Solar Heat Europe

Contribution from the EU Solar Thermal sector to the Call for Evidence on the upcoming Heating & Cooling Strategy

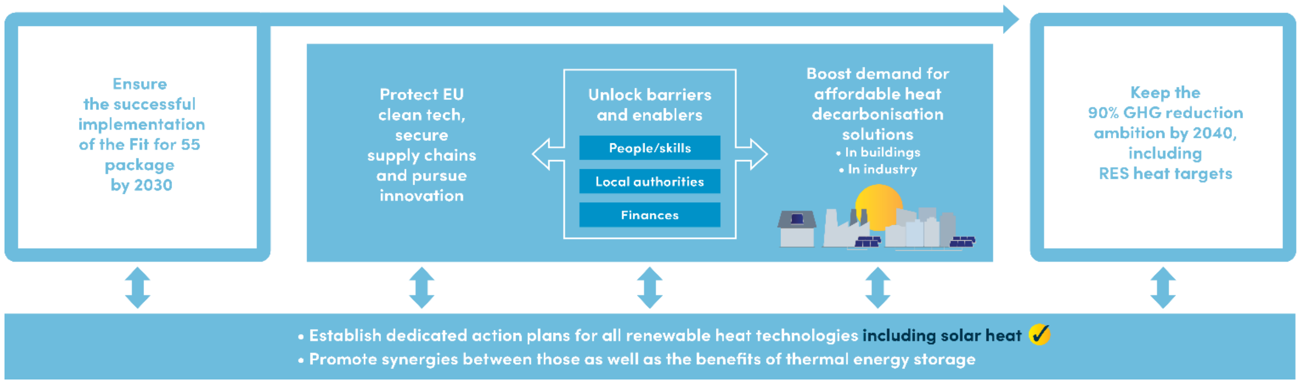
9th October 2025

EXECUTIVE SUMMARY:

The upcoming Heating & Cooling Strategy is essential to achieve the EU's **decarbonisation targets and ensure energy security**. Solar Heat Europe urges the European Commission to adopt a comprehensive and ambitious approach that prioritises the **deployment of available and EU-made renewable heat technologies**. Solar Heat Europe calls in particular for **dedicated measures to promote the uptake of solar thermal technologies** (see box below), in line with the Net Zero Industry Act objectives which aims at promoting and protecting EU clean technologies. Structured in 6 pillars, this document outlines key proposals. Here is a snapshot overview of those applying to all renewable heat sources:

1- Prioritise decarbonisation of heat via the use of direct renewable heat sources over electrification.
2- Establish a European Heat Fund for citizens, district heating and industry.
3- Organise EU and national awareness-raising campaigns highlighting the importance of heating and cooling.
4- Fund an EU Heat Observatory monitoring project pipelines, technology costs, and best practices.
5- Launch a Strategic Dialogue on heating and cooling decarbonisation.
6- Create EIB-backed loans on heat decarbonisation.

2026 Heating & Cooling Strategy – Key pillars



The Solar Thermal sector calls specifically for measures to:

1- Prioritise the use of **decentralised renewable heat sources** and the use of solar heat.

2- Lead awareness raising campaigns and **national strategies for solar heat**.

3- Set **targets for the use of Solar Thermal Technologies** (STT, including solar thermal and PVT) such as: tripling their use by 2030 in Buildings, achieving a 5% share of district heating supply by 2050, steer the development of Solar Heat in Industrial Processes for dedicated sectors.

4- Protect **EU's excellence** in Solar Thermal manufacturing, pursue research and promote exports and develop an **EU Solar Thermal Industry Alliance**.

5- Facilitate **permitting and access to finance**, especially for STT (having high CAPEX).

6- Include a **merit order for renewable heat technologies** regarding the access to finance.

7- Establish a '**Made in Europe preference**' in public procurement, especially for STT.

8- Encourage **technology coupling** using solar heat and other clean technologies as well as **thermal energy storage** to successfully achieve the transition.

INTRODUCTION

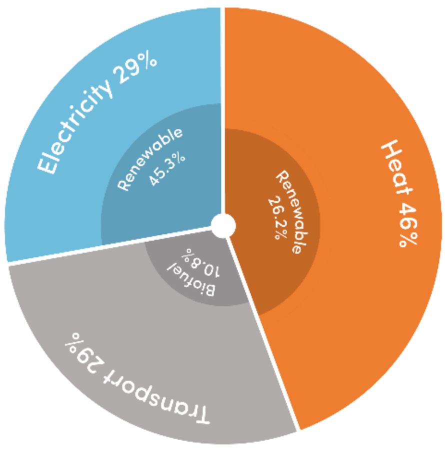
Heating and cooling, representing half of Europe's energy needs, have so far been an underestimated sector. Yet, they are an essential element to achieve the EU's **decarbonisation targets and ensure energy security**. The upcoming Heating & Cooling Strategy is therefore welcomed as it represents the opportunity to address this gap. Solar Heat Europe urges the European Commission to adopt a comprehensive and ambitious approach that prioritises the **deployment of available and EU-made renewable heat technologies**. Solar Heat Europe calls for **dedicated measures to promote the uptake of solar thermal technologies**, in line with the NZIA objectives whose aim is to promote and protect EU clean technologies.

This paper outlines our **key pillars for an effective strategy**: ensuring the robust implementation of the Fit for 55 package, establishing dedicated action plans – including for solar heat – while fostering synergies, securing the supply of EU-made clean technologies, boosting demand for affordable decarbonisation solutions in buildings and industry, unlocking persistent barriers, and maintaining a high GHG reduction ambition for 2040. By embracing these recommendations, the EU can accelerate its energy transition, bolster industrial competitiveness, and deliver affordable, clean energy to citizens.

Heating and Cooling: A priority energy need which must gain more awareness

The urgency of decarbonising Europe's energy system cannot be overstated, and at its core lies heating and cooling, which accounts for **half of our energy needs** – significantly more than electricity (29%) and transport (29%). Citizens and industrial users often underestimate this critical sector, yet its rapid transition is paramount for achieving **climate neutrality**, enhancing **energy security**, and safeguarding the **health and well-being** of European citizens. Giving more visibility to this **number one energy need** is key. For **households**, heating and cooling constitute **80% of energy needs** (15% domestic hot water and 65% for space heating), highlighting its importance for citizen's health, hygiene, better lives, and energy security. For **industry**, heating and cooling represent **60% of their energy needs**, requiring affordable and accessible energy to support Europe's competitiveness and reindustrialisation.

Total final energy and total modern renewable energy share, by energy carrier, European data (Source: Eurostat for year 2023)



- ⇨ ***The EU Heating & Cooling Strategy must help bring attention and awareness towards authorities, citizens, industries and investors on the key heating and cooling needs.***
- ⇨ ***By doing so, accompanied with key measures, this will help accelerate energy transition projects.***

The use of decentralised renewable heat sources should be a top priority of the H&C strategy

To implement an effective Heating & Cooling Strategy, the European Union must prioritise local heat generation. Direct renewable heat sources (DRHS) are mature and ready to deploy technologies (e.g. solar thermal, geothermal, biomass). Most of these are **manufactured in Europe**, ensuring local economic growth and creating jobs. For instance, the **solar thermal sector meets 90% of European demand with EU-made products**, demonstrating significant potential for job creation and economic benefit within the Union. In addition, such technologies contribute to energy decarbonisation whilst relieving pressure on electricity grids.

➩ ***Prioritise the deployment of renewable heat sources over electrification.***
➩ ***Propose dedicated measures to foster the development of direct renewable heat technologies such as solar heat.***

EU-made renewable heat technologies contribute to energy security and must be supported

EU clean technologies such as solar thermal are a clear asset for **European competitiveness and access to secure energy sources**. The local production of solar thermal technologies (m**ore than 100 manufacturers in Europe**) not only guarantees high-quality products for customers but also reinforces the resilience of value chains. As such, the solar thermal sector is a key enabler towards **EU's energy security and sovereignty goals**.

