# Decarbonising heat with Solar thermal

## Market outlook 2022/2023

Solar Heat Europe
ESTIF

**40.5 $GW_{th}$**
Cumulative capacity in operation in Europe

**+12%**
market growth (2022 vs 2021)

**#Heatishalf**

# Heat is half of our current energy needs

## Giving heat the visibility it deserves...

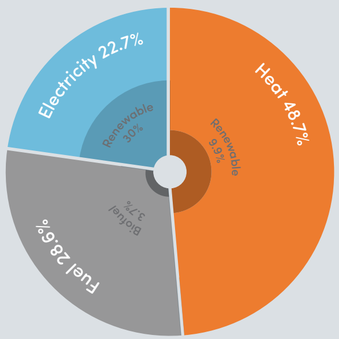
**Heat is half of the total energy that we need - far more than the energy required for fuel/ transport and electricity.**

**Despite this, only 10% of our heat worldwide is generated from renewable sources.***

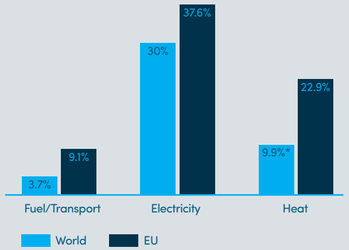
In addition, REN 21 reports that globally:

- demand for energy increased by +4% in 2021, based on more use of fossil fuels
- most national renewable targets are based upon electricity generation, not heat

Total final energy and total modern renewable energy share, by energy carrier, global data
(Source: REN21)




Share of Renewable Energy Sources (RES) Wordwide/Europe
(Sources: REN 21, Eurostat April 2022)




Europe is a clear role model in terms of roll out of renewable energies compared to the rest of the world. Yet, a great percentage still remains ahead to achieve the climate targets and $CO_2$ emission reductions, EU energy security and reduction of dependency from fossil fuel imports.

In addition, most policy measures implemented to date in Europe have essentially tackled the electricity agenda.

Energy demand grew

**4%**

**in 2021**

compared to the pre-pandemic level

**EU Renewable Energy Directive (RED) targets (2023):**

- Art. 3: Total share of RES sources in 2030: 42.5%, aiming for 45%
- Art. 23: Binding target for the share of RES for heating and cooling: Member States to increase by at least 0.8 percentage points annually (for 2021-2025) and by at least 1.1 percentage points annually (for 2026-2030).

**Giving more visibility to heat and its decarbonisation, notably through direct RES heat sources such as Solar Thermal, is therefore urgent and of utmost importance to:**

- **relieve pressure on the grid**
- **create a level playing field for all technologies.**

* Essentially biomass



# Solar Thermal:

## An obvious source of energy to provide hot water and heating for millions of applications, from individuals to professional users...

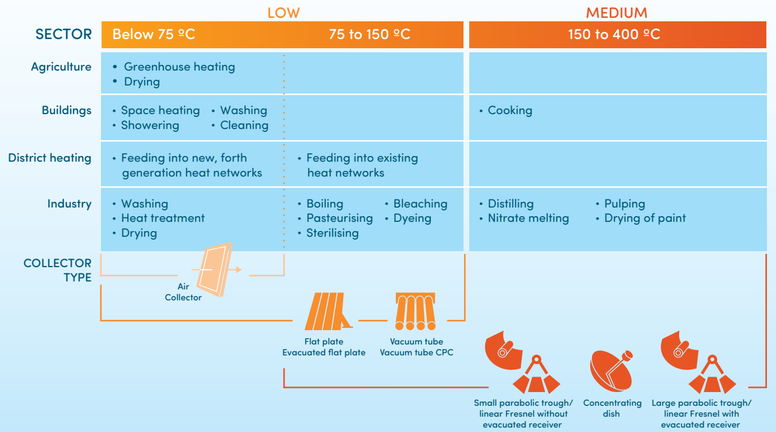
Solar thermal is based on a simple principle: capturing the free energy of the sun to deliver hot water and heat.

Members of Solar Heat Europe are proud of their a strong manufacturing base of solar thermal collectors in Europe, meeting 90% of EU demand and being a net exporter worldwide.

