



# 5<sup>th</sup> International Solar District Heating Conference

11-12 April 2018  
Graz, Austria



Supported by:



This project has received funding  
from the European Union's  
Horizon 2020 research and  
innovation programme under grant  
agreement No 691624



# WELCOME TO THE 5<sup>TH</sup> SDH CONFERENCE

Our program is based on more than 80 submitted contributions and SDH plants in different stages of development: new plants and system components, results. Some sessions are dedicated to market development and policy issues and share their vision and experience. We wish you an interesting conference!

## PROGRAMME OVERVIEW

### Wednesday, 11 April 2018, Congress Graz

**08:00h | Registration**

**09:00h - 10:30h | Opening plenary session (Hall Steiermark) |**  
European perspective - Integration of solar thermal in the large city of Graz

**10:30h - 11:00h | Coffee break**

**11:00h - 13:00h | Parallel session 2.1 (Hall Steiermark)**  
Integration in urban district heating systems

**13:00h - 14:30h | Lunch break, visit to the technical and postgraduate exhibition**

**14:30h - 18:00h | Technical site visits - Introduction and key SDH plant in Graz (Hall Steiermark)**  
Parallel technical tour I  
SDH plants at Fernheizwerk Graz and Helios

**19:30h | Aperitif and dinner, invitation by the governor of Styria**

### Thursday, 12 April 2018, Congress Graz

**08:00h - 09:00h | Industry session 3.1 (Hall Steiermark)**

**09:00h - 10:30h | Parallel session 4.1 (Hall Steiermark)**  
Policy and market framework

**10:30h - 11:00h | Coffee break**

**11:00h - 12:30h | Parallel session 5.1 (Hall Steiermark)**  
Land areas and roof integrated SDH concepts

**12:30h - 13:45h | Lunch break, visit to the technical- and postgraduate exhibition**

**13:45h - 15:15h | Parallel session 6.1 (Hall Steiermark)**  
SDH combined with biomass heating plants

**15:15h - 16:30h | Closing session 7.1 (Hall Steiermark) | Key SDH heating - Panel debate ,District Heating 2050, how do we get there?**

## ENCE!

includes the presentation of a wide range of solar district heating concepts but also feedback on operation experience and monitoring policy and several countries and regions will present their activities conference and good networking!

Welcome addresses - Solar thermal in district heating from the district heating systems of Hamburg and Graz

**Parallel session 2.2 (Long Hall)**  
Advanced system integration

er exhibition

note: Helios - an innovative solar and storage project

Parallel technical tour II  
Rural SDH plant Eibiswald

ylria, Old University Graz (Hofgasse 14, Graz)

**Poster session 3.2 (Long Hall)**

**Parallel session 4.2 (Long Hall)**  
Simulation tools and monitoring results

**Parallel session 5.2 (Long Hall)**  
Integration of thermal energy storage and heat pumps

ter exhibition

**Parallel session 6.2 (Long Hall)**  
Advanced system integration

note Roadmap for a transition to 4<sup>th</sup> generation district  
' - Poster Award

# Wednesday, 11 April 2018

08:00h | Registration

09:00h - 10:30h | Opening plenary session

**Welcome and introduction to the conference**

*Christian Fink, AEE INTEC*

*Thomas Pauschinger, Steinbeis Research Institute Solites*

**Welcome address by**

*Ingmar Höbarth, Austrian Climate and Energy Fonds*

*Michael Paula, Ministry of Traffic, Innovation and Technology*

*Christian Purrer, Energie Steiermark*

*Barbara Eibinger-Miedl, Styrian government for Economics, Tourism, Europe, Science and Research*

10:30h - 11:00h | Coffee break

11:00h - 13:00h | **Parallel session 2.1: Integration in urban district heating systems**

**Chair:** *Theodor Zillner, Ministry of Traffic, Innovation and Technology*

**Key note:** Big Solar Concepts

*Gerald Moravi, Energie Steiermark and Christian Holter, SOLID*

The role of thermal storage and solar thermal in transition to CO<sub>2</sub>-neutral hybrid heating and cooling systems in cities

