HyCool "Market Watch" Newsletter

Edition N°5 / January 2022

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This fifth edition of the internal HyCool market watch newsletter features:

- **Project dissemination actions** (and a call to action regarding stakeholder engagement)
- **Sister European project spotlight** (with a focus on three open projects)
- **ER-1)** HyCool Pre-Feasibility Simulator Open-Source Online Software (R2M/JER)
- **ER-9)** HyCool innovative technologies and environmental benefit Knowledge (CTEC)
- **ER-14)** HyCool Training Courses and Webinars Knowledge (AIT/EMPA)
- **In the news** (various topics related to HyCool)

Page 1. **Introduction**

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Page 1: **Overview of HyCool market watch Ed. N°5**

In Ed. N°2, we focused on:

- KER-1 (ERs 5+7): Linear Fresnel Collectors – ECO
- KER-2 (ER-6): Energy Management System software – ECO
- KER-3 (ERs 3+4): Hybrid Heat Pumps – FAHR, CNR
- KER-4 (ER-13): High temperature PCM storage – AIT

In Ed. N°3, we focused on:

- KER-5 (ERs 10+11): Absorber protocols & adsorbed material estimation tool – EMPA
- KER-6 (ER-8): HyCool systems prototype in an operating industrial process – ECO
- KER-7 (ER-2): ECOTHERM Solar Fields – ECO

In Ed. N°4, we focused on:

- ER-12: Report on the standardization landscape and applicable standards (UNE)
- ER-15: KPI list for application of solar technology in industrial sectors (IDP)

For this edition (N°5), we finalize this process by defining market landscapes of ERs 1,9, and 14:

- **ER-1)** HyCool Pre-Feasibility Simulator Open-Source Online – Software (R2M/JER)
- **ER-9)** HyCool innovative technologies and environmental benefit – knowledge (CTEC)
- **ER-14)** HyCool Training Courses and Webinars – knowledge (AIT/EMPA)

Page 2: **HyCool dissemination actions / urgent request**

An ongoing list of consortium activities and a call to action regarding stakeholder engagement

Page 3: **Sister European project spotlight**

Publications from SHIP2FAIR, FRIENDSHIP, and ASTEP, and other open and closed H2020 projects.

Page 4: **ER-1) Pre-Feasibility Simulator**

HyCool Pre-Feasibility Tool Open-Source Online Software (R2M/JER)

Page 5: **ER-9) Environmental benefits**

HyCool Innovative Technologies and Environmental Benefit Knowledge (CTEC)

Page 6: **ER-14) Training courses and webinars**

HyCool Training Courses and Webinars Knowledge (AIT/EMPA)

Pages 7-8. **"In the news"**

Previously unreported items on HyCool topics (e.g., SHIP, HPs, PCM, solar thermal/cooling, etc.)

Page 2. **Project dissemination actions**

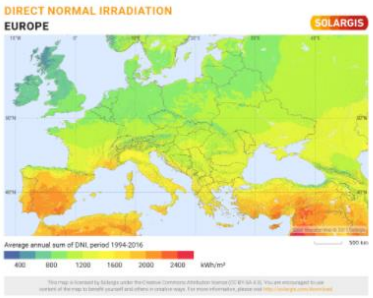
Recent or planned dissemination actions within the consortium

Recent dissemination actions

- WBCSD **(World Business Council for Sustainable Development, 28 September 2021)** – Jean Garandel of GIVAUDAN presented HyCool to an audience composed of various industries (Engie, DNV, EnelX, Iberdrola, Danone, Novartis, Unilever, IKEA, Dow). Questions asked were on how the project addresses sudden ramp up or ramp down for chilled water or steam demand, what the contributing factors for decarbonization are, and how the project is replicable.
- SP2021 **(Sustainable Places 2021, 30th September in Rome Italy)** Uli Jakob of JRE presented HyCool during the second iteration of a hybrid joint workshop entitled, "Renewable Heating and Cooling Solutions for Buildings and Industry 2.0"
- WSED21 **(World Sustainable Energy Days, Wels Austria, 25 June 2021)** – Several partners (i.e., VEO, AIT, JRE, ECO, R2M) presented aspects of HyCool in a virtual workshop entitled "Hybrid Systems for Industrial Solar Cooling"
- "Refrigeration Capacity and EER Calculator Tool" **(published on project website)** which can be used to predict the refrigeration capacity and energy efficiency ratio of the HyCool cascade chiller for a given industrial cooling process