Technological innovation has resulted in various ways to harness solar thermal for domestic and industrial use. Certification, including the Solar Keymark Network, provides reassurance to consumers and public authorities.

**The Solar Keymark**
CEN Keymark Scheme

- Over 20 years of certification standards
- More than 1 150 certificates granted
- CEN scheme
- Transparent and open
- More than 300 stakeholders




## Why Solar Thermal?

A ready-to-deploy technology, from

**30°C** to **400°C**

A strong European manufacturing base meeting 90% of the EU demand, and a net exporter worldwide

**145.4 million tons of $CO_2$ saved per year** thanks to 115 million solar thermal systems installed worldwide

**> 95%**

**recyclable**

(copper, glass, stainless steel, aluminium)

# Residential buildings

## The needs

Space heating
64.4%

Water heating
14.5%

**80%** of the energy needs by EU households relate to space heating & water heating.

Both can be addressed by Solar Thermal but only a fraction (1.5%) currently are.

Lighting & electrical appliances 13.6%

Cooking
6%

Other uses
1.1%

Space cooling
0.5%

Source: Eurostat

**EU Renewable Energy Directive (RED) targets (2023):**

- Art. 15a (new): sub-sectoral target for the share of RES in buildings: 49% in 2030.
- Art. 15c: introduction of renewable acceleration areas, where permit-granting shall be further streamlined.
- Art. 16c: specific provisions regarding permitting for the installation of solar energy equipment and co-located energy storage assets.

Energy consumption for heating in buildings by source, global data, 2021 (Source REN 21)

**63%**
**fossil fuels & other**

**23%**
**traditional biomass**

**14%**
**renewables**

- **0.6%** Renewable district heat
- **1.0 %** Geothermal heat
- **1.5% Solar heat**
- **3.0%** Renewable electricity
- **3.6%** Ambient heat
- **4.6%** Modern bioenergy



# Residential buildings

## The solution: Providing hot water and heat directly from the sun's energy with Solar Thermal

More than **10 million** rooftops in Europe are equipped with solar thermal & thermal storage

Total installed capacity in Europe (mainland): **40.5 $GW_{th}$**

That's 58 million m² of collectors

Constituents of the total installed capacity in 2021
Source: Solar Heat Europe/IEA Solar Heating and Cooling Programme - Solar Heat Worldwide

| | Technology | % of total |
|---|---|---|
| Water-based solar collectors m² | Unglazed | 3.27% |
| | Flat Plate Collector | 87.68% |
| | Evacuated Tube | 8.92% |
| Air-based solar collectors m² | Unglazed | 0.05% |
| | Glazed | 0.08% |

Did you know that Super Bonus in Italy, or Ma Prime Rénove in France have been significantly supporting the increase of sales in residential buildings in 2022?

Total installed capacity in 2022: **1.63 $GW_{th}$** **+12%**

An increase of 2.2 million m²

Countries with largest increase of sales in 2022 (vs 21)

- +43%
- +36%
- +17%
- +11%
- +11%

Countries with the largest Solar Thermal installed capacity (in operation):

- 15 470 $MW_{th}$
- 3 808 $MW_{th}$
- 3 708 $MW_{th}$
- 3 053 $MW_{th}$
- 2 568 $MW_{th}$

# Did you know that Solar Thermal

## Has a 3x more efficient yield compared to solar photovoltaics.

Yet they can both share the same rooftops.

| | Rooftop area: | Solar energy produced in 1 year |
|---|---|---|
| Solar Thermal | 6.4m² | 3MWh/a |
| Solar PV | 15.4m² | 3MWh/a |

## Thermal storage is integrated as standard

Leading to much more efficiency of the whole system

From domestic water tanks of 300 litres, to seasonal storage of 65,000 m³ for district heating, Thermal storage is extremely cost efficient.

Solar thermal storage (Europe):

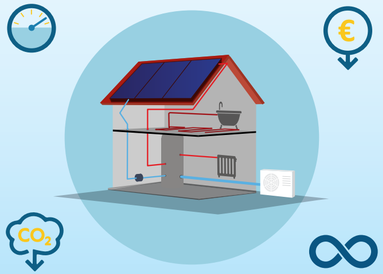
180GWh/a

## Can easily hybridise with a Heat Pump

Increasing the efficiency and durability of the whole system.