*Per Alex Soerensen, PlanEnergi*

Measures and enablers for integrating significant shares of solar thermal energy into urban district heating networks – preliminary results from SHC Task 55, Subtask A

*Ralf-Roman Schmidt, AIT Austrian Institute of Technology*

The role of solar thermal in urban heat supply – pilot scheme Freiburg Gutleutmatten in Freiburg

*Axel Oliva, Fraunhofer Institute for Solar Energy Systems ISE*

A case study of solar district heating in the context of technical, ecological and economic framework conditions

*Markus Stehle, University of Stuttgart*

**Poster presentations**

SDH in Italy - incentive scheme and development of new plants, *Riccardo Battisti, Ambiente Italia*

Towards giga-scale thermal energy storage for renewable districts in Austria, *Georg Engel, AEE INTEC*

Modular optimization-based energy management framework for cross-sectoral energy networks, *Daniel Muschick, Bioenergy 2020+*

**Solar thermal in district heating from the European perspective**

*Werner Lutsch, Euroheat&Power and AGFW*

**Decarbonizing the district heating system of the City of Hamburg**

*Michael Pollmann, Authority for Environment and Energy, City of Hamburg*

**Vision 2050 for the city district heating in Graz**

*Werner Prutsch, Environmental Agency, City of Graz*

**Parallel session 2.2: Advanced system integration**

**Chair: Cédric Paulus, CEA INES**

Towards intelligent and solar driven district heating: How simulation and energy master planning can contribute

*Harald Schrammel, AEE INTEC*

Controlling of a distributed solar district heating plant: a district heating case in Denmark

*Jes Donneborg, Aalborg CSP A/S*

Solar CHP systems for low-temperature district heating networks

*Marco Cozzini, Eurac Research*

Performance of the 27.000 m<sup>2</sup> parabolic trough collector field, combined with biomass ORC cogeneration of electricity in Broendeslev Denmark

*Bengt Perers, Technical University of Denmark*

Efficient heat distribution in solar district heating

*Helge Aeverfalk, Halmstad University*

**Poster presentations**

Challenges of a central or decentralized solar supply of solar district heating grids, *Markus Rabensteiner, 4ward Energy Research*

Effects on decentralized feed-in into district heating networks – a simulation study, *Sven Paulick, Technical University of Dresden*

Experimental plant for analyzing the technical feasibility of decentralized solar heat feed-in, *Kai Schäfer, Steinbeis Research Institute Solites*

## Poster presentations

Database for heating plants based on renewable energies in Styria/Austria, *Julia Karimi-Auer, Office of the Styrian Government*

Proposal for new ISO standard for guaranteed collector field performance, *Jan Eric Nielsen, PlanEnergi*

Analysis and identification of future potentials of SDH systems with seasonal thermal energy storage in Germany, *Natalie Gohl, University of Stuttgart*

Experimental Solar District Heating Network Operation at CEA INES, *Nicolas Lamaison, CEA INES*

The role of solar energy in the future heat supply portfolio - a techno-economic analysis for two different district heating grids, *Richard Buechele, Technical University of Vienna*

Integration of solar thermal installations into existing district heating systems – an overview of feasibility analysis tools and necessary improvements, *Carles Ribas, AEE INTEC*

**13:00h - 14:30h | Lunch break, visit to the technical and poster presentations**

## 14:30h - 18:00h | Technical site visits

**Chair and introduction to the technical site visits:** *Christian Fink, Initiating large scale solar thermal projects in Austria – the support of the Austrian Climate and Energy Fund*

**Key note: HELIOS – an innovative solar and storage project in Graz**

### Parallel Technical Tour I

To the urban SDH plants at Fernheizwerk Graz-Puchstraße (7.750 m<sup>2</sup> gross collector area, 2.750 m<sup>2</sup> of them ground mounted with 6 different collector types, direct feed in without storage) and the new Helios project in Graz-Neufeldweg (2.000 m<sup>2</sup> ground mounted gross collector area, 2.500 m<sup>3</sup> multifunctional used heat storage, CHP based on repository gas).



