



International Energy Agency
Photovoltaic Power Systems Programme



SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Task 69: Solar Hot Water for 2030



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Scope

~3.5-years into Task 69, focusing on **2** technologies:

- **Thermosyphons:** The most used solar heating system (~57% of domestic hot water systems in operation in 2019)
- **PV Hot Water:** Rapid PV growth! Can be simple (i.e., low cost) or advanced (i.e., soak up excess PV and power heat pumps).

Note: Both require very few moving parts, can be affordable and reliable, and provide opportunities for new products/components.

Significance of Solar Hot Water

- Domestic hot water accounts for 11% mean, to 50%, of residential energy use
- IEA estimated for 400 million solar hot water systems worldwide by 2030 to reduce fossil fuel reliance and emissions.
- Many countries have climate/RE commitments
- Adoption is limited by climate, income, building types, skills, and regulations across regions worldwide.



Key Findings from Global Market and Technical Analysis

Regional Market Diversity

Task 69 revealed regional differences in solar hot water technology adoption and system designs worldwide.

Common System Failures

Twelve failure modes were identified in thermosyphon systems, highlighting component and maintenance issues.

Emerging Innovations

Innovations include smart controllers, IoT monitoring, advanced materials, and overheating protection.

Systemic Adoption Barriers

Barriers to adoption are mainly systemic, involving standards, skills, policies, and market confidence.

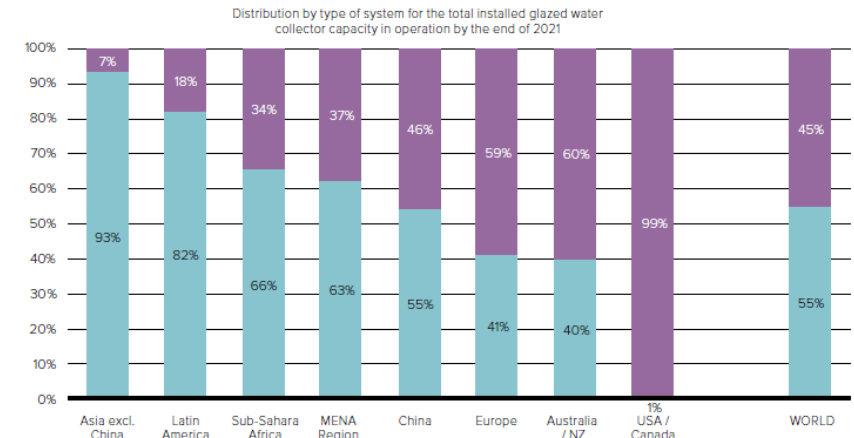
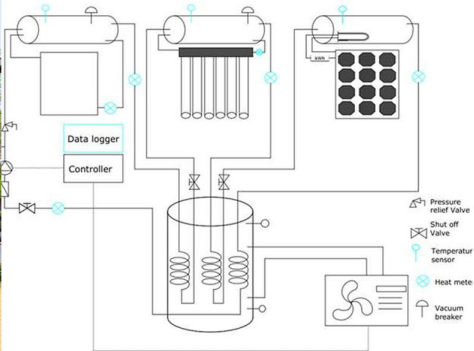
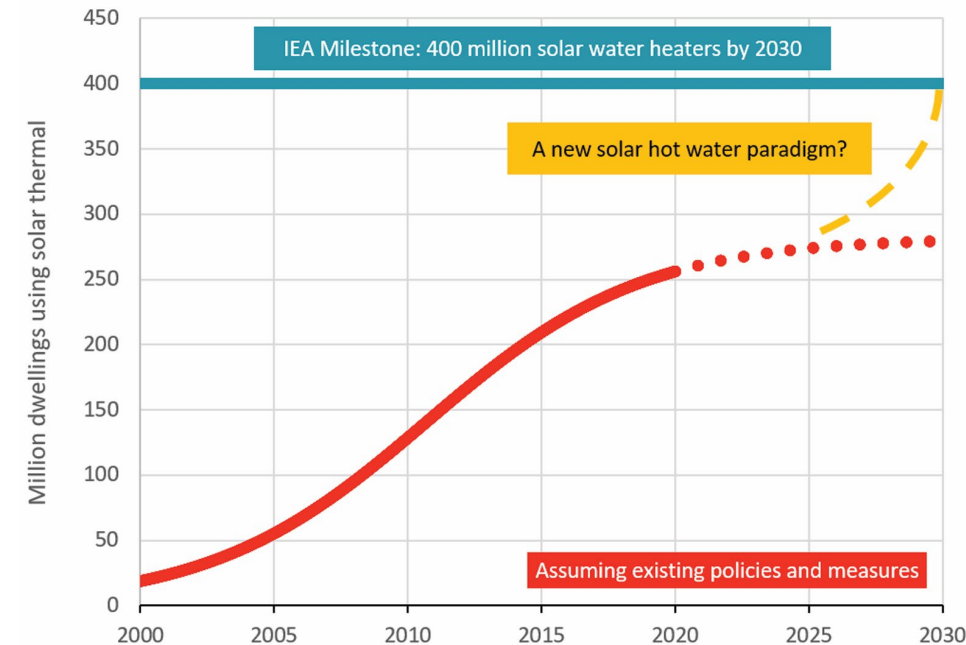


