



# INNOSTORAGE

Advances in Thermal Energy Storage  
חידושים באגירת אנרגיה תרמית

## CONFERENCE PROGRAM



אוניברסיטת בן-גוריון בנגב  
Ben-Gurion University of the Negev  
جامعة بن غوريون في النقب

February 16-18, 2016  
Beer-Sheva, Israel

## Day 1: Tuesday, February 16

09:00-10:00

### Opening Session

Opening remarks	<i>Prof. Gennady Ziskind</i> Department of Mechanical Engineering, Ben-Gurion University of the Negev
Greetings	<i>Prof. Dan Blumberg</i> Vice-President and Dean for Research and Development, Ben-Gurion University of the Negev <i>Prof. Joseph Kost</i> Dean, Faculty of Engineering Sciences, Ben-Gurion University of the Negev <i>Prof. Avi Levy</i> Head, Department of Mechanical Engineering, Ben-Gurion University of the Negev
INNOSTORAGE presentation	<i>Prof. Luisa F. Cabeza</i> GREA Innovació Concurrent, Universitat de Lleida, Spain Coordinator, INNOSTORAGE and INPATH-TES research frameworks

10:00-10:30

### Coffee break

10:30-12:10

### Session 1: Industrial and domestic applications

*Chairpersons:* Luisa F. Cabeza (Spain) and Rhys Jacob (Australia)

- Paper 023 Industrial waste heat (IWH) recovery potential assessment in Spain  
*Laiá Miró<sup>1</sup>, Sarah Brueckner<sup>2</sup>, Russell McKenna<sup>3</sup>, Luisa F Cabeza<sup>1</sup>*  
<sup>1</sup>GREA Innovació concurrent, Edifici CREA, Universitat de Lleida, Pere de Cabrera s/n, 25001-Lleida, Spain. E-mail: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)  
<sup>2</sup>ZAE Bayern, Walther-Meißner-Str. 6, 85748 Garching, Germany. E-mail: [sarah.brueckner@zae-bayern.de](mailto:sarah.brueckner@zae-bayern.de)  
<sup>3</sup>Institute for Industrial Production (IIP), Chair of Energy Economics, Karlsruhe Institute of Technology (KIT), Hertzstraße 16, 76187 Karlsruhe, Germany. E-mail: [russell.mckenna@kit.edu](mailto:russell.mckenna@kit.edu)
- Paper 025 MERITS project: a comparative study of shell-and-tube heat exchangers for domestic hot water (DHW) and industrial waste heat (IWH) applications  
*Jaume Gasia<sup>1</sup>, Jan Diriken<sup>2,4</sup>, Malcolm Bourke<sup>3</sup>, Johan Van Bael<sup>2,4</sup>, Luisa F. Cabeza<sup>1</sup>*  
<sup>1</sup>GREA Innovació concurrent, Edifici CREA, Universitat de Lleida, Pere de Cabrera s/n, 25001-Lleida, Spain. E-mail: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)  
<sup>2</sup>Flemish Institute for Technological Research (VITO), Boeretang 200, BE-2400 Mol, Belgium  
<sup>3</sup>Glen Dimplex Ireland, Church Road, Portadown, Co Armagh, BT63 5HU, U.K.  
<sup>4</sup>Energyville (joint venture of VITO NV and KU Leuven), Thor Park 8300, BE-3600 Genk, Belgium
- Paper 032 A compact multi-stage latent heat store for DHW applications  
*Jan Diriken<sup>1,2</sup>, Johan Van Bael<sup>1,2</sup>, Guy Meynen<sup>1,2</sup>, Filip Leemans<sup>1,2</sup>, Robbe Salenbien<sup>1,2</sup>, Martine Baelmans<sup>2,3</sup>, Luisa F. Cabeza<sup>4</sup>*  
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<sup>2</sup>Energyville (joint venture of VITO NV and KU Leuven), Dennenstraat 7, 3600 Genk, Belgium  
<sup>3</sup>KU Leuven, Department of Mechanical Engineering, Celestijnenlaan 300A, 3001 Leuven, Belgium  
<sup>4</sup>GREA Innovació Concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001 Lleida, Spain