**Higher efficiency**
Hybrid HP+ST has more efficiency than a standalone heat pump

**Lower operating costs**
Reduces the electricity consumption of a heat pump



**$CO_2$ Reduction**
Solar thermal produces $CO_2$ -free energy, reducing the impact of the carbon content in the electricity supplied to the heat pump.

**Higher longevity**
Reduces the stress on the heat pump, hence increasing the lifetime of the heat pump

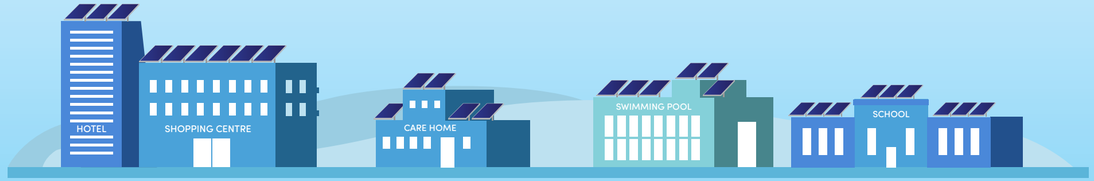


# Tertiary Buildings

Solar Heat Europe ESTIF

## PVT: A hybrid technology combining both PV and thermal

PVT technology is currently used on tertiary buildings including hotels, restaurants, leisure centers, and retirement homes. It is also applicable to residential developments.




## 2022 PVT data Highlights

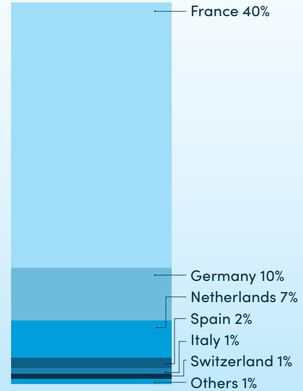
**950 155m²**
installed in Europe (FR, DE, NL, ES, IT)

**+9%**
on average globally between 2017 and 2022

**+414%**
**+126%**
**+52%**
versus 2021

Source : IEA Solar Heating and Cooling Programme, Solar Heat Worldwide

## Share of PVT capacity in Europe (in %)



# Industry Decarbonisation
## The needs

Industry represents

**33 %**
of the energy needs globally

**75%**
of these needs apply to heat


Source: REN 21

Industrial process heating in 2016 emitted 7.5 metric gigatons of $CO^2$

That's the equivalent to:

**15%** of all greenhouse gas emissions

About the same as the total emissions from the transportation sector

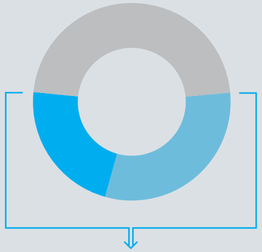
IEA reported that only 9% of the total industrial energy uses were based on renewables sources. 45% from Coal, 30% from Natural Gas, 15% from Oil.

Source: WBCSD/Bloomberg NEF report "Hotspots for Renewable Heat", Sep. 21

**Decarbonising industrial heat will play a key role in achieving net-zero targets**

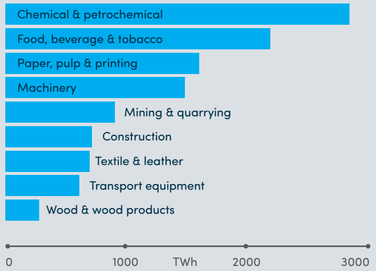
**EU Renewable Energy Directive (RED) targets (2023):**
- Art.22a: new sub-sectoral target for industry: average increase of 1.6 percentage points for the share of RES (for the periods 2021-25 and 2026-30).

Global industrial heat demand by temperature (2018)
(Source: IRENA, IEA)




**50%**
of the heat needs by temperature **can** be met by solar thermal applications i.e. from low- to medium-temperature

Demand for low- to medium-temperature heat in selected industries globally 2018 (TWh):




Source: IEA. Note: Demand for low- to medium-temperature heat in energy-intensive industry is excluded since it represents a small portion of the total and is usually available as a by-product of high-temperature heat.



