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<https://cms2017.solarpaces-conference.org/program>



## Greetings



Dear Friends,

Solar energy is undoubtedly an energy source that will allow us to face the main challenges associated with development and climate change. Renewable energies are the future of Chile, and this future will soon be upon us. Today 79% of the energy projects that are being built in our country are renewable. Only between January and July of 2017, 94% of the MW submitted to environmental assessment were from solar projects.

The emergence of new competitive technologies compels us to continually update our knowledge, in order to opportunely maximize the benefits that they offer. Matters such as the complementarity between different renewable energies, the role that energy storage technologies will play in the future, or the best way to manage the operation of energy systems with a high penetration of non-conventional renewables are being analyzed worldwide.

In this context, SolarPACES enriches the debate on the opportunities that solar concentration technologies opens for the future of Chile and the world.

Chile has the goal that by the year 2050 70% of our power generation will come from renewable sources, and we will achieve this. The Energy Agenda launched by President Bachelet establishes the need to build a sustainable energy matrix at reasonable prices and to take advantage of domestic energy resources. Solar energy will play a key role in this, not only because we have the best radiation in the world, but also because we have reached truly competitive prices compared to other technologies.

For the first time Chile will host the SolarPACES Conference, the world's most important meeting on solar concentration technologies. Each year this event gathers more than 500 researchers and representatives of the industry from nearly forty countries. It is a space where science and industry meet to discuss the main technological advances and the frontier of knowledge in solar concentration technologies and solar chemistry. We are looking for economical and sustainable technological options based on the locally available solar resource for all our productive sectors, and in Chile it is especially relevant for us to respond to the current and future challenges facing the mining sector.

We want our country to be renewable, and solar energy is a mainstay to reach that. We want Chileans to be leaders in this revolution. We hope to welcome all relevant actors on the national level and we look forward to sharing our experience with the international leaders of this industry. It is therefore a great pleasure to invite you on behalf of the Ministry of Energy and the SolarPACES organizing committee, to participate in this exciting conference and enjoy the hospitality of our beautiful country!

A handwritten signature in blue ink, appearing to read 'AR', with a stylized flourish at the end.

Andrés Rebolledo

Minister of Energy, Government of Chile

Chair of SolarPACES 2017

## Greetings

Dear SolarPACES participants,

Finally, time has come to talk about Solar Thermal Electricity not just in terms of long term potential but actually now in terms of a real, competitive choice for satisfying the need for dispatchable electricity generation that all countries are facing sooner or later, either because of demand growth or due to the planned dismantling of conventional plants.

Electricity from STE plants is currently being offered below two digits - 10 \$cts/kWh - in countries with moderate solar resources, as has been the case in the Arab Emirates, and even around 7 \$cts/kWh in places with excellent solar radiation, as happened already in Chile and Australia. This has been possible by a virtuous combination of factors – competition, improved performances and reduction in soft and hard costs – and it should continue to be fostered by increased market growth.

STE is nowadays – and will continue to be – the most competitive choice for utility scale renewable power plants with medium or large – 6 hours or longer – built-in energy storage. The distinct features and technical merits in terms of dispatchability and grid stability are only a part of the advantages when countries consider the positive macroeconomic impact of the local content on their respective economies as well.

Our STE community welcomes the interest of large utilities, which are currently showing great interest in participating in this field, since they are well aware of the real needs of the electrical systems in the different countries after an initial strong deployment period of non-dispatchable renewable technologies.

But electricity is not the sole product our solar concentrating technologies can deliver. There is a wide range of process heat applications, which could be supplied from our solar collector fields. Promoting the deployment of such applications is a must for governments committed to the mitigation of the climate change. There are many industrial, commercial and residential cases where solar heat at medium range temperatures is already competitive with fossil fuels and we hope to see major development in this field over the coming years.

I am really looking forward to seeing the outcome of this SolarPACES conference in Chile where the latest developments – market, industrial and scientific – will be shared for the sake of our sector. ESTELA is certainly pleased and prepared to disseminate the results and to provide advice and support to policy makers to speed up the deployment of this technology.

I am still proud to wear the “key of Sol” on the lapel of my jacket being convinced that “Sol is the key” for a truly sustainable energy mix at world level. I hope you share the same conviction and will continue to work enthusiastically to make it happen.

I wish you an enjoyable and fruitful stay in the lovely city of Santiago de Chile.



Luis Crespo

President of ESTELA



## Greetings



Dear colleagues,

This year's Welcome Message to the International SolarPACES Conference is very special for me. It is my last Welcome Message as Chair of the International Energy Agency's SolarPACES Technology Collaboration Program (TCP). The position of Chair is a two-years term and I already had the honour of being elected three consecutive terms. In the last election, I announced that this current term, which ends just after the conference, will be my last one. In any organization, periodic changing of the leadership is healthy. Thus, rather than running for re-election, I am looking forward to support the new Chair in advancing the cause of SolarPACES and, in so doing, contributing to facilitate a fast transition to a much more environmentally-friendly world energy system than the one we have. A new world energy system based mainly, if not completely, on the use renewable energy sources, free of CO<sub>2</sub> and other greenhouse emissions that contribute to climate change.

As any SolarPACES conferences, this year's conference is the place to be for anyone interested in Concentrating Solar Power and Solar Chemistry technologies and in the ways they can be used to improve our world energy system. It is the forum where ideas regarding the multiple aspects related to how to advance the state of the art of these technologies, how to improve their cost-competitiveness and how to increase their commercial deployment worldwide will be discussed; the melting point from which new international collaborations will emerge, and existing ones will be further reinforced and expanded.

As usual the country where the conference takes place – Chile – is fantastic in a myriad of dimensions. The way Concentrating Solar Power and Solar Chemistry technologies are being commercially deployed in Chile is a success story. One that should be clearly understood and from which lessons should be learned.

On behalf of the International Energy Agency's SolarPACES Technology Collaboration Program, I welcome you to the 2017 International SolarPACES Conference! Please, enjoy it!

A handwritten signature in blue ink that reads "Manuel Blanco". The signature is stylized with a long horizontal line extending to the right.

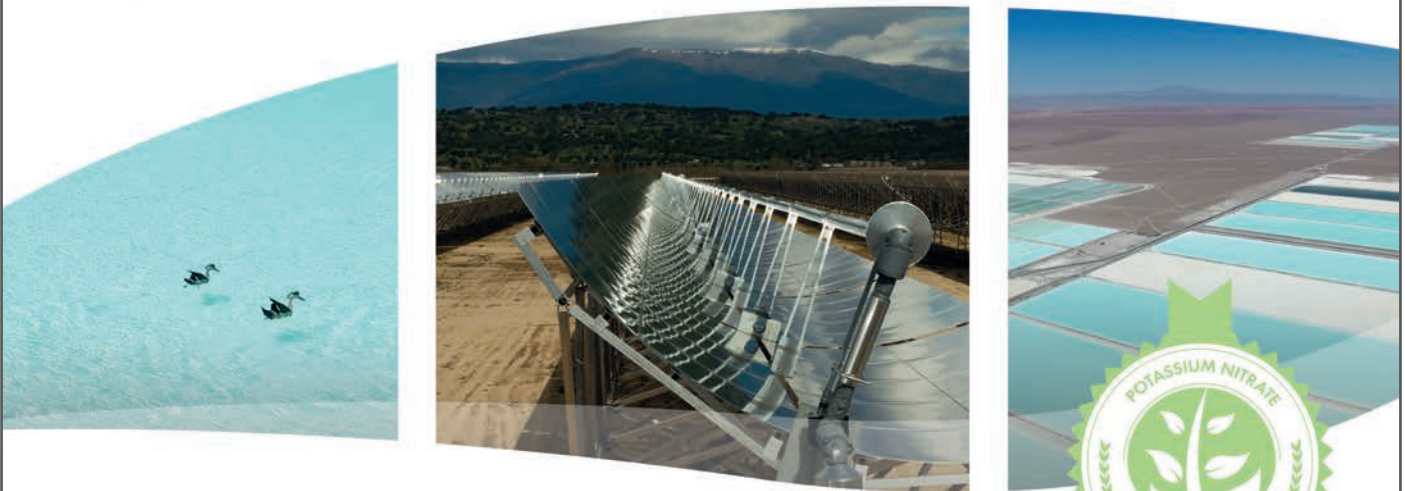
Manuel J. Blanco, Ph.D., Dr. Ing.

Chair of the SolarPACES Executive Committee



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## Conference Topics

Advanced Materials

Central Receiver Systems

Commercial Projects in the World

Direct Solar Metallurgy

Dish/Engine Systems

Emerging Concepts

Flux and Temperature Measurements

Heat Transfer Fluids

Hybridization

Linear Fresnel Systems

Parabolic Trough Systems

Policy and Marketing

Power Cycles

Process Heat

Reliability and Service Life Prediction of Components

Software Tools for CSP Analysis and Simulation

Solar Energy for Mining Industry

Solar Fuels and Chemical Commodities

Solar Resource Assessment

Thermal Energy Storage

Thermochemical Energy Storage

Water Desalination and Detoxification



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## Tuesday, September 26, 2017

08:30 am - 09:00 am Registration

09:00 am - 10:30 am **Opening Session**

ROOM: GREAT ROOM 2+3

Welcome and Opening Messages by:

**Andres Rebolledo**, *Minister of Energy, Conference Chair*

**Cédric Philibert**, *International Energy Agency*

**Luis Crespo**, *President of ESTELA*

**Manuel Blanco**, *Chairman SolarPACES*

10:30 am - 11:00 am Coffee Break

11:00 am - 12:30 pm **Plenary: CSP Policy**

ROOM: GREAT ROOM 2+3

*Chair: Cedric Philibert, International Energy Agency*

CSP Policy in Chile

**Rodrigo Mancilla**, *Chilean Solar Committee*

CSP Policy in Morocco

**Abderrahim Jamrani**, *MASEN*

CSP Policy – Views from Industry

**Michael Geyer**, *Abengoa*

CSP Policy – Views from Industry

**SolarReserve**

12:30 pm - 02:00 pm

Lunch Break

The Lunch Break is sponsored by SolarReserve. **Thank You!**

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02:00 pm - 04:00 pm **Policy and Marketing**

ROOM: GREAT ROOM 1

*Chair: Cedric Philibert, IEA*

02:10 pm

Potential Contribution of Concentrated Solar Power in Meeting the Sustainable Development Goals (SDGs): Theoretical Framework and Case Study Application

**Natalia Caldés Gómez<sup>1</sup>**, *Irene Rodriguez-Serrano<sup>1</sup>*

<sup>1</sup> CIEMAT

## Tuesday

02:10 pm	<p>The Potential Contribution of STE in the Mexican Intended National Determined Contributions (INDC) in the Light of the Paris Agreement</p> <p><b>Irene Rodríguez</b><sup>1</sup>, Natàlia Caldés<sup>1</sup></p> <p><sup>1</sup> CIEMAT</p>
02:20 pm	<p>Future CSP in South Africa – a Review of Generation Mix Models, Their Assumptions, Methods, Results and Implications</p> <p><b>Frank Duvenhage</b><sup>1</sup>, Omotoyosi Craig<sup>1</sup>, Alan Brent<sup>1</sup>, William Stafford<sup>1</sup></p> <p><sup>1</sup> Stellenbosch University</p>
02:40 pm	<p>Policies to Keep and Expand the Option of Concentrating Solar Power for Dispatchable Renewable Electricity</p> <p><b>Johan Lilliestam</b><sup>1</sup>, Touria Barradi<sup>2</sup>, Natàlia Caldés<sup>3</sup>, Marta Gomez<sup>4</sup>, Susanne Hanger<sup>1</sup>, Jürgen Kern<sup>5</sup>, Nadejda Komendantova<sup>1</sup>, Mark Mehos<sup>6</sup>, Wai Mun Hong<sup>7</sup>, Zhifeng Wang<sup>8</sup>, Anthony Patt<sup>1</sup></p> <p><sup>1</sup> ETH Zürich; <sup>2</sup> MENARES; <sup>3</sup> CIEMAT; <sup>4</sup> Dow Chemicals; <sup>5</sup> German Aerospace Center (DLR); <sup>6</sup> NREL; <sup>7</sup> Universidad Autonoma de Madrid; <sup>8</sup> Chinese Academy of Sciences</p>
03:00 pm	<p>Local Impacts of Large-Scale Solar Thermal Power Plants (CSP) – Findings from the Social Impact Assessment of the Plant Noor<sub>0</sub> I in Ouarzazate, Morocco</p> <p><b>Peter Viebahn</b><sup>1</sup>, Thomas Fink<sup>1</sup>, El Mostafa Jamea<sup>2</sup></p> <p><sup>1</sup> Wuppertal Institute für Climate, Environment and Energy; <sup>2</sup> MENARES</p>
03:20 pm	<p>Feasibility Study of the CSP Project in Namibia</p> <p><b>Juan Manuel Saenz Caballos</b><sup>1</sup>, Georgios Vantsiotis<sup>1</sup>, Rob Collins<sup>1</sup>, Margaret Mutschler<sup>2</sup>, Fred Bailey<sup>2</sup>, Gordon Gadney<sup>2</sup>, Grant Muller<sup>2</sup></p> <p><sup>1</sup> Mott MacDonald; <sup>2</sup> Namibia Power Corporation</p>
03:40 pm	<p>Chinese CSP Market Trends Inside the Global Market</p> <p><b>Hugo Cachafeiro</b><sup>1</sup>, Antonio Lecuona<sup>2</sup>, Rodrigo Medina<sup>1</sup>, Fernando Martin<sup>1</sup>, Ralf Wiesenber<sup>1</sup></p> <p><sup>1</sup> ÅF Aries; <sup>2</sup> University Carlos III of Madrid</p>

**02:00 pm -  
04:00 pm**

### Power Cycles

ROOM: GREAT ROOM 2  
Chair: Radia Lahlou, Masdar Institute

02:00 pm	<p>Off-Design Performance Modeling of the Supercritical Carbon Dioxide Recompression Brayton Cycle for CSP</p> <p><b>Sam Duniam</b><sup>1</sup>, Ananthanarayanan Veeraragavan<sup>1</sup></p> <p><sup>1</sup> The University of Queensland</p>
02:20 pm	<p>Analysis of Plant Performance with Improved Turbine Flexibility: Test Case on a Parabolic Trough Configuration</p> <p><b>Monika Topel</b><sup>1</sup>, Davide Ferruzza<sup>2</sup>, Fabian Seeger<sup>3</sup>, Björn Laumert<sup>1</sup></p> <p><sup>1</sup> KTH Royal Institute of Technology; <sup>2</sup> Technical University of Denmark; <sup>3</sup> University of Stuttgart</p>
02:40 pm	<p>Innovative Fluids for Gas Power Cycles Coupled with Solar Tower Systems</p> <p><b>Marco Binotti</b><sup>1</sup>, Costante Invernizzi<sup>2</sup>, Paolo Iora<sup>2</sup>, Giampaolo Manzolini<sup>1</sup></p> <p><sup>1</sup> Politecnico di Milano; <sup>2</sup> Università Degli Studi di Brescia</p>

## 02:00 pm - Water Desalination and Detoxification

04:00 pm

ROOM: GREAT ROOM 3

Chair: Camilo A. Arancibia, Universidad Nacional Autónoma de México

02:00 pm

Experimental and Numerical Evaluation of a Humidification Dehumidification Desalination Unit Driven by Solar Energy

**Rodrigo Barraza Vicencio**<sup>1</sup>, Catalina Hernandez<sup>1</sup>, Mauricio Reyes<sup>1</sup>, Udo Rheinschmidt<sup>1</sup>, David Saldivia<sup>1</sup>, Ricardo Vasquez Padilla<sup>2</sup>

Presented by Ricardo Vasquez Padilla<sup>2</sup>

<sup>1</sup> Universidad Tecnica Federico Santa Maria; <sup>2</sup> Southern Cross University

02:20 pm

Combining Concentrating Solar Power with Multiple Effect Distillation At Inland Locations - an Economically Viable Option for Northern Chile?

