

12th International Conference on Solar Energy for Buildings and Industry (EuroSun2018)

Rapperswil, Switzerland
10-13 September 2018

Volume 1 of 2

Editor:

Andreas Häberle

ISBN: 978-1-5108-9015-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2018) by International Solar Energy Society
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact International Solar Energy Society
at the address below.

International Solar Energy Society
Wiesentalstr. 50
79115 Freiburg
Germany

Phone: +49 761 459 06 0
Fax: +49 761 459 06 99

hq@ises.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Editorial

Editorial to the Proceedings of EuroSun 2018

Häberle, A, Stickelberger, D., Streicher, W., Renne, D. 1

Scientific Program

Solar Buildings

Evacuated Glazing with Silica Aerogel Spacers

Büttner, B., Beck, A., Buck, D., Heinemann, U., Nauschütz, J., Reichenauer, G.,
Scherdel, C., Weinläder, H., Weismann, S. 5

Radiative Cooling to Cover Cooling Demands of an Earthbag Building in a Training Medical Center in Burkina Faso

Castell, A., Carrobé, A., Martorell, I., Medrano, M., Rincón, L., Vall, S. 13

Definition of a Reference Office Building for Simulation Based Evaluation of Solar Envelope Systems

D'Antoni, M., Bonato, P., Fedrizzi, R., Geisler-Moroder, D., Loonen, R.C.G.M.,
Magni, M., Ochs, F.E., de Vries, S. 19

Building Integrated Photovoltaic Systems – Energy Production Modelling in Urban Environment

Govehovitch, B., Giroux-Julien, S., Ménézo, C., Peyrol, E. 29

The SOLAR DECATHLON Knowledge Platform – Concept and Initial Application

Hendel, S. 41

Difference in Evaluation of Discomfort Glare from Windows between Middle-Eastern and Japanese Students

Iwata, T. 51

Energy Efficient & Sustainable Buildings in Qatar & Integration of Solar Assisted Air-Conditioning Technology – a Step Towards Grid Free Zero Carbon Living

Khan, M., Hassabou, A., Heithorst, B., Spinnler, M. 61

Energy Performance Investigation of Energy-Plus Solar House Integrated Renewable Energy Systems

Kim, M. 71

Control Strategies for a Residential Property with Solar Building, Thermal and Electricity Storages

Korvola, T., Abdurafikov, R., Reda, F. 77

Modular Rooftop Building-Integrated Photovoltaic/Thermal Systems for Low-Rise Buildings in India	
<i>Kruglov, O., Athienitis, A., Bagchi, A., Ge, H., Lee, B., Rounis, E., Stathopoulos, T.</i>	89
Semi-Virtual Tests of a System Using Exhaust Air, Grey Water and Solar Heat for Domestic Hot Water and Space Heating Needs of a Multifamily House	
<i>Leconte, A., Moureaux, S.</i>	98
Thermal Monitoring on an Earthbag Building in Mediterranean Continental Climate	
<i>Martorell, I., Carrobé, A., Medrano, M., Rincón, L., Solé, C.</i>	109
Solar Seminar Room in the University of Balearic Islands with a New Advanced Radiant System	
<i>Moià-Pol, A.</i>	116
bFAST: A Methodology for Assessing the Solar Potential of Façades in Existing Building Stocks	
<i>Polo López, C.S., Corti, P., Frontini, F., Polo Lopez, C.S., Saretta, E.</i>	122
High Solar Fraction By Thermally Activated Components	
<i>Ramschak, T., Becke, W., Fink, C., Heimrath, R., Lerch, W., Mach, T.</i>	133
Early Design Stage Consideration of Building Form and BIPVT Energy Performance	
<i>Yip, S., Athienitis, A., Lee, B.</i>	140
An Aesthetic Energy Producing Roof with Integration of PV Modules and Solar Thermal Collectors	
<i>de Keizer, C., Rindt, C., de Jong, M., van Diemen, R., van Paassen, M., van de Voort, R.</i>	149

