ehi
association of the
European Heating Industry

Solar Heat Europe

Affordable and EU-made:

the potential of solar thermal for buildings decarbonisation

November 2025

Introduction

Solar thermal heating technology addresses one of the most essential human needs: heat. Heating ensures comfort and plays a critical role in health and well-being – whether at home, at work, or in public spaces.

Today, providing home heating accounts for a substantial portion of total global energy demand: on average, heating represents 50% of the final energy consumption worldwide. In Europe specifically, heating is responsible for 46% of Europe's total energy demand – and about 85% of energy consumption in households. As such, it stands as one of the most impactful areas for climate action. Transitioning to renewable heating solutions is essential to achieving the EU target of climate neutrality by 2050.

Within this context, an opportunity presents itself to make the coming years a decade of transformation. In the EU, recent initiatives and legislations have acknowledged solar thermal heating technologies – clean, efficient, and already available – as one of the key technologies for this transformation.

Solar thermal systems harness the sun's energy to provide hot water, space heating, and even industrial process heat. This technology is EU-made, cost-effective, and offers significant benefits in terms of affordability, health and environment. Its adaptability to various climates and building types makes it a practical and scalable solution for meeting the EU's climate and energy goals.

Yet, despite their clear advantages, solar thermal solutions remain underutilised. Their full potential to reduce fossil fuel dependency, contribute to energy security and cut carbon emissions has yet to be realised.

This paper seeks to increase awareness of solar thermal heating as a reliable and "no-regret" option for the energy transition. By accelerating its adoption, we can make rapid progress toward building decarbonisation while also strengthening Europe's industrial base and creating sustainable jobs.

To this end, the paper outlines the various solar thermal technologies, showcases their relevance for the European economy and their numerous benefits. It also presents the current market situation, estimates their deployment potential and provides policy recommendations to unlock that potential across the EU.

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EHI Secretary General

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SHE Managing Director

What is solar heat?

A solar thermal collector is an appliance that uses solar radiation – a renewable source of energy – to produce hot water or heat that can be used in residential and tertiary buildings or district heating for space and water heating purposes. It can also be used in industrial applications to deliver process heat or steam[1].

To address this variety of end-uses and their respective temperature needs, solar thermal solutions have been subject to research and development aiming at expanding their applications, including reaching higher temperatures (up to 400°C); some technologies also enable the combination of solar thermal collectors with solar photovoltaics technology in one same panel.

Today, the main solar heat solutions are:

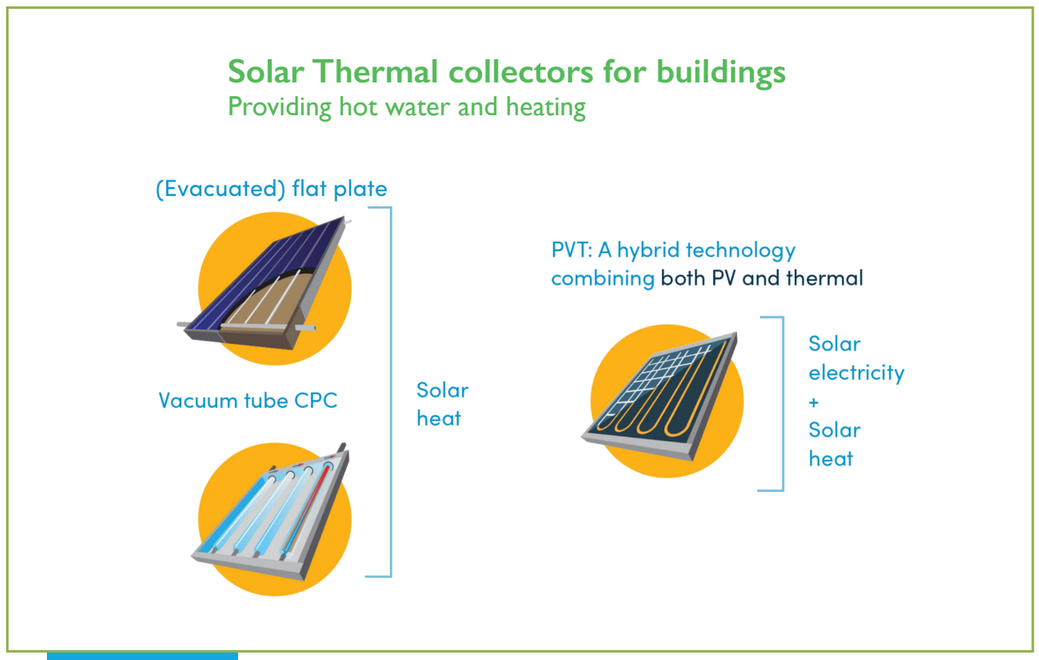


Figure 1 Types of solar thermal solutions for building applications (Source: Solar Heat Europe)

[1] The present brochure focuses on the buildings market. More information on other market applications of solar thermal is available on Solar Heat Europe's website (solarheateurope.eu)

Non-concentrated solar thermal collectors, provide heat up to 180°C by using direct and/or diffuse[2] solar radiation. Since they can use diffuse solar radiation, they can be utilised all year round, no matter the season or weather conditions.

Within non-concentrated solutions, one can distinguish two types of solar collectors, i.e. flat plate collectors and evacuated tube collectors:

- **Flat plate collectors** have a dark-coloured absorber plate inside a sealed, insulated box with a transparent cover (glass or plastic); this plate heats up when exposed to sunlight. The heat is then transferred to a fluid (usually water or antifreeze) thanks to a network of tubes that carry the fluid through the plate.

- **Evacuated tube collectors (or vacuum tubes)** contain rows of glass tubes that contain an absorber tube, through which the fluid flows. The air in the space between the two tubes is removed to create a vacuum, which minimises heat loss and increases efficiency. Therefore, they are well suited for applications where higher temperatures (up to 150°C) are required.