**Raymond Branke**<sup>1</sup>, Thomas Fluri<sup>1</sup>, Patricio Validvia<sup>2</sup>

<sup>1</sup> Fraunhofer ISE; <sup>2</sup> Fraunhofer Chile Research

02:40 pm

Yearly Simulations of the Electricity and Fresh Water Productions in PT-CSP+MED-TVC Plants: Case Study in Almería (Spain)

**Bartolomé Ortega Delgado**<sup>1</sup>, Patricia Palenzuela Ardila<sup>1</sup>, Diego César Alarcón Padilla<sup>1</sup>

<sup>1</sup> CIEMAT-PSA

03:00 pm

Thermodynamic Analysis of Hybrid Humidification-Dehumidification (HDH) - Reverse Osmosis (RO) Desalination System Powered by Concentrating Photovoltaic/thermal Solar Collector

**Todd Otanicar**<sup>1</sup>, Weilin Qu<sup>2</sup>

<sup>1</sup> The University of Tulsa; <sup>2</sup> University of Hawaii at Manoa

03:20 pm

The Combined Effect of Irradiance and Iron Concentration on Photo-Fenton Treatment Cost

**Alejandro Cabrera Reina**<sup>1</sup>, Lorena Cornejo Ponce<sup>1</sup>, Sara Miralles Cuevas<sup>1</sup>

<sup>1</sup> University of Tarapacá

## 02:00 pm - Hybridization

04:00 pm

ROOM: STUDIO 4 & 5

Chair: Eduardo Zarza, Plataforma Solar de Almería

02:00 pm

Hybridization of Concentrated Solar Power and Biomass Combustion for Combined Heat and Power Generation in Northern Europe

**Davide Ferruzza**<sup>1</sup>, Lasse Kjærgaard Larsen<sup>2</sup>, Fredrik Haglind<sup>1</sup>

<sup>1</sup> Technical University of Denmark; <sup>2</sup> Marstal Fjernvarme A.m.b.a

02:20 pm

Smart Renewable Hubs: Multi-Hybridization to Achieve High RE Penetration in a Grid-Friendly Manner

**Eduardo Cerrajero**<sup>1</sup>, Diego Lopez<sup>2</sup>, Francisco Javier Comas<sup>3</sup>, Alberto R. Rocha<sup>4</sup>, Jose M. Estebanz<sup>4</sup>, Ruben Duran<sup>4</sup>, Maria Kourasi<sup>5</sup>, Aris Dimeas<sup>6</sup>, Andrea Vaiani<sup>7</sup>

<sup>1</sup> Investigacion, Desarrollo e Innovacion energetica S.L.; <sup>2</sup> Solar Technology Advisors S.L. (STA);

<sup>3</sup> IDIE; <sup>4</sup> Cobra T&I; <sup>5</sup> Hellenic Electricity Distribution Network Operator (HEDNO); <sup>6</sup> National

Technical University of Athens (NTUA); <sup>7</sup> Centro Elettrotecnico Sperimentale Italiano S.p.A. (CESI)

02:40 pm

Performance of a Hybrid Solar Receiver Combustor

**Alfonso Chinnici**<sup>1</sup>, Graham J. Nathan<sup>1</sup>, Bassam B. Dally<sup>1</sup>

Presented by Bassam B. Dally<sup>1</sup>

<sup>1</sup> University of Adelaide

## Tuesday

03:00 pm	Dynamic Modeling of a Hybrid Solar-Combined Cycle Power Plant (ISCC) - Using a Solar Field Based on Parabolic Trough Solar Collector - Start-Up and Shutdown of the Solar Field <b>Baligh El Hefni, EDF</b>
03:20 pm	Integrated Techno-Economic Assessment of Hybrid CSP-PV Plants <b>Massimo Moser<sup>1</sup>, Tobias Fichter<sup>1</sup>, Jürgen Kern<sup>1</sup>, Franz Trieb<sup>1</sup></b> <sup>1</sup> German Aerospace Center (DLR)

04:00 pm - 04:30 pm	<b>Coffee Break</b>	The Coffee Break is sponsored by Dow. <b>Thank You!</b>
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### 04:30 pm - 06:00 pm **Linear Fresnel Systems and Dish/Engine Systems**

ROOM: GREAT ROOM 1  
Chair: Manuel Collares-Pereira, University of Evora

04:30 pm	Development and Lifecycle Testing of a Low Cost Waterborne Linear Fresnel Reflector (LFR) Collector Assembly for CSP Applications <b>Greg Mungas<sup>1</sup>, Nick Kramer<sup>1</sup>, Guangdong Zhu<sup>2</sup>, Cory Cunningham<sup>1</sup>, John King<sup>1</sup></b> <sup>1</sup> Hyperlight Energy; <sup>2</sup> NREL
04:50 pm	Application of an Adaptive Method Technique for Improved Performance of Linear Fresnel Secondary Designs <b>Guangdong Zhu, NREL</b>
05:10 pm	Enhanced Dynamic Performance Evaluation of Line-Concentrating Solar Collectors <b>Annie Zirkel-Hofer, Fraunhofer ISE</b>
05:30 pm	Post-Assembly In-Situ Check of Parabolic Trough Modules by ViSshed <b>Marco Montecchi<sup>1</sup>, Maurizio Dalla Casa<sup>2</sup></b> <sup>1</sup> ENEA; <sup>2</sup> MARPOSS S.p.A.
05:50 pm	Comprehensive Study of a Parabolic Solar Dish Collector in Isfahan, Iran <b>Sara Soltani<sup>1</sup>, Mohammad Moghimi Ardekani<sup>2</sup>, Mohammad Bonyadi<sup>1</sup>, Vahid Madadi Avargani<sup>1</sup></b> <sup>1</sup> Yasouj University; <sup>2</sup> University of Pretoria

### 04:30 pm - 06:00 pm **Direct Solar Metallurgy**

ROOM: GREAT ROOM 2  
Chair: Gustavo Cáceres, Universidad Adolfo Ibáñez

04:30 pm	Solar Thermal Treatment of Manganese Ore Fines <b>Lina Hockaday<sup>1</sup>, Frank Dinter<sup>2</sup>, Thomas Harms<sup>2</sup>, Quinn Reynolds<sup>1</sup></b> <sup>1</sup> MINTEK; <sup>2</sup> Stellenbosch University
04:50 pm	Solar Metallurgy for the Production of Al and Mg Particles <b>Jean Puig<sup>1</sup>, Marianne Balat-Pichelin<sup>1</sup></b> <sup>1</sup> PROMES-CNRS

## 04:30 pm - Advanced Materials and Manufacturing

06:00 pm

ROOM: GREAT ROOM 3

Chair: Avi Shultz, DOE

04:30 pm

Hydrophilic Anti-Soiling Coating for Improved Efficiency of Solar Reflectors

**Estibaliz Aranzabe**<sup>1</sup>, Itziar Azpitarte<sup>2</sup>, Aránzazu Fernández-García<sup>3</sup>, Gema Perez<sup>4</sup>, Josep Ubach<sup>4</sup>, Florian Sutter<sup>5</sup>, David Argüelles-Arízcan.<sup>3</sup>

<sup>1</sup> *Fundación Tekniker*; <sup>2</sup> *IK4-TEKNIKER*; <sup>3</sup> *CIEMAT-PSA*; <sup>4</sup> *Rioglass Solar*; <sup>5</sup> *German Aerospace Center (DLR)*

04:50 pm

Study and Characterization of Selective Coatings Based on Black Cobalt

**Dallely Melissa Herrera Zamora**<sup>1</sup>, Francisco Iván Lizama Tzec<sup>1</sup>, Juan José Becerril González<sup>1</sup>, Juan Daniel Macías<sup>1</sup>, Óscar Arés Muzio<sup>1</sup>, Gerko Oskam<sup>1</sup>

<sup>1</sup> *Cinvestav*

05:10 pm

Merging of Oxide Species with Black Spinel Structure by CSP Operating Temperature

**Ivan Jerman**<sup>1</sup>, Luka Noč<sup>1</sup>, Francisco Ruiz Zepeda<sup>1</sup>

<sup>1</sup> *National Institute of Chemistry*

05:30 pm

POSS Modified Black Pigment for CSP Deployment

**Luka Noč**<sup>1</sup>, Francisco Ruiz Zepeda<sup>1</sup>, Marija Čolovič<sup>1</sup>, Janez Kovač<sup>2</sup>, Ivan Jerman<sup>1</sup>

<sup>1</sup> *National Institute of Chemistry*; <sup>2</sup> *Jožef Stefan Institute*

05:50 pm

Solar Selective Absorbers Based on Semiconducting beta-FeSi<sub>2</sub> for High Temperature Solar-Thermal Conversion

**Yoshiki Okuhara**<sup>1</sup>, Tomohiro Kuroyama<sup>1</sup>, Masasuke Takata<sup>1</sup>, Takuhito Tsutsui<sup>2</sup>, Kazuto Noritake<sup>2</sup>

<sup>1</sup> *Japan Fine Ceramics Center*; <sup>2</sup> *Toyota Industries Corporation*

## 04:30 pm -

06:00 pm

## Hybridization

ROOM: STUDIO 4 & 5

Chair: Mark Mehos, NREL

04:30 pm

Integrated Solar Combined Cycles vs Combined Gas Turbine to Bottoming Molten Salt Tower Plants – A Techno-Economic Analysis

**Rafael Guedez**<sup>1</sup>, Jose Garcia<sup>1</sup>, Fernando Martin<sup>2</sup>, Ralf Wiesenber<sup>2</sup>, Björn Laumert<sup>1</sup>

<sup>1</sup> *KTH Royal Institute of Technology*; <sup>2</sup> *ÅF Aries*

04:50 pm

Multi-Objective Optimization of Hybrid PTC+PV Plant Using Genetic Algorithm

**Allan R. Starke**<sup>1</sup>, José Miguel Cardemil<sup>2</sup>, Rodrigo A. Escobar<sup>1</sup>, Sergio Colle<sup>1</sup>

<sup>1</sup> *Federal University of Santa Catarina*; <sup>2</sup> *University of Chile*

05:10 pm

Commissioning and Tests of a Mini CSP Plant

**Lisa Willwerth**<sup>1</sup>, Margarita Rodriguez<sup>2</sup>, Esther Rojas<sup>2</sup>, Ridha Ben Cheikh<sup>3</sup>, Souha Ferchichi<sup>3</sup>, Amani Jmili<sup>3</sup>, Abdallah Baba<sup>4</sup>, João Soares<sup>5</sup>, Francesco Parise<sup>6</sup>, Dirk Krüger<sup>1</sup>

<sup>1</sup> *German Aerospace Center (DLR)*; <sup>2</sup> *CIEMAT-PSA*; <sup>3</sup> *ENIT*; <sup>4</sup> *Alternative Energy Systems*; <sup>5</sup> *University of Porto*; <sup>6</sup> *Zuccato Energia*

05:30 pm

Technical Analysis of a Hybrid CSP+PV Plant Integrated with TESS and BESS at Northern Chile

**Adriana Zurita**<sup>1</sup>, Carlos Mata-Torres<sup>1</sup>, Carlos Valenzuela<sup>1</sup>, José M. Cardemil<sup>2</sup>, Rodrigo A. Escobar<sup>1</sup>

<sup>1</sup> *Pontificia Universidad Católica de Chile*; <sup>2</sup> *University of Chile*



# Tuesday

## 06:00 pm - 07:00 pm Poster Session 1

The poster numbers are based on the topics:

A	Advanced Materials and Manufacturing
B	Central Receiver Systems
C	Commercial Projects in the World

E	Dish/Engine Systems
F	Emerging Concepts
G	Flux and Temperature Measurements

A-01	Development of Air Stable Absorber Coatings for High Temperature Receivers <b>Javier Barriga</b> , <i>IK4-TEKNIKER</i>
A-02	Synthesis of Nanostructured Zirconia Using Concentrated Solar Energy <b>Laura Guadalupe Ceballos Mendivil</b> <sup>1</sup> , Rafael Enrique Cabanillas López <sup>2</sup> , Judith Celina Tánori Córdova <sup>3</sup> , Heidi Isabel Villafán Vidales <sup>1</sup> , Camilo Alberto Arancibia Bulnes <sup>1</sup> , Claudio Alejandro Estrada Gasca <sup>1</sup> <sup>1</sup> <i>Universidad Nacional Autónoma de México</i> ; <sup>2</sup> <i>Departamento de Ingeniería Química y Metalurgia, Universidad de Sonora</i> ; <sup>3</sup> <i>Universidad de Sonora</i>
A-03	Improving Reaction Kinetics and Oxygen Uptake Capacities of the Mn <sub>2</sub> O <sub>3</sub> /Mn <sub>3</sub> O <sub>4</sub> Thermochemical Storage System by Metal Doping <b>Stefan Härzschel</b> <sup>1</sup> , Annelies Vandersickel <sup>1</sup> , Stephan Gleis <sup>1</sup> , Hartmut Spliethoff <sup>1</sup> <sup>1</sup> <i>Technical University of Munich</i>
A-04	Improvement of the Thermal Stability of Electrodeposited Black Nickel for Selective Coatings <b>Francisco Iván Lizama Tzec</b> <sup>1</sup> , Juan Becerril-Gonzalez <sup>1</sup> , Dallely Herrera Zamora <sup>1</sup> , Juan Daniel Macías <sup>1</sup> , Oscar Arés-Muzio <sup>1</sup> , Gerko Oskam <sup>1</sup> <sup>1</sup> <i>Cinvestav</i>
A-05	Silica-Based and Zirconia-Based Coatings for Protection of Ferritic-Martensitic Steels in Molten Salt Environment for CSP Technology <b>F.J. Pérez</b> <sup>1</sup> , V. Encinas-Sánchez <sup>1</sup> , A. Macías-García <sup>1</sup> , M.I. Lasanta <sup>1</sup> , M.T. de Miguel <sup>1</sup> , G. García-Martí <sup>1</sup> <sup>1</sup> <i>Complutense University of Madrid</i> ; <sup>2</sup> <i>University of Extremadura</i>

A-06	Concentrated Solar Power Technology for In-Situ Elaboration of Carbide-Based Surface Layers on Metallic Substrates <b>Pandora Psyllaki</b> <sup>1</sup> , Athanasios Mourlas <sup>1</sup> , George Vourlias <sup>2</sup> , Eleni Pavlidou <sup>2</sup> , Jose Rodriguez <sup>3</sup> , Inmaculada Canadas <sup>3</sup> <sup>1</sup> <i>Piraeus University of Applied Sciences</i> ; <sup>2</sup> <i>University of Thessaloniki</i> ; <sup>3</sup> <i>PSA</i>
A-07	Determination of the Changes on the Thermal and Optical Properties of Selective Solar Absorber Coatings Induced by Prolonged Thermal Treatment <b>Hernando Romero-Paredes R.</b> <sup>1</sup> , Juan Daniel Macías <sup>2</sup> , Dallely Melisa Herrera-Zamora <sup>2</sup> , F. I. Lizama-Tzec <sup>2</sup> , Gerko Oskam <sup>2</sup> , José Bante-Guerra <sup>2</sup> , Oscar Arés-Muzio <sup>2</sup> , Camilo A. Arancibia-Bulnes <sup>3</sup> , Víctor Ramos-Sánchez <sup>4</sup> , Heidi Isabel Villafán Vidales <sup>3</sup> , Juan José Alvarado Gil <sup>2</sup> <sup>1</sup> <i>Universidad Autónoma Metropolitana Iztapalapa</i> ; <sup>2</sup> <i>Cinvestav</i> ; <sup>3</sup> <i>Universidad Nacional Autónoma de México</i> ; <sup>4</sup> <i>Universidad Autónoma de Chihuahua</i>
A-08	Antireflective Coatings on Quartz Glass for High Temperature Solar Receivers <b>Gema San Vicente</b> <sup>1</sup> , Nuria Germán <sup>1</sup> , Meryem Farchado <sup>1</sup> , Ángel Morales <sup>1</sup> <sup>1</sup> <i>CIEMAT-PSA</i>
A-09	Synthesis of “black” Semiconductors with High Solar Light Activity <b>Paola Santander</b> <sup>1</sup> , Hector Mansilla <sup>1</sup> , Jorge Yañez <sup>1</sup> , David Contreras <sup>1</sup> , Raul Molina <sup>1</sup> , T Pandiyarajan <sup>1</sup> , RV Mangalaraja <sup>1</sup> <sup>1</sup> <i>University of Concepción</i>
A-10	Meeting the Challenge: Sustainable Coatings for Sustainable Technology <b>Tobias Wingsiefen</b> , <i>Valspar Industries</i>

