SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

International Energy Agency (IEA)

Solar Heating and Cooling Technology Collaboration Programme (SHC TCP)

IEA SHC TCP
Strategic Work Plan 2019 - 2024

World's largest solar district heating plant in operation in 2018 (110 MWth) in Silkeborg, Denmark.
Photo Credit: Energie Steiermark

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IEA SHC TCP Executive Committee

SHC TCP Strategic Work Plan 2019 – 2024

The Technology Collaboration Programme on Solar Heating and Cooling (SHC TCP) is one of the oldest in the IEA, established in 1977. For over 40 years the SHC TCP's overarching objective has been co-operative research, development, demonstration and exchange of information regarding solar heating and cooling systems. This document describes the strategic direction and activities of the SHC TCP for the term from 2019 to 2024.

This Strategic Work Plan is based on the research priorities of the SHC TCP and supports the results and recommendations of the IEA Technology Roadmap on Solar Heating and Cooling, the IEA Medium Term Strategic Plan for Research and Technology 2018 – 2022[1], and the European Strategy on Heating and Cooling[2].

What do we mean by solar heating and cooling?

Solar energy technologies and architectural designs that include active **solar thermal heating** and **cooling**, **photovoltaic driven heating** and **cooling**, **passive solar building design** and **solar architecture**, including the consideration of **daylighting** and **thermal comfort**. This definition includes hybrid technologies and companion heat storage and supply technologies and applications**.** Active and passive solar heating and cooling can be applied to provide light, hot water as well as heating and cooling in the residential and service sectors and heating, cooling and drying in industrial and agricultural processes.

SHC TCP Vision

Solar energy technologies will provide **more than 50% of low temperature heating and cooling demand for buildings in 2050** and contribute a **significant share to the heat supply for the agricultural and industrial sectors**. Thus, solar heating and cooling will contribute significantly to lowering CO_2 emissions worldwide and reaching the Paris Agreement goal.

SHC TCP Mission

Through multi-disciplinary international collaborative research and knowledge exchange, as well as market and policy recommendations, the SHC TCP will **work to increase the deployment rate of solar heating and cooling systems by breaking down the technical and non-technical barriers to increase deployment.**

Strategic Objectives 2019 – 2024

Objective 1: *To remain the primary source worldwide of **high quality technical information** and **analysis** on solar heating and cooling and daylighting technologies and markets.*

Actions/foreseen outputs:

- Expand the Solar Heating and Cooling **Information Center** to oversee and strengthen ongoing SHC TCP initiatives and support stakeholder needs.
- Support the development and harmonization of new and current **standards** necessary for the widespread use of innovative solar designs and applications in the building, agricultural and industrial sectors. (Task 57)
- Evaluate and systematically examine the **CO_2 emissions reduction** contributed worldwide by SHC technologies.
- Continue to promote solar energy **conferences** and increase our effort to participate in their organization and success.
- Collect and provide **high quality data**, e.g., publish annual Solar Heat Worldwide report,

[1] http://www.iea.org/media/protected/iaforum/IEAMediumTermStrategyforEnergyResearchandTechnology20182022.pdf
[2] https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v14.pdf, published 2016

promote TCP's Levelized Cost of Heat, develop analytical tools that support solar heating and cooling R&D, effective deployment and market growth. (All Tasks)

Objective 2: *To contribute to a significant increase in the **cost effectiveness** of solar heating and cooling technologies and designs through **increased performance** and **reduced costs** to increase their **market competitiveness** in heating and cooling applications.*

Actions/foreseen outputs:

- Improve solar designs and technologies to increase **user acceptance.** (Tasks 54, 55, 56, 58, 59,60, 61, 62)
- Identify and prioritize **R&D needs** for solar heating and cooling that will lead to expanded markets due to significant performance increases.
- Develop **cost-effective designs and technologies** in collaboration with appropriate intermediary industries. (Tasks 54, 60)
- Continue **R&D activities** and strengthen interactions with industry to address cost drivers and market competitiveness. (All Tasks)
- Simplify **monitoring**/**performance assessment** as well as system maintenance needs for hybridization and digitalization.
- Intensify the cooperation with PV industry to classify best practices and cost reduction potentials when using **PV for heating and cooling**. (Task 60)
- Further develop **(heat) storage technologies** to enhance the use of solar heat and its combination with other technologies. (Task 58)
- Develop **software/hardware solutions** for adaption of solar heat systems to the digital energy revolution.

