SOLARUPDATE

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Newsletter of the International Energy Agency Solar Heating and Cooling Programme

INTERNATIONAL ENERGY AGENCY
Solar Heating & Cooling Programme

iea Energy Technology Network

#SolarHeat
#SolarThermal
#SolarProcessHeat
#SolarCooling
#SolarDistrictHeating

IEA SHC Solar Award 2019

The French company, KYOTHERM wins for solar thermal third-party ESCO financing

KYOTHERM's third-party ESCO solution creates a commercial advantage for solar thermal projects by taking on the investment costs and risks from end-users, which is the key to having a competitive investment environment from day one. CEO Mr. Arnaud Susplugas received the award on behalf of KYOTHERM during SHC 2019, our International Conference on Solar Heating and Cooling for Buildings and Industry held November 4-7 in Santiago, Chile together with the ISES Solar World Congress.

The **SHC Solar Award** recognizes an individual, company, or private/public institution that has shown outstanding leadership or achievements in the field of solar heating and cooling. With this year's award, the IEA SHC recognizes a financial service provider that is pairing an innovative financing mechanism with solar thermal projects. *"Low cost financing has been a key success factor in the widespread development of the photovoltaic sector. Our purpose at KYOTHERM is to provide an ESCO third-party financing solution to solar thermal project developers that will have the same impact."* ARNAUD SUSPLUGAS, CEO

Impact of Financing Mechanism

KYOTHERM has been structuring and financing renewable heat and energy savings projects since 2011. Continually refining and improving its ESCO third-party financing schemes, KYOTHERM recognizes that financing a solar thermal project is not just about putting cash on the table, it is about having a clear understanding of the technical solution, the associated risks, and the constraints of the energy end-user and the different technical solution providers. To date, KYOTHERM has structured and invested in 22 projects in solar thermal, geothermal energy, biomass energy, waste energy, energy savings, and district heating networks. Its more recent focus on solar thermal is spurred by the willingness of the French state agency ADEME to see a solar thermal

From left to right: Rémi Cuer (KYOTHERM Investment Manager)**, Daniel Mugnier** (IEA SHC Chairman)**, Arnaud Susplugas** (KYOTHERM CEO) and **Ken Guthrie** (IEA SHC Award Chairman and Australian representative).

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SHC Members

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SHC 2019 Together with SWC 2019 –

Once Again "THE" Solar Event to Attend

IEA SHC and ISES held their international conferences together for the second time. This year's event was held in Santiago, Chile, and hosted by SERC-Chile (Solar Energy Research Center). The conference brought 100s of people together to discuss, share results and experiences, and learn about the latest solar developments and research.

Over 400 experts in solar energy traveled to Santiago from 48 countries to discuss and present on everything solar from specific technologies and applications to polices and training.

The conference opened with a warm and informative welcome from Chile's Energy Minister Juan Carlos Jobet and Science Minister Andrés Couve. They were joined by Max Correa of CORFO (Comité Solar) and Alejandra Garcés of the BHP Foundation.

David Renné, ISES President, and Daniel Mugnier, IEA SHC Chair, noted the importance of this event as it is the first time either organization has held its conference in South America. And, what better country than Chile to host this event, a country committed to renewable energy and with one of the fastest growing and strongest markets for solar energy technologies. Chile is showing the world the possibilities of solar with projects like the world's second largest solar process heat plant, the Gabriela Mistral copper mine in the Atacama Desert.

The Chilean speakers attending the opening session emphasized that their country holds the top spot in solar irradiation levels thanks to the Atacama Desert, but is still working to become the number one market for solar installations in South America. Professor Rodrigo Palma, Director of the Chilean Solar Energy Research Centre (SERC), noted that if 5% of the Atacama Desert was covered in solar collectors that would be enough to produce 30% of the electricity needed for all of South America. Certainly, a goal to strive to reach in the near future.

See you again or for the first time in 2021. The location and date of this next conference will be announced in early 2020.

Collaboration Puts the Spotlight on Solar

IEA SHC International Conference on Solar Heating and Cooling for Buildings and Industry, bringing together the research and academic community with decision makers from government, industry, finance to discuss the latest developments in solar heating and cooling and market successes.

ISES Solar World Congress, addressing the key ingredients of the renewable energy transformation: technology innovation, financial opportunities, policy developments, as well as community and grass-roots actions, case studies and best practices.

International Conference on Solar Air Conditioning, focusing on the new generation of solar cooling systems based on the coupling between PV and air conditioning systems and the diversification of solar heat beyond simply cooling (domestic hot water, space heating, process heat, heating for networks).

YouTube Highlights from SHC 2019 are captured in our interview series. Fifteen presenters discuss a broad range of topics from specific technologies and applications – PV/Thermal systems, solar cooling, solar heat for cities, solar heat in industry, compact storage – to the future of solar in Chile and Brazil.

You can watch them all: SHC YouTube channel

To read the Conference Proclamation click here

Registered participants, to access the list of attendees and accepted abstracts click here

Task 56

Building Integrated Solar Envelopes: Common Challenges and Trends for the Future

Integrating solar systems into the envelope of buildings is receiving rising attention from stakeholders in the construction sector, like architects and façade systems manufacturers. Even though several barriers prevent a quick penetration of these solutions into the common practice of building design, a progressively increasing number of concepts and solutions is being developed, and several products have already reached the market.

IEA SHC Task 56: Building Integrated Solar Envelope Systems for HVAC and Lighting has gathered the experiences of both industry and research institutions on the challenges they are encountering and the trends that will characterize this market in the coming years. This has been a challenging task due to the variety of technologies embraced, which include any multifunctional envelope system that uses and/or controls solar energy that impact thermal energy demand, thermal energy consumption and comfort of the building. As such, these include building integrated solar thermal and photovoltaic solutions as well as sunlight control technologies. The analysis performed by the experts in SHC Task 56 takes into consideration the aesthetical and architectural aspects while tackling integration in building HVAC plants and socio-economic questions.

▼ **GAP:skin in a building complex in Graz, Austria.** (Source: GAP Solutions)

As the activities of SHC Task 56 are in the final phase (the project ends the beginning of 2020), it is time to sum up the main outcomes.

Starting with a review of solar envelope systems on the market, it has been possible to identify common threats and opportunities as perceived by manufacturers and researchers developing multifunctional façade systems:

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SHC Solar Award *from page 1*

market similar to the one in Denmark developing in France. The largest solar thermal plant in France, and the largest solar industrial process heat plant in Europe, is under construction and KYOTHERM's Heat Purchase Agreement will provide solar thermal heat for a set € or $ per MWh price. This means that KYOTHERM, and not the customer, bear 100% of the performance risk. Financing has become a commodity for the photovoltaic sector, and KYOTHERM's goal is to do the same for solar thermal with the help of their ESCO third-party financing solution.

"The 2019 SHC Solar Award spotlights successful financing mechanisms for solar thermal projects. The recipient, KYOTHERM, understands solar thermal's potential to decarbonize the energy sector, and using its novel ESCO solution will no doubt be a game-changer for the industry."

DANIEL MUGNIER, IEA SHC Chairman

KYOTHERM investing in clean energy

About KYOTHERM

KYOTHERM provides third-party finance for renewable heat production and energy efficiency projects. The company partners with project developers (energy service companies, EPC contractors, etc.) to finance their projects with an optimal capital cost. This partnership allows KYOTHERM to supply the heat or energy saving to the end-user over contract periods of 5 to 25 years so that they can realize savings from year 1 without having to invest.