- B-01 Numerical Study of the Thermal Properties of a Dense Suspension of Solid Particles Used as an HTF  
**Naji Abdenouri**<sup>1</sup>, Mohamed Gharafi<sup>1</sup>, Abdellah Hakim<sup>1</sup>  
<sup>1</sup> *FSTG-UCA*
- B-02 An Analysis of a Sandwich Composite Structure for Solar Central Receiver Heliostats  
**Tim Anderson**<sup>1</sup>, Sulaiman Fadlallah<sup>1</sup>, Roy Nates<sup>1</sup>  
<sup>1</sup> *Auckland University of Technology*
- B-03 Optimisation of Aiming Strategies in Solar Tower Power Plants  
**Thomas Ashley**<sup>1</sup>, Emilio Carrizosa<sup>1</sup>, Enrique Fernández-Cara<sup>1</sup>  
<sup>1</sup> *University of Sevilla*
- B-04 Experimental Analysis of a Heat Pipe Pressurized Air Receiver  
**Shunzhou Chu**<sup>1</sup>, Zhiying Cui<sup>1</sup>, Zhifeng Wang<sup>1</sup>, Yanhua Diao<sup>2</sup>  
<sup>1</sup> *Chinese Academy of Sciences*; <sup>2</sup> *Beijing University of Technology*
- B-05 Upper Limits to the Annual Optical Efficiency of Solar Tower Systems  
**Clotilde Corsi**  
*Australian National University*
- B-06 Optimization of the HeliopOD Structure for Dynamic Wind Loading Using CFD Data and Mode Superposition  
**Ken Craig**<sup>1</sup>, Gerrie Delpport<sup>1</sup>  
<sup>1</sup> *University of Pretoria*
- B-07 Two-Way Fluid-Structure Interaction of the LH-2 Heliostat  
**Ken Craig**<sup>1</sup>, Joshua Wolmarans<sup>1</sup>  
<sup>1</sup> *University of Pretoria*
- B-08 Where Should Beam Down Heliostat Central Rays Intersect the Final Optical Element Axis?  
**Miguel Diago**<sup>1</sup>, Peter Armstrong<sup>1</sup>, Alexander Slocum<sup>2</sup>, Nicolas Calvet<sup>1</sup>  
<sup>1</sup> *Masdar Institute*; <sup>2</sup> *Massachusetts Institute of Technology*
- B-09 Test Setup of a Centrifugal Particle Receiver System  
**Miriam Ebert**<sup>1</sup>, Lars Amsbeck<sup>1</sup>, Jens Rheinländer<sup>1</sup>, Bärbel Schlögl-Knothe<sup>1</sup>, Stefan Schmitz<sup>1</sup>, Ralf Uhlig<sup>1</sup>, Reiner Buck<sup>1</sup>  
 Presented by Lars Amsbeck<sup>1</sup>  
<sup>1</sup> *German Aerospace Center (DLR)*
- B-10 Geometric Optimization of a Solar Cavity Receiver Using 3-D Numerical Simulation: Ambient Disturbance Analysis  
**Huayi Feng**<sup>1</sup>, Chongzhe Zou<sup>1</sup>, Quentin Falcoz<sup>2</sup>, Pierre Neveu<sup>2</sup>  
<sup>1</sup> *Huazhong University of Science and Technology*; <sup>2</sup> *PROMES-CNRS*
- B-11 Thermal Evaluation of a Novel External Receiver Concept  
**Cathy Frantz**  
*German Aerospace Center (DLR)*
- B-12 Thermodynamic Simulation of a Hybrid Thermosolar Externally Fired Gas Turbine Power Plant Fueled with Biomass  
**Agustín Ghazarian**<sup>1</sup>, Daiana De León<sup>1</sup>, Pedro Curto<sup>1</sup>, Pedro Galione<sup>1</sup>, Alejandro Medina<sup>2</sup>  
<sup>1</sup> *Universidad de la República*; <sup>2</sup> *University of Salamanca*
- B-13 Experiments in Sun Tracking with a Novel Three-Degree-Of-Freedom Parallel Manipulator  
**Ashitava Ghosal**<sup>1</sup>, Ashith Shyam R B<sup>1</sup>, Mohit Acharya<sup>1</sup>  
<sup>1</sup> *Indian Institute of Science*
- B-14 Oxidation and Erosion of Metallic Construction Materials in Particle Receivers  
**Birgit Gobereit**<sup>1</sup>, Reiner Buck<sup>1</sup>, Timur Galiullin<sup>2</sup>, Dmitry Naumenko<sup>2</sup>, Willem J. Quadackers<sup>2</sup>  
 Presented by Lars Amsbeck<sup>1</sup>  
<sup>1</sup> *German Aerospace Center (DLR)*; <sup>2</sup> *Forschungszentrum Jülich*
- B-15 Assessment of Evaporators Using Solar Salt as Heat Transfer Fluid  
**Pedro Angel González Gómez**<sup>1</sup>, Jesús Gómez-Hernández<sup>1</sup>, Javier Villa Briongos<sup>1</sup>, Domingo Santana<sup>1</sup>  
<sup>1</sup> *University Carlos III of Madrid*

## Tuesday

- B-16 Parametric Study of an Identification Method on the Canting Errors of Heliostats Facets  
**Benjamin Grange**<sup>1</sup>, Cyril Caliot<sup>1</sup>, Gilles Flamant<sup>1</sup>  
<sup>1</sup> PROMES-CNRS
- B-17 A General Pitch-Roll Sun Tracking Angle Formula for a Heliostat with a Mirror-Pivot Offset and Other Angular Errors  
**Minghuan Guo**<sup>1</sup>, Zhifeng Wang<sup>1</sup>  
<sup>1</sup> Chinese Academy of Sciences
- B-18 Mesh Function Interpolation Methods Used to Reconstruct Elliptical Gaussian Solar Flux Images  
**Minghuan Guo**<sup>1</sup>, Zhifeng Wang<sup>1</sup>  
<sup>1</sup> Chinese Academy of Sciences
- B-19 Construction of Two Solar Towers for Agro-Industrial Electricity and Heat Production in Brazil  
**Johannes Hertel**<sup>1</sup>, Peter Schwarzbözl<sup>1</sup>, Gilles Maag<sup>2</sup>, Celso Eduardo Lins de Oliveira<sup>2</sup>, Rafael Gonsales Neto<sup>3</sup>  
<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> University of São Paulo; <sup>3</sup> Solinova
- B-20 Particle Swarm Optimization of the Layout of a Heliostat Field  
**Michel Izygon**<sup>1</sup>, Kenneth McMurtrie<sup>1</sup>, Ngoc Vu<sup>1</sup>  
<sup>1</sup> Tietronix Software
- B-21 Numerical Modelling of Convection Losses in a Solar Tower Central Receiver  
**Alfonso Jurado Sánchez**<sup>1</sup>, Diego López Barrio<sup>1</sup>  
<sup>1</sup> IDIE
- B-22 Structural Analysis of Optical Surface Composed by Small Facets “Mosaic Shape”  
**Cristina Tiyaki Koike**<sup>1</sup>, Pedro Henrique Silva Bezerra<sup>2</sup>, Achilles J. G. Neto<sup>1</sup>, Cristiano T. Boura<sup>3</sup>, Carlos Rendón<sup>3</sup>, Celso E. L. Oliveira<sup>1</sup>  
<sup>1</sup> University of São Paulo; <sup>2</sup> UNESP; <sup>3</sup> FH Aachen
- B-23 A Fast Molten Salt Receiver Model in MATLAB  
**Zhi Li**<sup>1</sup>, Qiangqiang Zhang<sup>1</sup>  
<sup>1</sup> Chinese Academy of Sciences
- B-24 Design and Performance Analysis of Volumetric Solar Receiver Based on Porous Foam Ceramics  
**Wenyi Liu**<sup>1</sup>, Gaosheng Wei<sup>1</sup>, Pingrui Huang<sup>1</sup>, Chao Xu<sup>1</sup>, Xiaoze Du<sup>1</sup>  
<sup>1</sup> North China Electric Power University
- B-25 Estimation of Visibility from Spectral Irradiance Using Artificial Neural Networks  
**Gabriel Lopez**<sup>1</sup>, Christian Gueymard<sup>2</sup>, Juan Luis Bosch<sup>1</sup>, Joaquín Alonso-Montesinos<sup>3</sup>, Igor Rapp-Arrarás<sup>1</sup>, Jesús Polo<sup>4</sup>, Jesús Ballestrín<sup>5</sup>, Javier Barbero<sup>3</sup>, Manuel J. Caro-Parrado<sup>1</sup>, Francisco Javier Batlles<sup>3</sup>  
<sup>1</sup> University of Huelva; <sup>2</sup> Solar Consulting Services; <sup>3</sup> University of Almería; <sup>4</sup> Plataforma Solar de Almería-CIEMAT; <sup>5</sup> PSA-CIEMAT
- B-26 Monte Carlo Ray-Tracing Optical Performance Analysis of a Plane-Facet Heliostat Design  
**Gilles Maag**<sup>1</sup>, Celso Eduardo Lins de Oliveira<sup>1</sup>  
<sup>1</sup> University of São Paulo
- B-27 Indirect Procedure for Correcting Tilt Errors in Heliostat Tracking Mechanisms  
**Rafael Monterreal**<sup>1</sup>, Raul Enrique<sup>1</sup>, Jesus Fernandez-Reche<sup>1</sup>  
<sup>1</sup> CIEMAT-PSA
- B-28 Analysis of the Tracking Behavior of a Linked Heliostat Array  
**Isaías Moreno-Cruz**<sup>1</sup>, Camilo A. Arancibia-Bulnes<sup>1</sup>, David Riveros-Rosas<sup>1</sup>  
<sup>1</sup> Universidad Nacional Autonoma de Mexico
- B-29 Advanced Methodologies for the Calculation of Shadowing & Blocking and Interception Efficiency in Central Receiver Systems  
**Guillermo Ortega**<sup>1</sup>, Antonio Rovira<sup>2</sup>  
<sup>1</sup> University of Huelva; <sup>2</sup> UNED
- B-30 Effect of Cavity Wall Reflectance in the Heliostat Aiming Strategy  
**João P. Cardoso**  
LNEG
- B-31 Two-Phase Flow Distribution in Manifold of Solar Tower Receiver  
**Liping Pang**<sup>1</sup>, Shunlong Li<sup>1</sup>, Xiaodong Li<sup>1</sup>, Liqiang Duan<sup>1</sup>, Yong-ping Yang<sup>1</sup>  
<sup>1</sup> North China Electric Power University
- B-32 Incidence Angles on Cylindrical Receivers of Solar Power Towers  
**Tobias Paret**<sup>1</sup>, Markus Wöhrbach<sup>1</sup>, Gerhard Weinrebe<sup>1</sup>  
<sup>1</sup> schlaich bergemann partner

B-33 Automated Particle Mass-Flow Control System for High-Temperature Falling Particle Receivers

**Gregory Peacock**<sup>1</sup>, Clifford Ho<sup>1</sup>, Joshua Christian<sup>1</sup>, Daniel Ray<sup>1</sup>

<sup>1</sup> Sandia National Laboratories

B-34 Experimental Analysis of a Flat Plate Receiver for Measurement of Low Thermal Power of a Central Tower Solar System

**Ricardo Arturo Perez-Enciso**<sup>1</sup>, Armando Piña<sup>1</sup>, Fernando Hinojosa<sup>1</sup>, Victor Maytorena<sup>1</sup>, Claudio Estrada<sup>2</sup>, Carlos Perez<sup>2</sup>, Ramiro Calleja<sup>1</sup>

<sup>1</sup> UNISON; <sup>2</sup> IER-UNAM

B-35 A Model of Heliostat Soiling and its Application to O&M Cleaning Studies

**Giovanni Picotti**<sup>1</sup>, Giampaolo Manzolini<sup>2</sup>, Pietro Borghesani<sup>1</sup>, Michael Cholette<sup>1</sup>, Ruizi Wang<sup>1</sup>

<sup>1</sup> Queensland University of Technology;

<sup>2</sup> Politecnico di Milano

B-36 A Parametric Study of Heliostat Size for Reductions in Levelized Cost of Electricity Power Tower Plants

**Arvind Sastry Pidaparathi**<sup>1</sup>, Jaap Hoffmann<sup>1</sup>, Frank Dinter<sup>1</sup>

<sup>1</sup> Stellenbosch University

B-37 Numerical Study of Heat Transfer in a Flat Plate Thermal Receiver for the Experimental Heliostats Field in Hermosillo, Sonora, Mexico

**Armando Piña**<sup>1</sup>, Fernando Hinojosa<sup>1</sup>, Ricardo Perez<sup>1</sup>, Claudio Estrada<sup>2</sup>, Carlos Alberto Perez Rabago<sup>2</sup>, Victor Manuel Maytorena Soria<sup>1</sup>, Ramiro Calleja Valdez<sup>1</sup>

<sup>1</sup> Universidad de Sonora; <sup>2</sup> Universidad Nacional Autonoma de Mexico

B-38 A New Procedure for Fast Heliostat Field Layout Optimization

**Lorenzo Pisani**<sup>1</sup>, Erminia Leonardi<sup>1</sup>, Iñigo Les<sup>2</sup>, Amaia Mutuberria<sup>2</sup>

<sup>1</sup> CRS4, Center for Advanced Studies, Research and Development in Sardinia; <sup>2</sup> CENER

B-39 Techno-Economic Analysis of a Small Scale Solar Power Tower at Varied Locations

**Jonathan Rea**<sup>1</sup>, Greg Glatzmaier<sup>2</sup>, Christopher Oshman<sup>1</sup>, Philip Parilla<sup>2</sup>, Nathan Siegel<sup>3</sup>, Eric Toberer<sup>1</sup>, David Ginley<sup>2</sup>

<sup>1</sup> Colorado School of Mines; <sup>2</sup> NREL; <sup>3</sup> Bucknell University

B-40 Eccentric Bayonet Receiver for Solar Power Tower

**María de los Reyes Rodriguez Sanchez**<sup>1</sup>, Antonio Acosta Iborra<sup>1</sup>, Carolina Marugan Cruz<sup>1</sup>, Domingo Santana Santana<sup>1</sup>

<sup>1</sup> University Carlos III of Madrid

B-41 Characterization Methodology for Central Tower CSP Heliostats

**Konstantinos Stokos**<sup>1</sup>, Evgeny Votyakov<sup>1</sup>, Costas Papanicolas<sup>1</sup>

<sup>1</sup> The Cyprus Institute

B-42 One-Dimensional Transient Filling Simulation of a Molten Salt Central Receiver Panel