Solar Assisted District Heating and Cooling

Comparison of Solar District Heating Concepts at Various Land Prices	
<i>Best, I., Orozaliiev, J., Vajen, K.</i>	156
Energetic and Economic Analysis of a Solar-Assisted Trigeneration System	
<i>D'Antoni, M., Fedrizzi, R.</i>	168
Thermo-Chemical District Networks	
<i>Koller, C., Bergmann, T., Danesi, S.</i>	178
Distributed vs Centralized Solar District Systems. Study Case in Balearic Islands Districts	
<i>Moià-Pol, A., Sabater, P.</i>	187
Development of a Software System for Optimal Operation of Heating Networks with Central Solar Plant	
<i>Oppelt, T., Frey, H., Göschel, T., Heinrich, I., Otto, S., Schmidt, A., Uhlig, U., Urbaneck, T.</i>	195
Opportunities for the Integration of Solar Thermal Heat, Photovoltaics and Biomass in a Brazilian Hospital	
<i>Pina, E.A., Lozano, M.A., Serra, L.M.</i>	200
Experimental Plant for Analyzing the Technical Feasibility of Decentralized Solar Heat Feed-In	
<i>Schäfer, K.</i>	212

Solar Heat for Industrial Processes

Optical Analysis of an Evacuated Tube Collector with Built-In Semicircular Concentrator for Process Heat Applications	
<i>Christodoulaki, R., Drosou, V., Tsekouras, P.</i>	222
Environmental Assessment of Industrial Solar Thermal Systems	
<i>Fokaides, P., Ioannides, A., Jurelionis, A., Kalogirou, S., Kylii, A., Souliotis, M., Valancius, R.</i>	229
RESSSPI: The Network of Simulated Solar Systems for Industrial Processes	
<i>Frasquet, M., Nel, Y., Silva, M., bannenber, J.</i>	239
Cleaning Strategies for Fresnel Linear Concentrator Mirrors in Solar Heating Plants	
<i>Gabbrielli, R., Del Medico, F., Di Palo, M., Gulino, G.</i>	248
Solar Heat in Industrial Processes in Switzerland - Theoretical Potential and Promising Sectors	
<i>Guillaume, M., Bunea, M.S., Caflisch, M., Martin, J., Rittmann-Frank, M.H.</i>	257
Solar Heat Integration in Rotational Molding Process: Case Study	
<i>Laadel, N.E., Agalit, H., Bennouna, E.G., Mouaky, A.</i>	268
Standardisation of Solar Process Heat Applications to Increase Market Penetration	
<i>Schmitt, B., Jesper, M., Pag, F., Ritter, D., Vajen, K., Wimmer, L.</i>	279
Thermal Analysis and Validation of a Geodesic Dome Dryer for Capsicum Baccatum	
<i>Vergara, S., Hadzich, M., Herrera, E., Lopez Vasquez, E., Perez, J., Tipula, R.</i>	290

Domestic Hot Water and Space Heating

Efficient Design of Solar Assisted Heating Systems for Multi-Family Houses	
<i>Backes, K., Adam, M., Eggert, D., Götzelmann, D., Helbig, S., Wirth, H.P.</i>	301
Energetic Behaviour of a Solar Thermal System Producing Domestic Hot Water and Preheating the Ventilation Air	
<i>Carbajo Jiménez, P., Fraisse, G., Leconte, A., Ouvrier Bonnaz, O., Wurtz, E.</i>	310
Comparative Dynamic Performance Tests of Two Real Technology Packages for Buildings Heating System Retrofit	
<i>Chêze, D., Fuligni, F., Nicolas, L., Patric, B.</i>	322
Drainback Solar Thermal Systems in Switzerland – Market Overview and Main Barriers	
<i>Eicher, S., Bony, J., Bunea, M., Citherlet, S., Guillaume, M.</i>	334
Experimental Analysis of Air-Water Heat Exchanger with Microchannel Coil Exposed to Different Working Parameters	
<i>Glazar, V., Kirini, M., Leni, K., Trp, A.</i>	345
Hardware-In-The-Loop Tests on Complete Systems with Heat Pumps and PV for the Supply of Heat and Electricity	
<i>Haberl, R., Bamberger, E., Haller, M., Reber, A.</i>	357
Sustainability Assessment of Most Relevant Solar Thermal Heat Systems	
<i>Kicker, H., Lang, R.W., Wallner, G.M.</i>	367