PVT (Photovoltaic-Thermal) collector is a hybrid technology that produces renewable heat and electricity by combining solar thermal and solar photovoltaics technology in one collector. Different types of PVT panels exist, including air PVT, uncovered, covered, evacuated tube collectors.

Concentrated solar thermal solutions work with mirrors or specialised lenses that focus the direct radiation of the sun on a secondary absorber element, resulting in higher supply temperatures between 150°C and 400°C. Therefore, they are more suitable for large-scale applications, for example district heating networks and industrial processes.

Figure 2 Example of a system with flat plate collectors (Royalty-free image)

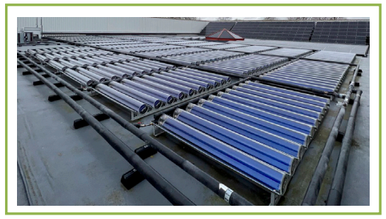


Figure 3 Example of a system with PVT evacuated tube collectors (Source: Naked Energy)

[2] sunlight scattered by clouds, dust, or other particles in the atmosphere

An EU-made technology

The solar thermal industry is well-established in Europe, with its origins dating back to the 1980s. The sector has a strong European manufacturing base, meeting 90% of the current domestic demand for solar thermal systems. This is true for the final systems, but also for the sector's value chain, which in turn ensures price stability and resilience to external shocks, whether economic or geopolitical. This is shown in Figure 4 which provides an overview of solar thermal manufacturing sites present in Europe – in total more than 100 – , be it for the production of comprehensive solar thermal systems or components of those (e.g. collectors, solar water storage tanks). Although there are some large manufacturers in the field, the vast majority of these companies are Small and Medium-sized Enterprises.

Geographical list of EU-based Solar Thermal Manufacturers/Manufacturing sites (collectors and components) September 2025:

Austria
- Cona
- Gasokol
- GREENoneTEC
- Hoval
- Siko Solar
- Solarfocus
- Sonnenkraft
- Technische Alternative
- Winkler Solar

Cyprus
- Arsos Therm
- C & K Kyriakou Bros
- Elcora
- Floga Solar
- Gasos
- Geosun
- Ilisa
- Johnsun Heaters
- Kafson Solar Heaters
- K.Theocharides Eco-Solar
- Lavra Solar Systems
- Metalco (Heaters)
- Solar Heaters Lux
- Sunergy
- Theohalko Solar
- Thriamvos
- Thylen Solar Systems
- Velpa

Czech Republic
- Gasokol

Finland
- Jaspi
- Meriaura Energy

France
- Alto Solution
- Dualsun
- Giordano R Energy
- HelioFrance
- Solisart
- Syrius Solar Industry Group
- Viessmann

Germany
- Akotec
- Alanod
- Almeco
- Aquasol Solar Techniek
- Bosch
- Capito Heiztechnik
- Citrin Solar
- Consolar
- Frenell
- Grammer Solar
- Protarget
- Ratiotherm
- Reinhard Solartechnik
- Ritter Solartechnik
- Solab
- Soliterm
- Solvis
- Sunmaxx
- TWL Technologie
- Wacher Chemie
- Wagner Solar

Greece
- Alpha Therm
- Antonakakis
- Bartec
- Calpak
- Cosmosolar
- Dimas
- Helioakmi
- Helional
- Lato
- Maltezos
- Papaemmanouel
- PrimeLaserTech
- Prisma Therm
- Refenergy IKE
- Sammler
- SIE I.K.E
- Sieline
- Sole
- Sonne Aktion
- Thermicsol
- Thermit Ecology
- Venman
- Xafis

Italy
- Ariston
- Avalen
- EDN Energia
- Immergas
- Naked Energy
- Pleion
- TVP Solar

Netherlands
- Escom
- G2 Energy
- HR Energy
- Solar Energy Booster
- Triple Solar

North Macedonia
- Camel Solar
- EcoSolar
- Euroterm
- Zrak

Poland
- Energetyka Solarna Ensol
- Galmet
- Hewalex
- Sunex
- Kospel
- Projprzem Eko
- Skorut Systemy solarne

Portugal
- Bosch
- Oliveira e Irmão
- Openplus

Spain
- Abora Solar
- BDR Thermea
- Delpaso Solar
- ENDEF
- Iaxxon energias
- Lapesa
- Orkli
- Promasol
- Termicol

Slovakia
- Greentechsolar
- Thermosolar

Sweden
- Absolicon

Switzerland
- Weishaupt
- Soblue

United Kingdom
- Naked Energy

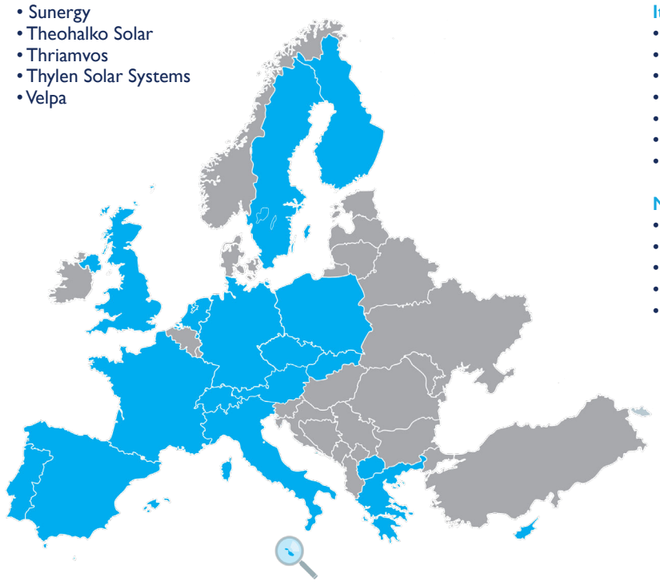


Figure 4

Overview of EU-based Solar Thermal Manufacturing sites, September 2025 (Source: Solar Heat Europe). For more information and latest updates, please visit https://solarheateurope.eu/market/our-industry-2/

The Clean Industrial Deal: an opportunity to support EU-made solar thermal

In a context of high energy costs and fierce global competition, the Clean Industrial Deal, launched by the European Commission in February 2025, should protect the competitiveness of European manufacturers producing clean technologies, such as solar thermal, while delivering on the decarbonisation goals.