Call for immediate action for all HyCool partners

This month we are asking ALL PARTNERS to complete two actions (R2M will follow-up via email in January on this matter):
1) Update the HyCool Dissemination Network (HDN) list which currently has 215 stakeholder contacts with new people who may be interested in learning about the project's results, and also testing the HyCool Pre-Feasibility Simulator (PFS).
2) Send an email to your HDN contacts about testing the PFS tool because for legal reasons, it is the partner who must contact these people directly, unless they have already explicitly agreed to 3rd party contact (e.g., in the HDN excel).



Solar resource map © 2019 Solargis

Solar Irradiation (KWh/M² Y)

DNI ≥ 2160

Please enter the yearly solar direct irradiation (DNI) in your location. You can get this information on the image.

Yearly Average Ambient Temperature (°C)

T ≥ 19,2

Please enter the yearly average temperature in your location. A possible source for yearly average ambient temperature is the 'Global Solar Atlas'.

Industrial Process Temperature (°C)

T ≥ 16

Please enter the required cooling-process temperature.

Electricity Price (€/KWh)

P ≥ 0,14

Please enter the electricity price.

Full Load Operation Hours (H/Y)

8200 ≤ N < 8760

Please enter the number of yearly full-load operation hours of the cooling process.

☐ I Have Read And Agree To The Privacy Policy

SUBMIT

Page 2. **Sister European projects spotlight**

H2020 industrial solar thermal projects and a focus on three that are still open

Open projects

ASTEP (2020-2025, H2020): Application of Solar Thermal Energy to Processes

- Paper (2021): H2020 ASTEP Project – Solar Heat for Industrial Processes (SHIP)
- Paper (2021, SolarPaces): Design and integration of a solar heat system based on the SunDial for industrial processes
- Paper and Presentation (2021, SolarPaces): Integration and Simulation of Solar Thermal Energy to Dairy Processes
- Paper and Poster (2021, SolarPaces): Dynamic Analysis of the SunDial, the Rotatory Fresnel Collector
- Poster (2021, SolarPaces): Thermal losses characterization for the receiver of the SunDial, the rotary Fresnel collector
- Deliverable D9.4 Solar Energy Helix
- Deliverable D9.6.1 Data Management Plan
- Newsletter (2021, Edition n°3)

FRIENDSHIP (2020-2024, H020): Forthcoming Research and Industry for European and National Development of SHIP

- Deliverable D2.4: Literature review of nanofluid based HTF focusing on stability at temperatures up to 250 °C
- Deliverable D3.1: Initial HP concepts and integration principles for SHIP200 targeting heat delivery up to 250 °C
- Paper: Solar Field Output Temperature Optimization Using a MILP Algorithm and a 0D Model in the Case of a Hybrid Concentrated Solar Thermal Power Plant for SHIP Applications

SHIP2FAIR (2020- 2022, H2020): Solar Heat for Industrial Process towards Food and Agro Industries Commitment in Renewables

- Factsheet (2020): Project concept and replication tool
- Paper (2020, CPOTE): Multi-objective dynamic integration of a solar thermal system in the agro-industry processes case study
- Paper (2020, Eurosun): Integrated platform for rooftop installations of Fresnel collectors for solar process heat generation
- Poster (2020, Eurosun): Latent storage based on Phase Change Materials for Solar Heat Integration in Industrial Processes
- Paper (2019, E3S): SHIP2FAIR – Martini & Rossi: integration of Solar Heat in Industrial Process – Preliminary evaluation
- Deliverable (2018): D2.1 – Use Cases for the Integration of Solar Heat in Industrial Processes Identification and Characterization
- Deliverable (2018): D2.3 – Key Performance Indicators to evaluate the integration of solar heating in industrial processes

