 000	227
Croatia	226 700	159	249 400	175
Slovenia	238 750	167	240 300	168
Slovakia	201 000	141	225 000	158
Romania	189 000	132	205 800	144
Malta	72 250	51	72 858	51
Luxembourg	63 150	44	66 568	47
Finland	60 000	42	63 200	44
Latvia	24 520	17	24 520	17
Lithuania	20 150	14	20 150	14
Estonia	16 120	11	16 120	11
Total EU 28	52 187 723	36 531	53 453 638	37 418

* All technologies, including unglazed collectors. ** Estimate. *** Overseas departments included. Source: EurObserv'ER 2019.

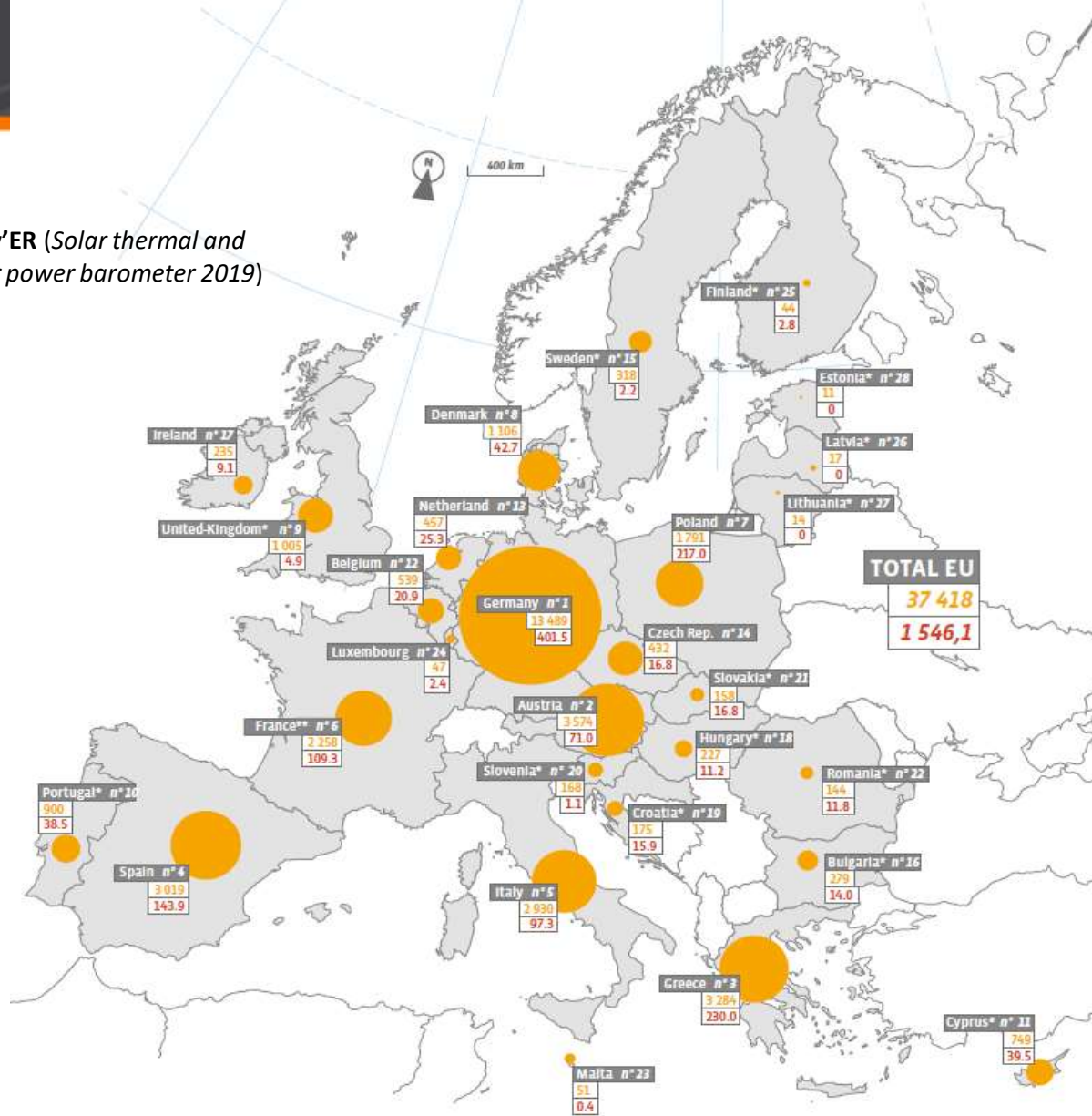
Solar thermal capacity* in operation per capita (m²/inhab. and kWh/inhab.) in 2018**