**19:30h | Aperitif and dinner, invitation by the governor of Styria**

## Poster presentations

Experience from a new-built feed-in plant in Ystad,  
*Gunnar Lennermo, Energianalys AB*

Primary energy based evaluation of heat pumps in district heating systems with multi-functional thermal energy stores,  
*Fabian Ochs, University of Innsbruck*

Optimizing efficiency of biomass-fired ORC with concentrated solar power - a combined heat and power case in Denmark,  
*Andreas Zourellis, Aalborg CSP*

Performance improvement of model-based control strategies in large-scale solar plants and its implementation details,  
*Peter Innerhofer, SOLID*

Thermal performance analysis of a CPC solar collector array with series connection to the flat plate solar collector field in the Saeby solar heating plant, *Simon Furbo, Technical University of Denmark*

Measurement-based description of the temperature distribution in large atmospheric heat storage tanks, *Luise Umbreit, Technical University of Dresden*

## Poster exhibition

### AEE INTEC

Support scheme of the Austrian Climate and Energy Fund,

Graz – *Boris Papousek, Energie Graz*

## Parallel Technical Tour II

To the rural SDH plant Nahwärme Eibiswald (2.450 m<sup>2</sup> gross collector area, partly with a double covered flat plate collector, 175 m<sup>3</sup> storage volume, 2 biomass wood chips boiler, 4 MW maximum heat load, more than 90 % solar fraction in summer). Installation of a 1.250 m<sup>2</sup> collector area in 1997, plant extension in 2012 with further 1.200 m<sup>2</sup> by the reason of increased heat load.





# Thursday, 12 April 2018

08:00h - 09:00h | Industry session 3.1

**Chair:** *Pedro Dias, Solar Heat Europe*

**Austria Solar**  
*[www.solarwaerme.at](http://www.solarwaerme.at)*

**Savosolar**  
*[www.savosolar.com](http://www.savosolar.com)*

**Austroflex**  
*[www.austroflex.com](http://www.austroflex.com)*

**S.O.L.I.D.**  
*[www.solid.at](http://www.solid.at)*

**KBB**  
*[www.kbb-solar.com](http://www.kbb-solar.com)*

**NMC Termonova Oy**  
*[www.nmc.eu](http://www.nmc.eu)*

**GREENoneTEC**  
*[www.greenonetec.com](http://www.greenonetec.com)*

**Sonnenkraft**  
*[www.sonnenkraft.com](http://www.sonnenkraft.com)*

**Wilo**  
*[www.wilo.at](http://www.wilo.at)*

**Isoplus**  
*[www.isoplus.at](http://www.isoplus.at)*

**ABSOLICON**  
*[www.absolicon.se](http://www.absolicon.se)*

**KYOTHERM**  
*[www.kyotherm.com](http://www.kyotherm.com)*

**Aalborg CSP**  
*[www.aalborgcsp.com](http://www.aalborgcsp.com)*

**Arcon – Sunmark**  
*[www.arcon-sunmark.com](http://www.arcon-sunmark.com)*

**Energie Steiermark**  
*[www.e-steiermark.com](http://www.e-steiermark.com)*





## Poster session 3.2

**Chair:** *Per Alex Soerensen, PlanEnergi*

Metrological and computational analysis of solar integration in a district heating system with variable temperatures, *Tobias Ramm, Technische Hochschule Ingolstadt*

Use of drones to evaluate the thermal performance of solar collector fields, *Simon Furbo, Technical University of Denmark*

Modelling faulty behaviour of large solar thermal systems, *Cédric Paulus, CEA INES*

Thermal performance analysis and comparison between measured performance and modelled performance of a parabolic trough solar collector array, *Janne Dragsted, Technical University of Denmark*

Adaptive forecasting methods for the prediction of future solar yield of solar thermal plants and heat demand of consumers, *Viktor Unterberger, Bioenergy 2020+*

Performance of overground hot water stores in segmental construction for solar and CHP district heating systems, *Jan Markus Mücke, Chemnitz University of Technology*

