SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2023 HIGHLIGHTS

Task 69 – Solar Hot Water for 2030

THE ISSUE

Hot water demand is continuously growing globally, and many IEA SHC member countries have 2030 commitments/targets to achieve a higher solar fraction of their economies. At present, ~16% of residential energy consumption in IEA countries goes to water heating (according to 2018 IEA data). However, the 'solar share' of low-temperature heating is still relatively low —only 2.1% of space and water heat demand was being met by solar thermal in 2018, and this mainly comes from evacuated tube systems installed in China. This same report states, "to be in line with the Sustainable Development Scenario (SDS), the share of clean energy technologies needs to exceed 50% of new heating equipment sales by 2030." To investigate the best way to fill this gap for solar hot water, SHC Task 69 focuses on two technologies that are expected to play the biggest role in the solar hot water market in 2030: solar thermal thermosyphon and solar photovoltaic (PV) derived hot water heating systems.

OUR WORK

SHC Task 69 is investigating the global market status, core technical issues, and the trainings/standards needed for these two cost-effective and reliable solar water heater technologies (thermosyphon and PV solar hot water heating systems). The Task relies on international knowledge among participants from the different IEA SHC member country regions to consider differences in economic development, solar resources, regulations, and other factors (i.e., GN SEC vs. Europe). A key part of the scope is to investigate 'smart' systems for thermosyphons and 'integrated' systems for PV-driven systems, including how to overcome barriers to further deployment in different climates and markets. As such, the Task has been working to identify opportunities to improve the performance, cost, and reliability of solar water heaters, aiming to accelerate the rollout of best practices for these technologies.

Participating Countries

Australia

Austria

Canada

China

Denmark

Italy

Norway

Portugal

Switzerland

SACREEE
Botswana
Lesotho
Namibia
South Africa
Zimbabwe

United Kingdom

Task Period 2022 – 2025
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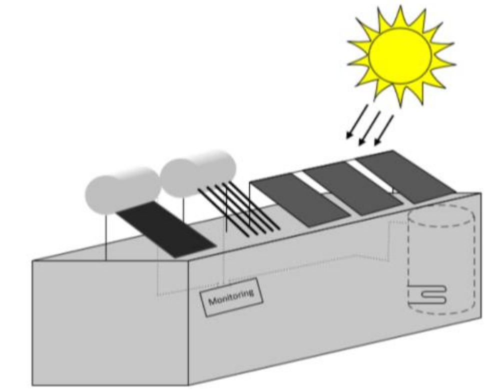
TASK 69
Solar Hot Water For 2030

KEY 2023 RESULTS

SOLTRAIN+ Comparison Test Bed

A side-by-side comparison of solar hot water technologies has been set up by participants at the Namibia University of Science and Technology (pictured to the right). The monitoring phase is from Q2 2024 to Q2 2025. The installed systems include an indirect thermosyphon system with a flat plate collector, an indirect thermosyphon system with an evacuated heat pipe collector, and a PV-to-Heat (PV2Heat) system. Data from the comparison test bed and insights from the SOLTRAIN project (665 demo systems over 12 years) and the SOLTRAIN+ project will be evaluated in 2024.



Solar Hot Water GHG Reduction Testing in China

More than a third of the newly installed collector area in 2021 globally was thermosyphon systems. They dominate sales in many Asian and Latin American countries. A large-scale outdoor test is underway in collaboration with the Chinese manufacturer Solareast Group (pictured to the right). These comparative tests will reveal key differences in the performance, greenhouse gas emissions reductions (GHG), and reliability of several key unpressurized evacuated tube and pressurized flat plate thermosyphon system designs in the actual operating environment.

Adopting PV Solar Water Heaters

The Task organized a Special Session on photovoltaic (PV) hot water systems during the Asia-Pacific Solar Research Conference in December 2023 in Melbourne, Australia. The "Key Considerations for the Adoption of PV Water Heaters" session presented several options for how PV water heating systems can be designed and operated to reduce peak loads in the public grid and provide the most value for households. These systems can range in complexity from simple resistance heaters (including repurposing controlled load water heaters, which were historically used to consume nighttime fossil fuel electricity) to complex systems, which include batteries, controllers, and heat pumps (pictured to the right). According to the Subtask C leader Dean Clift's recent work, heat pump water heaters combined with smart meters represent a cost effective and efficient solution for both homeowners and grid operators [see: Maximising the benefit of variable speed heat-pump water heater with rooftop PV and intelligent battery charging - ScienceDirect]. In most countries, hot water tanks represent a massive—underutilized—energy storage capacity. To unlock this capacity for daytime solar electricity, we just need cost-effective mechanisms for collective control of our humble water heaters.