**Jean Jacques Swart**<sup>1</sup>, Jaap Hoffmann<sup>1</sup>

<sup>1</sup> Stellenbosch University

B-43 Integrated Modelling of a Spiral Bladed Receiver

**Juan Felipe Torres**<sup>1</sup>, Ye Wang<sup>1</sup>, Meige Zheng<sup>1</sup>, Joe Coventry<sup>1</sup>, John Pye<sup>1</sup>

<sup>1</sup> The Australian National University

B-44 Evaluation of Convective Losses on a Novel External Receiver Concept

**Ralf Uhlig**<sup>1</sup>, Cathy Frantz<sup>1</sup>

<sup>1</sup> German Aerospace Center (DLR)

B-45 A Study on Calculating the View Factor in Cavity Solar Receivers with a Multiple-Surface Cover

**Li Xu**<sup>1</sup>, Zhifeng Wang<sup>1</sup>, Jin-Soo Kim<sup>2</sup>, Daniel Potter<sup>2</sup>, Wes Stein<sup>2</sup>

<sup>1</sup> Chinese Academy of Sciences; <sup>2</sup> CSIRO

B-46 Comparison of Steady and Dynamic Models for Simulating the Thermal Performance of External Solar Receivers

**Li Xu**<sup>1</sup>, Zhifeng Wang<sup>1</sup>, Jin-Soo Kim<sup>2</sup>, Daniel Potter<sup>2</sup>, Wes Stein<sup>2</sup>

<sup>1</sup> Chinese Academy of Sciences; <sup>2</sup> CSIRO

B-47 Analysis and Experimental Research on the Dynamic Performance of 1MWt Molten Salt Receiver System in a Solar Tower Power Plant

**Qiang Yu**, Chinese Academy of Sciences

B-48 Laboratory-Scale Experimental Testing of Innovative Stacked-Plate Volumetric Solar Absorbers

**Fritz Zaversky**<sup>1</sup>, Ronald Ivan Cano Huanay<sup>1</sup>, Xabier Randez Diago<sup>1</sup>, Iñaki Garrido Obregon<sup>1</sup>, Alberto Garcia de Jalon<sup>1</sup>, Javier García-Barberena<sup>1</sup>, Marcelino Sánchez<sup>1</sup>

<sup>1</sup> CENER

## Tuesday

B-49	A Non-Intrusive Optical Technology to Perform In-Situ Heliostat Canting <b>Guangdong Zhu</b> <i>NREL</i>	E-02	The Effect of the Dish on the Wind Induced Heat Loss from a Parabolic Dish Cavity Receiver <b>Tim Anderson</b> <sup>1</sup> , Muhammad Uzair <sup>1</sup> , Roy Nates <sup>1</sup> <sup>1</sup> <i>Auckland University of Technology</i>
C-01	Toward the Prediction of the Best Cleaning Cycle for the 1MWe Fresnel Test Pilot at Green Energy Park the Moroccan Research Facility <b>Ahmed Alami Merrouni</b> <sup>1</sup> , Alae Azouzoute <sup>1</sup> , El Ghali Bennouna <sup>1</sup> , Abdellatif Ghennioui <sup>1</sup> <sup>1</sup> <i>IRESEN</i>	E-03	Characterization of a Stirling Cavity Receiver Performance in the KTH High-Flux Solar Simulator and Comparison with Real Dish-Stirling Data <b>Jorge Garrido</b> <sup>1</sup> , Abdallah Abou-Taouk <sup>2</sup> , Björn Laumert <sup>1</sup> <sup>1</sup> <i>KTH Royal Institute of Technology</i> ; <sup>2</sup> <i>Cleanergy</i>
C-02	Maximizing Thermal Efficiency with Integrated Energy Systems: the Case of Sundrop Farms <b>Peter Badstue Jensen</b> <sup>1</sup> , Jelica Matoricz <sup>1</sup> Presented by Jens Taggart Pelle <sup>1</sup> <sup>1</sup> <i>Aalborg CSP</i>	E-04	Multi-Objective Optimisation of a Hybrid Microturbine-Based Concentrated Solar Power Plant with Integrated Thermal Storage <b>Davide Iaria</b> <sup>1</sup> , Jafar Al Zaili <sup>1</sup> , Abdalnaser Sayma <sup>1</sup> <sup>1</sup> <i>City, University of London</i>
C-03	A Reference of Performance in the US. SENERtrough Technology <b>Roberto Calvo</b> , <i>SENER</i>	E-05	Design and Implementation of a 38 kW Dish-Stirling Concentrated Solar Power System <b>Yan Jian</b> <sup>1</sup> , Cheng Ziran <sup>1</sup> <sup>1</sup> <i>Hunan University of Science and Technology</i>
C-04	Thermosolar Plants Solar Field Cleaning Methodology. Effects in Energy Production and Water Consumption Javier García <sup>1</sup> , Jorge Rodriguez <sup>2</sup> <sup>1</sup> <i>Ecilimp Termosolar</i> ; <sup>2</sup> <i>SENER</i>	E-06	Demonstration of a Solar Powered Energy System Based on the Integration Between Dish Technology and MGTs <b>Michela Lanchi</b> <sup>1</sup> , Massimo Falchetta <sup>1</sup> , Marco Montecchi <sup>1</sup> , Valeria Russo <sup>1</sup> , Tommaso Crescenzi <sup>1</sup> , Abdalnaser Sayma <sup>2</sup> , Jafar Alzaili <sup>2</sup> , Mahmoud Khader <sup>2</sup> , Mohsen Ghavami <sup>2</sup> , Bjorn Laumert <sup>3</sup> , Lukas Aichmaier <sup>3</sup> , Wujun Wang <sup>3</sup> <sup>1</sup> <i>ENEA</i> ; <sup>2</sup> <i>City, University of London</i> ; <sup>3</sup> <i>KTH Royal Institute of Technology</i>
C-05	Open Data for Concentrating Solar Power: www.csp.guru <b>Johan Lilliestam</b> <sup>1</sup> , Stefan Pfenninger <sup>1</sup> <sup>1</sup> <i>ETH Zürich</i>	E-07	A New Type of Giant Dish Concentration System-SUNSAIL System <b>Xiaobing Liu</b> <sup>1</sup> , Yufan Lang <sup>1</sup> , Yongkun Zhao <sup>1</sup> , Xianfeng Wu <sup>1</sup> , Zhiwei Ma <sup>1</sup> , Yonggang Hai <sup>1</sup> <sup>1</sup> <i>Focusing Solar Science and Technology (Beijing) Co., Ltd</i>
C-06	South Africa Bokpoort Project. First Year of Operation <b>Sergio Relloso</b> , <i>SENER</i>	E-08	Real-Time Gemoetric Monitoring of Solar Dish Facets Using a Camera Array <b>Dong Ni</b> <sup>1</sup> , Zhenyu Yi <sup>1</sup> , Gang Xiao <sup>1</sup> <sup>1</sup> <i>Zhejiang University</i>
C-07	Acceptance Tests of CSP Projects – a Review of Current Practices and Market Requirements <b>Juan Manuel Saenz Caballos</b> <sup>1</sup> , Inaki Perez <sup>1</sup> <sup>1</sup> <i>Mott MacDonald</i>	E-09	Thermo-Hydraulic Study of Solar Parabolic Dish – Modified Cavity Receiver for Process Heat Applications <b>K. S. Reddy</b> <sup>1</sup> , T. Sri Hari Vikram <sup>1</sup> <sup>1</sup> <i>Indian Institute of Technology</i>
C-08	Adapting Parabolic Trough Fields to Specific Site Challenges Like Extreme Wind and Topography <b>Axel Schweitzer</b> <sup>1</sup> , Finn von Reeken <sup>1</sup> , Verena Göcke <sup>1</sup> , Markus Balz <sup>1</sup> <sup>1</sup> <i>schlaich bergemann partner</i>		
E-01	Power Production Data: Cleanergys 3rd Generation Dish-Stirling System <b>Abdallah Abou-Taouk</b> <sup>1</sup> , Tommy Malm <sup>1</sup> , Jakob Jamot <sup>1</sup> , Pedro Banda <sup>2</sup> <sup>1</sup> <i>Cleanergy</i> ; <sup>2</sup> <i>Dubai Electricity and Water Authority</i>		

E-10	<p>Performance Study for Effect of Various Insulating Materials on First Order Heat Loss Coefficient of a Solar Thermal Concentrator</p> <p><b>Puneet Saini</b> <i>Quadsun Solar Pvt Ltd</i></p>	F-07	<p>Intermediate-Temperature Molten Salt as a Pathway to CSP Performance and Cost Goals under the U.S. SunShot Initiative</p> <p><b>Craig Turchi<sup>1</sup></b>, Judith Vidal<sup>1</sup>, Matthew Bauer<sup>2</sup> <sup>1</sup> NREL; <sup>2</sup> ManTech International</p>
F-01	<p>System Dynamics Analysis of CSP Technology Adoption in South Africa</p> <p><b>Omotoyosi Craig<sup>1</sup></b>, Alan Brent<sup>2</sup>, Frank Duvenhage<sup>1</sup>, Frank Dinter<sup>1</sup>, Josephine Musango<sup>1</sup> <sup>1</sup> Stellenbosch University; <sup>2</sup> Victoria University of Wellington</p>	F-08	<p>Theoretical Investigation on Zoom Fresnel Lens with Elastic Material</p> <p><b>Ma Xinglong</b> <i>Beijing Institute of Technology</i></p>
F-02	<p>Energy and Exergy Analysis of a Solar Thermo-Electro-Chemical Power Plant Based on Fuel Cells</p> <p><b>Elena Díaz<sup>1</sup></b>, Manuel Romero<sup>1</sup>, José González-Aguilar<sup>1</sup> <sup>1</sup> IMDEA Energy</p>	G-01	<p>Surface Temperature Measurement in Environments with Highly Concentrated Solar Radiation</p> <p><b>Jesús Ballestrín</b> <i>CIEMAT-PSA</i></p>
F-03	<p>High-Temperature Solar Electrochemistry Using Liquid Sodium</p> <p><b>Nerea Diez de los Rios Ramos<sup>1</sup></b>, Alexandru Onea<sup>1</sup>, Wolfgang Hering<sup>1</sup>, Robert Stieglitz<sup>1</sup> <sup>1</sup> Karlsruhe Institute of Technology</p>	G-02	<p>Novel Measurement System for Solar Extinction</p> <p><b>Jesús Ballestrín</b> <i>CIEMAT-PSA</i></p>
F-04	<p>Implementation of Thermal-Insulating and-Mixing Elements in a Concentrated Solar Power on Demand System</p> <p><b>Tyler Hamer<sup>1</sup></b>, Lei Zhou<sup>1</sup>, Victor Perez<sup>2</sup>, Antoni Gil<sup>1</sup>, David Trumper<sup>1</sup>, Alexander Slocum<sup>1</sup>, Nicolas Calvet<sup>2</sup> <sup>1</sup> Massachusetts Institute of Technology; <sup>2</sup> Masdar Institute</p>	G-03	<p>Characterization of a Lambertian Target for Measurement Techniques on Solar Concentration</p> <p><b>Jesús Ballestrín</b> <i>CIEMAT-PSA</i></p>
F-05	<p>Liquid Metal as Heat Transfer Fluid – Requirements to Avoid Risks</p> <p><b>Wolfgang Hering<sup>1</sup></b>, Nerea Dies de los Rios Ramos<sup>1</sup>, Alexandru Onea<sup>1</sup>, Robert Stieglitz<sup>1</sup> <sup>1</sup> Karlsruhe Institute of Technology</p>	G-04	<p>Measurement and Modelling of Wind Effect on the Tracking Error of CSIRO Heliostat</p> <p><b>Jin-Soo Kim<sup>1</sup></b>, Daniel Potter<sup>1</sup>, Mike Collins<sup>1</sup>, Michael Rae<sup>1</sup>, Ricky Dunbar<sup>1</sup> <sup>1</sup> CSIRO</p>
F-06	<p>A Review of the United States Department of Energy's Efforts to Collect, Transport, and Store Solar Heat at &gt; 700°C Using Solids, Liquids, and Gasses as Energy Carriers</p> <p><b>Levi Irwin<sup>1</sup></b>, Abraham Shultz<sup>2</sup> <sup>1</sup> ManTech International Corp.; <sup>2</sup> United States Department of Energy</p>	G-05	<p>An Statistical Model for Solar Flux Homogenization in Plane Receptors by Reorientation of Concentrating Mirrors</p> <p><b>Luar Moreno-Alvarez<sup>1</sup></b>, Luis Andres Amat-Castrillon<sup>1</sup> <sup>1</sup> TecNM/Instituto Tecnológico de la Laguna</p>
		G-06	<p>Optical Performance Evaluation Based on the Flux Mapping Method for Linear Fresnel Reflector</p> <p><b>Dong Yong Park<sup>1</sup></b>, SangNam Lee<sup>1</sup>, Ha Neol Kim<sup>1</sup> <sup>1</sup> Korea Institute of Energy Research</p>

07:00 pm - 08:30 pm

**Welcome Reception**

## Wednesday, September 27, 2017

### 08:30 am - 10:00 pm **Plenary: CSP Market & Projects**

ROOM: GREAT ROOM 2+3  
Chair: Wesley Stein, CSIRO

CSP Market and Perspective in China

**Sun Rui**, *Electric Power Planning Institute*

CSP Market and Perspective in Morocco

**Rachid Bayed**, *MASEN*

Project Development Experience in Chile: The Cerro Dominador Project

**Fernando Gonzalez**, *Cerro Dominador*

One Year Operation Experience NOOR1

**Sergio Relloso**, *SENER*

10:00 pm -  
10:30 pm

**Coffee Break**

### 10:30 am - 12:30 pm **Central Receiver Systems**

ROOM: GREAT ROOM 1  
Chair: Peter Nitz, Fraunhofer ISE

10:30 am

On-Sun Experiments on a Particle Heating Receiver with Red Sand as the Working Medium

**Hany Al-Ansary**<sup>1</sup>, Abdelrahman El-Leathy<sup>1</sup>, Sheldon Jeter<sup>2</sup>, Eldwin Djajadiwinata<sup>1</sup>, Shaker Alaqel<sup>1</sup>, Matthew Golob<sup>2</sup>, Clayton Nguyen<sup>2</sup>, Rajeh Saad<sup>1</sup>, Talha Shafiq<sup>1</sup>, Syed Danish<sup>1</sup>, Said Abdel-Khalik<sup>2</sup>, Zeyad Al-Suhaibani<sup>1</sup>, Nazih Abu-Shikhah<sup>3</sup>, Mohmmad Haq<sup>3</sup>, Ahmed Al-Balawi<sup>3</sup>, Fahad Al-Harhi<sup>3</sup>

<sup>1</sup> King Saud University; <sup>2</sup> Georgia Institute of Technology; <sup>3</sup> Saudi Electricity Company

10:50 am

High-Temperature Flow Testing and Heat Transfer for a Moving Packed-Bed Particle/sCO<sub>2</sub> Heat Exchanger

**Kevin Albrecht**<sup>1</sup>, Clifford Ho<sup>1</sup>

<sup>1</sup> Sandia National Laboratories

11:10 am

First Tests of a Centrifugal Particle Receiver with a 1m<sup>2</sup> Aperture

**Lars Amsbeck**<sup>1</sup>, Miriam Ebert<sup>1</sup>, Birgit Gobereit<sup>1</sup>, Johannes Hertel<sup>1</sup>, Andrea Jensch<sup>1</sup>, Jens Rheinländer<sup>1</sup>, David Trebing<sup>1</sup>, Ralf Uhlig<sup>1</sup>, Reiner Buck<sup>1</sup>