Additional open projects

- OPTAGON (2021-2025, H2020): An optical approach to next generation refrigeration
- SolarTwins (2020–2022, H2020): Solar Twinning to Create Solar Research Twins
- SecRHC-ETIP (2018-2022, H2020): Secretariat of the ETIP on Renewable Heating and Cooling
- SFERA-III (2019-2022, H2020): Solar Facilities for the European Research Area (focuses on concentrating solar thermal).

Closed projects

- I-ThERM (2015–2021, H2020): Industrial Thermal Energy Recovery Conversion and Management
- DryFiciency (2016–2021, H2020): Waste Heat Recovery in Industrial Drying Processes
- INSHIP (2017–2020, H2020): Integrating National Research Agendas on Solar Heat for Industrial Processes
- ZEOSOL (2017–2020, H2020): Integrated solar heating and cooling unit based on a novel zeolite chiller and heat pump
- TrustEE (2016–2020, H2020): innovative market-based Trust for Energy Efficiency investments in industry
- Re-Deploy (2016–2019, H2020): Re-deployable solar boilers based on concentrating solar collectors for ESCO type sale of thermal energy to industrial processes
- SOLPART (2016–2019, H2020): High Temperature Solar-Heated Reactors for Industrial Production of Reactive Particulates
- SUSPIRE (2015–2019, H2020): Sustainable Production of Industrial Recovered Energy using energy dissipative & storage tech.
- SolidCool (Feb–May 2018, H2020): Cost-efficient, solid-state refrigeration technology for cold storage
- LOWUP (2016–2020, H2020) LOW valued energy sources UPgrading for buildings and industry uses

Page 3. **ER-1: Pre-Feasibility Simulator (JER/R2M)**

ER-1 comprises ERs 2-5 inclusively (STC+HHP)

Stakeholders

- IEA SHC Task 64/SolarPACES Task IV: Solar Process Heat (2020-2023)
- Map (2021, Solar Payback): Suppliers of Turnkey Solar Process Heat Systems
- Marketplace (Energy XPRT): Solar Thermal Companies in Europe
- Database (California Solar & Storage Association): Solar Thermal Manufacturers
- Database (Green Cooling Initiative) List of industrial solar cooling network members
- News (2020, Solar thermal world): World's largest flat plate collector manufacturers in 2019

Open-source tools

- **Solar & system technology department; University of Kassel, DE** Excel Tool, Overview, Full Report, & News (2021, IEA-SHC Task64)
- Solar Payback Online Calculator (2016-2021, Solar payback): provides a simplified way for 5 cities to assess the economics of heat production with conventional fuels in comparison to solar thermal based heating alternative (see image below)

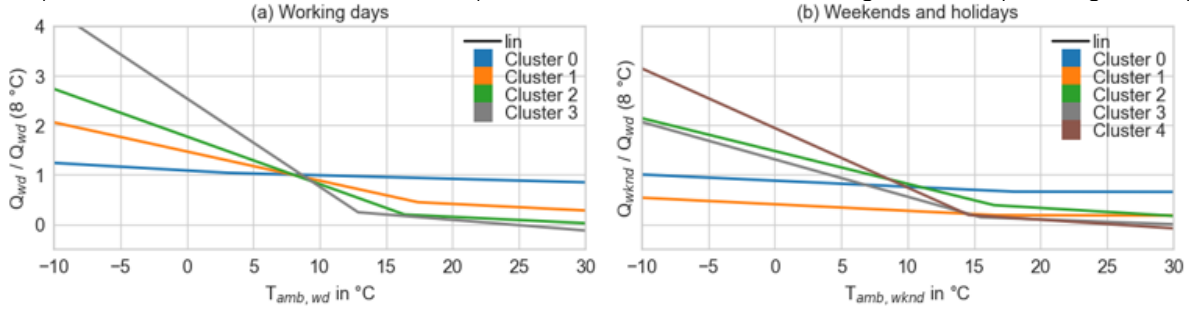


Fig. 1: Load profile cluster regressions.

