Decarbonising heat with Solar thermal

Market outlook 2022/2023

40.5 GWth
Cumulative capacity in operation in Europe

+12%
market growth (2022 vs 2021)

#Heatishalf
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

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 CO2 emission reductions, 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.

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.

**The Solar Keymark**

CEN Keymark Scheme

- Over 20 years of certification standards
- More than 115 million devices certified
- CEN in charge
- Transparent and open
- More than 25 stakeholders

**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 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, provides reassurance to consumers and public authorities.

**Why Solar Thermal?**

A ready-to-deploy technology, from 30°C to 400°C

165.4 million tons of CO2 saved per year thanks to 115 million solar thermal systems installed worldwide

> 95% recyclable (copper, glass, stainless steel, aluminium)

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* Essentially biomass

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Heat is half of our current energy needs

Giving heat the visibility it deserves...

Total final energy and total modern renewable energy share, by energy carrier, global data

(Source: REN21)

| Energy demand grew | 4% in 2021 | compared to the pre-pandemic level |

Share of Renewable Energy Sources (RES) Worldwide

(Source: REN 21, Eurostat April 2022)

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Residential buildings

The needs

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

<table>
<thead>
<tr>
<th>Source:</th>
<th>Technology</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable district heat</td>
<td>Unglazed</td>
<td>3.27%</td>
</tr>
<tr>
<td>Flat Plate Collector</td>
<td>87.68%</td>
<td></td>
</tr>
<tr>
<td>Evacuated Tube</td>
<td>8.92%</td>
<td></td>
</tr>
<tr>
<td>Ambient heat</td>
<td>Unglazed</td>
<td>0.05%</td>
</tr>
<tr>
<td>Glazed</td>
<td>0.06%</td>
<td></td>
</tr>
</tbody>
</table>

Constituents of the total installed capacity in 2021

Water-based solar collectors m²

<table>
<thead>
<tr>
<th>Technology</th>
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Air-based solar collectors m²

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That’s 58 million m² of collectors

23% traditional biomass

- 0.5% Renewable district heat
- 1.0% Geothermal heat
- 1.5% Solar heat
- 3.0% Renewable electricity
- 3.5% Ambient heat
- 4.6% Modern bioenergy

14% renewables

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

More than rooftops in Europe are equipped with solar thermal & thermal storages

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Total installed capacity in 2022 (MWth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>+43%</td>
</tr>
<tr>
<td>France</td>
<td>+36%</td>
</tr>
<tr>
<td>Spain</td>
<td>+17%</td>
</tr>
<tr>
<td>Germany</td>
<td>+11%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Total installed capacity (MWth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>15.470 MWth</td>
</tr>
<tr>
<td>France</td>
<td>3.808 MWth</td>
</tr>
<tr>
<td>Spain</td>
<td>3.708 MWth</td>
</tr>
<tr>
<td>Germany</td>
<td>3.053 MWth</td>
</tr>
<tr>
<td>Austria</td>
<td>2.568 MWth</td>
</tr>
</tbody>
</table>
Did you know that Solar Thermal...

Has a 3x more efficient yield compared to solar photovoltaics. Yet they can both share the same rooftops.

Integrates thermal storage as standard
Leading to much more efficiency of the whole system.
From domestic water tanks of 300 litres, to seasonal storage of 85,000 m³ for district heating. Thermal storage is extremely cost efficient.

Can easily hybridise with a Heat Pump
Increasing the efficiency and durability of the whole system.
Higher efficiency
Hybrid HP-ST more efficiency than a standalone heat pump.
Lower operating costs
Reduces the electricity consumption of a heat pump.

Integrates thermal storage as standard
From domestic water tanks of 300 litres, to seasonal storage of 85,000 m³ for district heating. Thermal storage is extremely cost efficient.

Solar thermal storage (Europe): 

3 MWh/a

Higher efficiency
Hybrid HP-ST more efficiency than a standalone heat pump.

Tertiary Buildings

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.

Solar thermal storage (Europe):

3 MWh/a

2022 PVT data Highlights

- France 40%
- Germany 10%
- Netherlands 7%
- Spain 2%
- Italy 1%
- Switzerland 1%
- Others 1%

Share of PVT capacity in Europe (in %)

France 40%
+9% on average globally between 2017 and 2022
+414% versus 2021
+126%

Rooftop area:

Solar Thermal: 6.4 m²
Solar PV: 15.4 m²

Solar energy produced in 1 year:

Solar Thermal: 3 MWh/a
Solar PV: 180 GWh/a

CO₂ Reduction
Solar thermal produces CO₂-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.

