

Solar Thermal Technology Assessment

The Renewable Thermal Collaborative (RTC) is developing a series of Technology Action Plans (TAPs) to accelerate the deployment of specific renewable thermal technologies and solutions. This Solar Thermal Technology Assessment (TA) is designed to provide the substantive basis for RTC Members to consider developing a full solar thermal TAP.

At present, renewable energy meets only 13 percent of global industrial heat demand. Solar thermal technologies produce less than 1 percent of global industrial heat, despite having a much greater technical potential.

This Technology Assessment (TA) answers four questions:

1. What is the economic and market potential of solar thermal in the near and long terms?
2. What are the major barriers to accelerated industrial deployment of solar thermal technologies?
3. How can we address those barriers?
4. What can large energy users do to accelerate their decarbonization efforts using solar thermal?

The RTC explored questions two, three, and four by convening a dedicated Working Group comprised of solar thermal developers and industrial end users. The developers represent a wide range of solar thermal technologies that can, in aggregate, provide heat across the full range of industrial temperature requirements. The industrial users represent a complex, global operational footprint with low-, medium-, and high-temperature heat requirements.

Technology	Year	Technical or Market Potential
Non-Concentrated Solar Thermal	2030	Technical potential to supply 30-40% of global low-medium temperature process heat demand; 14,000 PJ ⁴
Non-Concentrated Solar Thermal	2050	Predicted, using combined technical and market potentials, 6.3% of industrial global energy use; 8,000 PJ ⁵
CSP	2030	Cost is predicted to remain too large a barrier before 2030 ⁶
CSP	2050	Predicted, using combined technical and market potentials, 1% of U.S. industrial energy use; 135 GWh ⁷

1. Joint Institute for Strategic Energy Analysis for the National Renewable Energy Laboratory. (2017). Generation and Use of Thermal Energy in the U.S. Industrial Sector and Opportunities to Reduce its Carbon Emissions.
2. International Renewable Energy Association. (2021). Companies in Transition Towards 100% Renewables: Focus on Heating and Cooling. Available [here](#).
3. International Renewable Energy Association. (2021). Companies in Transition Towards 100% Renewables: Focus on Heating and Cooling. Available [here](#).
4. International Energy Agency, Solar Heating and Cooling Program. (2010). The Potential of Solar Thermal Technologies in a Sustainable Future. Available [here](#).
5. International Renewable Energy Agency. (2018). Global Energy Transformation: A Roadmap to 2050. Available [here](#).
6. National Renewable Energy Laboratory. (2019). The Potential Role of Concentrating Solar Power within the Context of DOE's 2030 Solar Cost Targets. Available [here](#).
7. U.S. Energy Information Administration. (2019). Use of Energy Explained: Energy Use in Industry. Available [here](#).



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Below is a summary of the Working Group's findings. The complete list of identified barriers, solutions, and actions can be found in the full report.

The Working Group identified and prioritized nine different barriers to scaling solar thermal. The three leading barriers were:

- **Low natural gas prices:** Particularly in the U.S., the low cost of incumbent natural gas is a challenge to scaling almost all renewable and low-carbon thermal technologies.
- **No easy guide to solar thermal technologies:** Buyers reported difficulty finding an easy-to-use resource that helps them match available solar thermal technologies to process requirements by temperature range and heat output.
- **Solar thermal technologies perceived as "pre-mainstream":** Many energy users shared that they perceive solar thermal technologies as developing; insufficiently mature or "mainstream" to be trusted.

The Working Group identified and prioritized eleven solutions addressing the complete barrier set. The top three potential solutions based on impact and actionability were:

- **Increase financial incentives such tax credits or subsidies:** Tax credits and subsidies helped launch the renewable electricity market, replicating this political assistance would likely have a similar effect in the renewable thermal market.
- **Support a carbon price or fuel tax:** Placing a price on carbon emissions or implementing a fuel tax for carbon emitting fuels increases the economic competitiveness of low- or zero-carbon fuel options.
- **Create a trusted educational resource for buyers to guide solar thermal technology matching:** Buyers need a resource to help navigate solar thermal technology questions, needs assessment, and deployment options and processes.

The Working Group identified possible actions that large energy buyers such as RTC members could take to work towards these solutions. Based on corporate ability to take steps towards these actions and the potential impact of the actions, the emerging top three were:

- **Support renewable thermal policy:** Companies can actively promote and advocate for state and federal policy that supports renewable thermal technologies.
- **Increase internal value for sustainability:** Companies can place explicit organizational and financial value on sustainability performance and GHG emissions reductions; example strategies could include internal carbon pricing and green revolving funds.
- **Commit to solar thermal pilot projects:** Companies can make proactive commitments to deploy solar thermal technologies, sending an important market signal.

To download the full *Solar Thermal Technology Assessment*, please click [here](#).