To achieve this, the European clean tech Small and Medium-sized Enterprises (SMEs) should be supported by means of measures ranging from direct investment support to new mechanisms providing technical and logistical support for new investments, innovation programmes and export activities. Moreover, resilient and circular supply chains should be supported for solar thermal, as it already uses abundant and recyclable materials, such as glass, aluminium, metal, and copper.

Additionally, European manufacturers export their solar thermal solutions all over the world, guaranteeing high quality standards across the globe and contributing to the EU's competitiveness.

Solar Keymark: high quality standards across the world

The Solar Keymark contributes to the spread of European standards across the world. Used in Europe and recognised worldwide, this voluntary third-party certification mark for solar thermal products ensures that a product is conform to the relevant European standards on safety, quality, performance and durability, while also fulfilling additional requirements. It was developed by Solar Heat Europe and CEN (European Commitee for Standardisation) in close co-operation with leading European test labs, certification bodies, and with the support of the European Commission.

The Solar Keymark
CEN Keymark Scheme

More info on https://solarkeymark.eu/

The benefits of solar thermal

User benefits: emission free and affordable

Firstly, solar thermal systems deliver important public health benefits because they are emissions and pollutant free and thus do not deteriorate air quality. Indeed, throughout their operational life, solar thermal systems produce heat exclusively from solar radiation, emitting no greenhouse gases or air pollutants. This reduction in harmful emissions supports healthier indoor and outdoor environments, which is essential given the well-documented impact of air pollution on respiratory illnesses and overall public morbidity and mortality. Consequently, the widespread adoption of solar thermal heating aligns with broader European objectives to promote sustainable, healthy communities while advancing climate goals.

Secondly, solar thermal heating offers consumers a smart, long-term solution to rising energy costs. With a single upfront investment, households and businesses can secure more than 20 years of free, renewable heat — produced without CO_2 emissions and with very low maintenance. Once installed, solar thermal systems harness the sunlight to deliver hot water and space heating reliably and efficiently. When combined with existing heating systems, such as heat pumps or condensing boilers, they reduce overall energy consumption — directly lowering energy bills. Because solar thermal systems have very low operating costs and long lifespan, the levelized cost of solar heat — the average cost per kilowatt-hour over time — is extremely competitive. This makes solar thermal not only a climate-friendly choice, but also one of the most economically sound energy investments available today.

Energy security benefits: decentralised and local

Decentralised solar thermal systems effectively address local heating demands while enhancing the resilience and security of energy supply. Once installed, solar thermal collectors harness solar energy independently, without requiring fuel or electricity to operate. As such, renewable heat generated by these systems constitutes a local resource.

When deployed at scale across buildings and industrial sectors — both grid-connected and off-grid — solar thermal technology can substantially reduce Europe's reliance on imported fossil fuels. This transition not only strengthens the European Union's energy sovereignty but also safeguards industries and consumers from the uncertainties and price volatility inherent in global energy markets.

Figure 5

Solar thermal systems deliver significant benefits for users and for energy security (Source: Gasokol)

Environmental benefits: emission free, resource & energy efficient

Solar thermal technologies deliver substantial environmental benefits throughout their entire lifecycle, from commissioning to decommissioning, by significantly reducing CO_2 and other greenhouse gas (GHG) emissions associated with thermal energy production.

Fundamentally, solar thermal systems rely on a renewable and inexhaustible energy source — the sun. As such, they contribute directly to the EU's decarbonisation goals, including the targets set under the Energy Efficiency Directive (EED) and Renewable Energy Directive (RED). The integration of solar thermal with other renewable-based systems (e.g., biomass boilers, heat pumps...), as well as with adequate Thermal Energy Storage systems ensures continuity of heat supply during periods of low solar irradiance, thereby enhancing system resilience and flexibility (see section on technical benefits).

During the operational phase, solar thermal collectors convert solar radiation into thermal energy with no direct emissions of CO_2 or harmful pollutants. Additionally, solar thermal systems exhibit high conversion efficiencies — particularly in low- to medium-temperature applications — making them one of the most energy-efficient renewable heat technologies currently available.

Notably, solar thermal technologies achieve among the shortest carbon payback periods in the renewable energy sector, meaning that the emissions associated with manufacturing, installation, and distribution are offset rapidly by the avoided fossil fuel use during operation. This, combined with long system lifespans and recyclability of components (such as glass, metal, and selective coatings), highlights the key role that solar thermal can play for a circular, sustainable heating economy.

The carbon payback time of solar thermal systems is of 1 year, on average. This means that a solar thermal system generates in one year the equivalent to the energy required to source the materials and to produce such system.

Figure 6 **Circularity of solar thermal raw materials (Source: Solar Heat Europe)**

Moreover, solar thermal panels are highly durable, with a typical operational lifespan of 25 to 30 years, during which they continue to deliver clean, renewable heat with minimal degradation. At end-of-life, the systems also offer strong circular economy benefits: more than 95% of the mass and volume of a solar thermal panel is recyclable. This high recyclability is due to their composition, which includes readily recyclable materials such as stainless steel, copper, aluminium, rockwool, polyurethane and glass (see Figure 6).

All these characteristics make solar thermal technology a key enabler of a sustainable, low-carbon heating sector.

Technical benefits: potential hybridisation with any other energy source

Solar thermal solutions can easily be combined with other efficient, renewable-based heating technologies. This is especially interesting in higher latitudes to accommodate the less radiation in winter than in the summer and provide the required heat also when the days are shorter.