- SAM – System Advisor Model (NREL, USA) is a free techno-economic software model that facilitates decision-making by modeling various renewable energy systems including industrial process heat from parabolic trough and linear Fresnel systems.
- greenius - The Green Energy System Analysis (DLR, Germany) The focus of the software is on solar thermal power plants. However, models for detailed simulations of several other renewable energy technologies have been added to the software in the last years. This includes non-concentrating solar collectors for process heat supply, PV plants and wind power parks.
- Xcos (SCILAB) – can be used for simulating a solar thermal system (e.g., consisting of solar collectors and storage tank).
- RETScreen® and video demo (Government of Canada) Clean Energy Management Software enables energy system planning
- Design Tool for the Solar Refrigerator (Excel, 2019, energypedia) / Solar Water Chiller for Cold Rooms (Excel, 2019, energypedia)

Proprietary tools

- SHIPcal (Ressspi, a single repository for solar applications in industrial processes, SOLATOM CSP; Valencia, Spain)
- POLYSUN – More than 1,000 templates for working systems to meet electricity, heating, and cooling needs.
- EBSILON®professional Solar Library (Energy Services GmbH, Germany) planning tool extended with solar thermal components.

Trends

- News (2021, IEA-SHC Task64): Standardized yield assessments for industrial solar heat plants
- Deliverable (2020, INSHIP): D5.1 – Process integration method for simulation software on EE measurements & heat storage
- Deliverable (2021, INSHIP): D5.7 – Software for basic design of 100% RES branch concepts
- Deliverable (2020, S-PARCS): D3.3 – Industrial Park Service Initial Assessment Tool
- Deliverable (2020, S-PARCS): D5.4 – Public report on the results from the feasibility studies for the most promising projects
- Paper (2020, Elsevier): Technical, financial, and environmental feasibility of solar water heater for industrial application
- Paper (2017, HPT): Simulation, validation, and demonstration of energetic optimization possibilities of industrial drying processes
- Paper (2017, HPT): Techno-economic feasibility study of a system for the transfer of refrigeration capacity from industrial assets
- Paper (2016, IJHT): Feasibility Study of Solar Cooling Thermally Driven System Configurations for an Office Building in Med. Area

Page 4. **ER-9 (CTech)**

HyCool innovative technologies and environmental benefits knowledge set

Open-source tools

- **IEA-SHC Task 48**: The LCA Method Tool is a tool for applying the Life Cycle Assessment (LCA) methodology, which is a technique for assessing the energy and environmental impacts associated with all stages of a product's life cycle from cradle to grave. LCA Method Tool can be used to create life cycle energy and environmental balances of SHC systems, to carry out simplified LCAs, and to compare the SHC systems with conventional ones
- **IEA-SHC Task 53**: Excel-based tool is the Environmental Life Cycle Impacts of Solar Air-conditioning Systems (ELISA). This user-friendly Life Cycle Assessment (LCA) tool can assist researchers, designers, and decision makers in evaluating the life cycle energy and environmental advantages for solar cooling systems in place of conventional ones. This tool takes into consideration specific climatic conditions and building loads.
- **IEA-SHC Task 54**: Task 54's aim is the purchase price reduction of installed solar thermal systems up to 40%. The Task 54 LCoH-Tool provides an easy-to-use method for calculating the Levelized Cost of Heat (LCoH) of solar thermal systems and other heating systems. The LCoH-Tool can be used to assess strategies for cost reduction and their effects on the heat cost for end-consumers.