- **Building codes and building integration:** Solar technologies integrated into the envelope of buildings must comply with building codes and standards, which in most cases were developed for conventional envelope elements. The lack of adequate test methods and references, as well as the presence of regulatory gaps, is hindering the spread of innovative integrated products. Nevertheless, the efforts of the scientific community and the lobbying action of façade manufacturing companies can lead to a standardization process and the development of new norms, as was done for Building Integrated PV (BIPV) solutions.

- **Conservative construction sector:** The construction market is, in general, conservative compared to other sectors. While light-shading elements are nowadays consolidated praxis in new-built tertiary buildings, envelope integrated PV and solar thermal products are still a niche market. Solar innovations can hardly find a place in building practices to show an established history of successful installations. Support by decision-makers to make public buildings available to these technologies could play an important role in promoting the adoption of solar envelope solutions in both the public and private sectors.

- **Building construction process:** Achieving optimal building-integration of solar components requires adjusting the conventional design processes and roles, which may, in turn, alter 'well-oiled' procedures and be met with suspicion at first. Depending on the type of solar envelope product, the traditional roles of the façade manufacturer, HVAC installer, interior designer, etc. can overlap during the building design process as well as in the manufacturing and installation of solar envelope elements. Roles and responsibilities, information and material fluxes, liabilities and warranties, and maintenance become relevant multifaceted issues that must be cleared and planned. Although this may seem to create additional burdens on the companies involved in the construction process, the upside is that new opportunities can be generated based on innovative business models and partnerships between companies.

Upward view of the demonstration facade of the lumiduct BIPV system (Source: Wellsun).

- **Government policies:** The policies adopted by national or supranational institutions are perceived to be determinant for promoting the adoption of Building Integrated Solar Envelope Systems. However, because this sector is highly diversified, with solutions ranging from PV and solar thermal systems to advanced shading solutions and daylighting management, it cannot be easily targeted with a single scheme or policy action. Possible action includes policies that support solar energy production, energy efficiency, daylight and visual comfort.

- **Increased awareness:** Over the last few years, rising interest for life-cycle sustainability and human comfort in buildings has spread in the construction sector and among the general public. These movements are drivers for the adoption of solar envelopes and are often rewarded when it comes to decentralized green energy production, energy savings, blackout security and user comfort. Simultaneously, the building construction industry, especially building designers, are gradually becoming more aware of the possibilities offered by solar envelope solutions and more informed on the options viable for new constructions and retrofitted buildings.

A few significant trends identified, thanks in particular to the Task's review of products being developed and tested in laboratories and that will be reaching the market in the coming years are:

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- **New materials and applications:** New materials entering the market are driving product innovation. For example, high-efficiency polymers used as absorbers in building-integrated collectors and the development of new light shifting species in luminescent BIPV windows. The progress in solar façade technology, however, doesn't stop with innovative materials; it also is pushing advances in the manufacturing and assembling of existing materials resulting in the development of new concepts, improvement of existing technologies and design of new applications from old concepts. An example is the use of solar envelope technologies for daylight management and electricity or thermal energy generation in residential to commercial sectors.

- **Adaptivity:** Many solar envelope solutions can adapt their behavior or characteristics to the local climate conditions. The adaption process can occur at very different timescales, e.g., from seasonal processes to instantaneous processes, as in electrochromic glasses used in transparent surfaces to shade from daylight. In doing so, they create a balance between offering opportunities for energy savings and improvements of indoor environmental quality.

- **Multifunctionality:** A prevailing trend in façade technology is multifunctionality, where the envelope element is designed to be more than the barrier from external weather and includes additional functions. Most of the solar envelope concepts analyzed in SHC Task 56 integrate RES generation or advanced daylight control and solar protection. In some solutions, this is pushed even further by replacing (part of) the building's central services, such as the artificial lighting system or entire parts of the HVAC system.

- **Prefabrication:** The practice of assembling a variety of components on a structure at the manufacturing site is one of the most common practices in the analyzed solar envelope solutions. Compared to traditional construction methods, prefabrication offers many advantages, such as the reduction of the construction/renovation time, the decrease in manufacturing process costs and the increase in product quality. These aspects are particularly relevant for solar envelope solutions since installing solar components in the envelope structure on-site would require multiple professionals (i.e., façade installers, plumbers and electricians) to cooperate. Thanks to prefabrication, this can be carried out by trained technicians in controlled industrial conditions.

- **Automation vs. passive approach:** The operation of several elements in a Solar Envelope System is performed by automatic control logic based on a variety of inputs (e.g., indoor air temperature, solar irradiation, occupation) integrated at the component level for a room, floor, building or multi-buildings. In some cases, the envelope component becomes a data source for smart building technology.

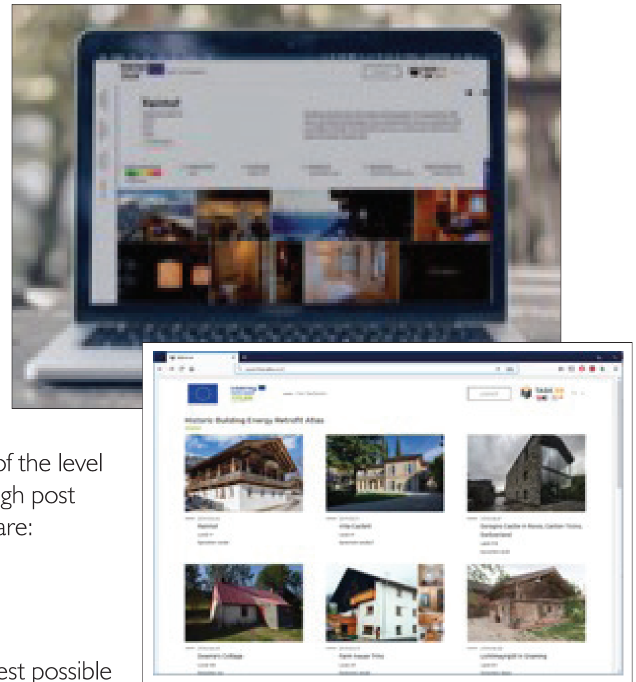
  At the same time, in the exact opposite way, there is the trend toward **completely passive components**, that is once installed, they require no type of active control. Such solutions are usually advertised as low-tech, self-regulating and low/free maintenance. Being completely passive, they are generally durable and not subject to users' possible misuse.

- **Architectural integration:** As highlighted by many producers, architectural integration (appearance and design flexibility) is vital for acceptance in the building sector. To appeal to architects and building designers, many solar envelope producers are investing in products that offer a range of colors, installation options and sizes (or even textures, transparency levels and materials) to allow for both seamless integrations and stand-out installations. In this sense, BIPV is an excellent example of how the industry is evolving to meet the demand of architects and building designers for architecturally integrated solutions.

There is a lot to look forward to in the next years as more innovative products enter the market and the existing solar envelope solutions progressively become part of the building construction practice. **Overall,** as the construction sector experiences a drift towards industrialization, it is likely that Building Integrated Solar Envelope Systems will gain a larger share of the market thanks to joint ventures between innovative companies and to new business models covering the whole construction process with one-stop-shop installations.

This article was contributed by Paolo Bonato of Eurac Research and Roberto Fedrizzi of Eurac Research and the project leader of SHC Task 56: Building Integrated Solar Envelope Systems for HVAC and Lighting. To learn more about this project and its results visit, http://task56.iea-shc.org.