Country	m ² /inhab.	kWh/inhab.
Cyprus	1,238	0,867
Austria	0,579	0,405
Greece	0,437	0,306
Denmark	0,273	0,191
Germany	0,233	0,163
Malta	0,153	0,107
Portugal	0,125	0,087
Slovenia	0,116	0,081
Luxembourg	0,111	0,077
Spain	0,092	0,065
Ireland	0,069	0,049
Italy	0,069	0,048
Belgium	0,068	0,047
Poland	0,067	0,047
Croatia	0,061	0,043
Czechia	0,058	0,041
Bulgaria	0,056	0,040
France***	0,048	0,034
Sweden	0,045	0,031
Slovakia	0,041	0,029
Netherlands	0,038	0,027
Hungary	0,033	0,023
United Kingdom	0,022	0,015
Latvia	0,013	0,009
Estonia	0,012	0,009
Finland	0,011	0,008
Romania	0,011	0,007
Lithuania	0,007	0,005
Total EU 28	0,104	0,073

* All technologies, including unglazed collectors. ** Estimate. *** Overseas departments included. Source: EurObserv'ER 2019

2018 -

Solar thermal capacity installed in the European Union at the end of 2018 (MWth)



Key

37 418 Total solar thermal capacity installed at the end of 2018 (MWth)

1 546,1 Solar thermal capacity installed during the year 2018 (in MWth)

* EurObserv'ER estimation.
** Overseas departments included.
Source: EurObserv'ER 2019.

The global situation of solar thermal market

- ▶ At a global scale, the solar thermal capacity installed in 2018 is put at 33,300 MW_{th}.
- ▶ China stands out from the field with 24,800 MW_{th} of additional capacity!
 - This figure is lower than its 2017 effort, primarily because the residential solar water heater market – the sector's main growth segment – is saturated.
- ▶ Turkey and India are also major players with national markets in excess of 1,200 MW_{th} in 2018.
- ▶ At the end of 2017, 130 countries had solar thermal installations with combined capacity put at 472,000 MW_{th}.

Source: EurObserv'ER (*Solar thermal and concentrated solar power barometer 2019*)

The global situation of solar thermal market

Main solar thermal markets outside the European Union (MWth)

	Annually Installed capacity		Total cumulative capacity in operation
	2017	2018	2017
China	26 100	24 800	334 500
Japan	1 348	1 320	16 300
USA	1 063	1 240	7 700
China	860	850	10 400
India	658	625	17 800
Rest of the world including EU	4 571	4 465	85 300
Total	34 600	33 300	472 000

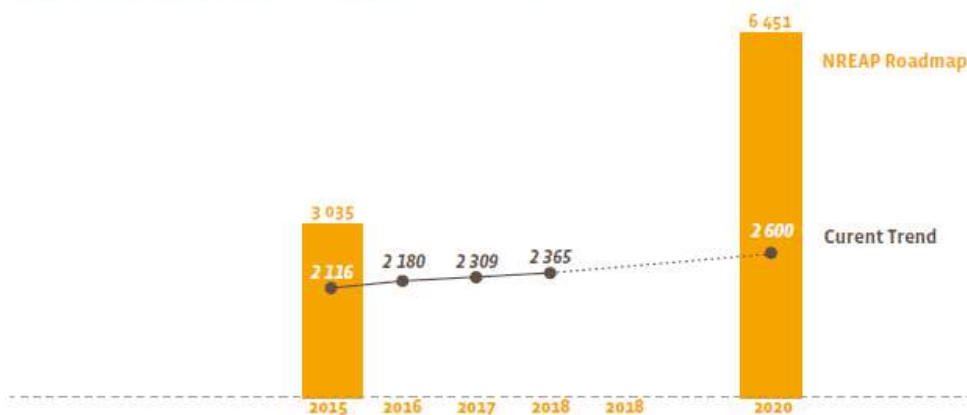
Source: REN21, EurObserv'ER

Source: EurObserv'ER (Solar thermal and concentrated solar power barometer 2019)