- Paper 059 Old and new concepts in development of PCM thermal energy storage systems  
*Eli Korin*  
Department of Chemical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel. E-mail: [ekorin@bgu.ac.il](mailto:ekorin@bgu.ac.il)
- Paper 055 A review of the connection between material property and performance of PCM in real scale applications  
*Harald Mehling<sup>1</sup>, Camila Barreneche<sup>2</sup>, Aran Solé<sup>2</sup>, Luisa F. Cabeza<sup>2</sup>*  
<sup>1</sup>Consultant, Weingartenstr. 37, 97074 Würzburg, Germany. E-mail: [harald.mehling@gmail.com](mailto:harald.mehling@gmail.com)  
<sup>2</sup>GREA Innovació concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001 Lleida, Spain. E-mail: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)

**12:10-13:30**

**Lunch**

**13:30-15:30**

**Session 2: Modeling**

*Chairpersons:* A. Inés Fernández (Spain) and Philip Griffiths (United Kingdom)

- Paper 036 Pumped heat electricity storage  
*André Thess*  
Institut für Technische Thermodynamik, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Pfaffenwaldring 38-40, 70569 Stuttgart, Germany. E-mail: [andre.thess@dlr.de](mailto:andre.thess@dlr.de)
- Paper 049 Development and validation of an adsorption heat storage numerical model  
*Damien Gondre<sup>1,2</sup>, Kévyon Johannes<sup>1,3</sup>, Frédéric Kuznik<sup>1,2</sup>*  
<sup>1</sup>Université de Lyon, CNRS  
<sup>2</sup>INSA-Lyon, CETHIL, UMR5008, F-69621, Villeurbanne, France  
<sup>3</sup>Université Lyon 1, F-69622, France. E-mail: [frederic.kuznik@insa-lyon.fr](mailto:frederic.kuznik@insa-lyon.fr)
- Paper 060 Dynamic melting of PCM: An experimental evaluation.  
*Jaume Gasia<sup>1</sup>, N.H. Steven Tay, Rhys Jacob<sup>2</sup>, Martin Belusko<sup>2</sup>, L.F. Cabeza<sup>1</sup>, Frank Bruno<sup>2</sup>*  
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<sup>2</sup>Barbara Hardy Institute, University of South Australia, Mawson Lakes, SA 5095, Australia.
- Paper 051 Implementation and comparison of three enthalpy methods for modelling solid-liquid phase change in OpenFOAM  
*Andreas König-Haagen<sup>1</sup>, Erwin Franquet<sup>2</sup>, Eric Pernot<sup>2</sup>, Dieter Brüggemann<sup>1</sup>*  
<sup>1</sup>University of Bayreuth, Centre of Energy Technology (ZET), Bayreuth, Germany. E-mail: [andreas.koenig-haagen@uni-bayreuth.de](mailto:andreas.koenig-haagen@uni-bayreuth.de)  
<sup>2</sup>University of Pau & Pays Adour, LaTEP, Pau, France
- Paper 057 One-dimensional analytical model of PCM melting  
*Vadim Dubovsky, Gennady Ziskind, Ruth Letan*  
Heat Transfer Laboratory, Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva 84105 Israel. E-mail: [vadimd@bgu.ac.il](mailto:vadimd@bgu.ac.il)
- Paper 050 Three-dimensional modelling of phase change with natural convection using the lattice Boltzmann method on graphics processing units  
*Wei Gong, Christian Obrecht, Kévyon Johannes, Frédéric Kuznik*  
Centre for Energy and Thermal Sciences of Lyon (CNRS, INSA-Lyon, UCB-Lyon 1), France. E-mail: [christian.obrecht@insa-lyon.fr](mailto:christian.obrecht@insa-lyon.fr)

**15:30-16:00**

**Coffee break**

**16:00-17:40**

**Session 3: Enhancement**

*Chairpersons: Maria Browne (Ireland) and Frederic Kuznik (France)*

Paper 019 Working towards solving the rate problem: geometric vs nano-enhanced PCM solutions

*Dominic Groulx<sup>1</sup>, Ali C. Kheirabadi<sup>1</sup>, Louis Desgrosseilliers<sup>1</sup>, Moe Kabbara<sup>1</sup>, Mohammad Azad<sup>1</sup>, Adam Donaldson<sup>1</sup>, Alain Joseph<sup>2</sup>, Mary Anne White<sup>1</sup>*

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<sup>2</sup>Nova Scotia Community College, Dartmouth, Nova Scotia, Canada.