ATLAS: A Best Practice Database for the Energy Retrofit of Historic Buildings



Historic buildings are the trademark of many cities, but they will only survive if maintained as living spaces. This means that we need to find renovation approaches and solutions that are compatible with their conservation and that allow for protecting their historic and aesthetic values while increasing comfort, lowering energy bills and minimizing environmental impacts.

The Historic Building Atlas brings together building renovation cases that are exemplary both in terms of heritage protection and energy efficiency. Through comprehensive and detailed documentation, including a building description, design considerations and implementation details, the case studies have the potential to inspire others and foster energy retrofits.

This database includes buildings of historic or cultural value independent of the level of protection – from medieval buildings to buildings from the 1920s through post WWII architecture. The basic requirements for inclusion in the database are:

- The project that has been implemented.
- The renovation is of the whole building.
- There is significant reduction in energy consumption (towards "lowest possible energy demand").
- The heritage compatibility of the solutions was evaluated.
- Documentation of the technical solutions is available.

The information in the database is presented in four categories:

1. Images of the building and some key figures about the intervention.
2. A description of the context and the rationale behind all the solutions adopted.
3. The different retrofit solutions implemented.
4. An evaluation of the intervention results in terms of energy efficiency, internal climate control, financial assessment and environmental impact.

The database is possible through the joint development of two research projects, both under the coordination of EURAC Research:

- The European Interreg Alpine Space project "ATLAS", co-funded by the European Union.
- SHC Task 59 within the Solar Heating and Cooling Programme (SHC) of the International Energy Agency (IEA).

Initially, the partners of both projects contributed evaluated case studies and in a second phase, owners and designers of suitable examples were invited to contribute. The publicly accessible website is expected to launch at the beginning of 2020. For now, a demo of the database is available at https://www.hiberatlas.com.

Task 59

Building Integrated Photovoltaic (BIPV) in Heritage Buildings

Improving energy efficiency in historic heritage is an extremely important topic, particularly since historic buildings constitute a considerable part of European buildings. In the attempt to lower the energy consumption from buildings, the EU Directive 2018/844 introduced the concept of near zero-energy buildings (NZEBs) for new buildings and existing buildings subject to major renovations. Among the strategies to reduce energy consumption, an important role is given to the promotion of renewable energy sources. In this context, SHC Task 59 aims to find retrofit approaches that are compatible with the preservation of the heritage of historic buildings.

Nowadays, the use of integrated solar systems within historic buildings to reduce energy consumption is possible due to a renewed compatibility of new products: the possibility to customize glass, colors and patterns allow for solutions to appear similar to traditional architectonic materials. There is a sporadic, but steadily increasing use of Building Integrated Photovoltaics (BIPV) systems in historic buildings. This mostly consists of integrating BIPV in roofs, where the technology is less visually intrusive. This makes BIPV systems increasingly suitable for the application in a heritage context with minor alterations of the original integrity, avoiding damaging the aesthetics and cultural value of historic buildings.

Source: Luciano Carugo (Architetti: deltaZERO, De Angelis - Mazza)

The Legislative Framework

It is difficult to define a precise legislative framework in Europe: while heritage authorization is necessary in Switzerland, in Italy, it depends on the landscape (rather than the building itself). Heritage authorization is mandatory for renewable energy installation on cultural heritage, including rural buildings in some instances, historical towns and settlements, areas of landscape protection.

However, now authorities and legal entities are taking positions with a more open-minded approach. While initially establishing basic criteria and guidelines to preserve as much as possible, the tendency is for greater permissibility, searching harmonious solutions with the landscape. The guiding principles behind any intervention can be summarized as:

1. To ensure maximum material preservation, it is preferable to intervene in traditional buildings where there is material degradation, for instance, new roofing is needed.
2. To minimize landscape alteration, it is preferable to intervene in annex buildings or those in the vicinity rather than on the historic buildings.
3. In the urban landscape, it is preferable to intervene in buildings already compromised or newer buildings where building materials and techniques differ from traditional architecture regulations.

Attitudes in Architectural Preservation and Restoration

Nowadays, it is possible to identify some lines of interventions in historic buildings. These can be summarized in the order from maximum preservation to a more dynamic approach:

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1. Maintaining all parts of historic buildings, valorizing all interventions that have taken place over the years.
2. Keeping some parts of the building that are considered consistent with the architectural language to preserve.
3. A more creative approach in which only outstanding aesthetical values of a monument are identified and restored.

The assessment of these interventions should take into consideration how much is lost in terms of material culture and historical value, how much is gained and the perceptive impacts on the building, on the context and on the landscape.

In any case and independent of whatever attitude is embraced, there are some criticalities connected to interventions on energy savings and their impact on the historical, landscape and environmental contexts. They are:

- visible intrusion, given chromatic characteristics, their shape, reflecting surface,
- replacement of existing materials and loss of characteristics in traditional architecture,
- modification of soil structure, vegetation, etc., and
- alteration of social perception of the places.

In conclusion, in the growing sector of sustainable architecture, solar energy represents one of the main challenges that are progressively changing the building sector with the tangible revolution of solar architecture. This, thanks to the advanced customization possibilities, will offer new opportunities to better insert into the contexts of special heritage protection buildings to preserve their cultural and essential values.

This article is based on the paper, "Acceptance of building integrated photovoltaic (BIPV) in heritage buildings and landscapes: potentials, barrier and assessment criteria" presented by SHC Task 59 experts, Cristina Polo Lopez (SUPSI), Elena Lucchi (Eurac Research) and Giovanna Franco (University of Genoa) at Rehabend, the Euro-American Congress on Construction Pathology, Rehabilitation Technology and Heritage Management. For more information on SHC Task 59, visit http://task59.iea-shc.org/.

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New SHC Projects in 2020

New Task on Solar Process Heat Starts in January

Our new project, Task 64: Solar Process Heat, builds upon our past work in this sector. The primary driver for continuing this work is the fact that the industrial sector accounts for approximately 30% of the total energy consumption in OECD countries. The major share of this energy is heat for production processes at temperatures that can be provided by solar thermal technologies.

The Task's main objective is to identify, verify, and promote solar heating plants in combination with other heat supply technologies for process heat supply, such as fossil and non-fossil (biomass and biogas) fuel boilers, combined heat and power, heat pumps, or power-to-heat. Doing this will in turn help solar technologies be a reliable part of process heat supply systems.

Emmi Dairy Saignelégier in Switzerland uses parabolic trough collectors to generate steam for different dairy processes. (Source: NEP Solar AG / SHIP database, http://ship-plants.info/)

Over the next four years, an international team of experts will work together to:

- Develop innovative hydraulic schemes for future process heat supply. These schemes will deploy different regenerative or highly efficient heating technologies to maximize the final energy and greenhouse gas emission savings compared to monovalent regenerative heating systems
- Define modularized and "normalized" components/packages for these applications (e.g., components/packages for the balance of plant, solar field, interfaces and hydraulic circuit).
- Develop simulations and monitoring tools for assessing the potential benefits of integrating Solar Heat into industrial processes. Assess monitoring strategies to help improve the performance of actual systems.
- Investigate standardization and certification of solar process heat technologies to support the existing activities and to suggest and develop new innovative standardization procedures and certification aspects.
- Prepare guidelines targeting industrial end-users to tackle the technical and non-technical barriers to market penetration and showing how this technology is a simple, reliable, innovative, affordable and profitable solution for decarbonizing industry's heating (and cooling) supply.