By combining an existing central heating system with a solar heat system, significant savings can be achieved. In the case of a condensing boiler, the saving on fuel is somewhere between 10% and 30% depending on the insulation levels of the building, with even greater savings in highly insulated buildings. Schematics of how hybrid systems combining solar thermal and a heat pump work, are to be found in Annex I.

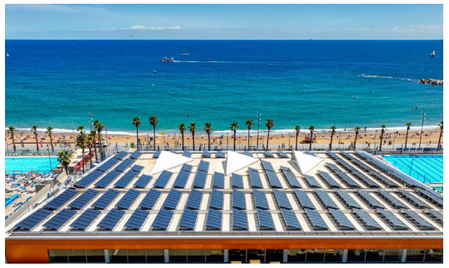
This compatibility with other technologies is a strong advantage for consumers, as it allows them to plan building renovations in stages, reducing the working of the supporting technology with increasing insulation levels. This approach does not only gradually increase the energy efficiency, it also allows consumers to spread their investments, making renovations more affordable.

The contribution of solar thermal to the total heat demand in a given building will vary, depending on the building's energy needs, local climate conditions and further factors[3].

The benefits of hybridisation[4] are illustrated with real-life examples (see Figure 7), showing the potential for using solar thermal energy in many different geographical and irradiation areas (Austria, Spain, UK, etc.).

Racibórz' multi-family buildings (PL) – Solar thermal panels and heat pumps

Large surface collectors designed for thermak energy storage installations were installed in Racibórz. The installation comes with heat storage tanks and heat pumps.



Barcelona's swimming club (ES) – PVT panels, and an auxiliary gas system

The club's rooftop carries 1,041 hybrid solar PVT panels significantly reducing the building's CO_2 emissions while also cutting electricity and gas bills of the facility.

[3] https://www.effizientesheizen.de/ (for more details, see Annex II)

[4] Hybridisation: combining two or more heat generators relying on different energy sources

Single family home in Vienna (AT) – Solar thermal panels and a heat pump

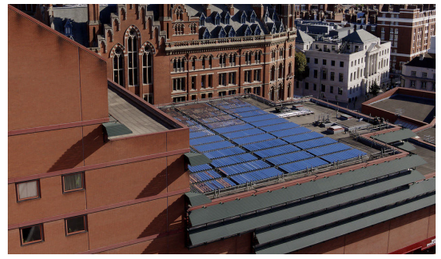
This 300 square meter single-family home in Vienna was converted to Passive House standards in 2016. The heat supply is provided by a combination of clean heat technologies being solar thermal and a heat pump with geothermal probes.

Belluno's student residence (IT) – PVT panels and biomass

32 hybrid PVT panels supply the student residence with clean heat and electricity all year round. Additionally, they work in combination with a biomass boiler.

La Marseillaise, 39 flats in Nantes (FR) – Solar thermal and heat pumps

The 66 m² of hybrid PVT collectors are combined to 2000 liters Thermal Energy Storage, and a large heat pump. Smart and connected regulation.



The British Library (UK) – Solar thermal, PVT panels, and an auxiliary gas system

240 PVT and 710 solar thermal evacuated tube drive the renewable heat installation of the British Library.

Vienna's fossil free quarter's (AT) – Solar thermal and geothermal heat pumps

The heating is provided by heat pumps and 304m² of unglazed solar absorbers, which regenerate 64 geothermal probes.

Figure 7 **Case studies of hybridisation with solar thermal solutions in different countries. For more case studies, please visit:** https://solarheateurope.eu/resource-center/case-studies/

The solar thermal market: the current market and growth potential

Current deployment of solar thermal

Because of its many benefits, solar thermal technology is used worldwide. The Solar Heating and Cooling Programme of the International Energy Agency (IEA SHC) reports[5] a total of 126 million solar thermal systems installed worldwide in 2024, producing 443 TWth. That year, the top markets installed in terms of installed capacity were China, Turkey and the United States, followed by Brazil and Germany.

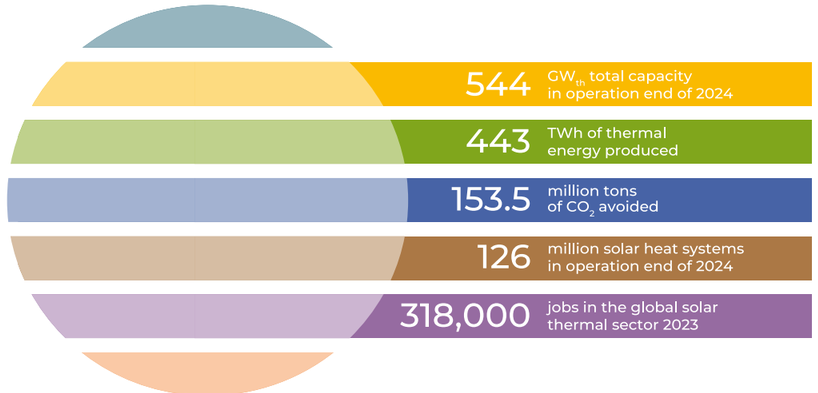


Figure 8

Solar heat on a global scale, key figures (Source: iea-shc.org)

Zooming in on Europe, it becomes clear that solar thermal technology is spread out heterogeneously. The biggest markets in terms of installed capacity are Germany, followed by Greece, Italy and Spain, then Austria (see Figure 9, right). On a per capita basis, Greece and Cyprus are the biggest users of solar heat in Europe, followed by Austria, then Denmark (thanks to their vast number of solar heat district heating networks) (see Figure 9, left). Altogether, solar heat technology accounts for more than 12 million systems installed across Europe in 2024, producing 43,6 GWth, most of these relating to the building market segment[6].