Artificial Intelligence for the Efficient Control of Solar Heating Systems <i>Kramer, W.</i>	377
Simulation-Based Optimization of Solar Combisystem. Sensitivity Analysis at Optimum <i>Kusyy, O., Vajen, K.</i>	385
Measurement Evaluation and Simulation of an Innovative Drainback Solar Combi-System <i>Louvet, Y., Orozaliiev, J., Vajen, K.</i>	397
Simulation and Monitoring of PV Heat Pump System with Seasonal Storage <i>Matuska, T., Broum, M., Sourek, B.</i>	409
Towards Automated Continuous Performance Benchmarking of DHW and Combi Systems <i>Schmelzer, C., Georgii, M., Kusyy, O., Orozaliiev, J., Vajen, K.</i>	418
Single Source “solar Thermal” Heat Pump for Residential Heat Supply: Performance with an Array of Unglazed PVT Collectors <i>Schmidt, C., Schäfer, A.</i>	426
Polymer Collectors with Temperature Control - Thermosyphon Valve Development and System Integration <i>Thür, A., Hauer, N., Schroll, J.</i>	438
Review of Combined Solar Thermal and Heat Pump Systems Installations in Lithuanian Hospitals <i>Valancius, R., Cerneckiene, J., Singh, R.M.</i>	444
Solar Thermal Systems VS. Photovoltaic Systems. Case Study: Single Family Building in Lithuania <i>Valancius, R., Cerneckiene, J., Fokaides, P., Jurelionis, A., Vaiciunas, J.</i>	449
Space Cooling Application with Unglazed Solar Absorber <i>Wemhoener, C., Schwarz, R.</i>	455
The Development of the Sunridge, an Orientation Independent Thermal Solar System <i>de Geus, A., de Beijer, H.</i>	463
Direct Solar Thermal Systems with Thermosiphon Frost Protection and Innovative Control Strategies Using a Thermo-Differential Bypass Valve <i>van Ruth, N., Kratz, P.</i>	474

Solar Air Conditioning and Refrigeration (8th International Workshop on Solar Air Conditioning)

Selection of High-Performance Working Fluid for a Solar-Geothermal Absorption Cooling System and Techno-Economic Study in the Northern Mexican Conditions <i>Altamirano Cundapí, A., Le Pierrès, N., Stutz, B.</i>	481
Life Cycle Assessment Experiences for Solar Heating and Cooling Systems <i>Beccali, M., Cellura, M., Cusenza, M.A., Longo, S., Mugnier, D., Selke, T., Vicente Quiles, P.G.</i>	493
Monitoring and Energy Performance Assessment of the Compact DEC HVAC System “Freescoo Facade” in Lampedusa (Italy) <i>Beccali, M., Di Pietra, B., Finocchiaro, P., Motta, M.</i>	505

Modelling of an Absorption Cycle With a Direct Ammonia Vapor Generator Inside a Concentrating Parabolic Trough Solar Collector	
<i>Celik, S.B., Famiglietti, A., Lecuona Neuman, A., Rodrigues Aumente, P.A.</i>	513
Modelling and Simulation of a PV Driven Refrigerator with Phase-Change Materials in the Internal Walls	
<i>Coca-Ortegón, A., Coronas, A., Müller, J., Torres, V.</i>	524
Simulations of Solar Thermal Cooling System for a Building at Innovation Park Muscat	
<i>Cordes, T., Al-Riyami, S., Scheuren, J., Schlatmann, R.</i>	536
Simulation of a Solar Fired Absorption System for a Case Study in the Dairy Industry	
<i>Correa-Jullian, C., Cortés, F., Crespo, A., Ibarra, M.</i>	544
Design and Construction of a 10 KW Sorption Heat Pump Prototype	
<i>Daguenet-Frick, X., Gantenbein, P., Haeberle, A., Persdorf, P.</i>	554
Development of a Photovoltaic Driven Thermodynamic Chiller – Application to Solar Air Conditioning And Cooling Storage	
<i>Esparcieux, P., Baup, O., Marvillet, C., Mugnier, D., Weber, C.</i>	562
Measurement Results and Operating Experience of Large-Scale Solar Air Conditioning Plants	
<i>Feierl, L., Holter, C., Poier, H.</i>	574
Experimental Investigation on the Dynamic Performance of a Thermally-Driven Adsorption Chiller Integrated with a Gas Boiler	
<i>Fuentes, E., Balsells, M., Bellanco, I., Impala, V., Mogro, O., Salom, J., SanJoaquín, S., Sayans, A.</i>	585
PV Driven Dew-Point Cooling for Australia	
<i>Goldsworthy, M., Sethuvenkatraman, S.</i>	597
Experimental Comparison of Scroll and Swash-Plate Compressors for PV Driven Compression Chillers and Heat Pumps	
<i>Heithorst, B., Bauer, G., Irrgang, L., Rauscher, B., Sattelmayer, T., Spinner, M.</i>	609
Design and Practical Validation of a Hybrid Absorption/Compression Chiller Driven by Low-Grade Heat	
<i>Helm, M., Eckert, T.</i>	621
Modified Solar-Assisted Ejector Cooling System	
<i>Huang, B., Ko, H.</i>	633
Levelised Cost of Thermal Energy Storage and Battery Storage to Store Solar PV Energy for Cooling Purpose	
<i>Luerssen, C., Cheong, K.W.D., Gandhi, O., Reindl, T., Sekhar, C.</i>	638
Comparison of Modeled and Measured Heat and Mass Transfer in a Liquid Desiccant Air-Conditioning System	
<i>Mandow, W., Fleig, D., Jordan, U., Lowenstein, A., Mützel, M., Vajen, K.</i>	648
Development of Solar Assisted Sorption Unit for Extraction of Water from Ambient Air in Desert Climate	
<i>Matuska, T., Sourek, B., Zmrhal, V.</i>	659
Using the Heat of Sun to Cool: A Case Study of 100 TR (350kWth) Solar Air-Conditioning System	
<i>Mehta, K., Gadhia, D.</i>	665