E-mail: [dominic.groulx@dal.ca](mailto:dominic.groulx@dal.ca)

Paper 033 Fast thermal energy storage using open-cell aluminum foam

*Henk Huisseune, Ben D'Haeger, Michel De Paepe*

Ghent University, Department of Flow, Heat and Combustion Mechanics, Sint-Pietersnieuwstraat 41, 9000 Gent, Belgium. E-mail: [Henk.Huisseune@UGent.be](mailto:Henk.Huisseune@UGent.be)

Paper 037 Close-contact melting in latent heat storage units with longitudinal fins

*Ron Hayat, Tomer Rozenfeld, Yoram Kozak, Gennady Ziskind*

Heat Transfer Laboratory, Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva 84105 Israel. E-mail: [gziskind@bgu.ac.il](mailto:gziskind@bgu.ac.il)

Paper 038 Modeling of melting in the presence of solid sinking

*Yoram Kozak, Gennady Ziskind*

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Paper 043 Close-contact melting of nano-enhanced PCMs

*Yoram Kozak<sup>1</sup>, Yi Zeng<sup>2</sup>, Rabih Al Ghossein<sup>2</sup>, Gennady Ziskind<sup>1</sup>, Jeyhoon M. Khodadadi<sup>2</sup>*

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**19:30-22:00**

**Dinner (included) – “Authentic” Restaurant, Beer-Sheva**

## Day 2: Wednesday, February 17

09:00-10:00

### Session 4: Novel Materials and Properties I

*Chairpersons:* Anna Laura Pisello (Italy) and Mohammed M. Farid (New Zealand)

Paper 058 Novel microencapsulated phase change material for thermal energy storage in building applications

*Halime Paksoy, Beyza Beyhan, Kemal Cellat*

Çukurova University, 01330, Adana, Turkey. E-mail: [beyzabeyhan@gmail.com](mailto:beyzabeyhan@gmail.com)

Manipulation of phase transition temperatures and supercooling of sugar alcohol based Phase Change Materials (PCMs) by urea

Paper 015 *Johan Göhl<sup>1</sup>, Robert Paberit<sup>1</sup>, Erik Rilby<sup>1</sup>, Jan Swenson<sup>2</sup>, Pär Johansson<sup>1</sup>, Helén Jansson<sup>1</sup>*

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<sup>2</sup>Dept. of Applied Physics, Chalmers Univ. of Technology, Gothenburg, Sweden.

Paper 022 Highly conductive stabilized TCM with graphite

*Aran Solé<sup>1</sup>, Camila Barreneche<sup>1,2</sup>, Anabel Palacios<sup>2</sup>, A. Inés Fernández<sup>2</sup>, Luisa F. Cabeza<sup>1</sup>*

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Paper 012 Thermophysical properties of low cost lithium nitrate salts produced in northern Chile for thermal energy storage

(Proceedings only)

*Ángel G. Fernández<sup>1</sup>, Judith C. Gomez<sup>2</sup>*

<sup>1</sup>Energy Development Center, University of Antofagasta, Av. Universidad de Antofagasta 02800, Antofagasta, Chile. E-mail: [angel.fernandez@uantof.cl](mailto:angel.fernandez@uantof.cl)

<sup>2</sup>National Renewable Energy Laboratory, 15013 Denver West Parkway 80401, Golden, Colorado. USA. E-mail: [judith.gomez@nrel.gov](mailto:judith.gomez@nrel.gov)

10:00-10:30

Coffee break

10:30-12:30

### Session 5: PCM Applications I

*Chairpersons:* Marilena de Simone (Italy) and Harald Mehling (Germany)

Paper 016 Design evaluation and improvements of a latent heat based thermal energy storage system

*Pepe Tan, Pär Johansson, Angela Sasic Kalagasidis*

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Paper 017 Natural convection melting in a high temperature flat plate latent heat storage system: Parameter study of enclosure dimensions

*Julian Vogel<sup>1</sup>, Jonina Felbinger<sup>2</sup>, Maike Johnson<sup>1</sup>*