Interested in learning more about this project? Contact Andreas Häberle of SPF Institute for Solar Technology, andreas.haeberle@spf.ch

"This new Task will be an efficient information exchange hub for international technology providers, planners and researchers to develop the wide range of process heat opportunities for solar thermal technologies."

ANDREAS HÄBERLE, *SHC Task 64 Operting Agent*

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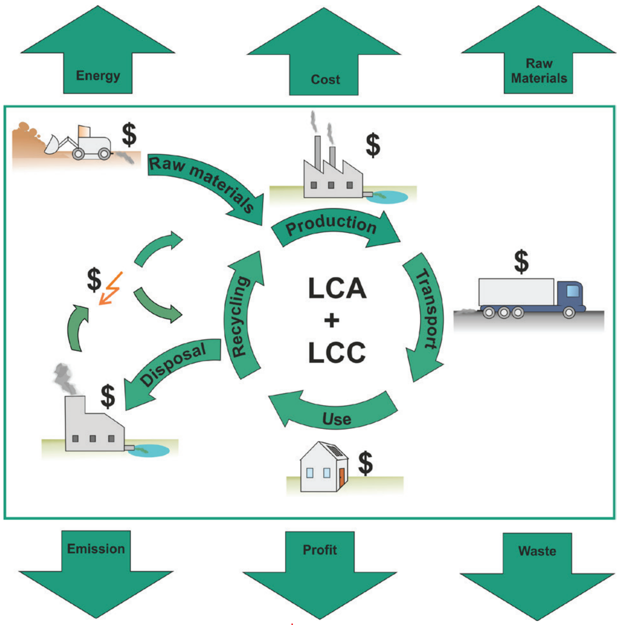
Planning Underway for a Working Group on Life Cycle and Cost Assessment for Heating and Cooling Technologies



Increasing political efforts to tackle urgent environmental problems like climate change, biodiversity loss and the rising demand for scarce resources lead to more regulations and standards for all kinds of products. Solar heating and cooling systems are considered as clean energy sources. Still, research on increasing their efficiency and decreasing their costs should not lead to trade-offs between technological innovation and (new) environmental burdens.

To build on the recent IEA SHC work on LCA and LCC, experts from Fraunhofer ISE (Germany), University of Palermo (Italy), CISRO (Australia), University of Stuttgart (Germany) and other institutions have formed a consortium to propose a new IEA SHC Working Group. The focus of the proposed work will be life-cycle-energy and environmental performance of products and systems from the solar heating and cooling industries, as well as their life-cycle costs. The scope of the work will include different heating technologies, such as heat-pumps, electrical heating, bio-mass and condensing fossil combustion.

The overall goal is for this to be a joint activity between industry and research to promote international collaboration on the sustainability and economics of renewable heating technologies. The existing methodology and data for Life Cycle Assessment and Life Cycle Costing will be applied and tailored to the systems and technologies. And reference systems will be defined as well as current and prospective scenarios designed and analyzed. The environmental impacts of the SHC technologies will then be assessed and compared to those of other technologies and trends in the improvement of the SHC environmental profiles. The economic optimization will be based on the LCOH calculation established in IEA SHC Task 54: Price Reduction of Solar Thermal Systems.

New Partners Welcome

The consortium is looking for more research and industry partners to contribute to tasks like the definition of methodologies, evaluation guidelines and reference systems, data collection and impact assessment as well as networking and exchange. If interested, please contact Dr. Karl-Anders Weiss at Fraunhofer ISE (karl-anders.weiss@ise.fraunhofer.de) for more information.

Collaboration with other IEA Technology Collaboration Programmes is key for the success of this project. For starters, we look forward to cooperating IEA PVPS and IEA to exchange information, share project experts and hold joint meetings.

KARL-ANDERS WEISS, Fraunhofer ISE

SOLAR ACADEMY SHC

FOR HEATING & COOLING IN BUILDINGS & INDUSTRY

UK TRAINING WORKSHOP ON RENEWABLE HEAT FOR HEAT NETWORKS

In December, Triple Point Heat Networks Investment Management, in collaboration with the IEA Solar Heating and Cooling TCP, hosted a workshop in the UK on Renewable Heat for Heat Networks. The workshop built upon the success of the March 2019 UK Solar Academy on Solar Heat Networks: Policy, Planning, Design and Performance (read more about the March workshop here). This second workshop was aimed at people either participating or seeking to participate in the HM Government Heat Network investment Project (HNIP) and provided attendees with a good grasp of what solar heat networks are, as well as supplying them with the resources they need to include solar in their heat network projects. *SHC Task 55: Towards the Integration of Large SHC Systems into District Heating and Cooling Networks* experts discussed the role which solar could play in decarbonizing UK heat networks, providing examples from other projects across the world, discussing how these had been achieved, and providing evidence of the level of decarbonization these had attained.

Four National Experts of SHC Task 55 spoke about the role of solar in heat networks.

These Experts were:

- Magdalena Kowalska from the renewable energy planning company, PlanEnergi, in Denmark;
- Christian Holter from the solar engineering company, SOLID, in Austria;
- Grant Feasey from the solar collector manufacturing company, AES Solar, in Scotland; and,
- Renaldi Renaldi from Oxford Martin School at the University of Oxford, in England.

The IEA Solar Heating and Cooling TCP speakers were also supported by experts from the IEA Heat Pumping Technologies TCP (Roger Hitchin), the IEA District Heating TCP (Dr Anton Ianakiev and Robin Wiltshire) and the Danish Embassy in the UK (Jacob Byskov Kristensen).

The workshop was fully booked, with the capacity of 120 attendees being reached within the first couple of weeks of launch. This clearly demonstrates the level of interest in solar as a component in heat networks and the demand for expert knowledge of their implementation.

Solar Academy WEBINARS

Most Recent **Material and Component Development for Thermal Energy Storage** | November 2019

1 **Renovating Historic Buildings Towards Zero Energy** | January 2020

2 **Application of PVT Collectors and New Solutions in HVAC Systems** | March 25

3 **Solar Heating and Cooling Markets and Industry Trends** | June 24

4 **Integrated Solutions for Daylighting and Electric Lighting: From Component to User Centered System Efficiency** | September 24

You can watch past webinars on the SHC YouTube channel click here

South Africa – Coal Out, Solar and Wind In

South Africa is demonstrating its commitment to a more sustainable future growth path by supporting renewable energy and energy efficiency measures, together with skills development and job creation through fostering a green economy. South Africa is among the highest emitters of carbon dioxide in the world, currently ranked in the top 20 in terms of top emitters per capita, since more than 75% of our primary energy requirement is derived from fossil fuels. The country responded to the urgent need to reduce fossil fuel dependency, diversify the energy mix and supply, and reduce the country's carbon footprint with a supportive policy and legislative framework that exploits the excellent local renewable energy resources, especially wind and solar.

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South Africa's renewable energy sector experienced explosive growth in the past 10 years. The renewable capacity in South Africa is forecast to grow by 40% from 8 GW in 2017 to nearly 12 GW in 2023. Solar PV is leading this renewable expansion accounting for almost half of all the additions (1.6 GW) followed closely by onshore wind (1.4 GW), CSP (0.4 GW) and bioenergy (0.2 GW). Growth is being driven by competitive auctions under the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) for utility-scale projects while distributed solar PV see growth from net-metering programs and self-consumption projects. Faster growth is limited due to uncertainties over the speed of the future auction rounds.