Technical and Economic Performance of Best Practice SHC Plants – A Compilation of IEA SHC Task 53 Results	
<i>Neyer, D., Köll, R., Mugnier, D.</i>	673
Experimentally Validated Dynamic Model for a Hybrid Cascade System for Solar Heating and Cooling Applications	
<i>Palomba, V., Frazzica, A., Große, A., Kühnert, S.</i>	684
Performance Analysis of a Small Scale Solar Cooling Plant Based on Experimental Measurements	
<i>Pellegrini, M., Bianchini, A., Guzzini, A., Sacconi, C.</i>	692
New Water Adsorbent for Adsorption Driven Chillers	
<i>Risti, A., Krajnc, A., Zabukovec Logar, N.</i>	704
Efficient Solar Driven Air Conditioning System for Hot Climates: Case Study of Doha	
<i>Tamainot-Telto, Z.</i>	710
Performance Investigation of Liquid Desiccant Dehumidification System Integrated with Solar Thermal Energy and Shallow Geothermal Energy	
<i>Tseng, C., Chen, S., Liang, J., Yang, L.</i>	716
Application of PCM in Building’s Envelope of Lightweight Prefabricated Houses as an addition to a PV driven renovation cooling system by EU project HEART	
<i>Zavr, E., Dovjak, M., Stritih, U., Zupanc, G.</i>	728

PV and PVT Systems for Buildings and Industry

Field Test Results of an Innovative PV/T Collector for an Outdoor Swimming Pool	
<i>Brottier, L., Bennacer, R.</i>	738
Performance Assessment of a Photovoltaic-Thermal Roof	743
Electrical and Thermal Performance Evaluation of a District Heating System Composed of Asymmetric low concentration PVT Solar Collector Prototypes	
<i>Cabral, D., Costeira, J., Gomes, J.</i>	755
Potential of Covering Electricity Needs of a Flat of a MFH with Decentral Compact Heat Pumps with PV – Simulation Study for Different DHW Profiles and PV Field Sizes	
<i>Calabrese, T., Dermentzis, G., Siegele, D.</i>	764
Assessment of the Suitability of Different Photovoltaic Cell Technologies for Product Development of Building Integrated Solutions Using the Hierarchy Process (ahp)	
<i>Haghighi, Z., Isabella, O., Konstantinou, T., Ortiz Lizcano, J.C., Zeman, M., van den Dobbela, A.</i>	774
Economic Feasibility of Solar PV System for Buildings	
<i>Huang, B., Hsu, P.C.</i>	784
Comparative Economic Analysis of Single and Dual-Fluid Based Photovoltaic Thermal Systems for Building Energy Needs	
<i>Hussain, M.I.</i>	788
Implementation and Experimental Validation of a Photovoltaic-Thermal (PVT) Collector Model in TRNSYS	
<i>Jonas, D., Frey, G., Theis, D.</i>	798