Trends

- **Factsheet** (IEA-SHC Task59): Multidisciplinary planning process: Enhancing the use of the European standard EN 16883:2017
- **Paper** (2021, Springer): A novel solar-powered milk cooling refrigeration unit with cold TES for rural application
- **Paper** (2021, MDPI): LCA of a CSP Plant in Tower Configuration with and without Thermal energy Storage
- **Deliverable** (2021, INSHIP Project): D4.3 – Conceptual design of large-scale implementation, economic analysis & CO2 mitigation
- **Paper** (2020, Researchgate): A comprehensive comparative thermo-economic investigation on SHC technologies
- **Paper** (2020, Elsevier): Life cycle analysis of ZEOSOL solar cooling and heating system
- **Paper** (2020, HAL): Life Cycle Assessment of Thermochemical Energy Storage Integration Concepts for a CSP Plant
- **Chapter** (2019, Springer): Life Cycle Assessment of Industrial Cooling Towers
- **Deliverable** (2019, INSHIP Project): D3.3 – Industrial environment conditions for solar collector degradation
- **Deliverable** (2019, INSHIP Project): D3.6 – Suitable ageing tests for industrial environment conditions

Table 1. Overview of accelerated ageing tests for solar mirrors. (García-Segura et al. 2016)

Reference	Name of test	Proposed conditions
IEC 62108:2016	Damp heat	T = 85 °C, r.H. = 85 % for 1000 h or T = 65 °C, r.H. = 85 % for 1000 h
ISO 6270-2:2018	Humidity or condensation	T = 40 °C, r.H. = 100 % for 480 h
IEC 61215:2016	Thermal cycling	200 cycles between -40 °C < T < 85 °C
IEC 61215:2016	Thermal cycling + condensation	10 cycles of thermal cycle between -40 °C < T < 85 °C and -40 °C < T < 40 °C at r.H. = 100 %
IEC 62108:2016	Humidity freeze	400 cycles of thermal cycle between -40 °C < T < 65 °C, 20 h at T = 65 °C and r.H. 85 % and 4 h at T = -40 °C
ISO 11341:2004	Weather-ometer (WOM)	Xenon-arc lamp on, cycles of (T = 65 °C, 40 % < r.H. < 60 %; water spray)
ISO 11507:2007-02	QUV or UV + water	250 cycles of UV on (T = 60 °C)/off (T = 45 °C) for 4 h per half cycle
ISO 9227:2017	Salt spray (NSS)	T = 35 °C, cNaCl = 50 g L-1, pH = 6.5 – 7.2 for 480 h
ISO 9227:2017	Salt spray (CASS)	T = 50 °C, cNaCl = 50 g L-1, cCuCl2 = 0.26 g L-1, pH = 3.1 – 3.3 for 120 h
ISO 6988:85	Acid rain	Gas on (T = 40 °C, r.H. = 100 % , SO2 for 8 h) / off (T = 23 °C, r.H. < 75 % for 16 h)

- **Report** (2018, IEA SHC Task53): LCA and techno-eco comparison between reference and new systems
- **Paper** (2018, EuroSun): Environmental assessment of industrial solar thermal systems
- **Paper** (2018, Elsevier): Life cycle assessment: a multi-scenario case study of a low-energy industrial building in Thailand
- **Paper** (2018, EuroSun): Lifecycle assessment experiences for solar heating and cooling systems
- **Paper** (2018, Springer): Life cycle sustainability analysis applied to an innovative configuration of concentrated solar power
- **Proceedings** (2018, ISES): Renewable Heating and Cooling in Integrated Urban and Industrial Systems
- **Proceedings** (2018, International Solar Energy Society): Environmental assessment of industrial solar thermal systems
- **Report** (2016, Elsevier): A Simplified LCA Tool for Solar Heating and Cooling Systems
- **Report** (2015, ESTIF): Technical study report on solar thermal technology LCIA methods and LCC models
- **Report** (2012, Elsevier): LCA of a solar heating and cooling system equipped with a small water–ammonia absorption chiller
- **Paper** (2012, IOP): LCA of distributed concentrating solar CHP: economics, global warming potential and water
- **Presentation** (2011, SHC): Life Cycle Assessment of solar cooling systems

Page 5. **ER-14 (AIT/EMPA)**

HyCool training courses and webinars (solar thermal, solar cooling, etc.)