CARE HOME  
SWIMMING POOL  
SHOPPING CENTRE  
HOTEL  
SCHOOL  

Source: IEA Solar Heating and Cooling Programme, Solar Heat Worldwide 2022 PVT data Highlights
Industry Decarbonisation

The needs

Industry represents
33% of the energy needs globally
75% of these needs apply to heat

Worldwide data

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

(Ref: preliminary estimates based on company data mid-2023)

In Europe 31 projects in the pipeline totalling 146 MWe
These include:

- 7 projects 37 MWth
- 3 projects 44 MWth
- 4 projects 11 MWth
- 4 projects 4 MWth

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


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

- Food
- Textile
- Beverage
- Chemical/Pharmaceutical
- Automotive
- Mining
- Agriculture
- Packaging
- Oil & Gas
- Water treatment
- Machinery
- Bricks & Ceramics
- Others

In Europe 31 projects in the pipeline totalling 146 MWe. These include:

- 99% of these 31 projects’ capacity are developed by EU companies

More details on 494 of these systems (incl. 197 in 40% from Europe) via ship-plants.info

Source: IEA SHC, Solar Heat Worldwide

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

Industry Decarbonisation

The needs

Industry represents
33% of the energy needs globally
75% of these needs apply to heat

Solar Thermal systems in operation
(of at least 50 m² collector area or 35 kWth)

Covering
1.22 million m²
Representing a capacity of
856 MWth

In 2022:
114 NEW systems were installed worldwide
With a capacity of
30 MWth

In Europe 31 projects in the pipeline totalling 146 MWe. These include:

- 7 projects 37 MWth
- 3 projects 44 MWth
- 4 projects 11 MWth
- 4 projects 4 MWth

What is SHIP?

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

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District heating

282 towns and cities in Europe use solar heat, with 1,373 MWth in operation.

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

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

Solar Thermal has great potential to be the route towards district heating decarbonisation.

Did you know?

In 2022 Germany’s Solar Thermal district heating capacity grew by +30%.

Out of the 20 biggest SDH in operation in the world, 16 are in Denmark, totaling an installed capacity of 134 MWth.

Solar thermal district heating networks in operation by European country:

<table>
<thead>
<tr>
<th>Country</th>
<th>Cumulative Installed Capacity in Operation (MWth)</th>
<th>Annual Evolution</th>
<th>New installed capacity in 2022 (MWth)</th>
<th>New installed capacity in 2022 (in m²)</th>
<th>New installed capacity in 2022 (kWth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>15</td>
<td>2%</td>
<td>710 000</td>
<td>497 000</td>
<td>11%</td>
</tr>
<tr>
<td>GR</td>
<td>3</td>
<td>5%</td>
<td>419 000</td>
<td>293 300</td>
<td>17%</td>
</tr>
<tr>
<td>IT</td>
<td>3</td>
<td>5%</td>
<td>321 750</td>
<td>225 225</td>
<td>43%</td>
</tr>
<tr>
<td>ES</td>
<td>3</td>
<td>2%</td>
<td>145 500</td>
<td>101 850</td>
<td>-3%</td>
</tr>
<tr>
<td>AT</td>
<td>2</td>
<td>-3%</td>
<td>58 970</td>
<td>41 279</td>
<td>-15%</td>
</tr>
<tr>
<td>PL</td>
<td>2</td>
<td>6%</td>
<td>210 000</td>
<td>147 000</td>
<td>11%</td>
</tr>
<tr>
<td>FR</td>
<td>1</td>
<td>3%</td>
<td>106 175</td>
<td>74 323</td>
<td>36%</td>
</tr>
<tr>
<td>DK</td>
<td>+ 1</td>
<td>-1%</td>
<td>2 664</td>
<td>1 865</td>
<td>-67%</td>
</tr>
<tr>
<td>CH</td>
<td>1</td>
<td>0%</td>
<td>24 605</td>
<td>17 224</td>
<td>-9%</td>
</tr>
<tr>
<td>PT</td>
<td>9</td>
<td>5%</td>
<td>68 565</td>
<td>47 996</td>
<td>-11%</td>
</tr>
<tr>
<td>CY</td>
<td>6</td>
<td>5%</td>
<td>73 924</td>
<td>51 747</td>
<td>5%</td>
</tr>
<tr>
<td>BE</td>
<td>5</td>
<td>2%</td>
<td>18 500</td>
<td>12 950</td>
<td>11%</td>
</tr>
<tr>
<td>UK</td>
<td>4</td>
<td>-2%</td>
<td>4 825</td>
<td>3 378</td>
<td>-14%</td>
</tr>
<tr>
<td>CZ</td>
<td>+ 4</td>
<td>3%</td>
<td>25 503</td>
<td>17 852</td>
<td>49%</td>
</tr>
<tr>
<td>NL</td>
<td>4</td>
<td>2%</td>
<td>42 097</td>
<td>29 468</td>
<td>38%</td>
</tr>
<tr>
<td>IE</td>
<td>+ 3</td>
<td>0%</td>
<td>1 116</td>
<td>781</td>
<td>-71%</td>
</tr>
<tr>
<td>HU</td>
<td>*</td>
<td>3%</td>
<td>14 000</td>
<td>9 800</td>
<td>0%</td>
</tr>
<tr>
<td>HR</td>
<td>2</td>
<td>4%</td>
<td>13 558</td>
<td>9 490</td>
<td>5%</td>
</tr>
<tr>
<td>RO</td>
<td>*</td>
<td>6%</td>
<td>16 932</td>
<td>11 852</td>
<td>3%</td>
</tr>
<tr>
<td>SE</td>
<td>1</td>
<td>-5%</td>
<td>2 014</td>
<td>1 410</td>
<td>3%</td>
</tr>
<tr>
<td>BG</td>
<td>+ 1</td>
<td>7%</td>
<td>18 500</td>
<td>12 950</td>
<td>-27%</td>
</tr>
<tr>
<td>SK</td>
<td>*</td>
<td>5%</td>
<td>14 060</td>
<td>9 842</td>
<td>5%</td>
</tr>
<tr>
<td>SL</td>
<td>0</td>
<td>0%</td>
<td>1 479</td>
<td>1 035</td>
<td>3%</td>
</tr>
<tr>
<td>FI</td>
<td>+ 5</td>
<td>9%</td>
<td>8 000</td>
<td>5 600</td>
<td>127%</td>
</tr>
<tr>
<td>LU</td>
<td>+ 5</td>
<td>3%</td>
<td>3 681</td>
<td>2 577</td>
<td>3%</td>
</tr>
<tr>
<td>ML</td>
<td>+ 3</td>
<td>-3%</td>
<td>1 083</td>
<td>758</td>
<td>-18%</td>
</tr>
<tr>
<td>LV</td>
<td>*</td>
<td>4%</td>
<td>1 700</td>
<td>1 190</td>
<td>3%</td>
</tr>
<tr>
<td>LT</td>
<td>*</td>
<td>7%</td>
<td>1 751</td>
<td>1 226</td>
<td>-37%</td>
</tr>
<tr>
<td>EE</td>
<td>*</td>
<td>6%</td>
<td>1 425</td>
<td>998</td>
<td>-29%</td>
</tr>
<tr>
<td>EU27</td>
<td>+ 2</td>
<td>2.6%</td>
<td>2 331 376</td>
<td>1 631 963</td>
<td>12.7%</td>
</tr>
</tbody>
</table>

Use of Solar Thermal per capita

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<tr>
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Recap: Solar Thermal 2022

Market overview - All applications

* Solar Heat Europe estimations
+ Based on the EurObserv’ER “Solar thermal and CSP Barometer” (2022).

1) The relation between collector area and capacity is 1m² = 0.7kWth (kilowatt-thermal)
2) Capacity “in operation” refers to the solar thermal capacity built in the past and deemed to be still in use. Solar Heat Europe/ESTIF assumes a 20 year product life for all systems installed since 1990. Most products today would last considerably longer, but they often cease to be used earlier, e.g. because the building was demolished, or there has been a change of building use.
3) The figures shown here relate to Metropolitan France (mainland). As a reference, in 2021 the newly installed capacity in overseas departments is estimated to be around 60 MWth (86 000 m²).

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

1) EU Renewable Energy Directive (RED) includes: - Art. 8.3: the indicative target for the share of BE in 2030 and annual heat output increase in percentage point to 2.2 percentage points (for 2031-2035).
2) EU Renewable Energy Directive (RED): • 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).

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

Solar Thermal has great potential to be the route towards district heating decarbonisation.

Did you know?

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, with a capacity of 37 MWth.

In 2022 Germany’s Solar Thermal district heating capacity grew by +30%.

9 new systems representing a collector area of 18,200 m² with a capacity of 19.6 MWth.

Out of the 20 biggest SDH in operation in the world, 16 are in Denmark, totaling an installed capacity of 134 MWth.

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 heating & cooling
Perspectives

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

- **Sector turnover:** €24.3 billion
- **Solar thermal systems in buildings:** 21 million
- **Number of jobs:** 250,000
- **Annual CO₂ Emissions savings:** 33.3 Mt CO₂
- **Annual Gas consumption avoided:** 12.1 BCM
- **Estimated energy storage capacity:** 750 GWh
- **Annual energy savings:** 125 TWh_th to 140 GWth in 2030.

Cumulative capacity in operation from 40.5 GWth now (2023) x3

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

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