Experimental identification of effective thermal conductivities in wall constructions with blow-in insulation for thermal energy storage tanks in segmental construction, *Jan Markus Mücke, Chemnitz University of Technology*

Radial diffusers in stratified hot water stores: simulation of three-dimensional flow behavior with CFD, *Fabian Findeisen, Chemnitz University of Technology*

Investigation of the integration of a newly developed overground hot water store in a solar district heating system, *Dominik Bestenlehner, University of Stuttgart*

Floating thermal collectors on top of seasonal water pit storages, *Milan Rashevsky, Institute for Zero Energy Buildings*

Seasonal thermal energy storage of solar energy in abandoned coal mines, *Dieter Patteeuw, KU Leuven*

Modesto – a multi-objective district energy system toolbox for optimization, *Annelies Vandermeulen, KU Leuven*

Multi-objective optimization of a district heating networks energy supply systems structure and dimension, *Jonas Gottschald, Hochschule Duesseldorf*

A novel simulation model, for the annual yield of parabolic trough collectors, including shading in the field, *Bengt Perers, Technical University of Denmark*

RELaTED, a flexible approach to the deployment and conversion of DH networks to low temperature, with increased use of local solar systems, *Roberto Garay Martinez, Tecnalia*

Design of consumer thermal substations for the integration of distributed solar technologies in district heating systems, *Roberto Garay Martinez, Tecnalia*

Energy integration and performance evaluation of a new concept of advanced solar district heating/cooling networks for energy supply in buildings, *Malick Kane, University of Applied Sciences and Arts of Western Switzerland*

Impact of solar share on optimal supply technologies and seasonal thermal storage size in solar district heating systems, *Hrvoje Dorotić, University of Zagreb*

Comparative analysis of biomass/solar district heating system implementation in Denmark and Croatia, *Borna Doračić, University of Zagreb*

**09:00h - 10:30h | Parallel session 4.1: Policy and market framework**

**Chair:** *Gernot Wörther, Climate and Energy Fund*

The many faces of solar district heating in Germany  
*Laure Deschaintre, Steinbeis Research Institute Solites*

Supporting policy for solar district heating as a component of the thermal energy transition in Thuringia  
*Aline Kornmann, Thuringian Ministry for Environment, Energy and Nature Conservation*

SDH market support in the French Region Auvergne-Rhône-Alpes  
*Mathieu Eberhardt, Auvergne-Rhône-Alpes*

Preferences and willingness-to-pay for district heating from renewables - results from a survey among end-users, municipalities and energy providers in Germany, France and Austria  
*Adriano Profeta, Prokribus GmbH*

IEA SHC Task 55 - towards the Integration of Large SHC Systems into DHC Networks  
*Sabine Putz, SOLID*

**10:30h - 11:00h | Coffee break**

**11:00h - 12:30h | Parallel session 5.1: Land areas for SDH and roof integrated SDH concepts**

**Chair:** *Wolfgang Jilek, Energy Agency Styria*

Potentials for ground-mounted SDH in Europe  
*Daniel Trier, PlanEnergi*

Energy and climate related spatial planning in the Province of Styria  
*Christine Schwabegger, Office of the Styrian Government, Lore Abart-Heriszt, University of Natural Resources and Life Sciences*

Multi-coded areas for SDH  
*Simona Weisleder, Hamburg Institut*

Integrated and sustainable heat supply concepts for urban neighbourhoods – a generic approach based on Austrian experiences  
*Gerhard Hofer, e7 Energie Markt Analyse GmbH*

Energieinsel Landskron  
*Christoph Aste, Aste Energy*

## Parallel session 4.2: Simulation tools and monitoring results

**Chair:** *Riccardo Battisti, Ambiente Italia*

How to model and optimize future district heating systems with small and large-scale solar systems?