Numerical Simulation of the Thermal Performance of Four Prototypes of CPC Collectors That Use Bifacial PV Cells	
<i>Lança, M., Gomes, J., Hayati, A.</i>	<i>810</i>
Organic PVT - A Novel Hybrid Collector Combining Organic Photovoltaics and Polymer Absorbers	
<i>Lämmle, M., Hernandez Gonzalez, H., Li, C., Meir, M., Piekarczyk, A., Pita Bauermann, L., Rekstad, J.</i>	<i>822</i>
Degradation of photovoltaic systems based on long-term measurements and laboratory tests	
<i>Muntwyler, U., Schott, T.</i>	<i>828</i>
Development and Field Testing of a Novel Hybrid PV-Thermal Solar Collector	
<i>Murrell, A., Alonso Alvarez, D., Ekins-Daukes, N., Mellor, A., Povall, S., Williams, C.</i>	<i>835</i>
Study on Distributed MPPT System in Solar EV	
<i>Nemoto, Y., Fujisawa, T.</i>	<i>841</i>
Glazed PVT Collector Integrated Into Façade Module	
<i>Pokorny, N., Jirka, V., Matuska, T., Sourek, B.</i>	<i>850</i>
Design and Performance Assessment of a Prefabricated BIPV/T Roof System Coupled with a Heat Pump	
<i>Rounis, E.D., Athienitis, A., Dumoulin, R., Ioannidis, Z., Kruglov, O., Stathopoulos, T.</i>	<i>859</i>
Solar Hybrid PVT Coupled Heat Pump Systems Towards Cost-Competitive NZEB	
<i>Sanz Martinez, A., Fuente Dacal, R., Martín Miranda, A.J.</i>	<i>869</i>
Experimental Performance Evaluation of PV/T Panels at Negative Reduced Temperatures	
<i>Simonetti, R., Manzolini, G., Molinaroli, L.</i>	<i>881</i>
Experimental Investigation of PVT Collectors with Phase Change Material	
<i>Simón, R., Brun, G., Guedea, I., Villén, R.</i>	<i>891</i>
A Techno-Economic Comparison Between PV and PVT Integrated Ground Source Heat Pumps for Multi-Family Houses	
<i>Sommerfeldt, N., Madani, H.</i>	<i>901</i>
Multi-Objective Optimization of a Solar Heat Pump System Using PVT and Ice-Based Latent Storage	
<i>Tamasauskas, J., Poirier, M., Zmeureanu, R.</i>	<i>911</i>
PV Power Production Estimation by Using Radiometric and Meteorological Data	
<i>Trigo, M., Alonso-Montesinos, J., Batlles, F.J., Cortés, M., Ferrada, P., Martinez-Durbán, M., Marzo, A., Portillo, C., Rosiek, S.</i>	<i>923</i>
Improvements on the Efficiency of the Photovoltaic Panel by Integrating a Spray Cooling System with Shallow Geothermal Energy Heat Exchanger	
<i>Yang, L., Chen, S., Liang, J., Tseng, C.</i>	<i>930</i>
Extended Hottel-Whillier Models for uncovered PVT-Collectors	
<i>Zenhäusern, D., Battaglia, M.</i>	<i>941</i>
An Overview of PVT Modules on the European Market and the Barriers and Opportunities for the Dutch Market	
<i>de Keizer, C., Bottse, J., Folkerts, W., de Jong, M.</i>	<i>949</i>

Solar Thermal Collectors and Solar Loop Components

Annual Efficiency - Easy Understanding of Collector Performance <i>Abrecht, S.</i>	956
Assessment of Durability of Solar Absorbers - Performance Criterion <i>Carvalho, M.J., Diamantino, T., Páscoa, S.</i>	964
Accelerated Aging Tests for Solar Absorber Coatings <i>Diamantino, T., Carvalho, M.J., Chambino, T., Ferreira, C., Gonçalves, R., Nascimento, I., Páscoa, S.</i>	973
Influence of Using Different SiO₂ Antireflective Coatings and Sintering Conditions on the Durability and Optical Performance of the Selective Solar Absorber <i>Farchado, M., Germán, N., Morales, Á., San Vicente, G.</i>	983
Testing and Modeling of Direct Steam Generating Parabolic Trough Collectors <i>Ferchichi, S., Ben Cheikh, R., Bouden, C., Castro, J., Kessentini, H., Morales, S., Oliveira, A., Soares, J., Willwerth, L.</i>	994
Basic Study on Flow Stabilization of Top-Heat-Type Thermosiphon <i>Fujisawa, T., Kawaguchi, T.</i>	1006
Ray Tracing Method for the Evaluation of Yearly Performance of a Solar Thermal Concentrator <i>García, H., Delgado, O., Gutierrez, A., Ramirez, C.</i>	1017
Tailoring Alumina Matrix Optical Properties for Colored Solar Thermal Absorber Coatings <i>Isac, L., Duta, A., Perniu, D.</i>	1025
Experimental Investigations on the Stagnation Behavior of Thermochromic Flat Plate Collectors <i>Müller, S., Giovannetti, F., Hafner, B., Reineke-Koch, R.</i>	1032
Theoretical Analysis of Combined Solar System Based on Dual Purpose Solar Collector <i>Pokorny, N., Matuska, T., Shemelin, V., Sourek, B.</i>	1043
Solar Flux Map Distribution of a Parabolic-Spheric Dish Based on Photographic Method <i>Roccabruna, M., Crema, L., Menna, F., Remondino, F.</i>	1055
Abrasion and Cleaning Tests on Antireflective and Antireflective/Antisoiling Coatings for Solar Glass Glazing <i>San Vicente, G., Farchado, M., Germán, N., Morales, Á.</i>	1063
Radiative Collector and Emitter: Experimental Results <i>Vall, S., Medrano, M., Solé, C.</i>	1071
Surface Modification of AISI 316 Stainless Steel by Oxynitrocarburizing for Solar Collector Applications <i>Vargas, G., Chávez, A.F., López, L.</i>	1077
Electroplating of Selective Surfaces for Concentrating Solar Collectors <i>Zäll, E., Mossegård, J., Nordenström, A., Wågberg, T.</i>	1086