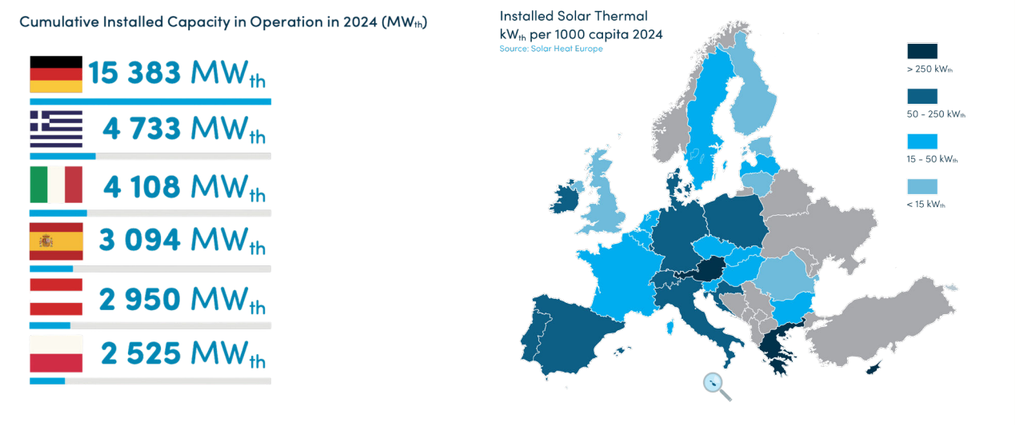


Figure 9 **Left: solar thermal installed capacity in top 5 EU countries; Right: solar thermal per capita. (Source: Solar Heat Europe)**

[5] IEA Solar Heating & Cooling Programme | www.iea-shc.org/solar-heat-worldwide

[6] Source: Solar thermal Market Outlook 2024/2025. To access the full report, visit https://solarheateurope.eu/market/market-data/solar-heat-europe-reports/

Solar thermal potential

Consensus exists that there is still a lot of potential for the deployment of solar thermal solutions. Indeed, several organisations report the potential for solar thermal to grow in the pathway towards reaching the global and European climate goals.

On a global level, the International Energy Agency (IEA) have indicated a strong potential and growth trend for the deployment of solar thermal solutions in buildings of around 50% (+0,9 EJ versus 2022) by 2030[7] (see Figure 10).

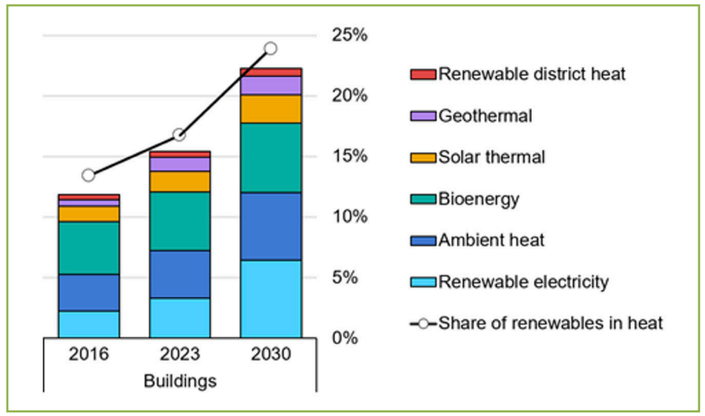


Figure 10

Modern renewable heat consumption and share of renewables in heat, 2016-2030 (Source: IEA)

Focusing on the European market, the Commission estimates that in order to reach the EU 2030 and 2050 decarbonisation targets, the share of final energy demand for space heating, cooling and hot water in residential and tertiary buildings covered by solar thermal should increase from 2% nowadays to 4% by 2030 and 10% by 2050 respectively[8]. Furthermore, the EU solar energy strategy released in 2022 calls for a tripling of the solar thermal capacity by 2030 versus 2019.

Solar heat in Europe by 2040

Market development projection by Solar Heat Europe

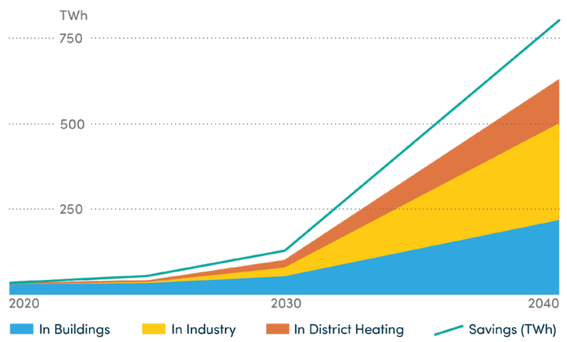


Figure 11 **Solar heat in Europe by 2040 (Source: Solar Heat Europe)**

SHE's roadmap[9] released in 2022 calls for the total installed solar thermal capacity in Europe to grow from 37,7 GWth in 2020 up to 2000 GWth by 2050. The largest growth potential is for the industrial sector, where solar thermal can reach 36 GWth by 2030 and 1125 GWth by 2050. In the buildings segment as well, there are major development prospects, as the installed capacity could reach 73 GWth in 2030 and over 500 GWth in 2050. For district heating, solar thermal can reach 31 GWth by 2030 and approximatively 375 GWth by 2050 (see Figure 11).

These opportunities for the deployment of solar thermal in Europe translate into different growth potentials at national level, depending among others on the already installed capacity and on the local climate. According to the European Commission, to reach 10% by 2050, a country like Poland will need to increase its share of solar thermal heating from 2% to nearly 8%, Portugal from 6% to 26%, and Germany will have to scale up its deployment by ten by the year 2050[10].

[7] https://www.iea.org/data-and-statistics/charts/global-modern-renewable-energy-use-for-buildings-related-heating-and-share-of-total-heat-con sumption-in-buildings-in-the-net-zero-scenario-2011-2030

[8] Renewable heating and cooling pathways – towards full decarbonisation by 2050, Oeko, Frauenhofer ISI, TU Wien, E-think and Halmstad University, February 2023 for the European Commission, DG Energy

[9] Energising Europe with Solar Heat- A solar thermal Roadmap for Europe (2022) Solar Heat Europe (Energising-Europe-Solar-Heat-STroadmap20302.pdf)

[10] Renewable heating and cooling pathways – towards full decarbonisation by 2050, Oeko, Frauenhofer ISI, TU Wien, E-think and Halmstad University, February 2023 for the European Commission, DG Energy

Policy context and opportunities

How can solar thermal systems further unlock their growth potential? What measures have been taken by the policy framework so far, and what additional actions can be implemented to propel their advancement?