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- Paper 018 Performance characteristics of thermoelectric generator (TEG) with PCM module  
*Maciej Jaworski, Marta Bednarczyk, Marcelli Czachor*  
 Institute of Heat Engineering, Warsaw University of Technology, Nowowiejska 21/25, 00-665 Warsaw, Poland. E-mail: [mjawo@itc.pw.edu.pl](mailto:mjawo@itc.pw.edu.pl)
- Paper 024 Experimental evaluation of a cooling radiant wall coupled to a ground heat exchanger  
*Joaquim Romani<sup>1</sup>, Alvaro de Gracia<sup>2</sup>, Luisa F. Cabeza<sup>1</sup>*  
<sup>1</sup>GREA Innovació Concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001, Lleida, Spain. Email: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)  
<sup>2</sup>CELiMIN, Universidad de Antofagasta, Campus Coloso, Av. Universidad de Antofagasta, 02800 Antofagasta, Chile
- Paper 034 Multipurpose characterization of cool roof membrane with paraffin based PCM inclusion  
*Anna Laura Pisello<sup>1,2</sup>, Elena Fortunati<sup>3</sup>, Samantha Mattioli<sup>3</sup>, Camila Barreneche<sup>4</sup>, Franco Dominici<sup>3</sup>, Cristina Piselli<sup>2</sup>, Veronica L. Castaldo<sup>2</sup>, Luisa F. Cabeza<sup>4</sup>, Franco Cotana<sup>1,2</sup>, Luigi Torre<sup>3</sup>, José M. Kenny<sup>3</sup>*  
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- Paper 014 Experimental evaluation of PCMs for heat storage in solar cooling systems  
*Vincenza Brancato, Andrea Frazzica*  
 CNR - Istituto di Tecnologie Avanzate per l'Energia "Nicola Giordano", Via Salita S. Lucia sopra Contesse 5, 98126 Messina, Italy. E-mail: [andrea.frazzica@itae.cnr.it](mailto:andrea.frazzica@itae.cnr.it)

**12:30-13:30**

**Lunch**

**13:30-15:30**

**Session 6: PCM Applications II**

*Chairpersons:* Halime Paksoy (Turkey) and Maciej Jaworski (Poland)

- Paper 040 Analysis of a multi-PCM latent heat storage unit  
*Moran Ezra, Yoram Kozak, Gennady Ziskind*  
 Heat Transfer Laboratory, Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva 84105 Israel. E-mail: [gziskind@bgu.ac.il](mailto:gziskind@bgu.ac.il)
- Paper 045 The up-scaling of a Photovoltaic/Thermal (PV/T) system with integrated phase change material  
*Maria C. Browne, Sarah J. McCormack*  
 Department of Civil, Structural and Environmental Engineering, Trinity College, University of Dublin, College Green, Dublin 2, Ireland. E-mail: [brownema@tcd.ie](mailto:brownema@tcd.ie)

- Paper 052 Experimental and theoretical study of cold storage with PCM  
*Yoram Kozak<sup>1</sup>, Mohammed Farid<sup>2</sup>, Gennady Ziskind<sup>1</sup>*  
<sup>1</sup>Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel. E-mail: [kozaky@post.bgu.ac.il](mailto:kozaky@post.bgu.ac.il)  
<sup>2</sup>Department of Chemical and Materials Engineering, The University of Auckland, Auckland, New Zealand. E-mail: [m.farid@auckland.ac.nz](mailto:m.farid@auckland.ac.nz)
- Paper 030 Fire reaction behavior of coated microencapsulated PCM  
*Camila Barreneche<sup>1,2</sup>, Anabel Palacios<sup>1,2</sup>, Refat Al Shannaq<sup>3</sup>, Jamal Kurdi<sup>4</sup>, Mohammed M. Farid<sup>3</sup>, Luisa F. Cabeza<sup>2</sup>, A. Inés Fernández<sup>1</sup>*  
<sup>1</sup>Department of Materials Science & Metallurgical Engineering, Universitat de Barcelona, Barcelona, Spain. Martí i Franqués 1-11, 08028-Barcelona, Spain. E-mail: [ana\\_inesfernandez@ub.edu](mailto:ana_inesfernandez@ub.edu)  
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<sup>3</sup>Department of Chemical and Materials Engineering, University of Auckland, Auckland, New Zealand. E-mail: [m.farid@auckland.ac.nz](mailto:m.farid@auckland.ac.nz)  
<sup>4</sup>College of the North Atlantic, Doha, Qatar
- Paper 041 A novel latent heat storage unit with a helical fin  
*Avi Rozenfeld, Yoram Kozak, Tomer Rozenfeld, Gennady Ziskind*  
Heat Transfer Laboratory, Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva 84105 Israel. E-mail: [gziskind@bgu.ac.il](mailto:gziskind@bgu.ac.il)
- Paper 042 Prediction of charging and discharging performance for a domestic scale phase change thermal energy storage system with different heat exchanger designs.  
*Philip Eames*  
Centre for Renewable Energy Systems Technology (CREST), Loughborough University, UK.  
E-mail: [P.C.Eames@lboro.ac.uk](mailto:P.C.Eames@lboro.ac.uk)