➩ ***Public financing and taxation policies must be designed to favour EU clean technologies.***
➩ ***Prioritise the uptake of clean tech products "made in Europe" (e.g. in public procurement).***
➩ ***Pursue EU-based research & innovation for EU clean technologies related to heating & cooling to promote EU's leadership and competitiveness.***

Coupling solar thermal with other technologies enhances system performance and flexibility

Solar thermal, geothermal, biomass, waste heat, renewable gases and hybrid combinations of those are all relevant solutions to decarbonise the energy system**. These technologies can work together and create synergies**, thus leading to greater efficiency. To strengthen the decarbonisation of the European heating and cooling system, coupling solar thermal with adequate complementary technologies should be a key focus. **Solar thermal systems can also efficiently work alongside electricity-based solutions**, optimising renewable energy use and reducing load on electrical grids (e.g. solar thermal and heat pumps). Moreover, **Thermal Energy Storage (TES)** – the most cost-efficient storage technology – is already used in millions of solar thermal systems, at buildings level or in large-scale installations. TES is commonly shared by the different renewable heat solutions and is an essential asset to bring flexibility to the energy supply, acting as an enabler of technology integration. **These combinations increase overall system energy efficiency** and enhance the performance and resilience of the heating system as a whole.

➩ ***Stimulating technology coupling and system integration to reach 2050 targets.***
➩ ***Reflect appropriately the benefits of Thermal Energy Storage to provide flexibility and technology integration. It is pivotal to the energy transition and should be central to the EU Heating & Cooling Strategy.***

Solar thermal enables affordable and predictable heating costs

Affordability must be at the core of the Heating & Cooling Strategy, and solar thermal technologies offer a strong advantage in this regard. By harnessing **free energy from the sun**, solar thermal ensures predictable and stable heating costs over time, unlike volatile gas and electricity prices. Although the technology involves a one-off investment, the **long lifetime of collectors** (more than 25 years) and very low maintenance costs make it a highly cost-effective solution.

➩ ***Develop financial mechanisms to secure a level playing field between technologies (high CAPEX & low OPEX vs. low CAPEX & unpredictable OPEX).***
➩ ***Ensure that all actors involved in projects get access to transparent information on both CAPEX and OPEX of heat technologies.***

PILLAR 1: Ensure adequate support for the successful implementation of the Fit x 55 package by 2030

The Fit for 55 package is EU's compass towards 2030's 55% GHG's emission reduction vs 1990. The solar heat sector is committed to its successful implementation. Its robust and timely application is essential to create a stable regulatory environment and foster investment in renewable heat solutions. It is key that Member States implement these measures, enabling the EU to effectively meet its climate targets.

Actionable measures to be led at EU level:

- Monitoring and steering progress at EU and national level:
  - Ensure that **ambitious targets and concrete measures** are included in the **NECPs** regarding heating and cooling.
  - Establish **monitoring mechanisms** to support a clear, integrated and updated overview of the **heating and cooling decarbonisation in the EU**.
  - Establish a **Strategic Dialogue on Heat Decarbonisation**, involving experts from the renewable heat sector, public authorities (European, national and local level) and civil society, as a forum to discuss main challenges to the heat decarbonisation and solutions.

- Renewable Energy Directive:
  - Ensure monitoring of the actual achievements by Member States of the **targets established on renewable energy in the heating and cooling sector**, but also sub-sectoral targets in building and industry.

- Energy Performance of Buildings Directive:
  - Ensure **adequate evaluation of National building renovation plans.**
  - Monitor implementation of the **Article 10 (Solar mandate)** and secure fair treatment of technologies through active engagement with Member States. Solar Heat Europe produced its own guidance for a fair implementation of this article[1]: identify energy needs of buildings and optimise energy production of the rooftop space (between ST, PVT and PV).
  - Member States to be provided with clear and consistent guidelines to **integrate solar energy** (solar thermal and photovoltaics) into new and renovated buildings.

- Energy Efficiency Directive:
  - Prioritise the **effective and successful development of the local heating and cooling plans by municipalities through the allocation of adequate resources**:
    - ⇨ Assess the ability and needs of local authorities in charge of drawing up these plans.
    - ⇨ Tailor EU and national collaboration tools to support their work in line with the assessment. Allocate technical assistance funds to support smaller or less developed communities in drawing up the plans.
    - ⇨ Facilitate the involvement of industry to join these plans to share their needs and perspectives, best practice and lessons learned.
  - Monitor and **track the deployment of renewable heat sources** (incl. details of sources used) **in district heating** to ensure compliance with EED Article 26 on efficient district heating.
  - Ensure that the **comprehensive assessments** are extensive enough to support the development of European, national and local energy transitions in heating and cooling.

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

Solar Heat Europe

PILLAR 2: Boost the demand for affordable heat decarbonisation solutions (in buildings and industry)

Buildings represent a significant opportunity for heat decarbonisation, with Domestic Hot Water representing 15% and Space Heating 65% of households' energy needs.

European industries have enormous needs for affordable and reliable decarbonisation solutions. Whilst the Clean Industrial Deal introduces two key priority sectors (i.e. hard to abate industries and clean tech industries), it is also key to promote heat decarbonisation and energy efficiency measures in other sectors, such as industrial heat users below 400° (chemicals, food & beverage, pulp & paper, textile etc).

Solar Heat Europe calls for the development of two specific decarbonisation roadmaps.

A Building decarbonisation roadmap	**An industry decarbonisation roadmap**
Actionable measures should include: • Encourage the **replacement of heating in a planned way** (instead of "emergency replacement") through awareness campaigns and targeted financial instruments. • Foster **synergies** between H&C replacement and renovation plans. • Accelerate **deployment programmes** for buildings, such as the Article 10 of the EPBD. • **Lead by example: e.g. public authorities** with the solar mandate on their buildings. • **Stimulate the adoption of direct renewable heat projects by energy cooperatives.** • Trigger volume investment by **clustering renovation projects**. For ex. joint funding for a public building and residential buildings nearby (engagement with private investors, etc.). • **Boost thermal storage deployment in buildings**. Facilitate central storage in multi-family buildings, develop mini district networks. • Facilitate **interactions between buildings** (thermal exchange); Promote the use of on-site thermal energy storage coupled with solar thermal. • **Prioritise solar thermal** and other RES in urban planning. • Encourage **social leasing for solar thermal and relevant renewable heat sources**.	**Actionable measures should include:** • Promote, among national measures, the definition of **individual requirements for companies** to include a percentage of renewable energy in their heat demand, for example 5% by 2030 and 10% by 2035 favouring direct renewable heat sources. • These requirements for minimum RES heat should be supported by clear reporting mechanisms and linked to financial incentives or disincentives to ensure compliance and drive investment. • Create a special programme to support **first-of-a-kind decarbonisation projects per industrial sector** and per country (or region), to demonstrate and de-risk innovative renewable heat solutions within specific industrial contexts and locations. • Stimulate **sectoral-oriented measures** for investments in RES heat (e.g. tourism, health, textiles, agrifood, agriculture). • Accelerate deployment programs for industry at national and local levels. • **Facilitate access to funding**, ensuring that dedicated financial instruments such as low-interest loans and de-risking mechanisms are readily available for industrial heat decarbonisation projects.

PILLAR 3: Establish dedicated action plans for all renewable heat technologies including solar heat and promote their synergies

The energy transition will only be successful if it capitalises on the potential from all renewable heat technologies. Policymakers must ensure a level playing field for all renewable energy sources (RES). While electrification is advancing, fair treatment of all relevant renewable energy sources is essential. Direct renewable heat sources (such as solar thermal), and electrification are complementary. It is key to remind that electrification of uses in regions where the carbon intensity of the electrical grid remains high will not lead to decarbonisation. Direct renewable heat sources are ready to deploy and EU-made. Tapping into these resources will help release pressure from the grid. Whilst electrification is key to progress the decarbonisation of specific sectors (such as transport, use of AI, data centres, etc.), the use of direct renewable heat technologies should be prioritised in all instances.

FACTS:

Renewable heat technologies face shared barriers which must be tackled to enable growth, such as:

- *weak fossil fuel price signals*
- *low awareness*
- *lack of stable support*

Without strong carbon pricing or clear phase-out dates for fossil fuels, the upfront investment in renewable heating can appear less attractive. Similarly, a lack of public understanding about the benefits and availability of these technologies, coupled with inconsistent policy frameworks, hinders their widespread adoption.