Thermal Storage

Stratification in Large Thermal Storage Tanks	
<i>Battaglia, M., Haller, M.</i>	1097
Thermal Collection and Seasonal Storage Potential of a Mixed-Use Neighborhood	
<i>Hachem-Vermette, C., Cellura, M., Guarirno, F.</i>	1108
Experimental Study of a 600 w Seasonal Solar Heat Storage Reactor for the Heating of Buildings	
<i>Hennaut, S., André, P., Baiwir, R., Collard, L., Davin, E.</i>	1118
Sensible Thermal Energy Storage in Packed Bed for Industrial Solar Applications	
<i>Kocak, B., Paksoy, H.O.</i>	1130
Encapsulation of Inorganic Phase Change Materials by Sol-Gel Method for Thermal Energy Storage	
<i>Lucio, B., Romero, M.</i>	1137
Preliminary Results for the First Year of Operation of a Seasonal Storage Solar Combisystem for a Single Detached House	
<i>Meister, C., Beausoleil-Morrison, I.</i>	1144
Modeling and Validation of Different Heat Exchanger Geometries for Solar Ice Storage Systems	
<i>Paulini, S., Brüggemann, D., Plessing, T.</i>	1154
Validation of an Ice Storage Model and Its Integration Into a Solar-Ice System	
<i>Philippen, D., Battaglia, M., Carbonell, D., Kunath, L., Thissen, B.</i>	1162
Decentralized DHW Production from Exhaust Air in the Bathroom Prewall	
<i>Ruesch, F., Büchel, E., Haller, M., Persdorf, P., Urena, D.</i>	1174
Design and Evaluation of a Compact Thermal Storage System Using River Stones for a Continuous Drying Process of Agricultural Products in Peru	
<i>Tipula Ramos, R.R., Hadzich Marin, M.A., Herrera, E., Lopez Vasquez, E., Vergara Dávila, S.G.</i>	1181
Development of a Solar Paddy Dryer by Fluidization Technique Using Heat from a Solar Pond	
<i>Tundee, S., Rongchai, K.</i>	1189
High Temperature Seasonal BTES for Effective Load Shifting and CO2 Emission Reduction	
<i>Weber, R., Baldini, L.</i>	1201
Semi Continuous Thermochemical Reactor for Thermal Storage	
<i>Wytttenbach, J., Descy, G., Descy, A.</i>	1210

Testing & Certification

Optical Properties of Solar Absorbers – Results on Round Robin and Guidelines	
<i>Carvalho, M.J., Bohren, A., Fischer, S., Loren, A., Nielsen, J.E., Páscoa, S., Sallaberry, F., Wilson, H.R.</i>	1223
In Situ Characterization of Thermal Collectors in Field Installations	
<i>Fahr, S., Gumbel, U., Kramer, K., Zirkel-Hofer, A.</i>	1231
Modelling the Relative Humidity Inside Flat Plate Collectors	
<i>Fischer, S., Marquez, F.</i>	1241

Comparative Analysis of Life-Cycle Assessment Tools (LCA) Using the Example of Different Energy Supply Variants of a Purpose-Built Building	
<i>Kastner, R., Reim, M., Weismann, S., Yu, Y.</i>	1253
Quasi-Dynamic Testing of a Novel Concentrating Solar Collector According to ISO 9806:2013	
<i>Kurdia, A., Gomes, J., Ollas, P., Olsson, O., Pius, G.</i>	1262
Comparison of Two Whole System Test Methods: CCT and PLPE	
<i>Menegon, D., Haberl, R., Haller, M.</i>	1274
Analysis of Applicability of PLPE Method for the Test of a Solar Cooling System	
<i>Menegon, D.</i>	1285
OTSun: An Open Source Code for Optical Analysis of Solar Thermal Collectors and PV Cells	
<i>Pujol-Nadal, R., Bonnin-Ripoll, F., Cardona, G., Hertel, J.D., Martínez-Moll, V.</i>	1295
Ageing Performance of New Solar Cover Materials After Outdoor Exposure	
<i>Ruesch, F., Brunold, S.</i>	
CFD-Based Development, Testing and Optimization of Flat Plate Collectors	
<i>Vetter, B., Drück, H., Fischer, S.</i>	1309