Recent developments over the past two years signal an increase in momentum for renewable deployment in South Africa, yet grid constraints and policy uncertainty remain key forecast challenges. Through the support of the new South African administration, Power Purchase Agreements (PPAs) were signed for 2.3 GW of installed capacity awarded under REIPPPP rounds 3.5, 4 and 4.5 in April 2018 after three years of delay. Shortly after these developments, the government announced plans to hold round 5 for another 1.8 GW. While these are seen as positive steps towards maintaining investor confidence, grid constraints remain a key challenge to future deployment.

The contribution of a green economy to economic growth and job creation is promising, and South Africa is preparing to play a leading role in renewable energy deployment. South Africa has abundant natural resources that can be harnessed for energy production. It boasts one of the best solar regimes in the world, measured at 4.5 to 6.6 kWh/m^2, one of the most abundant renewable energy resources in the country (1,900-2,200kWh per annum solar yield).

"The two solar thermal systems launched in 2019 were built as part of SOLTRAIN and are the two largest solar thermal systems south of the Sahara."

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▲ **Figure 1. District heating system on the Wits Junction residence building combines solar thermal, co-generation and gas technologies**

Utilizing South Africa's solar resource for direct solar thermal energy production is one of the most resource efficient means of approaching renewable energy system integration. An electrical grid is not required to achieve this, and REN21 maintains that approximately 50% of the energy requirement is for heating; this makes solar thermal the most suitable technology for large scale implementation. South Africa has already begun to invest in this market development and harness this resource. This is evident from the solar heating average annual growth rate in technology deployment between 2010-2015 was only 6%, however within the year of 2015, it boosted to 12%, and it has continued to increase. This indicates significant market support to the technology being deployed nationally. In summary, renewables are gaining a proportionally larger share of the heat market, with the market size likely to be stable.

There have been some significant developments in large scale solar thermal systems in South Africa over the past three years. On 15 May 2019, the Austrian Ambassador to South Africa, Dr. Johann Breiger, officially launched two major SOLTRAIN projects, the first solar district heating system and the largest solar process heat system in Sub-Saharan Africa. These are the first sub-Saharan district heating plant at the University of Witwatersrand in Johannesburg and solar process heat plant for the Klein Karoo tannery in Oudtshoorn, both of which will save millions in energy costs over the lifetime of the plants.

SOLTRAIN

The Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN) is a regional initiative on capacity building and demonstration of solar thermal systems in the Southern Africa Development Community (SADC) region. The program in South Africa is managed by the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University and the South African National Energy Development Institute (SANEDI) in partnership with AEE - Institute for Sustainable Technologies (AEE INTEC) from Austria. It is funded by the Austrian Development Agency and co-funded by the OPEC Fund for International Development (OFID).

"SOLTRAIN is the most important and most successful know-how transfer project that AEE INTEC carries out worldwide," explains Mr. Werner Weiss, Director of AEE INTEC. "The two solar thermal systems launched in 2019 were built as part of SOLTRAIN and are the two largest solar thermal systems south of the Sahara. We are proud to have supported our South African partners to design and build them."

The success of the program has led to SOLTRAIN going into a fourth phase from July 2019 until December 2022. And Weiss adds, "We are already looking forward to the continued excellent cooperation with our South African partners and the joint implementation of many other demonstration projects."

With the widespread transition to solar thermal systems for hot water preparation in the residential, commercial and industrial sectors, the electricity sector in the SADC region could be massively relieved and, moreover, contribute to the reduction of CO_2 emissions since the vast majority of the region's power plants are run on coal.

The 326 solar thermal systems built to date in the SOLTRAIN program have a solar yield of 1,834 MWh/year and save about 2,000 MWh/year of electricity and avoid annually 638 tons of CO_2. If one kWh of electricity is valued at R0.21, the installed solar thermal systems save R4.3 million in electricity costs per year.

Wits Junction at the University of Witwatersrand

The first of its kind, the Wits Junction district heating project, combines solar, co-generation and gas heating technologies, servicing 14 student residence buildings with hot water from one centralized hot water plant room. Installation includes a 600m² solar heating plant with 10m² Austrian collectors.

A combined system uses the advantages of each technology: solar has a very low running cost while CHP

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South Africa *from page 13*

(combined heat and power) gives continuous baseload coverage. The combination covers thermal and essential electrical loads.

Over 1,100 students reside in 14 buildings, with an average consumption of 94,000 liters of hot water per day. Peak demand is in the morning, averaging 30% of daily consumption, with a maximum demand of 28,200 liters in an hour. The system supplies the entire hot water demand, including kitchens, laundry, cleaning and other domestic uses. Each student has his/her own kitchen and there are some centralized service rooms for cleaning staff.

Since the system was commissioned, the complaints of not having hot water have reduced by 98%. The redundancy design guarantees supply also during maintenance periods.

The estimated cost savings are R40 million over the next 20 years, and already the University has seen substantial electricity savings over the eight-month trial period. As the electricity cost from the co-generator is equal to municipal cost, the thermal energy is free and the centralized plant requires a lot less maintenance intervention, hence fewer costs. There is currently a backup water system installation in progress, with 300,000-liter tanks, and a more advanced logging and measurement system is also planned.

The system has been a major success in not only meeting financial and energy saving parameters, but also the service delivery levels have vastly improved. The small interruptions are from water interruptions from municipality or ring main circulation pumps blocked from debris in the water. Unlike previous systems, this project comes with integrated monitoring and maintenance from the very first planning day.

Klein Karoo Tannery

The Klein Karroo International (KKI) tannery installed a 600m^2 solar collector system to reduce costs and increase competitiveness since fuel costs are highly volatile. There was also an underlying strategy to move its production to a more renewable base; however, finance was the main driver.

"Stellenbosch University approached various tanneries for process heat application viabilities and this tannery was the most forthcoming and had the budget to contribute to the study," says Mr. Doran Schoeman of E3 Energy.

The process heat infrastructure uses an oil burner and not electrical heating. The fuel source is LO10 paraffin oil, at an indicated rate of 11.8 kWh per liter. The feasibility study design was that the solar would displace the local fuel, indicated as 60% solar fraction. The estimated savings, based on measurements from the plant, are 285,000 kWh and an average of R265,000 over eight months or 24,150 liters of oil.

Stellenbosch University indicated a payback of 6.5 years based on a solar fraction of 60%. This is from a financial model analysis from the feasibility study, which includes maintenance, finance costs and all system-related expenses.

▲ **Figure 2. Ground mounted system at the Klein Karroo tannery.**

Strategically, the approach was to implement a first phase of renewable energy utilizing solar thermal and to monitor actual results to estimated savings. There has been no further commitment as yet, as the analysis is still in progress.

Dr. Karen Surridge, Centre Manager of Renewable Energy Centre of Research & Development at SANEDI concludes, "SANEDI is delighted to be associated with such landmark developments that put the SOLTRAIN projects firmly on the renewables table."

This article was contributed by Dr. Karen Surridge and Ms. Khothasto Mpeqeke of SANEDI and Ms. Karin Kritzinger of the University of Stellenbosch. For more information, go to https://soltrain.org

MEMBER NEWS

Portugal and Spain's Innovative Solar Solutions for Waste Management in the Iberian Peninsula

The SECASOL project is implementing innovative solar thermal solutions in wastewater sludge and municipal solid waste drying processes in southern Portugal and Spain.

The management of wastewater treatment (WWT) and municipal solid waste (MSW) installations pose significant challenges when considering both the economic and environmental aspects. These challenges tend to increase whenever custom designed solutions are required, which can be highly complex in nature when choosing the right treatment options, considering the environmental requirements (e.g., legal restrictions for discharging wastewaters into the environment or wastes disposal regulations) and local regulations that can vary from region to region.