Overall, it is critical to have clear and coordinated policy signals to the market. Investors, manufacturers, installers are key to unlocking the potential of renewable heat technologies.

Technology coupling is essential to ensure a stable energy mix. The different energy solutions complement each other creating synergies and efficiencies. There are already existing solutions in the market, for different applications and in different sizes, with clear advantages stemming from their hybridisation. Hybrid solutions such as pairing heat pumps with solar thermal for residential heating, integrating waste heat recovery with solar thermal in industrial processes, or combining geothermal with solar thermal in district heating networks can significantly improve overall system efficiency and reduce dependence from a single energy source.

Thermal energy storage is also of paramount importance. It can be used/shared by different technologies, allowing an effective combination of heat sources. Only this complementarity of technologies will allow reaching high decarbonisation rates at project level. It is therefore essential that the upcoming Electrification Action Plan and Heating and Cooling Strategy, acknowledge the vital role of thermal energy storage in balancing energy demand and supply.

A solar thermal action plan is needed to boost demand, attract investment and support the growth of this virtuous and crucial industry for the EU value chain. Solar thermal is an EU-made technology, meeting 90% of the current demand. With already 43.6 GWth installed in Europe, it has the potential to grow significantly, using the sun's free and reliable energy. To do so, clear political support and specific actions are necessary for the entire sector (e.g. awareness, permitting, skills, etc.) as well as dedicated measures per market segments to generate new projects in buildings, district heating and industry.

Actionable measures to be led at EU and national levels, common to all renewable heating technologies:

- **Awareness raising activities on the importance and the benefits of clean heat solutions**
  - Develop a co-created (with authorities, civil society, energy agencies, industry) central and multi-lingual European reference source promoting equally all renewable heat sources and their complementarity with electricity sources. Such a tool will be a valuable resource for one-stop shops (required under EPBD and EED).

- Develop and promote awareness raising campaigns towards citizens highlighting the benefits of renewable heat technologies for people's health (i.e. no emissions), job creation, and the environment. These campaigns should be led by energy agencies, authorities, civil society across Member States and portray all technologies available.
  - ⇨ *Good example: Previous EU-led campaign on the importance of energy efficiency: https://tinyurl.com/yepcxef5 ; something similar could be done on clean heat*
- Incentivise companies on the benefits of transitioning towards clean heat solutions (independence/energy security, better price visibility, provision of local jobs, ETS savings, CSRD benefits, community engagement etc).

- **Ensure fair treatment and fair competition between all renewable technologies:**
  - Make sure that measures relating to clean technology manufacturing sites are equally applicable and do not position one technology "over" another one. Level playing field and fair treatment for all: tax incentives, tax credits, etc.
    - ⇨ *Bad practice: In France, tax credits for the manufacturing sites of solar PV panels are exempted from taxes but not the ones producing solar thermal panels. This is clearly distorting the market and creates an unfair competition among industrial actors, whilst all work towards decarbonisation and job creation.*
  - The deployment of these technologies: equivalent conditions should apply regarding permitting.
    - ⇨ *Bad practice: In France, the zero net artificialisation law considers solar thermal fields as "artificialisation", whereas photovoltaic fields are exempted. This is a case of an uneven playing field and unfair competition that should not exist.*

- **Encourage coupling between technologies**
  - Promote synergies and system efficiency through system integration and technology coupling, both for the adoption and installation and subvention mechanisms. This will ensure further savings, energy efficiencies and system optimisation. Policies and related subvention schemes, skills etc should be organised as such.
  - Pursue the research to further stimulate hybridisation and coupling solutions.

- **Profile the key role of Thermal Energy Storage (TES) in the decarbonisation of heating and cooling.**
  - Highlight the role of TES in the efficient district heating networks development.
  - Produce a guidance on the uses of TES in multi-family buildings.

- Fund an **EU Heat Observatory** to monitor project pipelines, technology costs, and best practices across Member States.

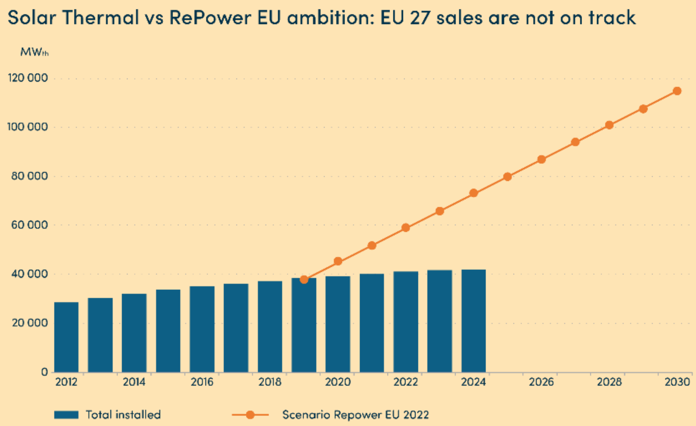
- **Pursue research & innovation** to promote system integration and complementarities between technologies, including hybrid renewable heat solutions.

DEVELOP AN EU SOLAR THERMAL ACTION PLAN:

On 16th June 2025, in the Presidency conclusions on "*strengthening the Energy Union through reinforcing energy security*", Member States called the Commission to present "*a comprehensive EU Heating and Cooling Strategy to support the uptake of clean and domestic heat and flexibility sources such as geothermal energy,* ***solar thermal energy*** *and bioenergy*". Along these lines, Solar **Heat Europe is calling for the inclusion of a dedicated Solar Thermal Action Plan in this strategy.**

Solar Thermal Technologies (STT) referred herewith include concentrated and non-concentrated technologies (producing hot water, heat or steam) as well as the hybrid PVT (producing electricity and heat); they can also produce cooling when coupled with other technologies (such as absorption chillers). Such technologies are mature and ready-to-deploy and can be used for a broad range of markets, from residential to tertiary buildings, to district heating and industries. See Annex 1a for an overview of STT and latest market trends.

Under the REPowerEU Plan in 2022, the EU Solar Energy Strategy[2] called for a tripling of the deployment of solar thermal technologies. However, this strategy gave more emphasis to solar PV and did not lead to the expected results for the STT sector.



Solar Thermal Technologies are manufactured in Europe by hundreds of companies, most of those being SMEs (see Annex 1b). Clearly recognised as a strategic sector under the Net Zero Industry Act, Solar Thermal now counts a total installed capacity of 43,6 GWth in EU 27+ CH/UK and can easily ramp up production. **As renewable, EU-made, clean technologies, the contribution of Solar Thermal Technologies to the heating and cooling decarbonisation agenda should be prioritised. Unlike other technologies, those have clearly suffered from a lack of political attention and extremely challenging market conditions recently** (as outlined in Solar Heat Europe latest 2024 market report[3]) despite their clear benefits.

As outlined in IEA's Renewable report launched on 7th October 2025[4], in the European Union, solar thermal use is expected to climb in all market segments (buildings, district heating and industry). The report also includes a specific section entitled "*Technology trends to watch for by 2030*" dedicated for solar thermal energy. With a total installed capacity of 560 GWth globally at the end of 2023, solar thermal has a lot of potential in Europe and in other geographical areas, with a strong EU leadership and level of exports worldwide thanks to high quality products and standards.

The proposed list of dedicated measures below, specifically targeted for Solar Thermal Technologies, should be adopted in the upcoming EU Heating and Cooling Strategy to trigger market uptake for these technologies. Solar Heat Europe's proposal outlines common measures to all markets segments, as well as others dedicated to Buildings, District Heating and Industry.