# Industry Decarbonisation
## The transition, with Solar Thermal for heating and/or cooling needs

Solar Heat Europe ESTIF

**Worldwide data**:

**1 089**
Solar Thermal systems in operation
(of at least 50 $m^2$ collector area or 35 $kW_{th}$)

Covering

**1.22**
**million $m^2$**

Generating

**856 $MW_{th}$**

In 2022:

**114**
NEW systems were installed worldwide

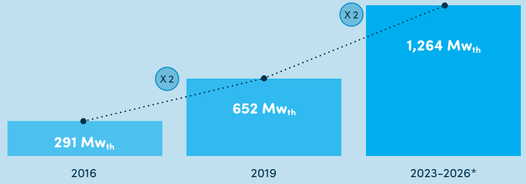
Generating

**30 $MW_{th}$**

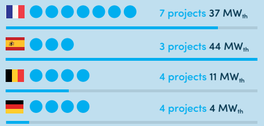
More details on 494 of these systems from ship-plants.info

Sources: IEA SHC, Solar Heat Worldwide

The outlook is bright: A doubling of capacity between 2016 and 2019 and a forecast of similar growth from 2019 - 2023/2026



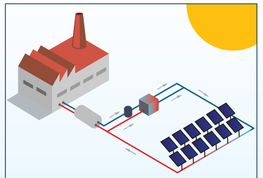

In Europe 31 projects in the pipeline totalling 146 $MW_{th}$. These include:




**99%**
of these 31 projects' capacity are developed by EU companies

The 62 projects worldwide apply to a vast number of industry applications:


*2023 - 2026 includes all announced projects at full capacity. Projects in China are not considered in this chart.
Source : Enquiry by Solrico, Sept 23. https://solarthermalworld.org/news/promising-solar-industrial-heat-outlook-2023-2026/



**What is SHIP?**
Solar Heat for Industrial Processes (SHIP) describes systems which provides solar heat in a factory. A collector field heats a process fluid, and a heat exchanger transfers this heat as hot water, air flow, or steam. Storage units enable this heat to be used when required.

Did you know that a SHIP project is currently being finalised in Croatia, partially benefitting from the EU Innovation fund?

# District heating

**282**
towns and cities in Europe use solar heat[1], with

**1 373 $MW_{th}$**
in operation

In 2023, the total number of District Heating networks existing in the EU reached 17,000[2]

Yet the share of Solar Thermal, based on total energy output, is only 0.5%.

**Solar Thermal has great potential as a route towards decarbonisation.**

1 source IEA SHC/solrico
2 source EHP

**81%**
of the total Solar District Heating networks in the world are in Europe

**EU Renewable Energy Directive (RED) targets (2023):**
- Art. 24: raises the indicative target for the share of RES and waste heat in district heating and cooling from a 1 percentage point increase to 2.2 percentage points (for 2021-2030).

Solar thermal district heating networks in operation by European country:


## Did you know?

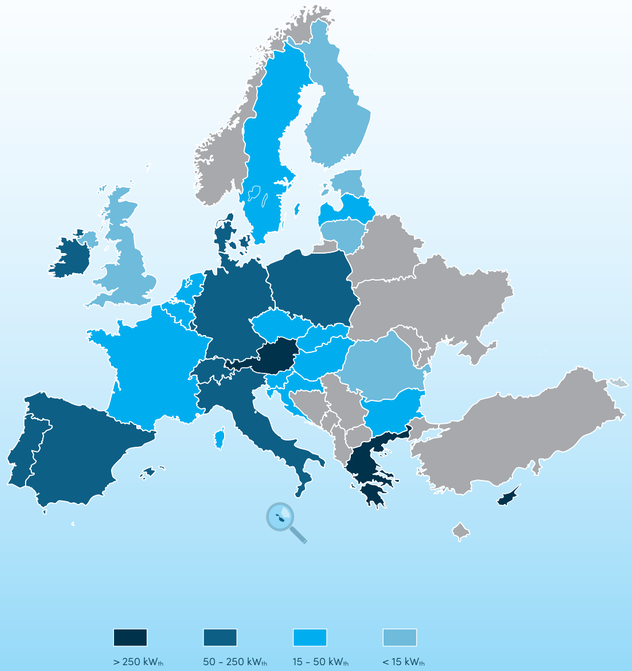
That in the Netherlands a 48,000m² project is under construction? This will be the fourth biggest district heating network supplied by solar thermal in the world, generating 37 $MW_{th}$.