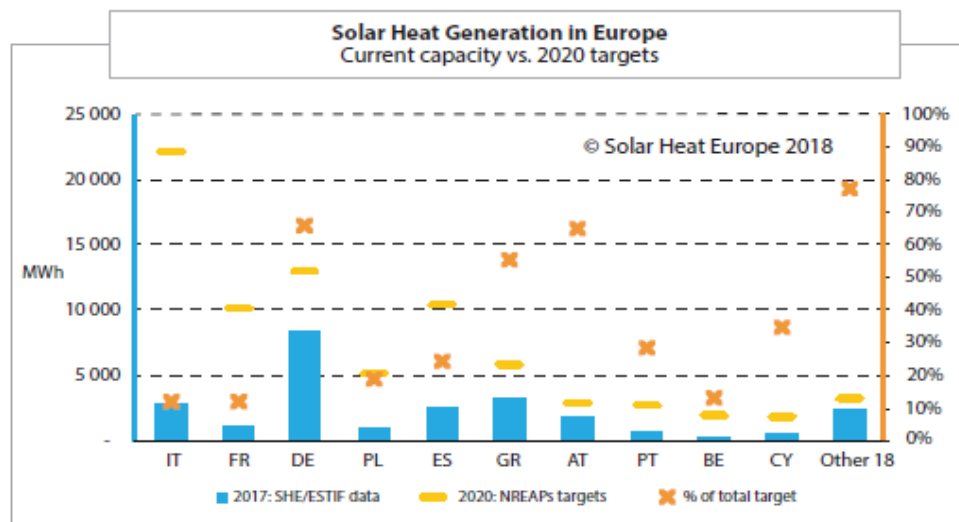
EU solar thermal market outlook

- ▶ The late return to growth in the solar thermal market, even if it were to continue in 2019 and 2020, will not be enough for the EU countries to achieve the targets they have set for 2020 (6.45 million tonnes of oil equivalent / Mtoe).
- ▶ By 2020, 2.6 Mtoe will be reached.
- ▶ The solar energy sector's main obstacle continues to be initial investments as the bulk of the energy bill of the installation that has more than a 20-year lifespan, is paid for at the time of purchase...

Comparison of the current trend against the NREAP (National Renewable Energy Action Plans) roadmap (In ktOE)



Source: EurObserv'ER 2019



EU solar thermal market outlook

- ▶ IRENA prepared a report in cooperation with the EC looking into cost-effective renewable energy options in the EU that can contribute to accelerate the deployment of renewables towards 2030.
- IRENA identified solar thermal in buildings as one of main solutions to be explored in Europe until 2030.
- ▶ Besides ranking high in cost-effectiveness and potential contribution to the increase of the overall RES share, solar thermal can increase substantially, from a contribution of 3% of the heat demand in the reference case (24% renewables by 2030) to 6.2% in the optimistic scenario (34% renewables by 2030).
- ▶ By 2030, solar thermal in buildings and industry under the optimistic scenario can reach 192 TWh of energy generation, which translates to 269 MW_{th} (384 mio m²) of installed capacity. To this total, solar thermal in buildings can contribute 158 TWh of energy generation, which translates to 222 MW_{th} (371 mio m²) of installed capacity.

Source: “Renewable Energy Prospects for the European Union”, published by IRENA (International Renewable Energy Agency) in 2018

EU solar thermal market outlook

- ▶ The same can be said for **concentrated solar thermal energy** (solar thermal power plants):
 - The capacity of the European solar farms stands at 2,314.3 Megawatts (MW), mostly located at Spain, a figure that is expected to reach 2,323 MW by 2020.
- ▶ However, the various MSs National Renewable Energy Action Plan (NREAP) roadmaps recommended a threshold of 6,594 MW by this deadline...

Data Highlights of 2017



Total installed capacity
in operation:
35.2 GW_{th}



Total installed
capacity in 2017:
1.4 GW_{th}



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



(Estimated)
sector turnover
1.7 EUR billion



Numbers of jobs
(estimated):
17 400



Estimated
6.65 Mt CO₂
emission savings

The Greek solar thermal market

- ▶ The results of 2018 confirm that the Greek market is robust.
- ▶ According to EBHE (the Greek Solar Industry Association), it made 4% growth, or 328,500 m² sold in 2018. This compares to 316,000 m² in 2017 (16.2% more than in 2016, the year when 272,000 m² was installed).
- ▶ EBHE points out that more collector surface was installed than the collector surface Greece decommissioned (233,400 m² scrapped in 2018), which means that the solar thermal base in service continues to increase. It has risen from 4,595,900 m² in 2017 to 4,691,000 m² in 2018.
- ▶ The equipment level is very high in Greece with 0.437 m² per inhabitant.
- ▶ EBHE ascribes this growth to a set of favourable elements, starting with the drop in system prices due to keen competition between players, multiplication of distribution grids as e-commerce builds up steam, the arrival of major DIY retailers on this market such as Leroy Merlin, the entry of new private labels working with OEM partners and a slight improvement in the Greek economy.