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[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A221%3AFIN&qid=1653034500503
[3] Market_outlook_2023_2024_297mm_x_210mm_lowres.pdf
[4] Renewables 2025

Common actions relevant to all Solar Thermal market segments:

- Promote and protect EU solar thermal manufacturers in line with NZIA via **strong political measures at both EU and national levels**, highlighting the excellent quality of European products and their competitive advantage.
  - Create an EU solar thermal industry alliance, on the model of the EU solar PV industry alliance.
  - Address flanking measures, such as standards & certification (e.g. Solar KEYMARK), that help consolidate this advantage.
  - Position EU as a leader in solar thermal manufacturing.
  - Ensure 'EU-made' conditions for solar thermal products are included in public procurement tenders.
  - Create a market monitoring platform for unfair practices.

- Protect EU solar thermal manufacturers in line with NZIA through **strict import policies. Promote EU exports and EU's excellence**.
  - Ensure EU exporters have access to similar conditions (related to insurance for instance) compared to other international players.
  - Put in place anti-dumping measures on imports from outside the EU.
  - Ensure minimum standards for efficiency and durability for imported products, in line with EU standards.
  - Impose tariffs/quotas on non-compliant imports.

- Promote and protect EU solar thermal manufacturers in line with NZIA through **research & innovation.**
  - Allocate R&D funding via Horizon Europe & innovation programs.
  - Pursue SET Plan Implementation Working Group work on Solar Thermal Technologies including topics such as new hybridisation solutions, improved thermal energy storage technologies and integration, new solar thermal components and manufacturing processes to reduce costs, etc (cf upcoming Implementation Plan for Non-Concentrated technologies).

- **Commission and Member States to encourage and lead awareness raising activities** on the benefits of solar thermal with relevant stakeholders (EU-made, renewable heat technology, no-regret energy source), clearly highlighting the differences and complementarities vis-à-vis solar photovoltaics.

⇨ *Good practice: Raising awareness at regional level (Styria, Austria):*
In 2023, the state of Styria led a joint initiative whereby they doubled their subsidies for the installation of solar thermal collectors, recognising their many benefits AND accompanied this with 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. These combined activities led to a 55% increase in solar thermal installations that year and a doubling of the market in that region over a two-year period.

- Favour **best practice sharing** among the solar thermal sector, building on existing resources for the adequate development, sizing of STT projects.
  - ⇨ *Good practice: In collaboration with ADEME, the French solar thermal industry has developed a number of tools for the economic evaluation of collective solar thermal systems, their adequate sizing, performance etc. These tools can be used to prepare the design of solar thermal projects. Such tools could be further rolled out across Europe thanks to supportive measures by the Commission.* https://www.solaire-collectif.fr/catalogue/les-outils-techniques.htm
  - ⇨ *Good practice: the French authorities have also set up regional relays by hiring people at the regional level to support businesses and local authorities wishing to embark on heat decarbonisation. Such resources help awareness and help generate new projects.*

GOOD PRACTICE:

FRENCH SOLAR THERMAL NATIONAL PLAN

In collaboration with the French solar thermal sector and the Directorate General for Energy and Climate, the French Agency for Ecological Transition (Ademe) has brought together various stakeholders in order to identify further actions to be implemented by 2035. The aim of this cooperation is to boost solar thermal capacity from 1.3 TWh in 2022 to 10 TWh in 2035 in mainland France. These proposals cover specific targets for all market segments, from small residential installations to large scale installations. Key focus areas include the regulatory environment, public awareness, skills training, financial incentives, operational tools, etc.

- ⇨ These proposals will improve the visibility and market uptake of solar heat.
- ⇨ **Solar Heat Europe would strongly welcome similar initiatives throughout all Member States, ideally coordinated by the European Commission through collaborative dialogues.**

- Member States to further use and promote **solar thermal energy in NECPs and National Building Renovation Plans.**

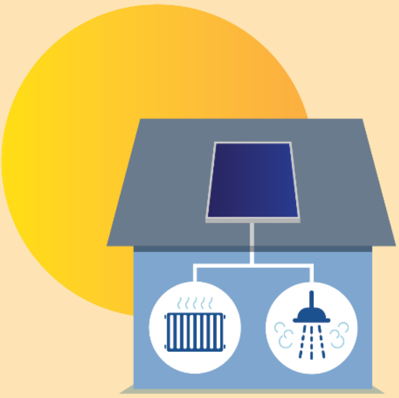
- **Improve financial support** to solar thermal technologies:
  - Ensure VAT reduction for ST and PVT products and zero VAT on EU-manufactured solar thermal products.
  - Offer tax deductions for households installing EU-made solar thermal systems.
  - Make sure that local and national taxes on fossil fuels are directly benefitting renewable technologies, making them more competitive. These benefits should apply for all renewable technologies, including solar heat.
  - Shorten the assessment of projects by subsidy bodies: integrate easy assessment tools for authorities.
    - ⇨ *Bad example: In Greece, the 2025 market has been completely "frozen" in terms of sales due to an unjustified delay in the implementation of a financing programme, stemming from the Recovery and Resilience Fund. As a result, the whole market has been on hold, creating very challenging economic situation for local manufacturers.*

- Simplify the existing **permitting** barriers:
  - Share best practices and guidance to accelerate and simplify permit-granting procedures, including the involvement of local communities.

- **Facilitate permitting:** Solar thermal should be considered first when heat decarbonisation projects are proposed/subject to permitting as available land close to heat users is key for any heat project (unlike electricity which may be located further).
- **Accelerate permitting**: giving a maximum duration of 12 months for large scale projects.
- Exempt (or reconsider) permitting for buildings and simplify building codes, allowing for solar thermal to flourish.

- Address the **skills agenda** for the whole value chain
  - Raise awareness of careers in solar thermal manufacturing through the Net Zero Academies.
  - Bridge the skills gap by training installers in solar thermal energy, engineers, project developers, energy consultancies etc on the benefits of solar thermal technologies.

Specific measures dedicated to the use of solar heat in the buildings market:



To date, the vast majority of the installed capacity of solar thermal technologies in Europe - accounting for 43.6 GWth - applies to buildings. With very different market penetration across countries (see Annex 1c), these technologies have a high growth potential in most regions.

Considering that the domestic hot water demand accounts for 15% of all energy needs - covering basic health and hygiene needs (showering, laundry cleaning, dish care, etc.), the use of solar thermal to meet such needs as an obvious and direct source of energy, emission-free, locally sourced and always combined with energy storage should be prioritised.

Other applications in buildings such as space heating (and cooling to some extent for larger segments) can also be met thanks to solar thermal technologies requiring adequate sizing and coupling.

- In line with the Solar Energy Strategy of REPowerEU (2022) – calling for tripling the deployment of the solar thermal capacity by 2030 –, **the EU solar heat sector calls to stick to this ambition, i.e. ramp up the total installed capacity to 115 GWth by 2030 for residential and tertiary buildings**.

- Buildings with **high domestic hot water needs (multi-family buildings, swimming pools, elderly houses, hospitals, hotels, etc.)** should have mandatory measures for the use of solar thermal technologies to cover a significant share of their domestic hot water needs.
  - All public authorities owning swimming pools, sport centers, elderly houses and hospitals should consider EU-made solar thermal first to fulfil their hot water needs, in line with the requirements of the Article 10 of the EPBD.
  - A minimum percentage (e.g. 50%) of hot water energy needs of swimming pools, sport centers, elderly houses and hospitals should be met by EU-made solar thermal technologies.

- **Systematic consideration of solar thermal in new multi-apartments buildings**. Residential buildings have significant heating requirements and limited roof space. To maximise the use of this space according to their needs, solar thermal energy should always be the priority (working with architects, project developers, etc.) to further incentivise their use.

- **Facilitate cross-sectoral dialogue to accelerate project uptake** between solar thermal actors and high hot water consumption sectors (such as hotels, campings, leisure centers, hospitals, elderly houses, professional cleaning sector, car washing, etc.).
    - Commission and Member States to foster dialogue between these actors.
    - KPI: guidance per sector, development of first-of-a-kind projects in each sector for more projects
    - Best practice sharing of these lead projects to encourage the sector to follow their example.
    - Help clustering projects in these sectors to attract private investment.

- **Access to finance**
    - Facilitate access to low-interest loans with particular attention to vulnerable consumers.
    - Encourage new business models & clusterisation of projects to trigger private funds investment.
    - Ensure that solar thermal technologies are included in schemes related to social leasing.
    - Provide financial incentives to energy cooperatives undertaking solar thermal projects.