*Keith O'Donovan, AEE INTEC*

SCFW – Solar yield prediction tool for solar district heating systems based on Scenocalc

*Magdalena Berberich, Steinbeis Research Institute Solites*

Monitoring, simulation and real time control of large solar collector fields - the case of Loegumkloster

*Jan Erik Nielsen, PlanEnergi*

Long term measured and simulated performance of a combined solar district heating plant with flat plate collectors and parabolic trough collectors in series

*Zhiyong Tian, Technical University of Denmark*

## Parallel session 5.2: Integration of thermal energy storage and heat pumps

**Chair:** *Dirk Mangold, Steinbeis Research Institute Solites*

Combined solar thermal ground source heat pump system delivers heat for a micro grid heating network in the city of St.Pölten

*Daniel Blasel, BES BuildingEnergySolutions*

Seasonal heat storage

*Flemming Ulbjerg, Ramboll*

Storage management and system concept for a solar district heating system

*Nirendra Lal Shrestha, Chemnitz University of Technology*

Comparison of methods for storage sizing in solar district heating networks

*Olatz Terreros, AIT Austrian Institute of Technology*

Operational analysis and detailed monitoring results of solar thermal heat pump combinations integrated into Austrian district heating networks

*Samuel Knabl, AEE INTEC*

**12:30h - 13:45h | Lunch break, visit to the technical- and post**

**13:45h - 15:15h | Parallel session 6.1: SDH combined with biomass heating plants**

**Chair:** *Roger Hackstock, Austria Solar*

**Key note:** Success factors of Salzburg's incentive scheme for biomass and solar heating plants

*Gerhard Löffler, State of Salzburg*

SDH plant with 5.000 m<sup>2</sup> flat-plate collectors feeding in the district heating network of Mürzzuschlag, Austria

*Robert Söll, SOLID*

Small heating grids for communities in Balkan countries: The Cool-Heating Project

*Dominik Rutz, WIP – Renewable Energies*

Feasibility studies for SDH in combination with biomass heating plants in Västra Götaland

*Jan-Olof Dalenbäck, CIT Energy Management AB*

Flat-plate and vacuum collector SDH plants - performance comparison after one year of operation and future expansion of the system using national incentive schemes

*Luca Degiorgis, Politecnico of Torino*

**15:15h - 16:30h | Closing session 7.1**

**Key note:**

Roadmap for a transition to 4<sup>th</sup> generation district heating *Sven Werner*

**Panel debate:**

District Heating 2050 – How do we get there?

*Boris Papousek, Energie Graz*

*Bernd Vogl, City of Vienna*

*Christian Maaß, Hamburg Institut*

*Eva Bauer, Austrian Non profit Housing Association*

*Torsten Lütten, Savosolar*

**Award ceremony for the best posters**

*Riccardo Battisti, Ambiente Italia, Ines Arias, Euroheat and Power a*

**Conference wrap-up, SDH Highlights to come?**

*Thomas Pauschinger, Steinbeis Research Institute Solites and Heiko*

**16:30h - 17:30h | Farewell collation**

## Parallel session 6.2: Advanced system integration

**Chair:** *Heiko Huther, German Heat and Power Association AGFW*

Modeling and simulations of solar bidirectional substations  
*Nicolas Lamaison, CEA INES*

Concept, construction and first measurement results of two decentralized feed-in substations  
*Toni Rosemann, Technical University of Dresden*

Solar thermal prosumer in Lodi district heating network  
*Marco Calderoni, Politecnico di Milano*

In-situ testing and modeling of large collector arrays  
*Daniel Tschopp, AEE INTEC*

*ner, Halmstad University*

*and Torsten Lütten, Savosolar*

*Huther, German Heat and Power Association AGFW*

## Gold sponsor

---



ENERGIE STEIERMARK

## Silver sponsors

---

**AALBORG**   
- *Changing Energy*



Bronze sponsors



*we will succeed together*





## Media partners

---



# Solarthemen



## The conference is organised by

---



# solites

# AGFW

### Conference venue

Congress Graz, Schmiedgasse 2, 8010 Graz, Austria

### Registration

The registration link and conference information are available at  
[www.solar-district-heating.eu](http://www.solar-district-heating.eu)