**15:30-16:00**

**Coffee break**

**16:00-18:00**

**Session 7: Novel Materials and Properties II**

*Chairpersons:* Helen Jansson (Sweden) and Dominic Groulx (Canada)

- Paper 026 Methodology for specific heat capacity determination by DSC  
*Gerard Ferrer<sup>1</sup>, Camila Barreneche<sup>1,2</sup>, Aran Solé<sup>1</sup>, Luisa F. Cabeza<sup>1</sup>*  
<sup>1</sup>University of Lleida, Pere de Cabrera s/n 25001, Lleida, Spain. E-mail: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)  
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- Paper 029 Corrosion of AISI316 stainless steel by molten carbonate mixtures  
*Mercè Segarra<sup>1</sup>, Juan Gallardo<sup>1</sup>, Camila Barreneche<sup>2</sup>, Ana Inés Fernández<sup>1</sup>, Ming Liu<sup>3</sup>, N.H. Steven Tay<sup>3</sup>, Frank Bruno<sup>3</sup>*  
<sup>1</sup>DIOPMA, Dept. Materials Science and Metallurgical Engineering, Universitat de Barcelona, Martí i Franqués, 1, 08028 Barcelona, Spain. E-mail: [m.segarra@ub.edu](mailto:m.segarra@ub.edu)  
<sup>2</sup>GREIA Innovació Concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001, Lleida, Spain.  
<sup>3</sup>Barbara Hardy Institute, School of Engineering, University of South Australia, Mawson Lakes Boulevard, Mawson Lakes, SA5095 Australia.

Paper 031 Crossed analysis by T-history and Turbiscan for the characterization of PCM with Glauber salt

*Maria Gabriela De Paola<sup>1</sup>, Marilena De Simone<sup>1</sup>, Natale Arcuri<sup>1</sup>, Vincenza Calabrò<sup>2</sup>*

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Paper 054 Double salts coming from wastes of the non-metallic industry for thermal energy storage (TES)

*Andrea Gutierrez<sup>1</sup>, Camila Barreneche<sup>2,3</sup>, Mario Grageda<sup>1,4</sup>, Luisa F. Cabeza<sup>3</sup>, Svetlana Ushak<sup>1,4</sup>*

<sup>1</sup>Department of Chemical Engineering and Mineral Processing and Center for Advanced Study of Lithium and Industrial Minerals (CELiMIN), Universidad de Antofagasta, Campus Coloso, Av. Universidad de Antofagasta 02800, Antofagasta, Chile. E-mail:

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<sup>3</sup>GREA Innovació Concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001, Lleida, Spain

<sup>4</sup>Solar Energy Research Center (SERC-Chile), Av Tupper 2007, Piso 4, Santiago, Chile

Paper 053 Design of mixtures with bischofite as low temperature thermal energy storage materials

*Yana Galazutdinova<sup>1</sup>, Svetlana Ushak<sup>1,2</sup>, Luisa F. Cabeza<sup>3</sup>, Mario Grágeda<sup>1,2</sup>*

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<sup>2</sup>Solar Energy Research Center (SERC-Chile), University of Chile, Av. Tupper 2007, Santiago, Chile <sup>3</sup>GREA Innovació Concurrent, Universitat de Lleida, edifici CREA, Pere de Cabrera s/n, 25001 Lleida Spain. E-mail: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)

Paper 039 Mathematical modeling of solidification with subcooling

*Avihai Uzan, Yoram Kozak, Yosef Korin, Gennady Ziskind*

Heat Transfer Laboratory, Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva 84105 Israel. E-mail: [gziskind@bgu.ac.il](mailto:gziskind@bgu.ac.il)

Paper 020 (Proceedings only) The development of three different carbon based networks for the enhancement of thermal properties of energy storage materials: heterogeneously suspended graphite nanofibers, aligned graphene fibers, and aerogels

*Rebecca Weigand, Yue Xu, Di Zhang, Gang Feng, Amy Fleischer*

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20:00-23:00

Conference Dinner – “Arabica” Restaurant, Beer-Sheva



## Day 3: Thursday, February 18

09:00-10:00

### Session 8: Storage Costs and Societal Aspects

Chairpersons: Michel de Paepe (Belgium) and Andre Thess (Germany)