<sup>1</sup> German Aerospace Center (DLR)

11:30 am

Limits of the Cylindrical Absorber Design for a Sodium Receiver

**Charles-Alexis Asselineau**<sup>1</sup>, William Logie<sup>1</sup>, John Pye<sup>1</sup>, Joe Coventry<sup>1</sup>

<sup>1</sup> Australian National University

11:50 am

Diffraction Gratings to Improve TiAlN Based Spectrally Selective Solar Absorbers

**Maxime Bichotte**<sup>1</sup>, Audrey Soum-Glaude<sup>2</sup>

<sup>1</sup> Laboratoire Hubert Curien; <sup>2</sup> PROMES-CNRS

12:10 pm

ARGOS: Solar Furnaces Flat Heliostats Tracking Error Estimation with a Direct Camera-Based Vision System

**Emmanuel Guillot**, *PROMES-CNRS*

## 10:30 am - 12:30 pm Thermochemical Energy Storage

ROOM: GREAT ROOM 2

Chair: Gilles Flamant, CNRS-PROMES

- 10:30 am Oxides and Porous Structures Based on Earth-Abundant Elements for Hybrid Sensible/Thermochemical Solar Energy Storage in Air-Operated Solar Thermal Power Plants  
**Christos Agrafiotis<sup>1</sup>**, Stefania Tescari<sup>1</sup>, Martin Roeb<sup>1</sup>, Christian Sattler<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR)
- 10:50 am Isothermal and Non-Isothermal Kinetics of Metal Oxide Redox Reactions Performed in a Solar Furnace  
**Elisa Alonso<sup>1</sup>**, Carlos Pérez-Rábago<sup>2</sup>  
<sup>1</sup> University of Antofagasta; <sup>2</sup> IER-UNAM
- 11:10 am Mixed Co, Cu and Mn-Based Metal Oxides for Thermochemical Energy Storage Application  
**Laurie André<sup>1</sup>**, Stephane Abanades<sup>1</sup>, Laurent Cassayre<sup>2</sup>  
<sup>1</sup> PROMES-CNRS; <sup>2</sup> INPT UPS CNRS
- 11:30 am Investigation of Novel Hydroxyapatite-Doped CaO Material for Calcination-Carbonation Thermochemical Energy Storage  
**Larissa Fedunik-Hofman<sup>1</sup>**, Alicia Bayon<sup>2</sup>, Wojciech Lipinski<sup>3</sup>, Scott Donne<sup>1</sup>  
<sup>1</sup> University of Newcastle; <sup>2</sup> CSIRO; <sup>3</sup> The Australian National University
- 11:50 am Magnesium Oxide Honeycomb Thermochemical Heat Storage Materials  
**Hong Soo Kim<sup>1</sup>**, Keun Hoi Kim<sup>1</sup>, Doo Won Seo<sup>1</sup>, Si-kyung Kim<sup>1</sup>, Hyouck Ju Kim<sup>1</sup>, Jae-yong Lee<sup>1</sup>  
<sup>1</sup> KIER
- 12:10 pm Kinetics Analysis on Thermal Characteristics of CuO/Cu<sub>2</sub>O Redox System  
**Guangwei Yang**, Zhejiang University

## 10:30 am - 12:30 pm Software Tools for CSP Analysis and Simulation

ROOM: GREAT ROOM 3

Chair: Robert Pitz-Paal, German Aerospace Center (DLR)

- 10:30 am Heliostat Structural Optimization: A Study of Wind Load Effects with CFD-FEM Methods  
**Leticia Aldaz Asurmendi**, CENER
- 10:50 am System-Level Simulation of a Novel Solar Power Tower Plant Based on a Sodium Receiver, PCM Storage and sCO<sub>2</sub> Power Block  
**Alberto de la Calle<sup>1</sup>**, Alicia Bayon<sup>1</sup>, Jim Hinkley<sup>1</sup>, John Pye<sup>2</sup>  
<sup>1</sup> CSIRO; <sup>2</sup> Australian National University
- 11:10 am CSP Dispatch Optimization Considering Forecast Uncertainties  
**Ana Carolina do Amaral Burghi<sup>1</sup>**, Tobias Hirsch<sup>1</sup>, Robert Pitz-Paal<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR)
- 11:30 am Performance Assessment of a PTC Plant Simulated with Measured and Modeled Irradiation Data  
**Leonardo Freire Lacerda Lemos<sup>1</sup>**, Allan Ricardo Starke<sup>1</sup>, José Miguel Cardemil Iglesias<sup>2</sup>, Sergio Colle<sup>1</sup>  
<sup>1</sup> Federal University of Santa Catarina; <sup>2</sup> University of Chile
- 11:50 am Cavity Losses Estimation in CSP Applications  
**Jorge Galan-Vioque<sup>1</sup>**, Juan Carlos Herruzo<sup>2</sup>, Juan Valverde<sup>2</sup>, Miguel Angel Herrada<sup>1</sup>  
<sup>1</sup> University of Sevilla; <sup>2</sup> VirtualMech



# Wednesday

12:10 pm HeliOS Control System Virtually Operates a 100 MW Molten Salt Tower  
**Mark Geiger**<sup>1</sup>, Fabian Gross<sup>1</sup>, Reiner Buck<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR)

## 10:30 am - 12:30 pm Solar Resource Assessment

ROOM: STUDIO 4 & 5  
Chair: Marion Schroedter-Homscheidt, German Aerospace Center (DLR)

10:30 am Reflected Solar Irradiance for CSP Plants Simulation: Impact and Importance for Solar Resource Assessment  
**El Ghali Bennouna**<sup>1</sup>, Ammar Mouaky<sup>1</sup>, Abdellatif Ghennioui<sup>1</sup>, Abdessamad Barka<sup>2</sup>, Ahmed Alami Merrouni<sup>1</sup>  
<sup>1</sup> IRESEN; <sup>2</sup> UEMF

10:50 am Data Quality Analysis for a Smart Solar Resource Assessment  
**Moulay Hafid Bouhamidi**<sup>1</sup>, Amine Amar<sup>1</sup>  
<sup>1</sup> MASEN

11:10 am Statcasting: A Machine Learning Based Methodology for Post-Processing Ensemble Predictions of Direct Normal Solar Irradiance  
**Martín Gastón**<sup>1</sup>, Carlos F. Peruchena<sup>1</sup>, Ana Bernardos<sup>1</sup>  
<sup>1</sup> CENER

11:30 am Nowcasting of DNI Maps for the Solar Field Based on Voxel Carving and Individual 3D Cloud Objects from All Sky Images  
**Bijan Nouri**<sup>1</sup>, Pascal Kuhn<sup>1</sup>, Stefan Wilbert<sup>1</sup>, Christoph Prah<sup>1</sup>, Robert Pitz-Paal<sup>1</sup>, Philippe Blanc<sup>2</sup>, Thomas Schmidt<sup>3</sup>, Zeyad Yasser<sup>4</sup>, Lourdes Ramírez Santigosa<sup>5</sup>, Detlev Heineman<sup>6</sup>  
<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> MINES ParisTech; <sup>3</sup> CSP Services; <sup>4</sup> TSK Flagsol Engineering GmbH; <sup>5</sup> División de Energías Renovables; <sup>6</sup> University of Oldenburg

12:30 pm - 02:00 pm Lunch Break

## 02:00 pm - 04:00 pm Central Receiver Systems

ROOM: GREAT ROOM 1  
Chair: Zhifeng Wang, IEECAS

02:00 pm Automated Applicator for High-Absorptivity Coating for Solar Receiver  
**Yaniv Binyamin**, BrightSource Energy

02:20 pm Optical Characterization of Heliostats using Multiple 3D Geometry Characterization Sensors  
**Aristides M. Bonanos**<sup>1</sup>, Marina Faka<sup>1</sup>, Dante Abate<sup>1</sup>, Sorin Hermon<sup>1</sup>, Manuel Blanco<sup>1</sup>  
<sup>1</sup> The Cyprus Institute

02:40 pm Scalable Heliostat Calibration System (SHORT) - How to Calibrate Your Whole Heliostat Field in a Single Night  
**Michael Burisch**<sup>1</sup>, Marcelino Sanchez<sup>1</sup>, Xabier Olano<sup>1</sup>, Aitor Olarra<sup>2</sup>, Cristobal Villasante<sup>2</sup>, David Olasolo<sup>2</sup>, Rafael Monterreal<sup>3</sup>, Raul Enrique<sup>3</sup>, Jesus Fernandez<sup>3</sup>  
<sup>1</sup> CENER; <sup>2</sup> IK4-TEKNIKER; <sup>3</sup> CIEMAT-PSA

03:00 pm	Numerical Identification of Mirror Shapes with the Backward-Gazing Method Using an Actual Solar Profile <b>Cyril Caliot</b> , CNRS-PROMES
03:20 pm	Dynamic Model of a Sodium-Cooled Billboard-Type Receiver for High Temperature Concentrated Solar Power Systems <b>Laura Savoldi</b> <sup>1</sup> , Mattia Cagnoli <sup>1</sup> , Alberto de la Calle <sup>2</sup> , Pablo Giomi <sup>3</sup> , John Pye <sup>4</sup> , Roberto Zanino <sup>1</sup> <sup>1</sup> Dipartimento Energia; <sup>2</sup> CSIRO; <sup>3</sup> Politecnico di Torino; <sup>4</sup> Australian National University
03:40 pm	Assessment of Different Control Strategies to Manage Cloud-Induced Transients in Central Receiver Systems Using Molten Salts <b>Marco Binotti</b> <sup>1</sup> , Andrea Toscani <sup>1</sup> , Francesco Crespi <sup>2</sup> , David Sanchez <sup>2</sup> , Giampaolo Manzolini <sup>1</sup> <sup>1</sup> Politecnico di Milano; <sup>2</sup> University of Sevilla

## 02:00 pm - Thermal Energy Storage

04:00 pm

ROOM: GREAT ROOM 2  
Chair: Ana Maria Ruz, Chilean Solar Committee

02:00 pm	Protective Coatings for High Temperature Molten Salt Heat Storage Systems in Solar Concentration Power Plants <b>Alina Agüero</b> <sup>1</sup> , Pauline Audigié <sup>1</sup> , Sergio Rodríguez <sup>1</sup> , Víctor Encinas Sánchez <sup>2</sup> , María Teresa de Miguel <sup>2</sup> , Francisco Javier Pérez <sup>2</sup> <sup>1</sup> National Institute for Aerospace Technology; <sup>2</sup> Universidad Complutense de Madrid
02:20 pm	Economic Evaluation of Towers for Central Receiver Systems <b>Anne K. Burghartz</b> <sup>1</sup> , Markus Balz <sup>1</sup> , Finn von Reeken <sup>1</sup> <sup>1</sup> schlaich bergemann partner
02:40 pm	Extended Modeling of Packed-Bed Sensible Heat Storage Systems <b>Thibaut Esence</b> <sup>1</sup> , Arnaud Bruch <sup>1</sup> , Jean-François Fourmigué <sup>1</sup> , Benoit Stutz <sup>2</sup> <sup>1</sup> CEA; <sup>2</sup> Université Savoie Mont Blanc
03:00 pm	Flow Modeling of a Packed Bed High Temperature Thermal Energy Storage System <b>Eva Faust</b> <sup>1</sup> , Dominik Schlipf <sup>1</sup> , Guenter Schneider <sup>2</sup> , Hartmut Maier <sup>2</sup> <sup>1</sup> enolcon gmbh; <sup>2</sup> Storasol GmbH
03:20 pm	Dynamic Corrosion Tests Comparison: Dynamic Reactor vs High Temperature Pilot Plant Scale Setup for Chilean LiNO <sub>3</sub> Containing Molten Salt <b>Angel G. Fernández</b> <sup>1</sup> , Javier Nieto-Maestre <sup>2</sup> <sup>1</sup> Antofagasta University; <sup>2</sup> TECNALIA

## 02:00 pm - Software Tools for CSP Analysis and Simulation

04:00 pm

ROOM: GREAT ROOM 3  
Chair: Vikesh Rajpaul, ESKOM

02:00 pm	Modelling an Automatic Controller for Parabolic Trough Solar Fields Under Realistic Weather Conditions <b>Kareem Noureldin</b> <sup>1</sup> , Tobias Hirsch <sup>1</sup> , Pascal Kuhn <sup>1</sup> , Bijan Nouri <sup>1</sup> , Zeyad Yassef <sup>2</sup> , Robert Pitz-Paal <sup>1</sup> <sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> TSK Flagsol Engineering GmbH
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# Wednesday

02:20 pm	<b>New Functionalities for the Tonatiuh Ray-Tracing Software</b> <b>João P. Cardoso</b> <sup>1</sup> , Amaia Mutuberrria <sup>2</sup> , Costas Marakkos <sup>3</sup> , Peter Schöttl <sup>4</sup> , Tiago Osório <sup>5</sup> , Iñigo Les <sup>2</sup> <sup>1</sup> LNEG; <sup>2</sup> National Renewable Energy Center; <sup>3</sup> The Cyprus Institute; <sup>4</sup> Fraunhofer ISE; <sup>5</sup> University of Évora
02:40 pm	<b>Heliosim: An Integrated Model for the Optimisation of Central Receiver CSP Facilities</b> <b>Daniel Potter</b> <sup>1</sup> , Jin-Soo Kim <sup>1</sup> , Alex Khassapov <sup>1</sup> , Ric Pascual <sup>1</sup> , Lachlan Hetherington <sup>1</sup> , Zikai Zhang <sup>1</sup> <sup>1</sup> CSIRO
03:00 pm	<b>Particles-based Thermal Energy Storage Systems for Concentrated Solar Power Applications</b> <b>Miguel A. Reyes-Belmonte</b> <sup>1</sup> , Elena Diaz <sup>1</sup> , Manuel Romero <sup>1</sup> <sup>1</sup> IMDEA Energy
03:20 pm	<b>SunFlower: A New Solar Tower Simulation Model for Use in Field Layout Optimization</b> <b>Pascal Richter</b> <sup>1</sup> , Gregor Heimig <sup>1</sup> , Nils Lukas <sup>1</sup> , Martin Frank <sup>1</sup> <sup>1</sup> RWTH Aachen University
03:40 pm	<b>Tower Illuminance Model (TIM): Interactive Real-Time Flyover Simulation Tool to Evaluate Glare and Avian-Flux Hazards</b> <b>Cianan Sims</b> <sup>1</sup> , Clifford Ho <sup>2</sup> , Luke Horstman <sup>2</sup> , Timothy Wendelin <sup>3</sup> , Julius Yellowhair <sup>2</sup> Presented by Clifford Ho <sup>2</sup> <sup>1</sup> Sims Industries, LLC; <sup>2</sup> Sandia National Laboratories; <sup>3</sup> NREL