EU policy context

By signing the Paris Agreement of 2015, the EU pledged to fight climate change and ensure that global average temperature increase should not exceed 1.5°C by the end of the century. To implement this agreement, the EU launched the European Green Deal[11] in 2019, a package of policy initiatives which set the EU on the path to a green transition, with the goal of decreasing carbon emissions by at least 55% by 2030 and reaching climate neutrality by 2050. The speed with which Europe planned to move away from fossil fuel dependency was accelerated in 2022, with Europe's response - the REPowerEU plan[12] - to energy crisis due to Russia's invasion of Ukraine. This plan includes the EU solar energy strategy, which aims at tripling the solar capacity- including solar thermal- by 2030 in comparison to 2019.

Altogether, these strategies resulted in several key legislative initiatives, such as the Energy Performance of Buildings Directive[13], the Energy Efficiency Directive[14], the Renewable Energy Directive[15] and the Net Zero Industry Act[16], that include measures to accelerate the deployment of solar thermal technologies at national and local level (see more details in the box below).

How is the EU supporting the uptake of solar thermal in Europe?

The energy performance of buildings directive (EPDB) foresees that Member States should ensure the deployment of solar technologies – both solar thermal and photovoltaics - in various building types, by specific deadlines. Solar Heat Europe released a guidance for its optimal implementation by Member States (see more details in Annex II).

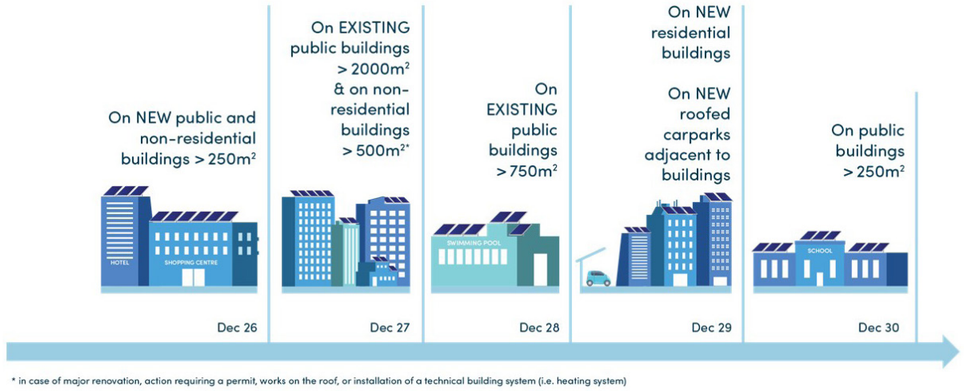


Figure 12 Detailed timeline for the deployment of solar energy installations per building type (Source: visual by Solar Heat Europe, based on the text of the Energy Performance of Buildings Directive)

[11] COM/2019/640 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions- The European Green Deal

[12] COM/2022/230 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions- REPowerEu Plan

[13] Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (recast)

[14] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast)

[15] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652

[16] Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724

Barriers

Despite the already existing recognition and support for solar heat technologies, there are still major barriers for their deployment. These include the low visibility of solar thermal in public policies; the lack of stable financial incentives; some local and national building codes constraints; and the lack of qualified installers.

First, **awareness and strong political support** for solar thermal technologies are essential at both EU and Member State levels. Despite the many benefits of these technologies, the focus is and has often been on photovoltaics in policy debates. This is because the increase of renewable energy - with specific targets - already focusses on electricity generation since 2001[17], while for heating this only came after 2018[18]. Since the heating sector now has clear targets to increase their share of renewables, and because buildings have different needs in terms of hot water versus electricity, more emphasis needs to be put on solar thermal technologies.

The solar thermal industry also faces some confusion with photovoltaics, which is sometimes considered a simpler technology to adopt.

Solar thermal and solar photovoltaics: Two complementary technologies

Solar photovoltaics produce electricity. Solar thermal technologies produce hot water and heat. Both technologies can share the rooftop space, providing different and complementary energy needs.

Solar thermal systems require **three times less space** to produce the same amount of energy compared to photovoltaics. However, since buildings have different needs, one technology is often better suited than the other. As an example, some buildings such as hospitals, nursing houses, residential buildings and sports centers have a much higher need for hot water and heating than for electricity, thus, for those, solar thermal would make more sense.

Figure 13 Example of a rooftop combining a solar thermal system with photovoltaics (Source: Abora Solar)

Second, the lack of **clear, stable financial incentives** for the purchase of a solar thermal system is decreasing the appeal of solar thermal solutions for the consumer. Indeed, although they are cost-efficient, they are often combined with other heating systems. Without financial incentives for the purchase and installation of a solar thermal system, consumers will only focus on the replacement of their main heating system without considering a solar thermal addition. On top of that, if financial incentives exist for solar thermal systems, they are often short term and complex, because of their design and limited budget coupled to them. This creates confusion for consumers, who tend to adopt a "wait-and-see" attitude, postponing their purchasing decision to a later point.

Third, in certain regions or cities in the EU, an additional challenge is posed by **local restrictions** or limitations on the installation of solar panels. In some parts of Portugal, local building codes prohibit homeowners from installing solar panels - both solar thermal and photovoltaic - in order to preserve the distinctive appearance of historic towns. Similarly, in Paris, almost 60% of buildings are protected by strict rules defined in the Plan Local d'Urbanisme (PLU), aiming at preserving their historical identity. These rules add significant complexity to the customer journey, thus making solar thermal technologies less attractive.