- Ensure coherent and systematic inclusion of Solar Thermal as a positive contributor to **Energy Performance Certificates** of Buildings across Member States.

- Finalise the revision of the **Ecodesign and Energy labelling** criteria for space and water heaters, ensuring relevant measures are applied for the specific case of solar thermal technologies.

<u>Specific measures dedicated to the use of solar heat in large scale district heating projects (SDH):</u>

Solar thermal currently represents 0.2% of the district heating energy sources in Europe, with 162 large district heating networks operational across Europe (Denmark leading the way, as well as Germany, Austria, Sweden). In line with the EED Article 26 pathway, the potential for use of renewable heat in general and solar heat in particular is massive, both for current networks to decarbonise, but also for new ones to come.

- Impose a specific target for the use of solar thermal in district heating: **5% of the DH production** should be met by solar thermal by 2050. The solar thermal sector sees a clear potential in small cities and villages to develop solar thermal district heating (cf land availability).
    - ⇨ *Good practice: Germany's "**Kommunale Wärmeplanung**", which requires municipalities to plan for 100% climate-neutral heat supply by 2045, and 50% by 2030.*

- Provide **objective information on all renewable heat technologies to local authorities** and consulting engineers.
    - Member States should issue guidance to local authorities and district heating operators to take solar thermal energy into account during regional or urban planning.
    - Such guidance should be in line with the comprehensive heating and cooling assessment required by the Energy Efficiency Directive.

- Raise **awareness among district heating companies, city planners and energy consultancies on the potential of solar thermal for DH decarbonisation**. Ensure that all relevant stakeholders are appropriately informed on the full range of available technologies to decarbonise DH, and that calls for tenders and requests for quote to be opened to all relevant technologies.

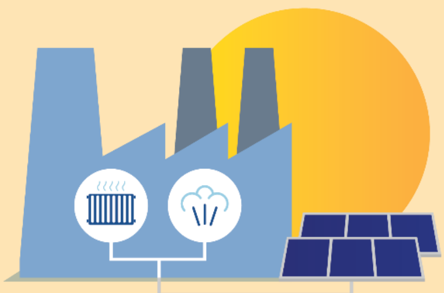
- Create an **easy assessment tool** to significantly reduce the waiting time imposed by subsidy bodies. By reducing this delay for renewable technologies, we will help accelerate deployment and reduce uncertainty surrounding projects.

- **Permitting:**
  - **Implement an EU-wide "fast-track status" for renewable heat projects** of public interest (as done for electricity in RED III).
  - See above our recommendations in "Common sectoral actions" part**.**

COMMON MEASURES FOR INDUSTRY AND DISTRICT HEATING NETWORKS REGARDING FINANCING OF SOLAR THERMAL PROJECTS:

- Develop best practices and models to facilitate **long-term contracts**, such as renewable heating and cooling purchase agreements.
- Favour **EIB-backed** loans. Recommend tax relief for entities undertaking solar thermal projects.
- Develop European guidance on **heat-as-a-service** contracts.
- To make renewable heat projects viable and scalable, EU-level schemes should ensure a **minimum of 50 % support on total CAPEX for all mature renewable heat technologies**.
- **Subsidised rates via the EIB**: The EIB offers subsidised rates to banks to finance solar PV and/or wind power projects. Similar conditions should be applicable to solar thermal projects.
- **"Contracts for Difference" (CfD-type mechanisms)** should be extended to renewable heat, offering a top-up to market-based prices and ensuring predictable long-term revenues. This approach has already proven successful for renewable electricity and could ensure parity between fossil and renewable heat in industrial and district heating applications.
- **Introduce a "merit order", in the use of various technologies,** inspired from the French example (Fonds Chaleur by ADEME, see Annex 2), to allocate financing support. The priority heat sources to be sought should be locally generated renewable heat sources (like solar thermal).

Specific measures dedicated to the use of Solar Heat in Industry:



Whilst specific targets are proposed for the use of solar heat for other market segments, it is more challenging to suggest such targets for industrial use given the heterogeneity of the sectors and the more challenging nature of the projects (short term planning, etc). A more qualitative set of proposals is therefore suggested below, seeking however a level playing field for STT vs other clean technologies. The potential of solar thermal energy for industrial processes (SHIP) has been subject to a detailed publication released by the World Business Council for Sustainable Development in December 2024[5].

[5] https://www.wbcsd.org/resources/solar-thermal-solutions/

- Ensure that the upcoming **Industrial Decarbonisation Bank framework** appropriately allows all Solar thermal technologies to access the fund (lowering the temperature threshold to 80°). Ensure level playing field for all technologies in this Bank.

- Make sure that companies and consulting engineers are provided with **objective and comprehensive information** on all renewable heat technologies.

- **Facilitate cross-sectoral dialogue to accelerate the transition** between solar thermal actors and low to medium temperature industry sectors (such as pulp and paper[6], chemicals, textiles, food and beverage, agriculture, etc.).
  - Commission and Member States to foster dialogue between these actors.
  - KPI: development of first-of-a-kind projects in each sector.
  - Best practice sharing of these lead projects to encourage the sector to follow their example.
  - R&D fund to help generate projects.
  - Clustering of projects for example in a common industrial park should be encouraging to mutualise assets and invest jointly, attracting also more easily private investment.

- **Permitting:**
  - **Implement EU-wide "fast-track status" for renewable heat projects** of public interest (as done for electricity in RED III).
  - See above our recommendations in "Common sectoral actions" part.

- **De-risking:**
  In the case of solar thermal projects, de-risking conditions would apply in case of bankruptcy of the single user of the technology (making the payment of the long-term contract challenging for the project developer and investors).
  Adequate measures need to be foreseen to avoid such cases.

[6] https://solarheateurope.eu/2024/04/17/solar-heat-for-the-decarbonisation-of-the-pulp-and-paper-industry/

PILLAR 4: Secure supply and protect EU-made clean technologies, while enabling innovation

Safeguard existing European-based cleantech sectors and support their growth - 90% of European demand for solar thermal is met by EU-made products. We must ensure that this stays the same, boosting the demand. Fair treatment among clean technologies is necessary, with particular emphasis on SME sectors - such as the solar thermal sector -, as referred in the Net-Zero Industry Act (NZIA). Wit this in mind, the heating and cooling strategy shall include EU renewable heat equipment production as a priority for Net Zero industrial valleys. European legislators must promote access to raw materials from Europe (supply chain) and stimulate the circularity potential of the various RES heat technologies.

Actionable measures to be led at EU and national level:

- Promote **EU-made solutions:**
  - Introduce a **mandatory EU-made target in the heating and cooling mix** to ensure energy security and independence of Europe.
  - In the development of **access to subventions/loans etc**, privileging EU-made technologies (see pillar 5).
  - **In public procurement,** through an EU-made target for public procurement for heating and cooling (e.g., minimum 50% EU-made manufacturing, including majority of EU made components).

- **Protect Imports:**
  - After careful analysis of the current value chain sources, place **key barriers on imports to avoid exclusive use of imported renewable technologies**. This can include the implementation of robust quality standards, carbon footprint requirements for imported goods, or incentives for domestic production capacity building.
  - Align with Net-Zero Industry Act (NZIA) proposals by incorporating specific mandatory targets for EU-made clean technologies in the heating and cooling sector to ensure energy security and independence of Europe.

- **Pursue research and innovation**
  - To ensure competitiveness of EU-made clean technologies.
  - To protect supply chains.
  - To promote access to raw materials and circularity.

- **Promote and attract EU clean tech jobs in manufacturing sites.**

PILLAR 5: Unlock barriers and enablers

Having the right skills at all relevant development and implementation levels (national policy level, energy agencies, cities, engineering consultancies) is key for the energy transition overall and H&C strategy; ensure right access of information and objective, not biased information. The specific role of installers is of paramount importance as they have act as ambassadors for technologies and should provide comprehensive and objective information. Joint recruitment and training schemes should be organised by the relevant industries, authorities, training institutes to attract people, ensure relevant qualifications, quality training for those. Building on good practices (such as tool like the ones used in SOCOL in France) and helping share such good practice should be encouraged.