Ongoing training

Free courses

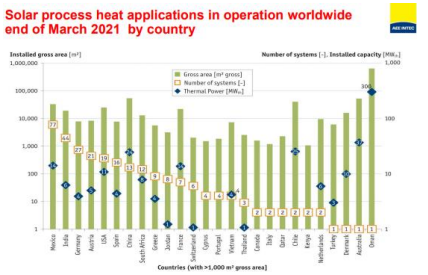
- **SFERA-III:** Optimization of Concentrating Solar Thermal training course (25-29 April 2022, Almería Spain)
- **6.2.1:** Solar Thermal Energy- Part 1 (TUDelft, OpenCourseWare)
- **RE100**: Introduction to renewable energy (Solar Energy International, USA)
- **RE101**: Fundamental math for solar applications (Solar Energy International, USA)
- **SOLTRAIN**: Southern African Solar Thermal Training and Demonstration Initiative (2009 – 2022, AEE INTEC)
- **ALISON**: Diploma in Solar Thermal Energy and Technology
- **Lesson 3**: Renewable Energy Technologies (EMMA, H2020)
- **ACTeco Platform** (2021, Erasmus+): Free online training materials on solar thermal and solar cooling
- **VU22744**: Work safely in the solar industry (Victorian Government, Australia)

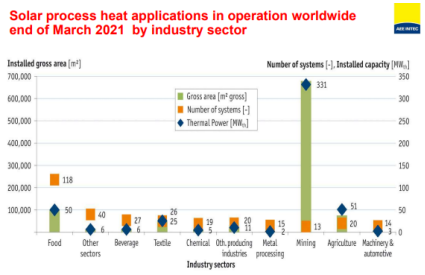
Paid courses

- **STARS:** Solar Thermal and Associated Renewable Storage (European Master in Renewable Energy, EURAC)
- **Solar Cooling Training** (Strathmore University Energy Research Centre, Nairobi Kenya)
- **Solar Thermal Hot Water** (National Inspection Council for Electrical Installation Contracting, UK)
- **BPEC Solar Thermal Hot Water** (GRE Training Ltd., UK)
- **ENGN4525**: Solar Thermal Technologies (Australian National University)
- **CE509**: Advanced solar thermal troubleshooting and repair (Solar Energy International, USA)
- **SHOL101**: Solar thermal training – Solar hot water design and installation (Solar Energy International, USA)
- **EME 811**: Solar Thermal Energy for Utilities and Industry (Penn State, Renewable Energy and Sustainability Systems, USA)
- **CAS-2**: Solar Thermal Energy Technology (Solar Energy Engineering, Germany)
- **Solar Thermal Power Plants** – Course Catalogue (RENOVE TECNOLOGÍA S.L., Spain)

Past training

- Solar Heating and Cooling Market and Industry Trends **2021** and **presentation**, **2020**, **2018**, **2017** (Online, IEA SHC TCP)