Lastly, when a consumer does decide to purchase a solar thermal system, the difficulty to find a **qualified installer** may pose a final challenge. Today, there are over 1.5 million installers of heaters in Europe. However, as the deployment of efficient and renewable technologies needs to accelerate, and while the current workforce is getting older, an additional 0,75 million installers will be needed by 2030, that is around 50% more than today[19]. Moreover, the installation of renewable-based appliances such as solar thermal requires new skills, that are not yet mastered by the entire workforce: for instance, in 2021, only 4% of heating installers in the Czech Republic and 2,5% of installers in Poland were certified to work with solar thermal. This lack of certified installers is slowing down the deployment of solar thermal.

[17] Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market

[18] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)

[19] See EHI's 2022 report "Heating system installers - Expanding and upskilling the workforce to deliver the energy transition"

Recommendations

In order to address the barriers mentioned above and to unleash the full potential of solar thermal, we recommend stable and clear financial incentives; increasing the visibility of solar thermal in public policies; revising local legislations and further improving the design of solar thermal panels; as well as upskilling and extending the installers workforce.

First, to increase **visibility of solar thermal technologies**, governments should treat them fairly, in their solar strategies considering their respective specific features. In practice, this means that national and local governments should base the optimal mix between solar thermal collectors and photovoltaic collectors on the specific needs of buildings. Moreover, financial incentives can be a powerful tool to raise the attention of consumers about the existence of solar thermal systems. Additionally, broad national or regional promotion campaigns in cooperation with the industry can play a significant role in increasing the visibility of solar thermal solutions.

Raising awareness at European level: the upcoming EU Heating and Cooling Strategy

To achieve long-term decarbonisation targets and reach climate neutrality in buildings by 2050[20], it will be essential to keep on building the right legislative framework at European level by further highlighting the role of solar thermal. In this regard, the upcoming Heating and Cooling Strategy, due in the first quarter of the year 2026, presents a key opportunity to raise awareness of policymakers on the untapped potential of solar thermal systems. To deliver on its objectives, the strategy should aim at supporting the demand for efficient and renewable-based heating technologies, such as solar thermal, and increasing the competitiveness of the industry.

More details on how to make the best out of the Heating and Cooling Strategy can be found in the corresponding European Heating Industry recommendations[21] and on the Solar Heat Europe website[22].

Rasing awareness at national level: good practice in Styria (Austria)

In 2023, the state of Styria doubled its subsidy for solar thermal collectors, recognising their many benefits. This enhanced subsidy led to a 55% increase in solar thermal installations that year.

Additionally, a promotional campaign was launched in early 2024 by the state of Styria, the State Guild of Installers, and the Association Austria Solar. The campaign included billboards, social media outreach and a series of articles in the state's highest-circulation newspaper, among other measures and led to doubling of the market over a two-year period.

Figure 14

Poster for the awareness-raising campaign in Styria (Credits: Austria Solar)

[20] Article 3 of the EPBD states that "*Each Member State shall establish a national building renovation plan to ensure the renovation of the national stock of residential and non-residential buildings, both public and private, into a highly energy-efficient and decarbonised building stock by 2050*".

[21] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14818-Energy-Heating-and-Cooling-Strategy/F33080838_en,

[22] https://solarheateurope.eu/.

Second, **effective financial incentives are key** to support the demand for solar thermal systems. In order to reap the benefits of solar thermal energy, incentive schemes should take into account both the investment costs and the operating costs of the various technologies. Operating costs for solar thermal energy being very low, it should help to reduce long-term costs.

These incentives should be simple to apply, stable and long term by means of a smart design. In order to allow market actors to get used to these subsidies, it is preferable to avoid stop-and-go measures and opt for predictability instead. Recommendations for a toolbox for such a smart design of incentives can be found in the next frame.

Specific recommendations for a toolbox on incentive schemes for solar heat technologies

Duration: should be aligned with the duration of incentives for other efficient and renewable-based heating systems that they can hybridise with. More specifically, the duration of the incentives should match the time it takes to ramp up their sales and reduce their cost due to economies of scale. This will encourage households to adequately plan the replacement of their heating system.

Scope and application:

- Focus not only on residential, but also on public buildings with a priority given to renovations.
- Have one single scheme with different modalities of application, depending on the types of building and financial capability of the buildings' owner.
- Cover a large scope of technologies, including solar thermal, various types of heat pumps, biomass and boilers, that are not powered by fossil fuels.

Beneficiaries: for all.

Type: right type of incentive to the right target:

- "Direct grants" allow for more targeted support and are more effective, simpler to navigate for all beneficiaries, including vulnerable households with limited financial resources.
- "Tax reduction" are less bureaucratic but they effectively support mainly the wealthier households.
- A mix of direct grants and tax reduction would be ideal to effectively support all population segments.
- "Zero-interest loans" are a good complementary measure.

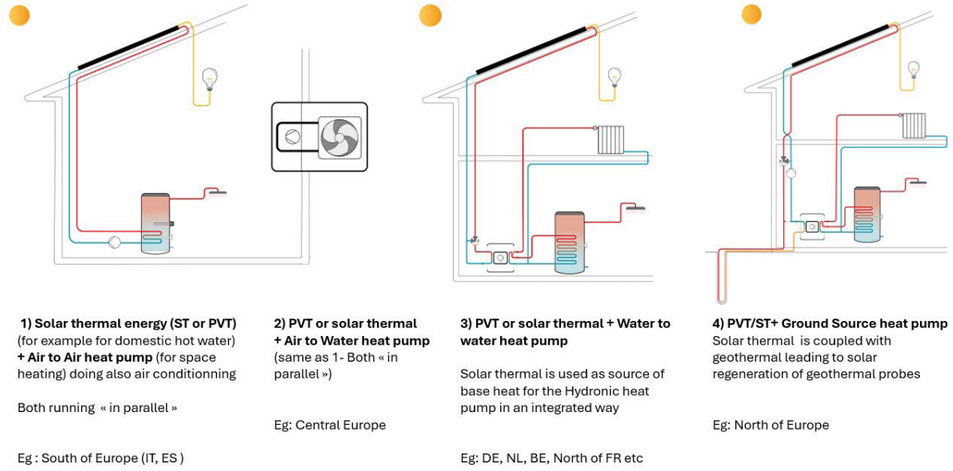
Level of support: should be adapted to the technology, the financial capability of the buildings' owner and the type of incentives.