When industrial companies face these challenges and are confronted with the need to treat and, whenever possible, to economically valorize the produced waste, the first question is:

What Available Solutions Could Be Implemented?

A number of technical and technological solutions are currently available or under development that effectively apply solar thermal energy. And, *IEA SHC Task 62: Solar Energy in Industrial Water and Wastewater Management* started work the end of 2018 on developing and providing the most suitable and accurate information on the technical and economic possibilities for effectively applying solar thermal energy and solar radiation to disinfect, decontaminate and separate industrial process water and wastewater.

To help choose the most adequate solutions for each specific case, some questions may help:

- What are the waste characteristics (e.g., type and amount of contaminants, moisture content and composition)?
- What are the legal and environmental regulatory requirements?
- Which wastes can undergo economic valorization?

Considering the answers to these three questions as well as the abundant solar resource found in the Iberian Peninsula, particularly in its southern region, the energy needs of several thermal processes and the need to increase the share of renewable sources in the energy system means that Concentrated Solar Thermal (CST) technologies could offer a sound option for the decarbonization and sustainability of this sector.

SECASOL Project

The SECASOL project (http://www.diphuelva.es/secasol) was developed by an Iberian consortium of public and private entities to foster the inclusion of solar-based technologies in the WWT and MSW sectors. With a total budget of approximately €790,000€co-financed by FEDER, the European Regional Development Fund), this project aims to promote and demonstrate the implementation of innovative solar thermal solutions using CST technology for waste drying processes and targeting WWT and MSW facilities located in the cross-border region of Andalucía-Algarve-Alentejo.

Through this cooperation and joint work, replicable experiences are under development in the Andalucía-Algarve-Alentejo cooperation region, which has similar drying needs and available solar resources.

IEA SHC Task 62: Solar Energy in Industrial Water and Wastewater Management started work the end of 2018 on developing and providing the most suitable and accurate information on the technical and economic possibilities for effectively applying solar thermal energy and solar radiation to disinfect, decontaminate and separate industrial process water and wastewater.

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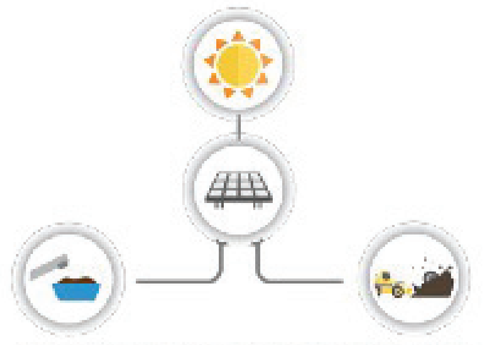
Portugal and Spain *from page 15*

Concentrated Solar Thermal Technology

Apart from power generation, solar energy also plays an important role in fuel savings for heating and cooling applications using CST technologies. Indeed, CST can be used to drive a variety of thermal processes through different geometries and arrangements, although with the same principle of operation: A solar concentrator focuses the solar radiation into a solar thermal receiver (absorber) converting it into thermal energy.

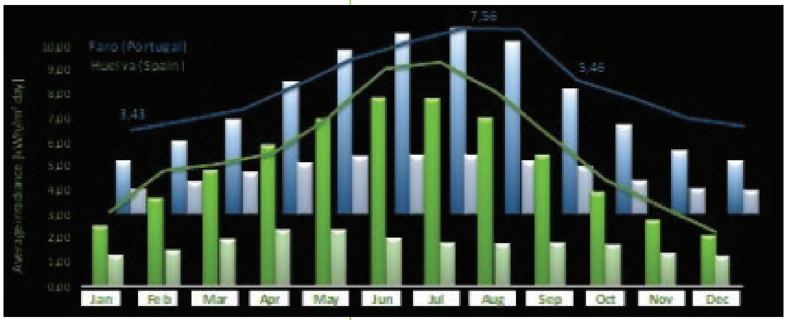
CST technologies present a huge potential to impact the carbon footprint. The implementation of CST systems are distinguished from other renewable energy sources, mostly due to their unique integration potential in processes that require heat produced by conventional fuel-based systems.

In addition, the solar solution can very easily be adapted to a custom size design thus taking advantage of the on-site resource without the need to transport the waste to large processing facilities the added the expense of transport (both economic and environmental).



Generic concept of the concentrating solar drying solution for WWT and MSW facilities

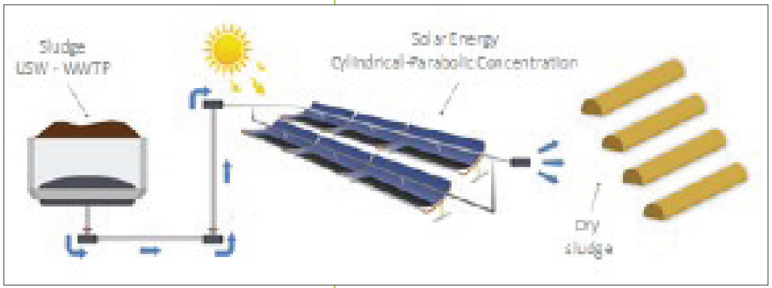
Average irradiance in the SECASOL project areas in southern Portugal and Spain.



The inclusion of solar technologies in these sectors will contribute to energy security, and in this way, contribute favorably to the development of a more green economy.

The use of solar radiation as a renewable source of thermal energy is suitable for use in different industrial applications that require large amounts of heat, not only in the production processes but also in the various stages of waste treatment. Thus, solar thermal energy could be used to partially replace the fossil fuels used in the production of heat in a wide range of industrial processes. Processes requiring temperatures below 100ºC could technically be supplied by heat produced by non-concentrating solar thermal systems. Heat requirements for higher temperature levels could be adequately supplied throughout current solar concentration technologies.

Municipal solid waste solar drying process



As a result, and considering the direct irradiance estimated in the normal plane (DNI), for those regions in the scope of the project, there is the needed solar thermal energy for drying applications suitable for using solar concentrator systems.

For the MSW drying processes, a first rough estimation of the solar drying capacity reaches values between 4,100 kg/(m^2 year) to 4 550 kg/(m^2 year) for the Algarve region and 4,300 kg/(m^2 year) to 4,500 kg/(m^2 year) for the Alentejo region. For the Andalusia region, the values range between 4,100 kg/(m^2 year) and 4 600 kg/(m^2 year).

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For WWT, the estimated values range between 2,050 kg/(m^2 year) and 2,450 kg/(m^2 year) for the Algarve region and 2,100 kg/(m^2 year) to 2,350 kg/(m^2 year) for the Alentejo region. For the Andalusia region, no significant differences were found in the values ranging between 2,100 kg/(m^2 year) and 2,350 kg/(m^2 year).

Additional information on the subject can be found in Deliverable PP1 of the SECASOL project (Potencial de aplicação da energia solar térmica de concentração aos processos de depuração de águas residuais e de tratamento de resíduos sólidos urbanos).

Expected Project Outcomes

- More efficient use of locally available natural resources - solar energy
- Increase in the implementation of solar solutions for a greener economy
- Incorporation of innovative solutions based on solar thermal energy in waste treatment drying processes
- Improve knowledge transfer capability between research centers, universities and private and public institutions as well as identification of shortcomings in research and training
- Demonstration of the technical feasibility of implementing CST solutions in a solar drying prototype
- Development of a solar dryer simulation and validation tool
- Promote the reduction of the environmental impact throughout the integration of renewable energy in waste treatment processes
- Contribution for the EU cohesion and sustainable growth policy through Portugal-Spain cross-border cooperation mechanisms focused on the risk prevention and improvement of natural resource management

This article was contributed by Miguel Miranda, João Cardoso, Pedro Azevedo, David Loureiro, Farinha Mendes and Victor Mantilla of LNEG, Portugal. The authors would like to thank the INTERREG Program for financing the project N.º 0029_SECASOL_5_E.