- Paper 011 Acceptable and realised storage capacity costs of thermal energy storages  
*Christoph Rathgeber, Stefan Hiebler, Eberhard Lävemann, Andreas Hauer*  
Bavarian Center for Applied Energy Research (ZAE Bayern), Walther-Meißner-Str. 6, 85748 Garching, Germany. E-mail: [christoph.rathgeber@zae-bayern.de](mailto:christoph.rathgeber@zae-bayern.de)
- Paper 013 Embodied energy and cost of high temperature thermal energy storage systems for use in concentrated solar power plants  
*Rhys Jacob<sup>1</sup>, Martin Belusko<sup>1</sup>, A.I. Fernández<sup>2</sup>, L.F. Cabeza<sup>3</sup>, Wasim Saman<sup>1</sup>, Frank Bruno<sup>1</sup>*  
<sup>1</sup>Barbara Hardy Institute, University of South Australia, Mawson Lakes, SA 5095, Australia. E-mail: [rhys.jacob@mymail.unisa.edu.au](mailto:rhys.jacob@mymail.unisa.edu.au)  
<sup>2</sup>Department of Materials Science and Metallurgical Engineering, Universitat de Barcelona, Martí i Franqués 1, 08028 Barcelona, Spain  
<sup>3</sup>GREA Innovació Concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001 Lleida, Spain
- Paper 027 Reflections on the social approach of renewable energy studies using TES as case study. A responsible and participatory overview for researchers  
*Ruth Carbajo, Luisa F. Cabeza*  
GREA Innovació Concurrent, Universitat de Lleida, Edifici CREA, Pere de Cabrera s/n, 25001 Lleida, Spain. E-mail: [ruth.carbajo@diei.udl.cat](mailto:ruth.carbajo@diei.udl.cat)

10:00-10:30

Coffee break

10:30-11:50

### Session 9: Building Applications

Chairpersons: Diana Bajare (Latvia) and Yoram Kozak (Israel)

- Paper 021 Comparative study of sustainable and Mediterranean conventional constructive systems thermal behavior  
*Susana Serrano<sup>1</sup>, Belén González<sup>2</sup>, Antonia Navarro<sup>2</sup>, Luisa F. Cabeza<sup>1</sup>*  
<sup>1</sup>University of Lleida, Pere de Cabrera s/n, Lleida, Spain. E-mail: [lcabeza@diei.udl.cat](mailto:lcabeza@diei.udl.cat)  
<sup>2</sup>GICITED Departament Construccions arquitectòniques II (EPSEB - UPC), Dr. Marañón 44-50, Barcelona, Spain. E-mail: [antonia.navarro@upc.edu](mailto:antonia.navarro@upc.edu)
- Paper 044 The inherent thermal storage capacity of buildings – potential for load shifting with electricity powered heating systems  
*Henryk Wolisz, Tobias Blacha, Pooyan Jahangiri, Mark Wesseling, Dirk Müller*  
RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate, 52074 Aachen, Germany. E-mail: [hwolisz@eonerc.rwth-aachen.de](mailto:hwolisz@eonerc.rwth-aachen.de)
- Paper 046 Impact of different building materials on summer comfort in Latvian climate  
*Andris Jakovics<sup>1</sup>, Stanislavs Gendelis<sup>1</sup>, Diana Bajare<sup>2</sup>, Ansis Ozolins<sup>1</sup>*  
<sup>1</sup>University of Latvia, Zellu 25, Riga, Latvia. E-mail: [Andris.Jakovics@lu.lv](mailto:Andris.Jakovics@lu.lv)  
<sup>2</sup>Riga Technical University, Kalku 1, Riga, Latvia. E-mail: [Diana.Bajare@rtu.lv](mailto:Diana.Bajare@rtu.lv)

Paper 056 Advanced solar energy store for residential buildings using phase change materials

*Ming Jun Huang, Philip Griffiths, Neil James Hewitt*

Centre for Sustainable Technologies, Ulster University, Northern Ireland, UK

E-mail: [m.huang@ulster.ac.uk](mailto:m.huang@ulster.ac.uk)

**12:00-12:30**

**Closing Session**

**12:30-13:30**

**Lunch (optional)**