Objective 3: *To enhance **cooperation** with stakeholders, namely industry, international organizations and local, regional and national governments, potential customers, energy and urban planners.*

Actions/foreseen outputs:

- Establish and enhance **partnerships** with intermediary industries and end users, with international organizations/initiatives, such as the IEA, IRENA[3], ISO[4], ISES[5], Mission Innovation[6], Solar Heat Europe[7], UNEP[8] and UNIDO[9], governments and municipalities, building label organizations. (All Tasks have varying partnerships)
- Support the greater use of solar designs and applications in **developing countries** through targeted dissemination of Task results, country/sponsor membership in the TCP, Solar Academy activities and other TCP initiatives. (Task 62)
- Collaborate with **other TCPs** to more effectively contribute to the vision. (Tasks 55, 58, 59, 60, 61)
- Work to address issues regarding building design, aesthetics and architectural value and long-term urban energy strategies. (Tasks 56, 59)
- Work to bridge solar heat into the broader energy supply system investigations as **sector coupling** of renewable heat and electricity supplies increases. (Tasks 55, 56, 62)

Objective 4: *To increase **awareness** and **understanding** on the potential and value of solar heating and cooling systems with thermal and PV technologies by providing information to non-technical stakeholders such as decision makers and the public.*

Actions/foreseen outputs:

- Communicate the **value** of solar heating and cooling designs and technologies in publications, conferences, workshops and seminars to the public and relevant stakeholders and through the

[3] IRENA : International Renewable Energy Agency (http://www.irena.org/)
[4] ISO : International Organization for Standardization (https://www.iso.org)
[5] ISES : International Solar energy Society (https://www.ises.org/)
[6] http://mission-innovation.net/
[7] http://solarheateurope.eu/
[8] UNEP : United Nations Environment Programme (https://www.unenvironment.org/)
[9] UNIDO :United Nations Industrial Development Organization (https://www.unido.org/)

TCP website. Continue outreach activities, including SHC Conference, Solar Academy webinars, SHC Award, and targeted Task and TCP publications. (All Tasks)

- Conduct **analysis** that links solar heating and cooling designs and technologies as solutions to energy security concerns, environmental and economic goals.
- Promote the **advantages** of solar thermal and hybrid applications with other renewables. (Tasks 55, 56,59, 60, 61, 62)
- Assist the IEA to **better communicate** the value and potential of solar heating and cooling.

Solar heating and cooling market drivers and segments

The SHC TCP Executive Committee foresees the following market drivers and market segments for the solar heating and cooling sector during the term 2019 to 2024. It is these drivers and market segments that underlie the direction of this Strategic Work Plan.

In the years 2019 to 2024, the SHC TCP foresees the principal driving forces for the solar heating and cooling sector will be:

- The global response to limit the ambient temperature increase (Paris Agreement), which will require the 50% of energy consumed as heat to be produced from low carbon technologies.
- The global ambition to meet the Sustainable Development Goals, particularly as it relates to Affordable and Clean Energy, Clean Water, Climate action and Sustainable Cities and Communities.
- An increase in investment in renewable energy systems (capital, research and development) that is focused on electricity now and will include heating and cooling in the future[10].
- Urbanization, an aging population and an increase in the standard of living, which will increase the need for heating and cooling for comfort and health.
- The rapidly lowering cost of renewable electricity generation technologies.

In the years 2019 to 2024, the key market segments for solar heating and cooling systems will be:

- Building applications such as solar water heating, solar combisystems (domestic hot water and space heating), PVT[11] systems and solar air conditioning,
- District scale systems for solar heating and cooling,
- National, regional and city planning where solar resource assessment is an important input,
- Building design and renovation that considers passive and active solar energy concepts,
- Artificial Intelligence (AI), data, and digitalization for enhanced integration of solar energy use,
- Sector coupling of renewable heat and electricity,
- Thermal storage (diurnal to seasonal),
- Process heating and cooling for agriculture and industry, and
- Water treatment assisted by solar energy.

[10] REN21 2018 *'Renewables Global Status Report'*, http://www.ren21.net/status-of-renewables/global-status-report/
[11] PVT: combination of solar PV and solar thermal collectors