Figure 50: Distribution by type of system for the total installed glazed water collector capacity in operation by the end of 2021



IEA Milestone: 400 million solar water heaters by 2030

A new solar hot water paradigm?

Assuming existing policies and measures

Future Directions and Strategic Takeaways

Scaling Advanced Systems

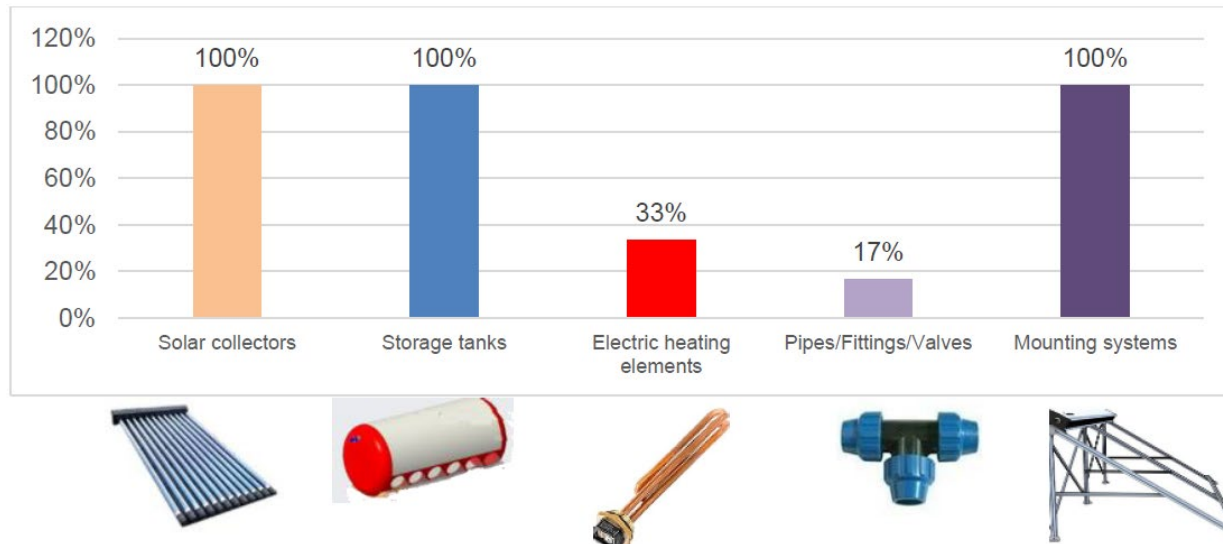
Prioritize scaling manufacturing of advanced thermosyphon and photovoltaic hot water systems for wider adoption.