Third, to **avoid barriers due to local restrictions or limitations**, at national and local level, countries should evaluate their local legislation and building codes and where possible - without endangering the cultural heritage - remove unnecessary barriers to the deployment of solar thermal. Additionally, manufacturers of solar thermal systems should continue advancing the development and roll out of solutions that seamlessly integrate into building surfaces or rooftops, remaining discreet and visually unobtrusive to maintain the architectural and aesthetic value of historical buildings and towns.

Lastly, to ensure the roll out of solar thermal at its full potential, governments should support the expansion and upskilling of the **installers network**. In the European Union, this effort should be supported at all levels (local, national and European), for instance by funding training programmes and by launching awareness raising programmes to attract new individuals to the profession. More suggestions on how to achieve this can be found in the European Heating Industry report on the role of installers in the energy transition of buildings[23].

[23] EHI 2022 report "Heating system installers- Expanding and upskilling the workforce to deliver the energy transition".

Annex I: Hybridisation of solar thermal with a heat pump: theoretical outline and simulations



1) Solar thermal energy (ST or PVT) (for example for domestic hot water) **+ Air to Air heat pump** (for space heating) doing also air conditionning

Both running « in parallel »

Eg : South of Europe (IT, ES)

2) PVT or solar thermal + Air to Water heat pump (same as 1- Both « in parallel »)

Eg: Central Europe

3) PVT or solar thermal + Water to water heat pump

Solar thermal is used as source of base heat for the Hydronic heat pump in an integrated way

Eg: DE, NL, BE, North of FR etc

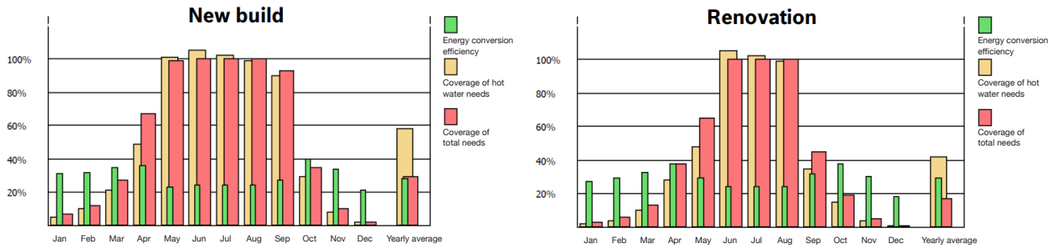
4) PVT/ST+ Ground Source heat pump
Solar thermal is coupled with geothermal leading to solar regeneration of geothermal probes

Eg: North of Europe

Figure 15 **As this illustration by Dualsun shows, solar thermal technology can be combined with all kinds of heat pumps, making it a perfect combination in all the climates found in Europe. The picture above is featuring a PVT panel on the rooftop but the same principle would apply with a classical solar thermal collector in terms of heat supply.**

With the project "Effizientes Heizen", the Fraunhofer ISE simulates the functioning of various combinations of heating technologies in several building types. Investigating among others the case of a new single family house located in Potsdam and using a combination of an air-to-water heat pump with solar thermal collectors, they find that solar thermal can contribute 60% of the needs in domestic hot water and 30% of the heating needs. What is more, the demand for domestic hot water and heating will be fully covered by solar thermal during the 4 summer months. This means that during these months, there is no need to use the heat pump. Similarly, in the case of a renovated single family house, the demand for domestic hot water and heating will be fully covered by solar thermal during 3 of the summer months[24].

Internal Simulations
Single Family House AW/HP+Solar



[24] The detailed assumptions for these simulations are to be found in the report of the project, available on the corresponding website: Effizientes Heizen

Annex II: Recommendations for the national implementation of EU existing legislation

The EU 'Fit for 55 Package' includes promising measures to decarbonise European buildings by rolling out efficient, renewable-based heating technologies, including solar thermal (see Figure 7). For this ambition to become reality, and to create a stable investment environment for the European industry, the emphasis should be on the adequate transposition of the package by European Member States in their national law.

Regarding the implementation of the article 10 of the Energy Performance of Buildings Directive (EPBD), which requires the deployment of solar technologies in various building types, Solar Heat Europe developed recommendations for national governments on how to formulate criteria in their national law. These recommendations can be found on Solar Heat Europe's website[25]. They include the need to take into account the energy needs of buildings (80% of those related to heating), and the need to consider the energy production of each technology. The guidance of Solar Heat Europe includes the three following options:

OPTION 1	OPTION 2	OPTION 3
Referring to a minimum coverage of energy needs	Based on a minimum energy generation capacity from solar technologies	Based on a minimum percentages of the rooftop to be used by the different solar technologies (PV, ST, and PVT)

We also recommend that local heating and cooling plans, to be developed in large municipalities as required by the Energy Efficiency Directive (EED), should consider all technologies and all energy carriers, including solar thermal technology. They should assess the heat demand and potential for solar thermal deployment.

Lastly, carbon pricing under the Emissions Trading System (ETS) for buildings also has potential to be a driver for the deployment of solar thermal. Indeed, applying a carbon price on the fossil fuels used in heating will increase running costs for appliances powered by these fuels, ultimately improving the business case for renewable fuels and renewable-based technologies, such as solar thermal. To protect vulnerable consumers, the revenues expected for the period 2030-2035 should be frontloaded by means of a temporary lending facility, where Member States could borrow the necessary funding to finance the support schemes mentioned above, and the decarbonisation of buildings in general.

[25] https://solarheateurope.eu/2025/05/20/solar-heat-europes-guidance-for-the-solar-mandate-epbd-art-10/

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