Interreg Atlantic Area
European Regional Development Fund
EUROPEAN UNION

The University of Évora Renewable Energies Chair is participating in a new INTERREG Atlantic Area project - **EERES4WATER** - devoted to the promotion of direct use of renewable energy sources and energy efficiency in the water cycle. One of the project actions, related to the objectives of *IEA SHC Task 62: Solar Energy in Industrial Water and Wastewater Management,* will be focused on the direct use of solar photons in photochemical and photocatalytic processes for wastewater decontamination and disinfection, which could provide an efficient solution, particularly in the case of emerging contaminants. The reactor of such a system is the receiver of a solar collector that captures and uses both direct and diffuse solar radiation in the visible and UV range. Different collector configurations and reflector designs of the CPC-type, along with the use of low-cost materials, will be investigated and validated. A case study will be selected and a complete solution will be designed to achieve 100% solar by including a PV system with electric storage that will provide energy to run the auxiliary components, including pumping.

2019 Solar Thermal Trends

As 2019 comes to an end and 2020 begins, our team of SHC Task managers want to share some trends they see in their fields of expertise. We hope that by taking the time to stop and think about where solar thermal is headed, we can stay one step ahead of the technological advances and market changes.

TECHNOLOGY TRENDS

Solar Cooling

Large potential. The demand for cooling and refrigeration will continue its rapid growth, particularly in emerging countries (the IEA estimates several hundred million AC units to be sold per year by 2050, https://www.iea.org/reports/the-future-of-cooling). This means there is a **huge potential for cooling systems that use solar energy**, thermal systems as well as photovoltaic (PV) systems. A key argument for this application is that it consumes less than conventional energy sources and generally uses natural refrigerants, such as water and ammonia. (In Europe, this application is also pushed by the European F-gas Regulation No. 517/2014).

Adaptation to Sunbelt Regions. The know-how capitalized in OECD countries (Europe, US, Australia, etc.) on solar cooling, both thermal and PV, is essential. Still, very few efforts have been made to **adapt and transfer this know-how to the Sunbelt regions** in Africa, MENA and Asia, all of which have dynamic emerging economies. Therefore, new developments and innovations for affordable, safe and reliable cooling systems for the Sunbelt regions (sunny and hot climates between the 20th and 40th degrees of latitude in the northern and southern hemispheres) are underway to cover medium to large size segment of cooling and air conditioning (between 10 kW and 1,000 kW).

Thermal storage for PV cooling. The continued declining cost for PV and the need for self-consumption mechanisms is energizing the market for **green cooling systems in buildings**. In these products, thermal cold storage will be key because it offers the lowest cost option to store cooling energy between its production and its consumption.

PV/Thermal Systems

Market trends. Interest in PVT collectors (PV and Solar Thermal collectors combined) is growing and new and innovative PVT collectors are emerging in several countries. A SHC TCP survey of the PVT market showed **more than 1 million square meters of PVT** already installed and a **demand that is booming**. Sound examples of the technology at work continue to bolster this growing solar application.

Viable solar option. A growing number of installations are demonstrating why PVT leads to reliable results when it comes to maximizing the output of 1 square meter of a roof. **Combined with heat pumps, PVT solutions show the lowest CO_2 emissions** and can avoid the need for a borehole and the noise of an air heat pump.

BUILDING TRENDS

Building Integrated Solar Envelope Systems for HVAC and Lighting

Market trends. The solar envelope systems **market is highly diversified**, ranging from building-integrated PV and solar thermal to shading solutions controlling solar thermal gains and luminous comfort. While shading solutions are now common practice in new-construction office buildings, **envelope integrated PV and ST products are still a niche market.**

Multifunctionality. The envelope element is designed to be more than the barrier from the external weather and includes additional functions. Many of the solar envelope concepts analyzed **integrate by design RES generation or advanced daylight control and solar protection.** In some solutions, however, this limit is pushed even further by replacing (part of) a building's central services, such as the artificial lighting system, or entire parts of the HVAC system.

Prefabrication. The practice of assembling a variety of components on a structure at the manufacturing site is one of the most common traits among the analyzed solar envelope solutions. Compared to traditional construction methods, prefabrication offers many advantages, such as a **reduction in the construction/renovation time and the cost of the manufacturing process, and ultimately, better product quality.**

Architectural integration. To appeal to architects, many solar envelope producers are developing **products in a range of colors, installation options and sizes** (even textures, transparency levels and materials) that allow for both seamless integrations and stand-out installations.

Lighting

"LEDification". The trend "more for less" in today's solid state lighting (SSL) market persists. Generally, prices for LED-based lighting systems keep dropping, while quality levels and provided additional features are increasing. LED spectra have been better matched to natural spectra. LED chips are enabled to provide flexible color temperatures (2,700K - 6,500K). Both allow, among other things, to much **better mimic the quality and dynamics of daylight**. Micro-optical and side-emitting systems for de-glaring and light redistribution provide designers not only with new tools in fixture design, but also are starting to find their way into building facades.

Smart building/connectivity. Lighting is part of the growing smart building and "connectivity" wave. In particular, **wireless lighting controls are becoming an affordable way** to implement state-of-the-art light management concepts in retrofits and new buildings. For example,

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the integration of electric lighting with natural light – daylight mimicking.

Health impacts. Tremendous research efforts can be found in the field of a **more holistic understanding of lighting's impact on human beings.** This includes several non-visual physical as well as psychological effects. Initiatives like the Good Light Group "Good light for healthy people" are trying to support and promote outcoming results.

Standards and regulations. New findings are entering markets through several new standards and regulations. For instance, the new European Standard EN 17037 "Daylight of buildings" addresses important issues for the beneficial daylight design of buildings encompassing daylight supply, view out, insolation of indoor spaces, and glare protection. Market acceptance and application will very much depend on the **implementation of these rules in the widely used design tools.**

INDUSTRY TRENDS
Solar District Heating

Feasibility funding. More and more banks and funding organizations are **financing feasibility assessments for large-scale solar district heating in cities and communities.** This type of funding strengthens the whole value-added chain of SDH installations – feasibility, planning, implementation and monitoring.

Digitalization for large-scale SDH. Different digitalization topics like **monitoring, fault diagnosis, advanced process control, big data and cross-sectoral energy management** will be major focus areas in the coming year.

High temperature SDH. Many district heating systems work at >100°C, and this trend will last for many years until the 4th generation of district heating – low temperature – is implemented around the world. Further investigation is needed on the **system integration of existing and newly developed collectors** in high temperature networks. And a big challenge will continue to be the integration of seasonal storages for high temperature networks.

Solar Heating for Industrial Processes

Market trends. To overcome barriers between the research community, solar suppliers and industry, it will be necessary to **push implementation in the upcoming years**. A standard economic evaluation based on a leveled comparison with other technologies (e.g., Levelized Costs of Energy/Heat) that highlights non-energy-benefits, boosts innovation and supports industry with innovative financing models will not only attract investors, but make solar heating for industrial processes essential for a holistic renewable industrial energy system.