- **Potential of Solar Process Heat** (2021, Online, Solar Payback) Training on solar process heat in South Africa
- **Optical characterization of reflectors and receivers** (2021, Freiburg Germany, Fraunhofer Institute for Solar Energy Systems ISE)
- **Engineering of Solar Thermal Processes** (2020, School of Industrial and Information Engineering, Politecnico Milano)
- **Solar Cooling in the Caribbean Training** (2020, Caribbean Centre for Renewable Energy & Energy Efficiency)
- Content of SFERA-III 2nd Summer School and Doctoral Colloquium (2019-2022, H2020): **1st** and **2nd** editions
- **SHIP training** (2019, São Paulo Brazil, Solar Payback): 12 PDFs by Fraunhofer ISE available for download
- **Solar Heat Networks**: Policy, Planning, Design and Performance (2019, London UK, IEA SHC TCP)
- **Solar Cooling and Air Conditioning - South Africa** (2018, South Africa, SHC TCP)
- **Price Reduction of Solar Thermal Systems** (2018, Online, SHC TCP)
- **Solar Air Conditioning and Cooling** (2018, Online, SHC TCP)
- **Solar Standards and Certification** (2018, Online, SHC TCP)
- **Solar Heat for Industrial Applications - South Africa** (2017, South Africa, SHC TCP)
- **Solar Heating for Industrial Processes** (2017, Online, SHC TCP)
- **Energy Economy and Solar Heat** – Perspectives and Best Practice (2017, Online, SHC TCP)
- SOLARCOMBI+ (2009, IEEE) **Project website** and **presentation on training courses**

Page 7. **"In the news" (1 of 2)**

Items related to SHIP, HPs, TES, PCM, solar thermal (i.e., all HyCool topics)

Upcoming events

- **WSED 2022** World Sustainable Energy Days (02-04 March 2022, Wels, Austria)
- **EuroSun 2022** (25. September 2022 - 29. September 2022)
- **ISEC 2022** (5-7 April 2022, Graz Austria) International Sustainable Energy Conference
- **14th IEA Heat Pump Conference** "Heat Pumps – Resilient and efficient" (2023, Chicago USA)

Trends (2021)

- **Report** (2021, IEA SHC TASK 64): Europe holds top spot for SHIP incentives
- **Report** (2021, IEA SHC TASK 64): How SHIP can compete with heat produced from natural gas in Europe
- **Report** (2021, IEA SHC TASK 64): DE.1 – Collection of available solar process heat related national & trans-national…programs
- **News** (2021, HPT): Simulations of Grid-Responsive HVAC Cooling Measures via Ice/PCM storage
- **News** (2021, Solar Thermal World): Growing interest in concentrating solar heat in central Europe
- **News** (2021, Solar Thermal World): Pathway to 100 % renewables: "Industry is a really hard-to-abate sector"
- **News** (2021, Solar thermal world): 10 MW solar plant heats air for malting plant in France
- **Paper** (2021, Frontiers in Energy Research): Application of Business Model Canvas for Solar Thermal Air Conditioners
- **Brochure** (2021, HPT): Technology Collaboration Programme on Heat Pumping Technologies – Annual Report 2020
- **Deliverable** (2021, INSHIP Project): D5.6: Key design strategies for hybridization concepts
- **News** & **Materials** (2021, ESTIF): The 2021 edition of the 100% RHC Event
- **News** & **Report** (2021, Solar thermal world / IRENA): IRENA report highlights falling solar heat project costs
- **Closed call** (2021, Solar Keymark): Solar Cert. Fund: 13th call – "Empowering Sustainable Heating"
- **News** (2021, Solar thermal world): Europe holds top spot for SHIP incentives
- **News** (2021, Solar thermal world): Dutch green heat tariff prompts record-size SHIP plant
- **News** (2021, Solar thermal world): Uncapped funding for large solar heat plants in Austria
- **News** (2021, Solar thermal world): Big plans for HPs but not for solar hybrid systems in the Netherlands
- **News** (2021, Solar thermal world): China keeps top spot for industrial solar heat
- **News** (2021, Solar thermal world): Multinationals strive to add more clean heat solutions
- **News** (2021, Solar thermal world): Editorial – Carbon Pricing: can it be a game-changer for solar heat?
- **News** (2021, Solar Thermal World): Innovation Fund approves EUR 4.5 million for Croatian SHIP plant
- **News** (2021, Solar Heat Europe): Editorial – A bright sunrise over the solar heat sector in 2022
- **News** (2021, Solar Heat Europe): Solar Heat Markets in Europe rebound
- **News** (2021, Solar Heat Europe): Solar Heat Europe 2021 reflection & future ambition
- **News** (2021, Solar Heat Europe): Promoting an adequate policy framework for solar heat (Consultations)
- **News** (2021, Solar Thermal World): IEA SHC Solar Cooling Task: "We can make a difference"
- **News** (2021, ESTIF): Solar Heat for Industrial Processes (SHIP) costs are going down
- **News** (2021, ESTIF): Solar Heat at EUSEW 2021
- **News** (2021, ESTIF): Solar Heat Europe SHIP Taskforce progress in 2021
- **News** (2021, HPT): Launch of Solar Thermal Yearbook 2021
- **News** (2021, RHC ETIP): Strategic research and innovation agenda for heat pumps