Training and International Standards

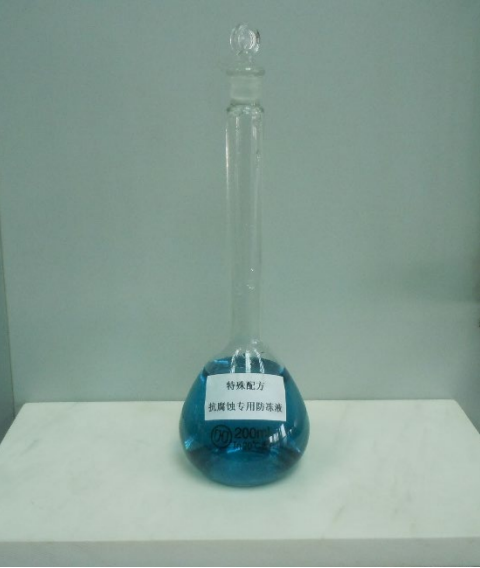
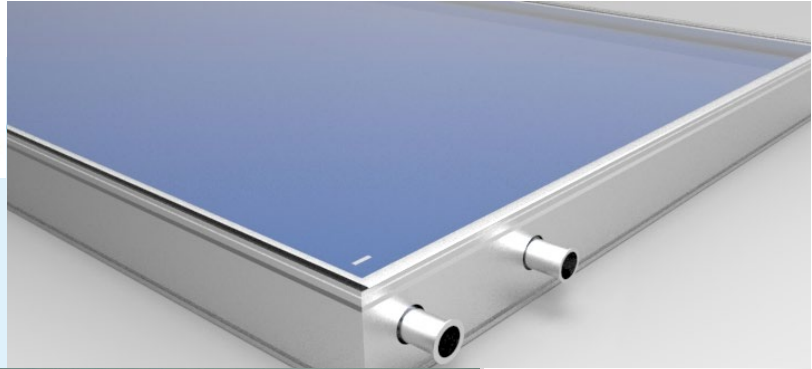
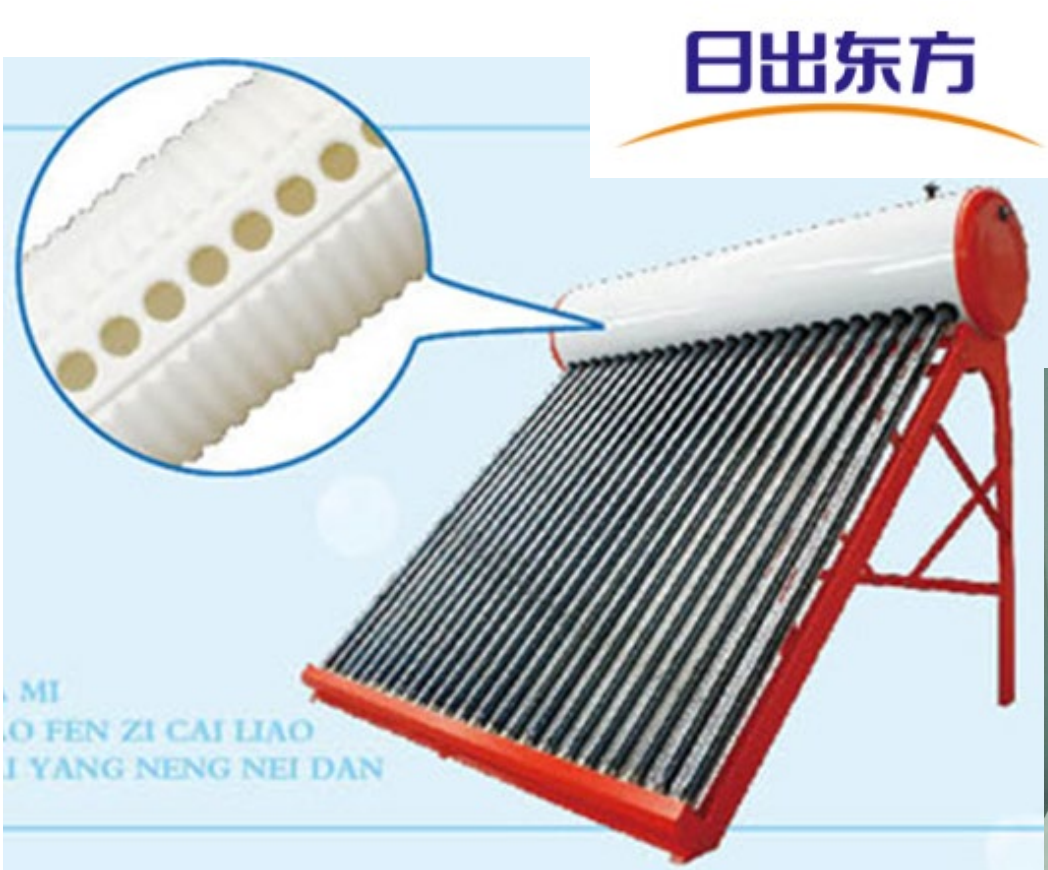
Harmonize standards globally, especially for PV2Heat technologies, to ensure compatibility and quality assurance.

Smart Controls and Monitoring

Accelerate integration of smart controls and digital monitoring to improve system efficiency and user experience.



Reliability and Durability Improvements



Sunrain: Polymer and Al headers/tank/tubing to avoid corrosion

Linou: Intelligent controllers

Impacts

- Deliverables from Task 69 can be found here: [IEA SHC || Task 69 || Publications](#),
- Task 69 has prepared 10 deliverable reports and 6 journal papers (links below):
- [Thermal characterization of domestic electric water heating systems as distributed storage - ScienceDirect](#)
- [Control optimization of PV powered electric storage and heat pump water heaters - ScienceDirect](#)
- [Assessment of advanced demand response value streams for water heaters in renewable-rich electricity markets - ScienceDirect](#)
- [Peer-to-peer energy trading for demand response of residential smart electric storage water heaters - ScienceDirect](#)
- [Maximising the benefit of variable speed heat-pump water heater with rooftop PV and intelligent battery charging - ScienceDirect](#)
- [Smart management of domestic storage water heater electrification to minimise impact on distribution networks - ScienceDirect](#)



Questions?



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 IEA Solar Heating and Cooling Programme
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