System Simulation (2nd SIGES Conference on the Simulation of Building-Integrated Energy Systems)

An Improved Model for Phase Change Material (PCM) Thermal Storage Tanks	
<i>Andrés Chicote, M., Sanz Jimeno, R.</i>	1322
Model Predictive Control for Building Automation	
<i>Bolt, P., Fuchslin, R., Jaeger, C., Maier, O., Ritzmann, R., Zierbart, V.</i>	1330
Techno-Economic Evaluation of Energy Self-Sufficiency for the	1342
PIPE Network Analysis for Solar Thermal Plants	
<i>Eismann, R.</i>	1353
Dynamic Modelling of a Hybrid Solar Thermal/Electric Storage System for Application in Residential Buildings	
<i>Frazzica, A., Barz, T., Cabeza, L.F., Emhofer, J., Ferraro, M., Karellas, S., Orò, E., Palomba, V., Sergi, F., Varvagiannis, S., Zsembinszki, G.</i>	1364
Potential of Direct Solar Thermal Driven Absorption Heat Pump in Hybrid Systems	
<i>Gritzer, F., Neyer, D., Ostheimer, M., Thür, A.</i>	1376
Dynamic Modeling and Optimization of Energy Use in Retrofitted Buildings at District Heating Level	
<i>Iturralde, J., Chicote, M.A., Martín, J., Martín, E., Pascual, C., Urrea, I., Vasallo, A.</i>	1387
BIM Use Case: Model-Based Performance Optimization	
<i>Jakobi, M., Stöckli, U., Witzig, A.</i>	1395
From Simulation to Reality: IEC 61499 Compliant Control Applications for Solar Energy Systems	
<i>Jakobi, M., Meier, L., Quaschnig, V., Stöckli, U., Tjaden, T.</i>	1403

Theoretical Analysis of Photovoltaic Panels Using a Spray Cooling System with a Shallow Geothermal Energy Heat Exchanger	
<i>Liang, J., Chen, S., Tseng, C., Yang, L.</i>	1413
BIM a Driver for Energy Transition and BIVP Adoption	
<i>Nguyen, V.K., Machado, M.</i>	1423
A Comparison of Stratified Heat Storage With and Without Modular PCM Storage Through Simulation	
<i>Pabst, V., Mengedoht, G., Renze, P.</i>	1433
Using Behavior Simulation to Synthesize Electromobility Charging Profiles	
<i>Pflugradt, N., Muntwyler, U.</i>	1445
Multiobjective Synthesis of a Polygeneration System for a Residential Building Integrating Renewable Energy and Electrical and Thermal Energy Storage	
<i>Pinto, E.S., Serra, L.M.</i>	1454
Quantifying the Potential of Smart Heat-Pump Control to Increase the Self-Consumption of Photovoltaic Electricity in Buildings	
<i>Stauffer, Y., Alet, P., Hutter, A., Koch, N., Pflugradt, N.</i>	1466
Integrating Polysun into a Test Bench for Prosumer Hardware	
<i>Wienands, S., Pflugradt, N.D., Vezzini, A.</i>	1475

Solar Resource and Energy Meteorology

A First Approach of the Influence of the Forecasting Horizon in the Electricity Generation Simulation of a Solar Tower Plant	
<i>Alonso-Montesinos, J.</i>	1482
Climatic and Global Validation of Daily MODIS Precipitable Water Data at AERONET Sites for Clear-sky Irradiance Modelling	
<i>Bright, J.M., Engerer, N.A., Gueymard, C., Killinger, S., Lingfors, D., Sun, X., Wang, P.</i>	1490
Brazilian Photovoltaic Potential	
<i>Bueno Pereira, E., Ramos Martins, F., Rodrigues Gonçalves, A., Santos Costa, R.</i>	1502
Assessing Solar Electricity Potential and Prospective Present Day Costs For A Low Latitude Caribbean Island: Trinidad	
<i>Dookie, N., Chadee, X.T., Clarke, R.M.</i>	1511
Accuracy of Solar Resource Assessments on the Basis of Publicly Available GHI Databases	
<i>Egler, M.</i>	1522
Solar Irradiation Over a Flat Surface with Different Tracking Strategies	
<i>Gonzalez-Cabrera, A.E., Arancibia-Bulnes, C., Estevez, H., Ramirez-Ramirez, A., Valdes-Barron, M., Zarzalejo, F.</i>	1532
Validation of Real-Time Solar Irradiance Simulations Over Kuwait Using WRF-Solar	
<i>Gueymard, C., Jimenez, P.</i>	1540
Progress in Sky Radiance and Luminance Modeling Using Circumsolar Radiation and Sky View Factors	
<i>Gueymard, C., Ivanova, S.</i>	1551