In 2022 Germany's Solar Thermal-powered District heating capacity grew by **+30%** with 9 new systems + 8,000m² collector area generating 19.6 $MW_{th}$.

That out of the **20** biggest SDH in operation in the world, **16** are in Denmark, totalling an installed capacity of 394 $MW_{th}$.

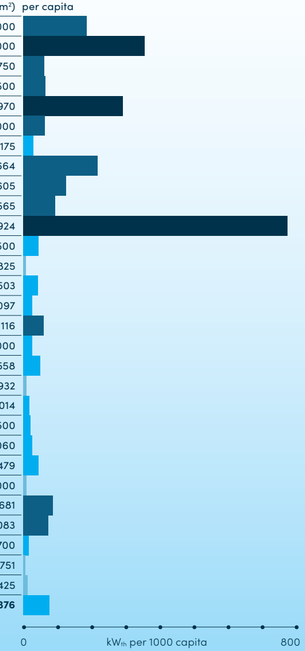


# Recap: Solar Thermal 2022
## Market overview - All applications




| Country | Cumulative Installed Capacity in Operation ($MW_{th}$) | Annual evolution 2022/2021 | New installed capacity in 2022 (in m²) |
|---|---|---|---|
| DE | 15 470 | 2% | 710 000 |
| GR | 3 808 | 5% | 419 000 |
| IT | 3 708 | 5% | 321 750 |
| ES | 3 053 | 2% | 145 500 |
| AT | 2 568 | -3% | 58 970 |
| PL | 2 354 | 6% | 210 000 |
| FR | 1 956 | 3% | 106 175 |
| DK + | 1 261 | -1% | 2 664 |
| CH | 1 072 | 0% | 24 605 |
| PT | 964 | 5% | 68 565 |
| CY | 676 | 5% | 73 924 |
| BE | 501 | 2% | 18 500 |
| UK | 495 | -2% | 4 825 |
| CZ + | 459 | 3% | 25 503 |
| NL | 443 | 2% | 42 097 |
| IE + | 292 | 0% | 1 116 |
| HU * | 258 | 3% | 14 000 |
| HR | 202 | 4% | 13 558 |
| RO * | 186 | 6% | 16 932 |
| SE | 180 | -5% | 2 014 |
| BG + | 150 | 7% | 18 500 |
| SK * | 142 | 5% | 14 060 |
| SL | 93 | 0% | 1 479 |
| FI + | 54 | 9% | 8 000 |
| LU + | 53 | 3% | 3 681 |
| ML + | 36 | -3% | 1 083 |
| LV * | 30 | 4% | 1 700 |
| LT * | 19 | 7% | 1 751 |
| EE * | 17 | 6% | 1 425 |
| **EU27 + CH + UK** | **40.501** | **2.6%** | **2 331 376** |

Use of Solar thermal per capita




* Solar Heat Europe estimations
\+ Based on the EurObserv'ER "Solar thermal and CSP Barometer" (2022).

# Solar heating & cooling
## Perspectives

## By 2030, solar heat in Europe has ambitions to provide:

Number of jobs
**250 000**

Sector turnover
**€24.3 billion**

Estimated energy storage capacity
**750 GWh**

Solar thermal systems in buildings
**21 million**

Annual $CO_2$ Emissions savings
**33.3 Mt $CO_2$**

Cumulative capacity in operation from
**40.5 $GW_{th}$**
now (2023)

to
**140 $GW_{th}$**
in 2030.

Annual energy savings
**125TWh$_{th}$**

Annual Gas consumption avoided
**12.1 BCM**

Source: Solar Heat Europe Roadmap, June 2022

### For more information on solar heating & cooling:

Global: **International Energy Agency - Solar Heating & Cooling Programme**
www.iea-shc.org

EU: **Solar Heat Europe**
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