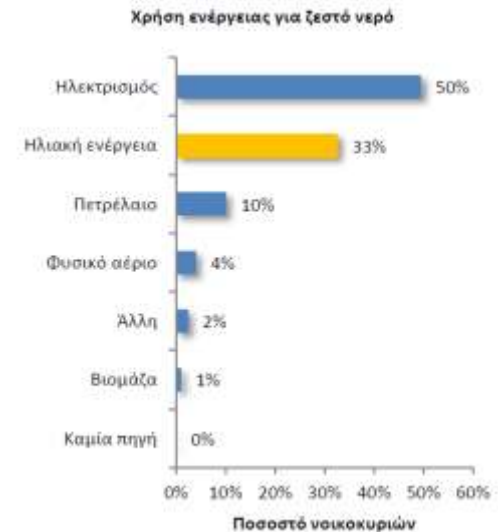
The Greek solar thermal market

- ▶ EBHE also highlights the country's solar thermal industry's increasing export volumes:
 - The surface area of exported collectors has increased by 20%, rising from 264,103 m² in 2017 to 316,908 m² in 2018.
- ▶ Some more data:
 - The industry currently comprises about 40 production companies, which have different levels of organization and production capacity.
 - The sector's total contribution to the GDP stood at €316 million in 2017. Respectively, the sector's contribution to public revenues is estimated at €86 million.
 - In terms of employment, the solar thermal systems industry directly offered approximately 1,820 jobs in 2017 (equivalent full time jobs). Taking into account the multiplier effects, the STS industry's total contribution to employment is estimated at 5,720 jobs.

Source: "Trends and prospects for the solar thermal system industry in Greece" (Foundation for Economic & Industrial Research - IOBE, 2019)

The Greek solar thermal market

- ▶ Some more data:
 - Quantities of fuels saved annually are estimated to range from 2.7 to 4.7 million barrels of oil equivalent (boe).
 - The improvement in the country's trade balance is estimated to range from € 103 to € 140 million.
 - The total energy generated by the STSs in Greece in 2017 corresponds to avoided emissions of 1.6 to 2.3 million tonnes of CO₂ per year.
 - With the current price level of CO₂ emission allowances (approximately 20 €/tCO₂), the overall benefit of saving CO₂ emissions resulting from the use of STSs is estimated at between €32 and €45 million.
- ▶ However, solar thermal systems constitute the major means of producing DHW for 33% of households in Greece (ELSTAT data, 2011).



Source: "Trends and prospects for the solar thermal system industry in Greece" (Foundation for Economic & Industrial Research - IOBE, 2019)

CRES experience in solar thermal training & certification

- ALTENER II Project 4.1030/Z/01-109: **“European Solar Water Heating Accreditation and Certification - SUNTRAIN”** (05/2002 – 04/2004)

RESULTS:

1. An in depth survey of the existing infrastructures for SWH training in Spain, Greece, Germany and the UK. This study examined the needs of both the training organisations and the students they provide for, and gave recommendations.
2. Dialogue between regional training bodies responsible for the training programs and institutions in each of the four pilot countries.
3. An assessment of resource and staffing requirements for organisations offering SWH training programs and definition of minimum requirements for certification.
4. The “key competencies” (the tasks that SWH installers should master to be able to properly and safely install domestic systems) of SWH systems installers.
5. Implementation of pilot training courses on the design, installation and maintenance of SWH systems. Competency certificates have been awarded by the proposed European accreditation mechanism.
6. A procedure for auditing the accreditation process. The accreditation process was taken over by the existing training infrastructure in each country, overseen by a European auditing body.

CRES experience in solar thermal training & certification

- Intelligent Energy-Europe Project EIE/04/038: “**Extend Accredited Renewables Training for Heating - EARTH**” (01/2005 - 12/2006)

RESULTS:

1. Training programmes for three RES Heating technologies:
 - a) biomass heating systems,
 - b) ground-source heat pumps (GSHP) and
 - c) solar water heating systems (SWH)
2. installers. Course definitions including task analysis, syllabus, entry requirements, and requirements for practical training.
3. Training materials for both trainers and students
4. Training of trainers
5. Assistance with pilot courses
6. Overview of relevant training programmes and frameworks in participating countries

LESSONS LEARNED:

- Training courses should become part of the national training infrastructure, to ensure that they continue on an ongoing basis beyond the lifetime of the project.