Local authorities have a central role to play in this strategy, be it through their one stop shops, local urban planning, the development heating and cooling strategies, permitting. These authorities must have better access to the benefits of solar heat projects development on their territories – improved air quality, no truck traffic, very low ground artificialisation, highly recyclable materials. This will help improve acceptability of the projects, shorten the iterations between project developers and public actors and therefore accelerate project development timelines.

Financing the transition is a must. Giving clear policy signals to end fossil fuels, making the prices of such sources less attractive ad less competitive than clean sources is key. Whether through public funding or other forms of financial support (e.g. leasing instead of ownership, etc). The consistency of the subvention schemes granted at national level is key to enable predictability for the market. This must be secured over a dedicated period.

The affordability concept must consider OPEX and CAPEX. It is important to bear in mind that some technologies may have a low CAPEX (e.g. gas boilers for households) but a high or unpredictable OPEX (i.e. price of gas from 2022). Giving visibility on the entire running cost of the technologies to the users is key to provide an objective information. Including the CO_2 footprint of the systems should also be part of the equation. Mechanisms should be put in place to help cover high CAPEX costs via facilitated financing schemes, grant subsidies, tax credits, etc. The subsidy tools available for solar thermal projects must be self-sufficient solutions – a level of subsidy insufficient for the projects to compete against fossil fuel/gas prices will be a positive support but will still bring some uncertainty up to financial close (difficulty to find and secure additional funding).

<u>Actionable measures to be led at EU and national level:</u>

A. Skills & workforce development

Foster and attract skills for renewable heating and cooling technologies overall:

- Develop **national skills agendas for renewable heating and cooling technologies**, from researchers to installers. These agendas should encompass curriculum development for vocational training, dedicated certification processes, and sustained funding for apprenticeships to ensure a robust pipeline of qualified professionals.
- Add flexibility to the training and qualification process, to increase the number of **qualified multi-technology installers**. One of the essential elements would be to set up a modular approach, identifying skills and competences common to different technologies, avoiding repetition in training or qualification processes.
- Engage in the **development of a qualified workforce**, using validation of competences and **micro-certification**.

B. Financial mechanisms & incentives

- **Stop subsidies to fossil-fuel only heating equipment**. Redirect this investment to renewable heating and cooling technologies and hybrid solutions.
  NB: hybrid installations (e.g. gas and Solar Thermal) should be exempted as they allow a progressive transformation towards renewable energy sources. Giving time for buildings to change their heating technologies with clean renewable energy sources will allow a smooth transition.
- **Secure a strong carbon (ETS) pricing policy at EU level with long-term visibility** to secure a highly efficient levier to convince industries and public authorities to launch ambitious decarbonisation projects.
- Financial schemes should be drawn to adequately and proportionally address technologies with **'low investment/high operating costs' and 'high investment/low operating costs' solutions**, ensuring transparency and accurate information on total cost of ownership for end-users.
- Stimulate **citizens empowerment** and the promotion of RES heat uptake, for instance, promoting the extension of the **energy communities' concept to better cover investment in renewable heat** (and energy efficiency).
- Create a **European Heat Fund for EU citizens, district heating networks and industries**, combining public funds (European and national), including from existing financing mechanisms, clearly tailored for each of these target groups. This fund must address citizens under risk of energy poverty and must be accessible to local authorities, with clear, streamlined application processes and a governance structure that ensures equitable distribution and measurable impact.
- Establish a European mechanism providing **access to EU citizens and companies to zero-interest loans** or other attractive financial incentives for renewable heating and cooling solutions such as direct grants for initial capital costs, tax credits for installation, and long-term, low-interest green loans (e.g. service/leasing, cooperatives of citizens to roll out more and more H&C solutions).
- **Incentivise Heat Purchase Agreements (HPAs)** provide a better solution to address the specificities of heat supply in comparison to PPA's, even more if coupled with de-risking instruments. This will provide transparency regarding the renewable origin of heat consumed and facilitate market-based support mechanisms for clean heat solutions.
- Ensure a fair representation of direct renewable heat technologies under the upcoming **Clean Energy Investment Strategy.**

C. Policy & regulatory support related to heat decarbonisation in buildings

- Support the **implementation of ETS2** at national level; make sure that revenues from the funds are specifically allocated to measures aimed at decarbonising the heating and cooling of buildings and reducing their energy demand. This implementation should avoid energy poverty by targeting vulnerable populations when implementing the Social Climate Funds.
- **Promote public sector investment** as, besides its exemplary role, it represents a unique opportunity to leverage the utilisation of renewable heat solutions (e.g. for their public buildings and for adjacent buildings).
- Develop policies that incentivise **the adoption of heat as a service or social leasing**, including solar thermal technologies. This includes subsidies, tax incentives, and regulatory support for renewable heat solutions.

D. Policy & regulatory support related to heat decarbonisation in industries & district heating networks

- Promote the **effective introduction of derisking instruments at national level**, supporting this process from the EU level. For instance, for the solar heat sector, this means ensuring that if an industrial user might no longer exist after a short/medium period, the project developer may still have some sources of income/compensation.
- The proposed **European Heat Fund** must provide sufficient level of subsidy for the renewable heat projects to fly – meaning, be competitive compared to natural gas - without any additional funding. Concretely, depending on regions, 45 to 65% of CAPEX subsidised is a must for projects in industry and DHNs to become a reality in Europe today, according to project developers.
- The recently announced **Industrial Decarbonisation Bank** under the Clean Industrial Deal should **specifically prioritise and allocate dedicated financial streams for industrial heat decarbonization projects**, including provisions for auction-based support mechanisms and long-term project de-risking guarantees. No limitation in terms of type of candidate eligible must be settled (for industries & DHNs, both service providers / ESCOs / public entities must be eligible).
- The EU, in cooperation with EIB and financial entities shall **create dedicated investment vehicles for renewable heat solutions**, such as solar thermal.
- The use of **Heat Purchase Agreements (HPAs)** shall be enhanced, in parallel to PPAs, considering also heat as an element of the Guarantees of Origin. This will provide transparency regarding the renewable origin of heat consumed and facilitate market-based support mechanisms for clean heat solutions."

PILLAR 6: Keep the 90% GHG reduction ambition by 2040 including renewable energy sources targets