## 02:00 pm - 04:00 pm - Solar Resource Assessment

ROOM: STUDIO 4 & 5  
Chair: Lourdes Ramirez, CIEMAT

02:00 pm	<b>Satellite-Based DNI Nowcasting Based on a Sectoral Atmospheric Motion Approach</b> <b>Marion Schroedter-Homscheidt</b> <sup>1</sup> , Niels Killius <sup>1</sup> , Diana Rocio Mancera Guevara <sup>1</sup> , Tobias Sirch <sup>1</sup> , Stefan Wilbert <sup>1</sup> , Zeyad Yasser <sup>2</sup> <sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> TSK Flagsol
02:20 pm	<b>Sunshape Measurements with Conventional Rotating Shadowband Irradiometers</b> <b>Stefan Wilbert</b> <sup>1</sup> , Marc Röger <sup>1</sup> , Jonas Csambor <sup>2</sup> , Florian Klinger <sup>1</sup> , Natalie Hanrieder <sup>1</sup> , Fabian Wolfertstetter <sup>1</sup> , David Schüler <sup>1</sup> , S. Shaswattam <sup>3</sup> , Sharad Kumar <sup>3</sup> , Neeraj Goswami <sup>3</sup> , Abdellatif Ghennioui <sup>4</sup> , Moritz Breitbach <sup>5</sup> , Roman Affolter <sup>5</sup> , Norbert Geuder <sup>6</sup> , Birk Kraas <sup>5</sup> <sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> University of Stuttgart; <sup>3</sup> NETRA; <sup>4</sup> IRESEN; <sup>5</sup> CSP Services; <sup>6</sup> Hochschule für Technik Stuttgart
02:40 pm	<b>Towards Knowing the Chilean Solar Thermal Potential for Solar Power Tower Plants</b> <b>Aitor Marzo</b> <sup>1</sup> , Luis Fernando Zarzalejo <sup>2</sup> , Mercedes Ibarra <sup>3</sup> , Ana A. Navarro <sup>4</sup> , Gonzalo Soto <sup>1</sup> , Lourdes Ramirez <sup>4</sup> , Rodrigo Escobar <sup>5</sup> , Manuel Silva <sup>6</sup> <sup>1</sup> University of Antofagasta; <sup>2</sup> Plataforma Solar de Almería-CIEMAT; <sup>3</sup> Fraunhofer Chile Research; <sup>4</sup> CIEMAT; <sup>5</sup> Pontificia Universidad Católica de Chile; <sup>6</sup> University of Sevilla
03:00 pm	<b>Automated Monitoring of Soiling with AVUS Instrument for Improved Solar Site Assessment</b> <b>Anna Heimsath</b> <sup>1</sup> , Thomas Schmidt <sup>1</sup> , Peter Nitz <sup>1</sup> , Jan Steinmetz <sup>2</sup> , Christian Reetz <sup>2</sup> , Marko Schwandt <sup>3</sup> , Richard Meyer <sup>3</sup> <sup>1</sup> Fraunhofer ISE; <sup>2</sup> PSE AG; <sup>3</sup> Suntrace GmbH

04:00 pm - Coffee Break  
04:30 pm

## 04:30 pm - Central Receiver Systems

06:30 pm

ROOM: GREAT ROOM 1  
Chair: Clifford Ho, Sandia National Laboratories

04:30 pm Revisiting Field Layout Designs for Large STE Solar Tower Plants

**Luis Crespo**<sup>1</sup>, Alberto Ramos<sup>2</sup>, Francisco Ramos<sup>1</sup>  
<sup>1</sup> ESTELA; <sup>2</sup> CERN

04:50 pm Preliminary Tests of an Integrated Gas Turbine-Solar Particle Heating and Energy Storage System

**Abdelrahman El-Leathy**<sup>1</sup>, Hany Al-Ansary<sup>1</sup>, Sheldon Jeter<sup>2</sup>, Eldwin Djajadiwinata<sup>1</sup>, Shaker Alaqel<sup>1</sup>, Matthew Golob<sup>2</sup>, Clayton Nguyen<sup>2</sup>, Rajeh Saad<sup>1</sup>, Talha Shafiq<sup>1</sup>, Syed Danish<sup>1</sup>, Said Abdel-Khalik<sup>2</sup>, Zeyad Al-Suhaibani<sup>1</sup>, Nazih Abu-Shikhah<sup>3</sup>, Mohmmad Haq<sup>3</sup>, Ahmed Al-Balawi<sup>3</sup>, Fahad Al-Harhi<sup>3</sup>  
<sup>1</sup> King Saud University; <sup>2</sup> Georgia Institute of Technology; <sup>3</sup> Saudi Electricity Company

05:10 pm Measurements of the Forced Convective Heat Loss from Open Cylindrical Cavities of Multi-MW Scale Solar Central Receiver Systems

**Silvan Siegrist**<sup>1</sup>, Hannes Stadler<sup>1</sup>, Bernhard Hoffschmidt<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR)

05:30 pm Advanced Power Cycles and Configurations for Solar Towers: Techno-Economical Optimization of the Decoupled Solar Combined Cycle Concept

**Francisco Javier Sorbet**<sup>1</sup>, Maria Iñigo<sup>2</sup>, Javier García-Barberena<sup>1</sup>, Ana Bernardos<sup>1</sup>  
<sup>1</sup> CENER; <sup>2</sup> Public University of Navarre

05:50 pm Development of High Absorption, High Durability Coatings for Solar Receivers in CSP Plants

**Kaoru Tsuda**<sup>1</sup>, Yasushi Murakami<sup>2</sup>, Juan Felipe Torres<sup>3</sup>, Joe Coventry<sup>3</sup>  
<sup>1</sup> Nano Frontier Technology Co.,Ltd.; <sup>2</sup> Shinshju University; <sup>3</sup> The Australian National University

## 04:30 pm - Thermal Energy Storage

06:30 pm

ROOM: GREAT ROOM 2  
Chair: Nicolas Calvet, Masdar Institute

04:30 pm Encapsulated Nitrates PCM to Improve TES in CSP Plants

**Karina Fullenkamp**<sup>1</sup>, Gustavo Cáceres<sup>1</sup>  
<sup>1</sup> Universidad Adolfo Ibáñez

04:50 pm Thermal Characterization of a Stratifying Molten Salts Storage Tank with Integrated Steam Generator in Real Operating Conditions

**Walter Gaggioli**<sup>1</sup>, Luca Rinaldi<sup>1</sup>, Pietro Tarquini<sup>1</sup>  
<sup>1</sup> ENEA

05:10 pm Solid Packed Bed Thermal Energy Storage for ORC Electric Generation in Fresnel Type Concentrated Solar Power Plants

**Ana Belén Hernández Sánchez**<sup>1</sup>, Irantzu Uriz<sup>1</sup>, Iñigo Ortega-Fernández<sup>1</sup>, Asier Ortuondo<sup>1</sup>, Abdessamad Faik<sup>1</sup>, Javier Rodríguez-Aseguinolaza<sup>1</sup>  
<sup>1</sup> CIC EnergiGUNE

# Wednesday

05:30 pm Experimental Performance Evaluation of a Laboratory-Scale Molten Salt Thermocline Storage

**Martin Karl**<sup>1</sup>, Bernhard Seubert<sup>1</sup>, Thomas Fluri<sup>1</sup>, Ralf Müller<sup>1</sup>, Peter Nitz<sup>1</sup>  
<sup>1</sup> *Fraunhofer ISE*

05:50 pm Techno-Economic Assessment for Large Scale Thermocline Filler TES Systems in a Molten Salt Parabolic Trough Plant

**Freerk Klasing**<sup>1</sup>, Christian Odenthal<sup>1</sup>, Benjamin Trost<sup>1</sup>, Tobias Hirsch<sup>1</sup>, Thomas Bauer<sup>1</sup>  
<sup>1</sup> *German Aerospace Center (DLR)*

## 04:30 pm - 06:30 pm **Software Tools for CSP Analysis and Simulation**

ROOM: GREAT ROOM 3  
Chair: *Manuel Blanco, The Cyprus Institute*

04:30 pm Efficient Ray-Tracing with Real Weather Data

**Pascal Richter**<sup>1</sup>, Janna Tinnes<sup>1</sup>, Peter Schwarzboezl<sup>2</sup>, Amadeus Rong<sup>2</sup>, Martin Frank<sup>1</sup>  
<sup>1</sup> *RWTH Aachen University*; <sup>2</sup> *German Aerospace Center (DLR)*

04:50 pm Numerical Simulation and Assessment of a 5MWel Hybrid System with a Parabolic Trough Once-Through Steam Generator Coupled to Biomass Gasification

**João Soares**<sup>1</sup>, Armando Oliveira<sup>1</sup>, Loreto Valenzuela<sup>2</sup>  
Presented by Loreto Valenzuela<sup>2</sup>  
<sup>1</sup> *INEGI*; <sup>2</sup> *CIEMAT-PSA*

05:10 pm The Control System at PROTEAS

**Konstantinos Stokos**<sup>1</sup>, Efstathios Stiliaris<sup>1</sup>, Aristides Bonanos<sup>1</sup>, Marios Georgiou<sup>1</sup>, Elena Guillen<sup>1</sup>, Alaric Montenon<sup>1</sup>, Costas Papanicolas<sup>1</sup>  
<sup>1</sup> *The Cyprus Institute*

05:30 pm Comparison of Optical Modelling Tools for Sunshape and Surface Slope Error

**Ye Wang**<sup>1</sup>, Daniel Potter<sup>2</sup>, Charles-Alexis Asselineau<sup>1</sup>, Clotilde Corsi<sup>2</sup>, Michael Wagner<sup>3</sup>, Manuel Blanco<sup>4</sup>, Jin-soo Kim<sup>2</sup>  
<sup>1</sup> *The Australian National University*; <sup>2</sup> *CSIRO*; <sup>3</sup> *NREL*; <sup>4</sup> *The Cyprus Institute*

## 04:30 pm - 06:30 pm **Solar Fuels and Chemical Commodities**

ROOM: STUDIO 4 & 5  
Chair: *Philipp Furler, ETH Zurich*

04:30 pm Dynamic Modelling of a Continuous Hydrogen Production Plant Based on CeO<sup>2</sup> Thermochemical Cycle

**Alicia Bayon**<sup>1</sup>, Alberto de la Calle<sup>1</sup>  
<sup>1</sup> *CSIRO*

04:50 pm CFD-DEM Investigation on Flow and Temperature Distribution of Ceria Particles in a Beam-Down Fluidized Bed Reactor

**Selvan Bellan**, *Niigata University*

## Program Overview

	Tuesday September 26, 2017				Wednesday September 27, 2017			
	Great Room 1	Great Room 2	Great Room 3	Studio 4 & 5	Great Room 1	Great Room 2	Great Room 3	Studio 4 & 5
8:30 am	Registration until 2:00 pm				CSP Market & Projects (Great Room 2+3)			
9:00 am	Opening Session (Great Room 2+3)				Coffee Break			
9:30 am	CSP Policy (Great Room 2+3)				Central Receiver Systems	Thermo-chemical Energy Storage	Software Tools for CSP ...	Solar Resource Assessment
10:00 am	Lunch				Lunch			
10:30 am	Coffee Break				Coffee Break			
11:00 am	Policy and Marketing	Power Cycles	Water Desalination and Detoxification	Hybridization	Central Receiver Systems	Thermal Energy Storage	Software Tools for CSP ...	Solar Resource Assessment
11:30 am	Lunch				Lunch			
12:00 pm	Coffee Break				Coffee Break			
12:30 pm	Linear Fresnel Systems and Dish/Engine Systems	Direct Solar Metallurgy	Advanced Materials and Manufacturing	Hybridization	Central Receiver Systems	Thermal Energy Storage	Software Tools for CSP ...	Solar Fuels and Chemical Commodities
1:00 pm	Poster Session 1				Poster Session 2			
1:30 pm	Welcome Reception				Gala Dinner			
2:00 pm								
2:30 pm								
3:00 pm								
3:30 pm								
4:00 pm								
4:30 pm								
5:00 pm								
5:30 pm								
6:00 pm								
6:30 pm								
7:00 pm								
7:30 pm								

## Thursday September 28, 2017

Great Room 1    Great Room 2    Great Room 3    Studio 4 & 5

**Beyond Power**  
Solar Fuels, Green Mining, Process Heat  
(Great Room 2+3)

Coffee Break

Central  
Receiver  
Systems

Emerging  
Concepts

Parabolic  
Trough  
Systems

Process  
Heat

Lunch

Central  
Receiver  
Systems

Thermal  
Energy  
Storage

Parabolic  
Trough  
Systems

Reliability  
and Service  
Life Predic-  
tion

Coffee Break

Central  
Receiver  
Systems

Thermal  
Energy  
Storage

Parabolic  
Trough  
Systems

Reliability  
and Service  
Life Predic-  
tion

Poster Session 3

## Friday September 29, 2017

Great Room 1    Great Room 2    Great Room 3    Studio 4 & 5

**CSP Technology Innovation**  
(Great Room 2+3)

Coffee Break

Central  
Receiver  
Systems

Heat Trans-  
fer Fluids

Solar Energy  
for the Min-  
ing Industry

Solar Fuels  
and Chem-  
ical Com-  
modities

Lunch

Closing Session  
(Great Room 2+3)

05:10 pm	Co-Production of Syngas and Zinc via Combined Solar-Driven Biomass Gasification and ZnO Carbo-Thermal Reduction in a Continuously-Operated Solar Reactor <b>Srirat Chuayboon</b> <sup>1</sup> , Sylvain Rodat <sup>2</sup> <sup>1</sup> KMITL; <sup>2</sup> CEA
05:30 pm	Preliminary Tests of Batch Type Fluidized Bed Reactor for Development of Continuously-Feeding Fluidized Bed Reactor - an Elevated Temperature and Gasification Processes <b>Nobuyuki Gokon</b> <sup>1</sup> , Shinpei Takagi <sup>1</sup> , Hyun-seok Cho <sup>1</sup> , Selvan Bellan <sup>1</sup> , Tatsuya Kodama <sup>1</sup> <sup>1</sup> Niigata University
05:50 pm	Particles Fluidized Bed Receiver/Reactor with a Beam-Down Solar Concentrating Optics: 30-kWth Performance Test on Two-Step Water Splitting with Ceria Particles Using a Big Sun-Simulator <b>Tatsuya Kodama</b> , Niigata University
05:50 pm	HYDROSOL-PLANT: Structured Redox Reactors for H <sub>2</sub> Production from Solar Thermochemical H <sub>2</sub> O Splitting <b>Souzana Lorentzou</b> , APTL/CPERI/CERTH

## 06:30 pm - 07:30 pm Poster Session 2

The poster numbers are based on the topics:

H	Heat Transfer Fluids
I	Hybridization
J	Linear Fresnel Systems
K	Parabolic Trough Systems
L	Policy and Marketing
M	Power Cycles

N	Process Heat
O	Reliability and Service Life Prediction of Components
P	Software Tools for CSP Analysis and Simulation
Q	Solar Energy for the Mining Industry

H-01	Enhancement of Thermal Energy Storage of Heat Transfer Fluid by Microencapsulated Phase Change Slurry <b>Xiaoze Du</b> <sup>1</sup> , Guannan Feng <sup>1</sup> , Xinglong Zhang <sup>1</sup> , Yu Wang <sup>1</sup> , Chao Xu <sup>1</sup> , Lijun Yang <sup>1</sup> <sup>1</sup> North China Electric Power University
H-02	New Solid Phase of KNO <sub>3</sub> – NaNO <sub>3</sub> Salt Mixtures Studied by Neutron Scattering and Differential Scanning Calorimetry Analysis <b>Alberto Giaconia</b> <sup>1</sup> , Tiziano Delise <sup>2</sup> , Anna Chiara Tizzoni <sup>2</sup> , Mariarosaria Ferrara <sup>1</sup> , Natale Corsaro <sup>1</sup> , Cadia D'Ottavi <sup>2</sup> , Luca Turchetti <sup>1</sup> , Maria Cristina Annesini <sup>3</sup> , Mark Telling <sup>4</sup> , Silvia Licocchia <sup>2</sup> <sup>1</sup> ENEA; <sup>2</sup> University of Rome Tor Vergata; <sup>3</sup> Sapienza Università di Roma; <sup>4</sup> ISIS Facility, Rutherford Appleton Laboratory