CRES experience in solar thermal training & certification

- Intelligent Energy-Europe Project IEE/08/479: ***“Quality Certification and Accreditation for Installers of Small-scale Renewable Energy Systems - QualiCert”*** (07/2009 - 12/2011)

RESULTS:

1. Assessment of the performance of existing schemes for accreditation of training and certification of installers of small scale RES systems in buildings EU-wide.
2. Validation of success criteria with stakeholders groups and development of a manual of success criteria addressing technical, legal, institutional, financial and communication aspects.
3. Adoption of a common approach to accreditation and certification schemes for installers of small-scale RE systems in 5 EU Member States (FR, AT, IT, PL, GR) with mutual recognition of the schemes (Article 14 and Annex IV of RES Directive).
4. Facilitation of implementation of accreditation and certification schemes based on the joint approach in the 5 MS.
5. Transfer of results to promote replication of the approach in other EU Member States.

REMARK: Among the participants were EREC, EGEC, EPIA, ESTIF, AEBIOM, EHPA, EBC, European Technical Contractors Committee for the Construction Industry.

CRES experience in solar thermal training & certification

- Intelligent Energy-Europe Project IEE/09/763: ***“Training courses for installers of small-scale renewable energy systems in buildings - Install+RES”*** (05/2010 - 04/2013)

RESULTS:

1. "Train the trainer" courses implemented in English and German language for the modules on small-scale Photovoltaic, Solar Thermal, Heat Pumps and Biomass systems in buildings.
2. 78 trainers qualified in the field of small-scale renewable energy systems in buildings.
3. The training material on Photovoltaic, Solar Thermal, Heat Pumps and Biomass has been developed in German and translated in English, Italian, Slovenian, Polish, Greek and Bulgarian. The training material can be downloaded for free at the Install+RES website: www.resinstaller.eu
4. 33 Install+RES training courses implemented in Germany, Italy, Slovenia, Poland, Greece and Bulgaria to qualify installers in the field of small-scale Photovoltaic, Solar Thermal, Heat Pumps and Biomass systems in buildings.
5. 516 installers qualified in the field of small-scale Photovoltaic, Solar Thermal, Heat Pumps and Biomass systems in buildings.

CRES experience in solar thermal training & certification

- Intelligent Energy-Europe IEE/CA/10/001: ***“Concerted Action supporting the transposition and implementation of Directive 2009/28/EC (RES Directive) – CA-RES”*** (07/2010 - 07/2013)

RESULTS:

1. A platform for knowledge transfer, exchange of experience and search for common ground between the participating countries was established .
2. A strong network amongst CA-RES participants enabling effective cooperation has been developed.
3. Areas for convergence amongst participating countries have been identified and coordinated approaches have been advanced.
4. Good-practice examples of policy instruments and measures promoting renewable energy have been shared.

For WG5 “Information and Training”: Indicative Competence Baseline for Mapping

- Solar Thermal Installation, Commissioning, Service and Maintenance
- Solar PV Installation, Commissioning, Service and Maintenance
- Heat Pump Installation, Commissioning, Service and Maintenance
- Geothermal Systems Installation, Commissioning, Service and Maintenance
- Biomass Installation, Commissioning, Service and Maintenance

CRES experience in solar thermal training & certification

PROGRAMME: *Operational Programme Competitiveness, Entrepreneurship and Innovation 2014-2020* (EPAnEK), under the Partnership and Cooperation Agreement (the new NSRF) for the period 2014-2020.

TITLE OF ACT: “Training and certification of knowledge and skills of employees in the solar thermal systems sector on the installation, configuration, monitoring and maintenance of STSs” (MIS Code: 5002431)

Start date: 01/05/2018 – End date: 30/04/2021

Description: It is an integrated approach to the training and certification of a number of private sector employees (target: 400 all over Greece) interested in the subject. The approach adopted consists of the following distinct steps:

- 1) Provision of training (nationwide, i.e. in all 13 Regions of the country, according to the financial key by Region type) to the beneficiaries (employees in the sector), based on a well-designed technical training program.
- 2) Certification of the acquired qualifications / skills of the beneficiaries of these training programs, through the assessment of their knowledge and competences by accredited certification bodies.

GSS-VET Workshop

Athens, February 13th 2020

THANK YOU FOR YOUR ATTENTION

ΚΑΠΕ

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