Most Probable Operating Conditions and Performance Assessment of Four PV Technologies at 10 Locations in India	
<i>Gupta, N.C., Das, P.K., Giridhar, G.</i>	1563
Short Term PV Forecasting Using Satellite Data for Austria	
<i>Kortschak, D., Feichtinger-Hofer, M., Kernitzkyi, M.</i>	1575
The Spatial and Temporal Patterns of the Surface Solar Irradiation in Northeastern Region of Brazil	
<i>Lima, F., Costa, R., Gonçalves, A., Martins, F., Pereira, E., Santos, A.P.</i>	1585
Regression by Integration applied to Angström-Prescott-type Relations	
<i>Morf, H.</i>	1597
Effect of Solar Position Calculations on Filtering and Analysis of Solar Radiation Measurements	
<i>Perez-Astudillo, D., Bachour, D., Martin-Pomares, L.</i>	1605
Urban Climate – Impact on Energy Consumption an Thermal Comfort of Buildings	
<i>Remund, J., Grossenbacher, U.</i>	1614
Evaluation of Solar Radiation from MERRA, MERRA-2, ERA-Interim and CFSR Reanalysis Datasets Against Surface Observations for Multan, Pakistan	
<i>Tahir, Z.u.R., Ahmad, S.U., Ali, M.J., Asim, M., Azhar, M., Hayat, N., Hussain, A.</i>	1624
Evaluation of NCEP-Products (NCEP-NCAR, NCEP-DOE, NCEP-FNL, NCEP-GFS) of Solar Radiation for Karachi, Pakistan	
<i>Tahir, Z.u.R., Ali, H., Asim, M., Azhar, M., Hayat, N., Shahid, H.</i>	1631
Monthly Solar Irradiance Variability in Brazilian Climate Zones	
<i>Weide Luiz, E., Bueno Pereira, E., Gonçalves de Souza, J., J. Lopes de Lima, F., Pizzuti Pes, M., Ramos Martins, F., Rodrigues Gonçalves, A., Santos Costa, R.</i>	1642

Solar Education

On the Importance of Education when Implementing Renewable Energy	
<i>Broman, L., Kandpal, T.C., Ott, A.</i>	1649
A Simple Tool for Assessing Solar and Daylight Access in Urban Canyons	
<i>Compagnon, R., Chatzipoulka, C.</i>	1655
Development of a Compact and Didactic Solar Energy Kit Using Arduino	
<i>Costeira, J., Cabral, D., Gomes, J., Hayati, A., Vieira, M.</i>	1663
Using Heliodon for Solar Building Design Education in the Age of Computer Simulations	
<i>Pajek, L., Božiek, D., Dovjak, M., Košir, M., Kuni, R., Potonik, J., Šubic, N.</i>	1668
Dialogue Between Research Solar Practices and Training Activities: Interactive Webinar by Integration of ICT in Education	
<i>Polo López, C.S., Frontini, F.</i>	1678
Understanding the Dynamics of Solar Energy Systems by Using Simulation Narratives	
<i>Witzig, A., Borth, J., Danesi, S.</i>	1687

Renewable Energy Strategies and Policies

Indoor Climate Agreements in Energy-Efficiency and Renovation Projects - A Question of Justice?	
<i>Henning, A.</i>	1694
Photovoltaics or Solar Thermal –The Winner Takes it All?	
<i>Muntwyler, U., Schuepbach, E.</i>	1704
Preliminary Economic Evaluation of the First Grid-Connected Photovoltaic System in the Aysén Region Under the Current Law of Distributed Generation in Chile	
<i>Osorio-Aravena, J.C., Muñoz-Cerón, E.</i>	1711
Accompanying Project Owners and Professionals All the Way to Secure Solar Thermal Plants	
<i>Porcheyre, E., Mugnier, D.</i>	1716
Research for Compiling a Mandatory National Standard Technical Code for Energy Efficiency in Buildings and Renewable Energy Application	
<i>Zheng, R., He, T., Li, B., Wang, M., Zhang, X.</i>	1722

Author Index

Index of all Authors