H-03	Field Survey on Hydrogen Concentration in Heat Transfer Fluids <b>Christian Jung</b> <sup>1</sup> , Marion Senholdt <sup>1</sup> , Carsten Spenke <sup>1</sup> , Steffen Ulmer <sup>2</sup> <sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> CSP Services
H-04	Performances and Site Assessment of a Parabolic Trough Collector Hybrid Solar/Gas Power Plant. Heat Transfer Fluids Parametric Study <b>Kamal Mohammedi</b> , MESOnexTeam/URMPE
H-05	Development of Laser Instrumentation Devices for Inner Wall of High Temperature Piping System <b>Akihiko Nishimura</b> <sup>1</sup> , Akinori Furusawa <sup>1</sup> , Yusuke Takenaka <sup>1</sup> <sup>1</sup> Japan Atomic Energy Agency



# Wednesday

H-06	<p>Modeling the Inclination Effect on the Weakly Compressible Anisothermal Poiseuille Flow Using Lattice Boltzmann Method with Multiple Relaxation-Time</p> <p><b>Sanae Ouajdi</b><sup>1</sup>, Fayçal Moufekkir<sup>1</sup>, Ahmed Mezrhab<sup>1</sup>, Marc Daumas<sup>2</sup></p> <p><sup>1</sup> <i>Laboratory of Mechanics and Energetic at University Mohammed 1st</i>; <sup>2</sup> <i>Laboratoire PROCédés, Matériaux et Energie Solaire</i></p>	I-02	<p>Thermoeconomic Assessment of Solar-Geothermal Hybrid Plants</p> <p><b>Jose Cardemil</b><sup>1</sup>, Mariana Gangas<sup>2</sup>, Cristóbal Sarmiento<sup>1</sup>, Rodrigo Escobar<sup>3</sup></p> <p><sup>1</sup> <i>University of Chile</i>; <sup>2</sup> <i>Universidad Diego Portales</i>; <sup>3</sup> <i>Pontificia Universidad Católica de Chile</i></p>
H-07	<p>Effect of Eccentricity on the Hydrodynamics and Heat Transfer of Molten Salt in Bayonet Receivers for Solar Power Towers</p> <p><b>Rafael Perez Alvarez</b><sup>1</sup>, María de los Reyes Rodríguez-Sánchez<sup>1</sup>, Antonio Acosta-Iborra<sup>1</sup>, Domingo Santana<sup>1</sup></p> <p><sup>1</sup> <i>University Carlos III of Madrid</i></p>	I-03	<p>Optimum Design of a Hybrid Diesel-Orc/ Photovoltaic System Using PSO</p> <p><b>Ana Lisbeth Galindo Noguera</b><sup>1</sup>, Electro Eduardo Silva Lora<sup>1</sup></p> <p><sup>1</sup> <i>Federal University of Itajubá</i></p>
H-08	<p>Effect of Wall-Slugs and Solid Back-Mixing on Wall to Bed Heat Transfer in Dense Suspension of SiC Particles</p> <p><b>Andrés Reyes Urrutia</b><sup>1</sup>, Mariana Zambon<sup>1</sup>, Florencia Toschi<sup>1</sup>, Daniel Gauthier<sup>2</sup>, Gilles Flamant<sup>2</sup>, Germán Mazza<sup>1</sup></p> <p><sup>1</sup> <i>PROBIEN</i>; <sup>2</sup> <i>PROMES-CNRS</i></p>	I-04	<p>The Safe and Economic Operation Analysis for Solar Aided Coal-Fired Power Plants</p> <p><b>Jianlan Li</b><sup>1</sup>, Zhiyi Wu<sup>1</sup>, Aosuang Ding<sup>1</sup>, Jizhou Wang<sup>1</sup></p> <p><sup>1</sup> <i>Huazhong University of Science &amp; Technology</i></p>
H-09	<p>Liquid Metals as Heat Transfer Fluid – Experimental Benchmark and Instrumentation Development</p> <p><b>Thomas Schaub</b><sup>1</sup>, Wadim Jäger<sup>1</sup>, Martin Lux<sup>1</sup>, Wolfgang Hering<sup>1</sup>, Robert Stieglitz<sup>1</sup></p> <p><sup>1</sup> <i>Karlsruhe Institute of Technology</i></p>	I-05	<p>Techno-Economic Analysis of CSP+PV+MED Plant: Electricity and Water Production for Mining Industry in Northern Chile</p> <p><b>Carlos Mata-Torres</b><sup>1</sup>, Rodrigo A. Escobar<sup>1</sup>, José M. Cardemil<sup>2</sup></p> <p><sup>1</sup> <i>Pontificia Universidad Católica de Chile</i>; <sup>2</sup> <i>University of Chile</i></p>
H-10	<p>Feasibility and Demonstrability of Corrosion Control of Molten Chloride Salts for the Next Generation Concentrated Solar Power Plants</p> <p><b>Rajgopal Vijaykumar</b></p> <p><i>United States Department of Energy</i></p>	I-06	<p>Modeling of Solar Polygeneration Plant with Linear Fresnel Collector</p> <p><b>Carlos Mata-Torres</b></p> <p><i>Pontificia Universidad Católica de Chile</i></p>
H-11	<p>Effect of Additives on the Thermal Stability of Nitrate</p> <p><b>Zhikang Wan</b><sup>1</sup>, Peng Zhang<sup>1</sup>, Jinhui Cheng<sup>1</sup></p> <p><sup>1</sup> <i>Shanghai institute of Applied Physics, Chinese Academy of Science</i></p>	I-07	<p>Molten Salt CSP Hybrid Opportunities in China</p> <p><b>Deven O'Rourke</b><sup>1</sup>, Nathan Schuknecht<sup>1</sup>, Pamela Kulbeik<sup>1</sup></p> <p><sup>1</sup> <i>SkyFuel</i></p>
I-01	<p>Transient Modeling of a Biomass Steam Generator Focusing its Hybridization with CSP</p> <p><b>Eduardo Burin</b><sup>1</sup>, Victor Neumann<sup>1</sup>, Leandro Rogel da Silva<sup>2</sup>, Paulo Smith Schneider<sup>3</sup>, Edson Bazzo<sup>4</sup></p> <p><sup>1</sup> <i>University of Parana</i>; <sup>2</sup> <i>ICAVI</i>; <sup>3</sup> <i>University of Rio Grande do Sul</i>; <sup>4</sup> <i>Federal University of Santa Catarina</i></p>	I-08	<p>Design of a Small Hybrid Solar Thermal Power System</p> <p><b>Hermenegildo Sántiz</b><sup>1</sup>, Roger Cundapí<sup>1</sup>, Antonio Sanda<sup>1</sup>, Sara Moya<sup>1</sup>, Guadalupe López<sup>1</sup>, Luis Vela<sup>1</sup></p> <p><sup>1</sup> <i>Centro Nacional de Investigación y Desarrollo Tecnológico</i></p>
		I-09	<p>Simulation of CSP-PV Hybrid Power Plant with Fixed Conditions for LCOE Reduction Analysis</p> <p><b>Marcos Torrezani</b><sup>1</sup>, Mario Siqueira<sup>1</sup></p> <p><sup>1</sup> <i>University of Brasília</i></p>

- J-01 High Performance Solar Selective Coating Paint System Based on Carbon Nanotubes as Optical Component and Graphene Nano-sheets as Metal Oxidation Inhibitors  
**Yaniv Binyamin**  
*The Hebrew University of Jerusalem*
- J-02 Power Generation with Linear Fresnel Collectors and Photovoltaic Systems in the Atacama Desert, Chile, a Techno-Economic Comparison  
**Dimitrij Chudinow<sup>1</sup>**, Jannik Haas<sup>1</sup>, Rodrigo Palma-Behnke<sup>2</sup>, Ludger Eltrop<sup>1</sup>  
<sup>1</sup> *University of Stuttgart*; <sup>2</sup> *Solar Energy Research Center*
- J-03 Strategies of Optical Aiming to Achieve Uniform Heat-Flux Distributions on a Solar Receiver of a Linear Fresnel Concentrator  
**Alessandro Gallo<sup>1</sup>**, Ricardo Pérez-Enciso<sup>2</sup>, Diego Pulido<sup>1</sup>, Carlos Pérez-Rábago<sup>3</sup>  
<sup>1</sup> *University of Antofagasta*; <sup>2</sup> *University of Sonora*; <sup>3</sup> *National Autonomous University of Mexico*
- J-04 Characterization of Optical and Thermal Performances of a Linear Fresnel Collector in Burkina Faso  
**Gaëlle Ko<sup>1</sup>**, Yezouma Coulibaly<sup>2</sup>, Edem N'Tsoukpoe<sup>2</sup>  
<sup>1</sup> *University of Perpignan, PROMES-CNRS*; <sup>2</sup> *2iE*
- J-05 Annual Performance Optimization of a Linear Fresnel Collector in Pretoria, South Africa  
**Mohammad Moghimi Ardeknai<sup>1</sup>**, Ken Craig<sup>1</sup>, Josua Meyer<sup>1</sup>  
<sup>1</sup> *University of Pretoria*
- J-06 Thermo-economic Analysis of an Advanced Linear Fresnel Collector Plant Coupled to an Organic Rankine Cycle  
**María José Montes Pita<sup>1</sup>**, Rubén Barbero<sup>1</sup>, Antonio Rovira<sup>1</sup>, Marta Muñoz<sup>1</sup>, Consuelo Sánchez<sup>1</sup>  
<sup>1</sup> *UNED*
- J-07 Performance Thermal Model and Parametric Studies of a Trapezoidal Fresnel Solar Receiver  
**Freddy Ordóñez Malla<sup>1</sup>**, Daniela Jaramillo<sup>1</sup>  
<sup>1</sup> *Departamento de Ingeniería Mecánica, Escuela Politécnica Nacional*
- J-08 Experimental Evaluation of Heat Loss from a LFC's Multi-Tube Trapezoidal Cavity Absorber Considering Strategic Painting of the Tubes  
**Selen Sousa<sup>1</sup>**, Alexandre Bittencourt<sup>1</sup>, Victor Pigozzo Filho<sup>1</sup>, Julio C. Passos<sup>1</sup>  
<sup>1</sup> *Federal University of Santa Catarina*
- J-09 A Detailed Ray Tracing Model of a Linear Fresnel Concentrating Solar Process Heat Collector for Yield Assessment in the Fresh NRG EU Project  
**De Wet van Rooyen<sup>1</sup>**, Peter Nitz<sup>1</sup>, Anna Heimsath<sup>1</sup>  
<sup>1</sup> *Fraunhofer ISE*
- J-10 Wind Load and Heat Transfer Analysis of a New Linear Fresnel Assembly  
**Guangdong Zhu, NREL**
- K-01 Estimation of the Maximum Thermal Efficiency and Required Concentration Factor for a Solar Receiver  
**Rubén Barbero<sup>1</sup>**, María José Montes<sup>1</sup>, Antonio Rovira<sup>1</sup>, Fernando Varela<sup>1</sup>  
<sup>1</sup> *Universidad Nacional de Educación a Distancia (UNED)*
- K-02 Validation and Optimization of a Parabolic Trough Power Plant  
**Reece Barnes<sup>1</sup>**, Frank Dinter<sup>1</sup>  
<sup>1</sup> *Stellenbosch University*
- K-03 MicroSol-R: Versatile Solar Facility for Research and Industry  
**Nicolas Boulet<sup>1</sup>**, Florent Lecat<sup>1</sup>, Gilles Flamant<sup>1</sup>, Jérôme Blanc<sup>2</sup>, Pierre Larnicol<sup>2</sup>  
<sup>1</sup> *PROMES-CNRS*; <sup>2</sup> *Arkema France*
- K-04 Thermal Analysis of the Parabolic Trough Organic Rankine Solar Power Plant  
**Gaylord Enrique Carrillo Caballero<sup>1</sup>**, Luis Sebastian Mendoza Castellano<sup>1</sup>, Osvaldo José Venturini<sup>1</sup>, Electo Eduardo Silva Lora<sup>1</sup>, Vladimir Rafael Melian Cobas<sup>1</sup>, Arnaldo Martin Martinez Reyes<sup>1</sup>  
<sup>1</sup> *Federal University of Itajubá*
- K-05 PVMirrors: Hybrid PV/CSP Collector Optimization  
**Kate Fisher, Arizona State University**

## Wednesday

- K-06** Error Impact in Parabolic Profile Computation  
**Daniela Fontani**<sup>1</sup>, Paola Sansoni<sup>1</sup>, Franco Francini<sup>1</sup>, Maurizio DeLucia<sup>2</sup>, Matteo Messeri<sup>2</sup>, Giacomo Pierucci<sup>2</sup>, Gianluca Marotta<sup>1</sup>, David Jafrancesco<sup>1</sup>  
<sup>1</sup> CNR INO; <sup>2</sup> University of Florence
- K-07** Demonstration of a 1 MWe Co-Generative CSP Plant Based on Direct Molten Salts in Linear Parabolic Concentrators Up to 550°C  
**Alberto Giaconia**<sup>1</sup>, Amr M.A. Amin<sup>2</sup>, Mohamed H. Ahmed<sup>2</sup>, Augusto Maccari<sup>3</sup>, Delphine Bourdon<sup>4</sup>, Christopher Sansom<sup>5</sup>, Mousatafa Moussa<sup>6</sup>, Raymond Branke<sup>7</sup>, Thomas Fluri<sup>7</sup>, Gaetano Iaquaniello<sup>8</sup>, Stefano Giansante<sup>8</sup>, Essam Elsayed<sup>9</sup>, Nabil Shenoda<sup>10</sup>  
<sup>1</sup> ENEA; <sup>2</sup> ASRT; <sup>3</sup> Archimede Solar Energy; <sup>4</sup> CEA; <sup>5</sup> Cranfield University; <sup>6</sup> Delft Environment; <sup>7</sup> Fraunhofer ISE; <sup>8</sup> Kinetics Technology S.p.A.; <sup>9</sup> NREA; <sup>10</sup> ORASCOM
- K-08** Study of the Reduction of Costs Within a Solar Field: Analysis and Approach for Creating a More Cost Effective Solar Field in Parabolic Trough Plants  
**Robert Laurie**<sup>1</sup>, Frank Dinter<sup>1</sup>  
<sup>1</sup> Stellenbosch University
- K-09** Test Loop for Inter-Connections of Parabolic Trough Collectors  
**Javier León**<sup>1</sup>, Javier Clavero<sup>1</sup>, Loreto Valenzuela<sup>1</sup>, Eduardo Zarza<sup>1</sup>, Christoph Hilgert<sup>2</sup>, Wolfgang Reinalter<sup>2</sup>  
<sup>1</sup> CIEMAT-PSA; <sup>2</sup> German Aerospace Center (DLR)
- K-10** A Medium Temperature Optimized Selective Absorber Coating for Solar Receivers: Durability Tests and Optical Performances  
**Augusto Maccari**<sup>1</sup>, Francesca Matino<sup>1</sup>, Alessio Stollo<sup>1</sup>, Antonio D'Angelo<sup>1</sup>, Salvatore Esposito<sup>2</sup>, Antonio Guglielmo<sup>2</sup>  
<sup>1</sup> Archimede Solar Energy; <sup>2</sup> ENEA
- K-11** Sensitivity Analysis on Cost and Performance of Receivers on Small PTC  
**Augusto Maccari**<sup>1</sup>, Francesca Matino<sup>1</sup>, Carlo Caranese<sup>1</sup>  
<sup>1</sup> Archimede Solar Energy
- K-12** State-Of-The-Art Mechanical Design Strategies for CSP Troughs  
**Patrick Marcotte**<sup>1</sup>, Henry Price<sup>1</sup>  
<sup>1</sup> Solar Dynamics LLC
- K-13** Indoor and Outdoor Methods for Evaluation of the Heat Loss of the Non-Evacuated HCE of the First Brazilian Demonstration PTC Installation  
**José Neto**<sup>1</sup>, Samira Domingos<sup>1</sup>, Eliézer Borges<sup>1</sup>  
<sup>1</sup> Centro Federal de Educação Tecnológica de Minas Gerais
- K-14** Novel Sensor for On-Line Monitoring of H<sub>2</sub> Generation and HTF Degradation: Validation in a Parabolic Trough Solar Thermal Power Plant  
**Iñigo Pagola**, CENER
- K-15** Retrofitting of Existing Parabolic Trough Collector Power Plants with Molten Salt Tower Systems  
**Carlos Rendón Díaz**<sup>1</sup>, Simon Dieckmann<sup>2</sup>, Mathias Weidle<sup>2</sup>, Jürgen Dersch<sup>2</sup>, Cristiano José Teixeira Boura<sup>1</sup>, Thomas Polklas<sup>3</sup>, Marcus Kuschel<sup>3</sup>, Ulf Herrmann<sup>1</sup>  
<sup>1</sup> Solar Institute Jülich; <sup>2</sup> German Aerospace Center (DLR); <sup>3</sup> MAN Diesel & Turbo SE
- K-16** Increase in Concentration Ratio of a Rooftop Parabolic Trough Using a Secondary Flat Reflector  
**David Rodriguez-Sanchez**<sup>1</sup>, Gary Rosengarten<sup>1</sup>  
<sup>1</sup> RMIT University
- K-17** Suitability of the Accuracy of a Tracking System with a CPC Solar Collector Acceptance Angle  
**Fabienne Sallaberry**<sup>1</sup>, Weiqiang Kong<sup>2</sup>, Simon Furbo<sup>2</sup>, Bengt Perers<sup>2</sup>, Hans-Erik Kiil<sup>3</sup>, Anders William Larsen<sup>3</sup>, René Bang Madsen<sup>3</sup>, Odei Goñi Jauregi<sup>4</sup>  
<sup>1</sup> CENER; <sup>2</sup> Technical University of Denmark; <sup>3</sup> POLYCSP ApS.; <sup>4</sup> UPNA (Public University of Navarra)
- K-18** Evaluation of the Tracking Accuracy of Parabolic-Trough Collectors in a Solar Heating Plant in Denmark  
**Fabienne Sallaberry**<sup>1</sup>, Zhiyong Tian<sup>2</sup>, Odei Goñi Jauregi<sup>3</sup>, Simon Furbo<sup>2</sup>, Bengt Perers<sup>2</sup>, Andreas Zourellis<sup>4</sup>, Jan Holst Rothmann<sup>4</sup>  
<sup>1</sup> CENER; <sup>2</sup> Technical University of Denmark; <sup>3</sup> UPNA (Public University of Navarra); <sup>4</sup> Aalborg CSP
- K-19** Heat Loss Tests on a Receiver Tube for a Small Size PTC and Validation of a Computational Model  
**Michele Salvestroni**  
Università degli Studi di Firenze