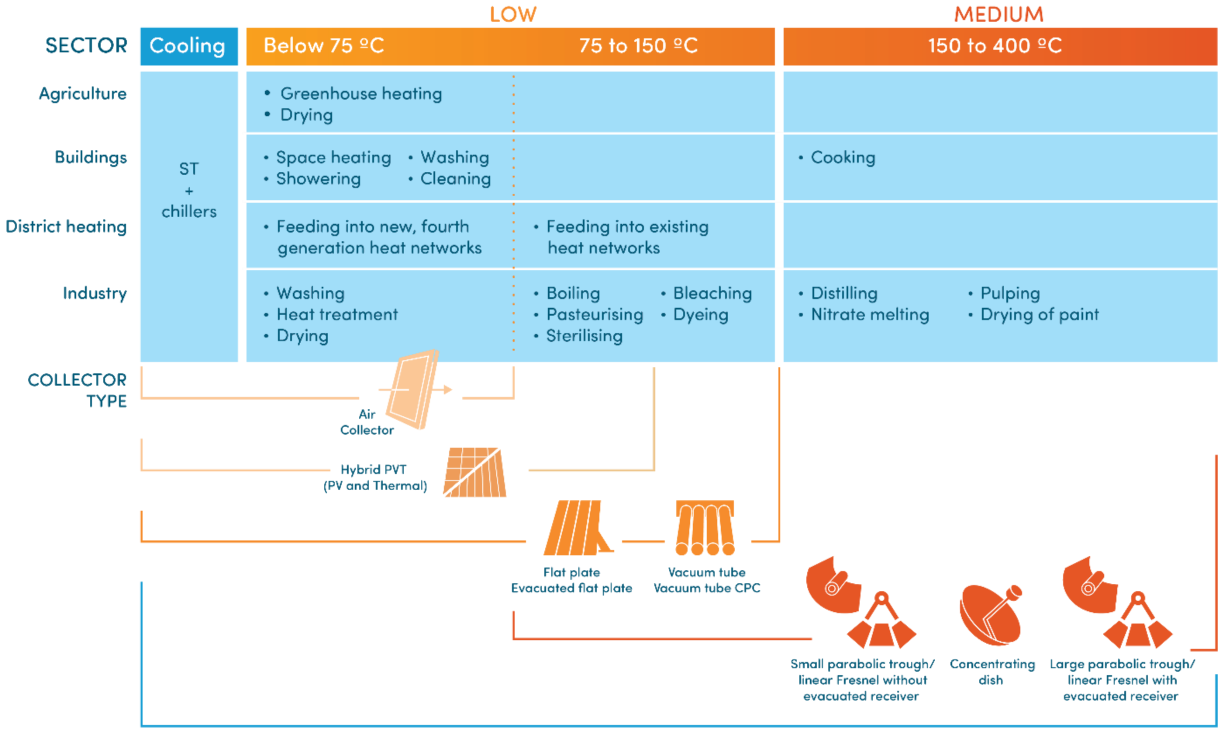
First indications under the 2040 Communication released in Feb 2024 that the ambitions will be to reduce the GHG emission by 2040. To complement the CO_2 target, it is essential to have a share of renewables and namely a share for renewable heat. Focusing solely on CO_2 targets risks being too generic, not concrete enough on how, EU as whole, will be moving towards decarbonisation in the future. The market needs these strategic signals, as well as combining these with other strategic priorities for the European Union, besides addressing climate change, such as energy security and energy independence, providing competitive energy costs and incentivising EU-made solutions. And renewable heating and cooling is a relevant part of this equation, hence the EU should not shy away from genuinely promoting the uptake of renewable energy sources, which are critical for long-term energy security and independence.

Actionable measures to be led at EU and national level:

- Keep the ambition of the 90% reduction of emission by 2040.
- Ensure that the 2040 target will lead to adequate renewable energy deployment, promoting them towards 70% share by 2040.
- Define high sub-targets for renewable heat both for buildings and industries.
- Develop the above targets on the basis of scientific-based modelling tools and EU energy security principle.

ANNEX 1: SOLAR THERMAL TECHNOLOGIES - FACTS & FIGURES

⇨ 1a) Solar Thermal technologies, market segments and temperatures addressed



⇨ 1b) Solar thermal: List of EU manufacturing sites

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 Irmao

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

Slovakia
- Greentechsolar

Sweden
- Absolicon

Switzerland
- Weishaupt
- Soblue

UK
- Naked Energy

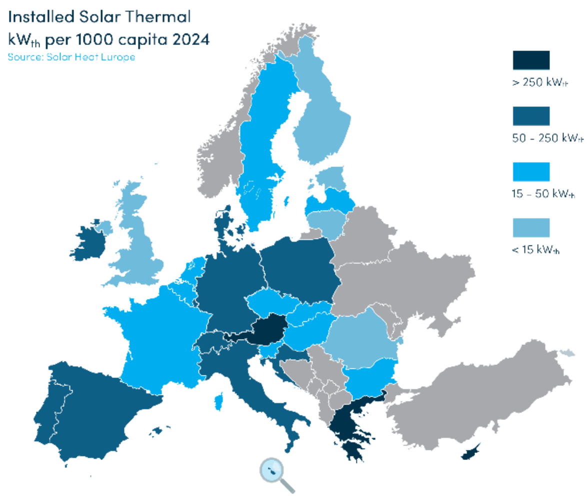
The Net Zero Industry Act (NZIA):
- Entered into force in June 2024
- Regulatory framework to boost the competitiveness of EU clean technologies crucial for decarbonisation.
- Objective: scale up the manufacturing of clean technologies in the EU
- **Solar thermal technology clearly listed in scope**; a sector meeting already 90% of the EU demand, exporting worldwide and ready to grow
- NZIA will include streamlined permitting, net zero priority projects, priviledged access to EU products eg via public procurement, measures for SMEs, start ups, skills etc.

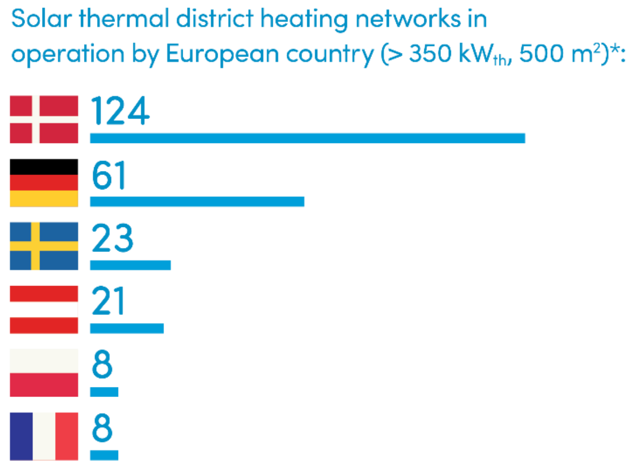
For more info or latest updates, please visit **solarheateurope.eu/market/our-industry/**

⇨ **1c) Latest Solar heat Europe Market data (2024):**

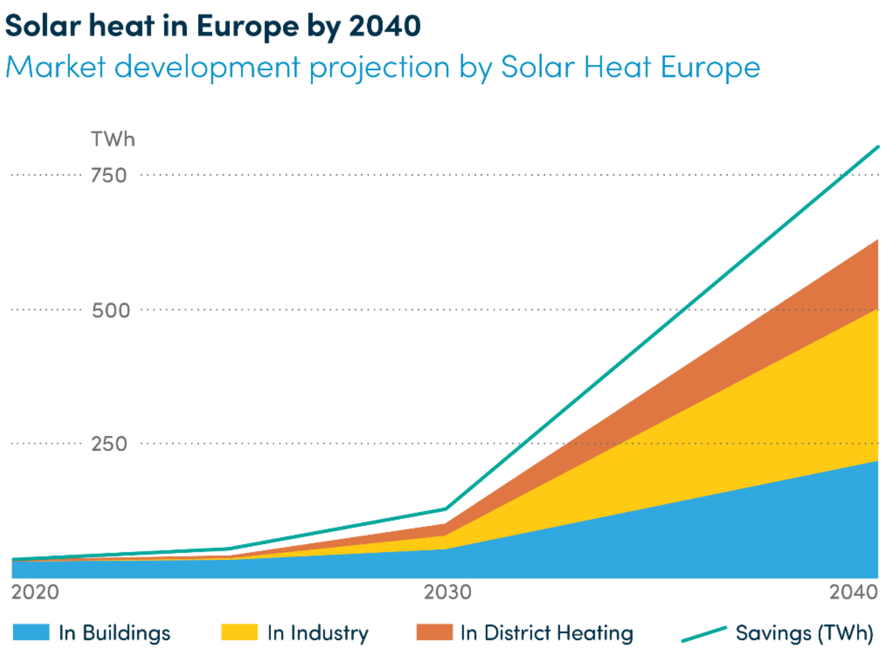
See full report herewith:

https://solarheateurope.eu/market/market-data/solar-heat-europe-reports/





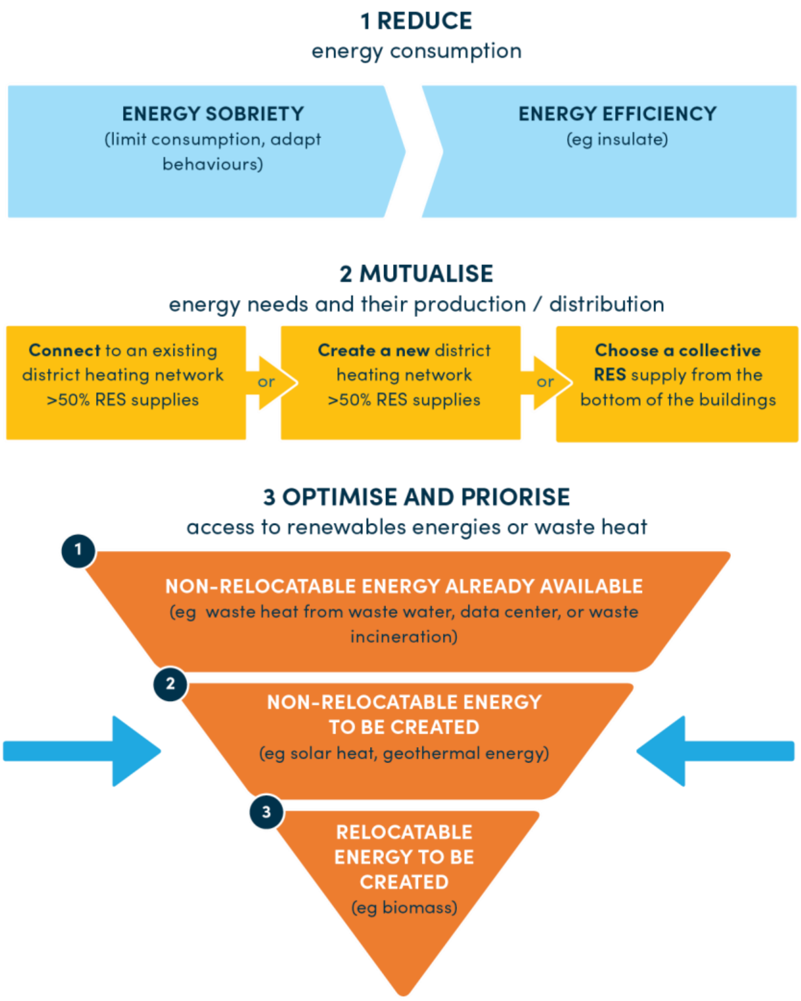
⇨ **1d) Solar Heat Europe Market Projections towards 2030-2040**



ANNEX 2: Merit order of ENR'Choix by ADEME

https://www.enrchoix.idf.ademe.fr/

https://fondschaleur.ademe.fr/



ANNEX 3: CASE STUDIES & EXAMPLES OF TECHNOLOGY COUPLING WITH SOLAR HEAT

⇨ **3a) Case studies available**

Solar thermal district heating – Recently commissioned

PROCEEDING

Advancing the use of datacenter waste heat, solar thermal, power-to-heat and heat storage with a digital twin for district heating supply in Groningen

Solar District Heating
plant in Groningen, the Netherlands

Commissioned in May 2025

Area collectors: **48 000 m²**

CO2 savings: **6,000 tonnes per year**

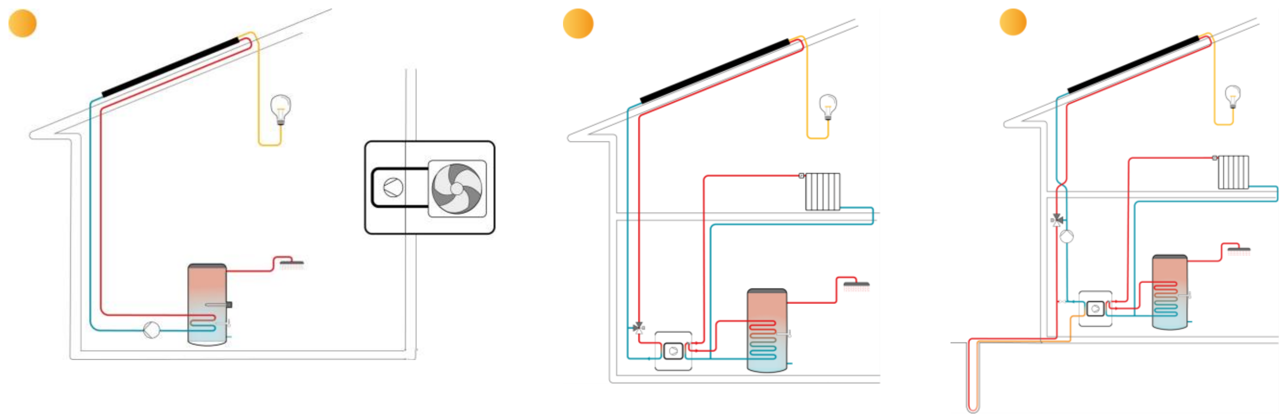
Gas savings: **3,000,000 m³ / year**

Thermal storage: **6,000 m³**

All solar thermal projects are based on the coupling with other energy sources.

For more information, visit the '[Case studies](#)' page on our website:

⇨ **3b) Hybridisation between PVT panels and heat pumps in different European climate conditions:**



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

Source: Dualsun

Hybridisation with other technologies: improving efficiency

Solar Heat Europe

Hybridisation with heat pumps:

- with few m² of solar panels it is possible to cover the DHW
- Significative reduction of HP working hours:
  - Electricity **savings**
  - **Decrease on-off** cycles
- Complete stop of Heat pump in summer:
  - HP can take care exclusively of **cooling**
  - Higher system **efficiency**
- Extra heat can be used for **Regeneration** of geothermal source (lower dimensioning of geothermal source)

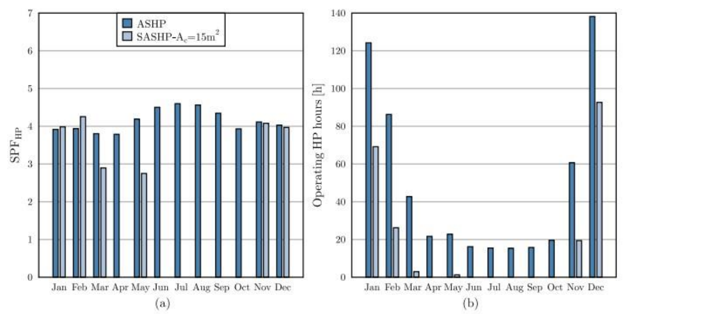


Fig. 3. Monthly values of the heat pump for a simulation in Madrid and SFH45. (a) Seasonal performance factor and (b) operating hours.

Source: [1] Potential Benefit of Combining Heat Pumps with Solar Thermal for Heating and Domestic Hot Water Preparation
https://doi.org/10.1016/j.egypro.2014.10.277
ASHP = Air Source Heat Pump
SASHP = Solar and Air Source Heat Pump

"EffizientesHeizen" by FrauenhoferISE :
https://www.ise.fraunhofer.de/de/forschungsprojekte/effizientes-heizen.html
Potential Benefit of Combining Heat Pumps with Solar Thermal for Heating and Domestic Hot Water Preparation:
https://www.sciencedirect.com/science/article/pii/S1876610214016440?via%3Dihub

⇨ **3c) Coupling SolarThermal with biomass and environmental savings achieved**

Effects of hybridization of solar thermal with biomass boilers

					Combining solar thermal with biomass boilers Savings over 30 years			
	subsidized biomass boilers annually (assumption)	**8 m² solar thermal with each subsidized biomass boiler**	**solar yield per solar system 400 kWh/m²/a Total**	**solar yield of all solar systems** lifespan 30 years	**Wood saved over 30 years** [1)]	**NO_x emissions saved over 30 years** [2)]	**fine dust emissions saved over 30 years** [3)]	**CO_2-emissions saved over 30 years** [4)]
	installations	m²	kWh/a	kWh	kg	kg	kg	kg
	10.000	80.000	32.000.000	960.000.000	213.333.333	342.720	61.440	356.266.667

1) 1 kg of wood has a energy value of 4.5 kWh (average of pellets 4.9 kWh/kg and logs 4.2 kWh/kg)

2) 100 mg/MJ NOx for pellets/wood chips according to the Austrian Wood Heating Directive UZ 37; 100 mg NOx / 0.28 kWh --> 357 mg NOx / 1 kWh

3) 18 mg/MJ fine dust for pellets/wood chips according to the Austrian Wood Heating Directive UZ 37; 18 mg fine dust / 0.28 kWh --> 64 mg fine dust / 1 kWh

4) Wood causes 0.37 kg CO2 / kWh --> 1.67 kg CO2 / kg wood (Source: https://www.volker-quaschning.de/datserv/CO2-spez/index.php)

Source: Austria Solar