Page 8. **"In the news" (2 of 2)**

Items related to SHIP, HPs, TES, PCM, solar thermal (i.e., all HyCool topics)

Trends (cont'd., 2020 and earlier)

- **News** (2020, IEA SHC ETP): Solar cooling concepts for hot climates
- **News** (2020, IEA SHC ETP): Solar thermal cooling reduces the strain on the power grid
- **News** (2020, IEA SHC ETP): Technical and market assessment of solar cooling in the Caribbean
- **Paper** (2020, Elsevier): Review on sensible thermal energy storage for industrial solar applications and sustainability aspects
- **Deliverable** (2020, INSHIP Project): D3.8 – Reference design of solar steam integration layout for food/beverage industry
- **Deliverable** (2020, INSHIP Project): D4.2 – Integration of TES and/or hybridization to solar-driven processes
- **Deliverable** (2020, INSHIP Project): D5.2: Roadmap for industrial solar heat supply combines with emerging tech.
- **Deliverable** (2020, INSHIP Project): D6.2 – Report on SHIP infrastructures / components new requirements
- **Deliverable** (2020, INSHIP Project): D8.1 – Analysis report of needed SHIP national and regional innovation strategies
- **Deliverable** (2020, INSHIP Project): D8.2 – Assessment of socio-economic impact scenarios of EU SHIP development
- **Deliverable** (2020, INSHIP Project): D8.3 – Report on comparative analysis and EU innovation support roadmaps
- **Deliverable** (2020, INSHIP Project): D8.4 – Report on guidelines of relationship between Industry and EU SHIP cluster
- **News** (2020, IEA SHC TASK 64): Hybrid solutions are key to decarbonising industry
- **News** (2020, IEA SHC TASK 64): TrustEE standardises project assessment and financing
- **News** (2019, IEA SHC ETP): In search of cost-effective, advanced PCMs
- **News** (2019, IEA SHC TASK 64): Go-to-market strategies for industrial solar heat
- **News** (2019, IEA SHC TASK 64): Andreas Häberle: First large projects tap the potential of solar industrial heat
- **News** (2019, Solar thermal World): SKN approves remote factory inspections, launches new certificate database
- **Video interviews** (2019, IEA SHC ETP)
- **Deliverable** (2019, INSHIP Project): D5.3: Characterization matrix on future industrial energy supply/storage tech.
- **Report** (2019, IEA): Solar Energy – Mapping the road ahead
- **Magazine article** (2019, HPT): Low Charge Evaporators for Industrial Heat Pumps
- **News** (2018, IntechOpen): Solar Cooling Technologies
- **Paper** (2017, HPT): Waste Heat recovery in industrial batch processes: combined heat storage & HP appl.
- **Paper** (2017, HPT): Analysis and testing of a novel cascaded adsorption-compression chiller for ind. Applications
- **Paper** (2017, HPT): Practical experience of feasibility in some real ind. waste heat recycling utilizing heat pumps
- **Report** (2016, UNEP): Assessment on the Commercial Viability of Solar Cooling Technologies and Applications in the Arab Region
- **Video interviews** (2015, IEA SHC ETP)
- **Project** (2011, UNEP): PROSOL Industry – promoted the development of solar thermal systems in the industrial sector
- **Project** (2006-2010, FP6): MEDISCO – MEDIterranean food and agro industry applications of Solar COoling technologies