

Heat Decarbonization - What Role can Solar Thermal Play?

Heat accounts for more than half of global final energy consumption. However, heat production remains heavily fossil-fuel based and is a significant contributor to CO₂ emissions, accounting for 39% of total annual energy-related emissions globally. To achieve the ambitious targets of the Paris climate change agreement, heat decarbonization is a must. But what role can solar thermal play?

The IEA's World Outlook 2016 (the 2017 edition was published in November) suggested that to help reach a 2 degrees climate target, solar thermal heat would have to see a massive increase of over 600% from 1.2 EJ today to 8.6 EJ in 2040. Most of the growth would have to be in buildings, with some increase also in industrial applications.

Recent trends suggest that a rapid increase of solar thermal deployment in buildings is possible. Over the period 2008-15, solar thermal doubled from 0.5 EJ to 1.2 EJ, reaching 7% of renewable heat consumption in 2015. Most of the increase was driven by installations of solar water heaters in Chinese homes. Yet despite this increase, the pace of growth is actually slowing. In 2016, gross annual additions were down 9% compared to 2015, mostly due to a slow-down in China. However this trend overshadows those of other smaller market segments, which are experiencing stable growth such as larger systems for commercial hot water and heating, industrial process heat, and district heating.

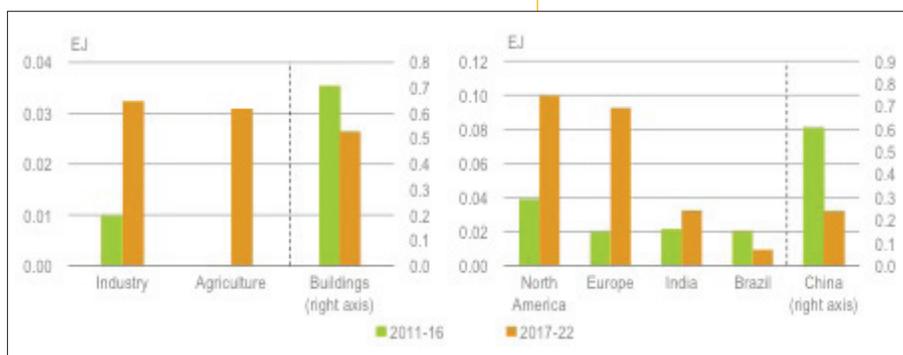
The IEA's 2017 Renewable Market Report, published on October 4, provides an outlook for solar thermal (and other renewable heat technologies) to 2022. We expect solar thermal energy consumption to increase by over a third globally, but the key Chinese market will grow at a slower pace than previously. This is due to the expectation of a continued decline in small domestic systems for hot water in China (see Figure 1). China has set an ambitious new solar thermal target in the 13th Five Year Plan. However, the absence of robust support programmes, uncertainty over the pace of new housing development and questions over consumer preferences as living standards increase are likely to challenge the pace of deployment for small hot-water systems.

On the positive side, we expect accelerated growth in the industrial and agricultural sectors, driven by increasing cost-effectiveness of systems to supply process heat. Most of the growth is expected to be in applications where high heat demands that are currently met by fossil fuels coincide with good solar insulation, such as in India, which leads the growth in industrial solar thermal consumption over the next five years.

Overall though, the deployment levels needed to meet long term decarbonization goals are ambitious given the current barriers the sector faces. Key challenges include cost-effectiveness, technological performance (especially for higher temperature heat demand) and competition from other sources, including solar PV coupled with heat pumps.

The work of the IEA Solar Heating and Cooling Programme can make an important contribution to addressing some of these challenges, with current Tasks (research projects) on issues such as cost reductions, thermal storage, and new generation solar heating and cooling systems.

This article was contributed by Ute Collier, Senior Programme Leader of the IEA's Renewable Energy Division.



▲ **Figure 1: Net solar thermal consumption growth by sector (left) and by region (right), 2011-22**

Note: Data for buildings and China are plotted on the right axis due to their larger magnitudes. Source: IEA (2017), *Renewables 2017*.

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