Integrated energy systems. Solar process heat is a core technology in low and medium temperature heating/cooling industrial energy systems. Current **integration concepts need to be adapted for industrial processes** to take advantage of the benefits of solar heat in combination with other renewable technologies. Doing this will significantly increase the solar fraction that can be technically and economically achieved.

Standardization, certification, digitalization. Solar process heat is a modular system of single components, all of the state-of-the-art and well-proven in hundreds of implementations. To achieve additional cost reductions, it is necessary to **streamline the design of solar integration concepts** by further standardizing the concept development, economic assessment and design of single components. Linked to the increasing digitalization of industrial production and the energy supply, optimized design and control of the solar system is key to further market uptake.

Wastewater treatment. The efficient supply of energy, the best possible integration of renewable energy sources and the recovery of resources in the sense of a circular economy must go hand in hand. The use of solar process heat represents a large, but so far mostly unused, potential in industry. Therefore, **innovative and concrete solutions are needed for the long-term and successful introduction** of solar thermal energy. For example, integrating solar process heat in wastewater treatment technologies has excellent technical and economic potential for solar thermal energy.

STORAGE TRENDS
Compact Thermal Energy Storage

Thermochemical materials. The **search continues for improved thermochemical materials, especially composite materials** consisting of a porous carrier material and a salt hydrate, with more focus on power-to-heat applications. The development of materials for higher temperature heat storage is ongoing, with special attention given to material stability during cycling in test reactors. Phase change materials (PCM) that blend two or three components to achieve performance characteristics for dedicated applications in low and medium temperature ranges will continue to be developed.

Development and testing. We now have a better overview of the different technologies to charge and discharge phase change materials. The next step is to work on a **common definition for the performance of PCM heat exchangers and test methods for the performance.** For thermo chemical material (TCM), the collection of performance measurement data for a variety of test reactors is needed to further develop/improve reactor modeling software. For high temperature storage, testing of moving bed reactors and other types of reactors will continue with the aim to improve heat transfer and reaction efficiency, coupled with material cycling stability.

Integration. At **medium and high temperature levels, more thermal energy storage technologies will enter the market** to provide power-to-heat services to the electricity grid. Medium temperature technologies will be mainly for the decentralized, domestic market while the higher temperature technology is aimed towards centralized solutions for industry and utilities.

Marketplace

The Solar Heating and Cooling Programme is not only making strides in R&D, but also impacting the building sector. This section of the newsletter highlights trends and solar technologies that have been developed, conceptualized or part of the research in one of our Tasks and are now being commercially manufactured, marketed or used.

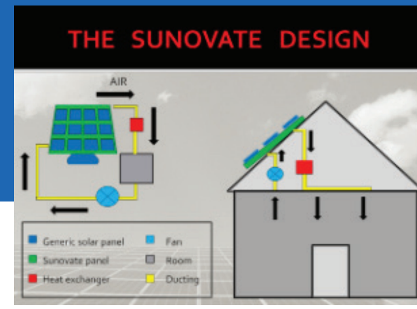


Photo credit: Sunovate, http://www.sunovate.com.au/

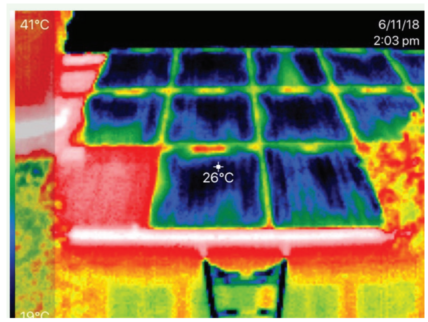


Photo credit: PVTLAB, https://www.pvtlab.com.au/home

PV/Thermal Innovations

Experts participating in *IEA SHC Task 60: Application of PVT Systems* exchange ways of designing and building new types of PVT collectors to improve performance, ease of installation and reduce costs.

Two Australian industry partners have taken advantage of the Task's R&D platform.

- Sunovate has completed its first demo project of its PVT panel that uses air as the transfer medium to reduce the investment and maintenance costs. Task experts estimate that by reducing the operating temperature of the solar cells 5°C can increase the timeframe for solar panels to reach 20% degradation by 40%.
- PVTLAB developed a new PVT collector solution called Coolsheet. They have achieved the lowest weight for a 300 W PVT panel at only 7 kg. The technology fixes a light thermal absorber with high heat exchange properties to an existing PV panel! The collector can also act as an insulation layer on roofs and in retrofits.

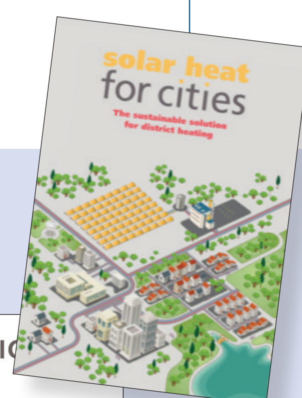
As SHC Task 60 wraps up in 2020 more examples of innovative components and system combinations will be publicized.

Solar District Heating Market is Set to Hit USD 7 billion by 2025

The global Solar District Heating market is poised to exceed USD 7 Billion by 2025, as reported in the latest study by Global Market Insights, Inc. Rigorous energy efficiency protocols coupled with government directives toward emission reduction will propel the solar district heating market growth. Changing climatic conditions on account of rising surface temperature coupled with growing adoption of sustainable energy technologies will boost the industry growth. And, the residential SDH market alone is projected to grow to USD 3 billion by 2025.

Increasing investments toward development of large commercial and industrial establishments including data centers, hotels, manufacturing, chemicals and pulp & paper plants will propel the large-scale systems. Furthermore, favorable regulatory norms toward the adoption of sustainable heating technologies coupled with rapid industrialization across the emerging economies will complement the business outlook.

In support of this, *IEA SHC Task 55: Towards the Integration of Large SHC Systems into District Heating and Cooling (DHC) Networks* recently published an investors brochure.

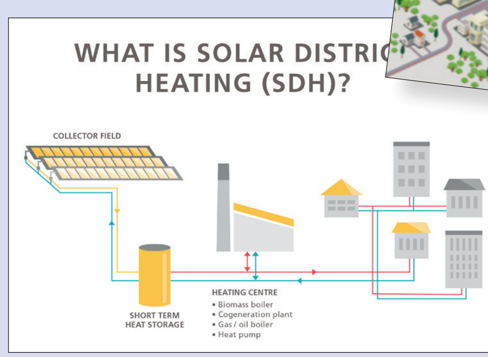


Solar Heat for Cities –The Sustainable Solution for District Heating

Interested in investing in Solar District Heating? Want to better understand why countries are investing in this technology? In search of running projects? Then the newly published 11-page brochure, Solar Heat for Cities – The sustainable solution for district heating, is what you are looking for. Using graphics, the authors describe:

- Solar District Heating and why countries are investing in it
- The Danish market, the world leader in Solar District Heating installations
- Nine systems running in Austria, China, Denmark, France, Germany, Latvia and Serbia

* The infographics can be downloaded in English, German and French



IEA programme SHC

The International Energy Agency was formed in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD) to implement a program of international energy cooperation among its member countries, including collaborative research, development and demonstration projects in new energy technologies. The members of the IEA Solar Heating and Cooling Agreement have initiated a total of 64 R&D projects (known as Tasks) to advance solar technologies for buildings and industry. The overall Programme is managed by an Executive Committee while the individual Tasks are led by Operating Agents.

Follow IEA SHC on

SOLARUPDATE

The Newsletter of the IEA Solar Heating and Cooling Programme

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by

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