- K-20** Model-Based Soiling Estimation in Parabolic Solar Concentrators  
**Daniel Sbarbaro**<sup>1</sup>, Ruben Peña<sup>1</sup>, Edward Fuentealba<sup>2</sup>  
<sup>1</sup> *University of Concepcion*; <sup>2</sup> *University of Antofagasta*
- K-21** Quantitative Vacuum Status Measurement of Parabolic Through Receivers by Infrared Radiometry  
**Eneko Setien Solas**<sup>1</sup>, Rafael López-Martín<sup>1</sup>, Loreto Valenzuela<sup>1</sup>  
<sup>1</sup> *CIEMAT-PSA*
- K-22** Analysis and Optimization of a Small Scale Solar Organic Rankine Cycle System for Power Generation  
**Umut Soysal**, *Bogazici University*
- K-23** Small Parabolic Trough Plant for Rural Producers in North-Eastern Brazil  
**Kimberly Tolentino De Oliveira**<sup>1</sup>, Gilles Maag<sup>1</sup>, Celso Eduardo Lins de Oliveira<sup>1</sup>  
<sup>1</sup> *University of São Paulo*
- L-01** Creating the Framework Conditions for CSP in Brazil  
**Samira Carmo**<sup>1</sup>, Dante Hollanda<sup>1</sup>  
<sup>1</sup> *Ministry of Science, Technology, Innovations and Communications of Brazil*
- L-02** SFERA2 EU Project: New Services Developed for the CSP Community  
**Emmanuel Guillot**, *PROMES-CNRS*
- L-03** Techno-Economic Assessment of Hybrid Parabolic Trough Collector Solar Thermal and Biomass Energy Plant  
**Varun Jyothiprakash**<sup>1</sup>, Vivek Vijay<sup>1</sup>  
<sup>1</sup> *Indian Institute of Technology*
- L-04** Assessing CSP Supply Chain Developing Potential in Brazil  
**Rodrigo Milani**<sup>1</sup>, Alexandre Szklo<sup>1</sup>  
<sup>1</sup> *Energy Planning Program - COPPE/UFRJ*
- L-05** Towards an Alignment of National Research Programmes and Funding for CST Technologies in Europe  
**João P. Cardoso**<sup>1</sup>, Teresa Marcelo<sup>1</sup>, Nicolas Jarraud<sup>2</sup>, Elena Dufour<sup>3</sup>, Costas N. Papanicolas<sup>2</sup>, João Farinha Mendes<sup>1</sup>, Julián Blanco-Gálvez<sup>4</sup>  
<sup>1</sup> *LNEG*; <sup>2</sup> *The Cyprus Institute*; <sup>3</sup> *European Solar Thermal Electricity Association*; <sup>4</sup> *CIEMAT-PSA*
- L-06** A Management Strategy for the Commercialization of Multi-Technology Renewable Energy Systems: The Case of Concentrating Solar Power Technologies in South Africa  
**Gregory Prentice**  
*Stellenbosch University*
- L-07** Incentives and Financial Conditions Effect Analysis on LCOE (Levelized Cost of Electricity) and Government Cost for Concentrated Solar Power (CSP) Projects in Chile  
**Yeliz Simsek**<sup>1</sup>, Carlos Mata-Torres<sup>1</sup>, Rodrigo Escobar<sup>1</sup>, Jose M. Cardemil<sup>2</sup>  
<sup>1</sup> *Pontificia Universidad Catolica de Chile*; <sup>2</sup> *University of Chile*
- M-01** Solar Energy for Combined Production of Electricity and Industrial Process Heat  
**Marcos Diego Albuquerque Costa Paes**<sup>1</sup>, André Felipe Vieira da Cunha<sup>1</sup>, Chigueru Tiba<sup>1</sup>  
<sup>1</sup> *Federal University of Pernambuco*
- M-02** Wind Flow Around Multiple Natural Draft Dry Cooling Towers  
**Tim Anderson**<sup>1</sup>, Mehrdad Khamooshi<sup>1</sup>, Roy Nates<sup>1</sup>  
<sup>1</sup> *Auckland University of Technology*
- M-03** Off-Design Performance and Operation Strategies of Hybrid Solar Gas Turbine  
**Omar Behar**<sup>1</sup>, Yann Volut<sup>1</sup>  
<sup>1</sup> *CNRS-PROMES*
- M-04** The Development of a Reciprocating Steam Engine for Use in Small Scale CSP Plants  
**Bradley Da Silva**, *Stellenbosch University*
- M-05** Concentrating Solar Power and the Energy-Water Nexus: Radiative Cooling  
**Ana Dyreson**<sup>1</sup>, Franklin Miller<sup>1</sup>  
<sup>1</sup> *University of Wisconsin - Madison*
- M-06** Techno-Economic Assessment of a Small Solar Driven Organic Rankine Cycle Unit for Remote Areas  
**Mercedes Ibarra**<sup>1</sup>, Antonio de Rovira<sup>2</sup>, Diego-César Alarcón-Padilla<sup>3</sup>  
<sup>1</sup> *Fraunhofer Chile Research*; <sup>2</sup> *UNED*; <sup>3</sup> *PSA-CIEMAT*

# Wednesday

M-07	<p>Simulations Showing How the SUNSPOT System Cycle Improves on Conventional Combined Cycle Technology</p> <p><b>Jan-Louis Janse van Vuuren<sup>1</sup></b>, Frank Dinter<sup>1</sup>, Theodore W. Von Backstrom<sup>1</sup></p> <p><sup>1</sup> Stellenbosch University</p>	N-03	<p>CSP Combined with Flat Solar Panels: A District Heating Case in Denmark</p> <p><b>Jes Donneborg<sup>1</sup></b>, Jelica Matoric<sup>1</sup></p> <p>Presented by Jens Taggart Pelle<sup>1</sup></p> <p><sup>1</sup> Aalborg CSP</p>
M-08	<p>Analysis of the Performance of a Supercritical CO<sub>2</sub> Recompression Brayton Cycle Including the Predesign of the Radial Turbomachinery</p> <p><b>Marta Muñoz Domínguez<sup>1</sup></b>, Antonio Rovira de Antonio<sup>1</sup>, Consuelo Sánchez Naranjo<sup>1</sup></p> <p><sup>1</sup> Universidad Nacional de Educación a Distancia (UNED)</p>	N-04	<p>Thermal Behavior and Heat-Flux Distribution in a Solar Rotary Kiln</p> <p><b>Alessandro Gallo<sup>1</sup></b>, Héctor González-Camarillo<sup>2</sup>, María Isabel Roldán<sup>3</sup>, Elisa Alonso<sup>1</sup>, Carlos Pérez-Rábago<sup>2</sup></p> <p><sup>1</sup> University of Antofagasta; <sup>2</sup> National Autonomous University of Mexico; <sup>3</sup> CIEMAT-PSA</p>
M-09	<p>Advanced Thermodynamic Cycles for Solar Thermal Power Plants Using Synthetic Oil or Molten Salt as Heat Transfer Fluid</p> <p><b>Antonio Rovira<sup>1</sup></b>, Consuelo Sánchez<sup>1</sup>, Marta Muñoz<sup>1</sup></p> <p><sup>1</sup> UNED</p>	N-05	<p>Performance of Solar Invictus 53S Direct Solar Steam Generation Pilot for Thermal Enhanced Oil Recovery in North Kuwait</p> <p><b>Umer Jamil<sup>1</sup></b>, Wajahat Ali<sup>1</sup></p> <p><sup>1</sup> ZED Solar Ltd.</p>
M-10	<p>Analysis of CSP Plants Applying sCO<sub>2</sub> Power Cycles and Particle-Based Thermal Energy Storage</p> <p><b>Peter Steiner<sup>1</sup></b>, Markus Haider<sup>1</sup>, Heimo Walter<sup>1</sup></p> <p><sup>1</sup> TU Wien</p>	O-01	<p>Design and Development of a New Test Bench for Simulating 25 Years' Cleanness Process on Mirror Surfaces Under Real Conditions</p> <p><b>Estibaliz Aranzabe</b>, IK4-TEKNIKER</p>
M-11	<p>Improving Plant Revenue of Concentrated Solar Power Plants with the Right Steam Generator System</p> <p><b>Jens Taggart Pelle</b>, Aalborg CSP</p>	O-02	<p>Accelerated Aging of Solar Mirrors: UV Irradiation of Mirrors' Back Side</p> <p><b>Coralie Avenel<sup>1</sup></b>, Olivier Raccurt<sup>1</sup>, Jean-Luc Gardette<sup>2</sup>, Sandrine Therias<sup>2</sup>, Angela Disdier<sup>1</sup></p> <p>Presented by Estelle Le Baron<sup>1</sup></p> <p><sup>1</sup> CEA; <sup>2</sup> Université Clermont Auvergne</p>
M-12	<p>Optimization of a Decoupled Combined Cycle Gas Turbine Integrated in a Modular Multi-Tower Solar Power Plant</p> <p><b>Benoit Valentin<sup>1</sup></b>, Frederic Siros<sup>1</sup></p> <p><sup>1</sup> EDF</p>	O-03	<p>Introduction of DLR QUARZ® Test Label Defining Scope Level and Significance Category of Independent Product Tests for CSP Key Components</p> <p><b>Christoph Happich<sup>1</sup></b>, Aránzazu Fernández García<sup>2</sup>, Eckhard Lüpfer<sup>1</sup>, Johannes Pernpeintner<sup>1</sup>, Björn Schiricke<sup>1</sup>, Florian Sutter<sup>1</sup></p> <p><sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> CIEMAT</p>
M-13	<p>Dynamic Modeling of 5 Mwe Supercritical CO<sub>2</sub> Recompression Brayton Cycle</p> <p><b>Zijiang Yang</b>, EDF</p>	O-04	<p>Towards Comparative Soiling Measurements for Tracked Collectors</p> <p><b>Anna Heimsath<sup>1</sup></b>, Alan Pino<sup>2</sup>, Fabian Wolferstetter<sup>3</sup>, Aránzazu Fernández-García<sup>4</sup>, Peter Nitz<sup>1</sup></p> <p><sup>1</sup> Fraunhofer ISE; <sup>2</sup> Fraunhofer CSET; <sup>3</sup> German Aerospace Center (DLR); <sup>4</sup> CIEMAT</p>
N-01	<p>Aluminium Miting with Indirect Solar Heating</p> <p><b>Lars Amsbeck<sup>1</sup></b>, Ralf Uhlig<sup>1</sup></p> <p><sup>1</sup> German Aerospace Center (DLR)</p>	O-05	<p>Exposure Conditions Effect on Soiling of Solar Glass Mirrors</p> <p><b>Mounia Karim<sup>1</sup></b>, Olivier Raccurt<sup>2</sup>, Sanae Naamane<sup>1</sup>, Christine DELORD<sup>2</sup></p> <p><sup>1</sup> MASCI; <sup>2</sup> CEA</p>
N-02	<p>Pre-Heating Boiler Feedwater for Expanded Cork Agglomerate Production Using a Parabolic Trough System</p> <p><b>António Castro<sup>1</sup></b>, João P. Cardoso<sup>1</sup>, Luís Filipe Mendes<sup>2</sup>, Pedro Azevedo<sup>1</sup>, João Farinha Mendes<sup>1</sup></p> <p><sup>1</sup> LNEG; <sup>2</sup> Universidade de Lisboa</p>		

- O-06** Durability and Characterization Platform for Solar Thermal Energy (STE) Component and Systems Under Desert and Sea-Side Morocco Climate  
**Estelle Le Baron, CEA**
- O-07** Structural Failure Analysis and Thermal Stress Simulation of Parabolic Trough Receivers  
**Dongqiang Lei<sup>1</sup>, Zhifeng Wang<sup>1</sup>, Yucong Ren<sup>1</sup>**  
<sup>1</sup> *Chinese Academy of Sciences*
- O-08** Implementing an Integrated Qualification Procedure for Structural, Optical and Thermal Characterization of Parabolic Through Prototypes  
**Manuel I. Peña-Cruz<sup>1</sup>, Gustavo A. Acevedo<sup>2</sup>, Iván Salgado-Tránsito<sup>1</sup>, Carlos A. Pineda-Arellano<sup>1</sup>**  
<sup>1</sup> *CONACYT*; <sup>2</sup> *Centro de Investigaciones en Optica, A.C. Unidad Aguascalientes*
- O-09** Characterization of Different Sands from MENA: A Study to Understand Soiling Effects on CSP Mirrors  
**Olivier Raccurt<sup>1</sup>, Anne-Claire Pescheux<sup>1</sup>**  
Presented by Estelle Le Baron<sup>1</sup>  
<sup>1</sup> *CEA*
- P-01** FEMRAY: Powerful Raytracing Tool for Detailed Receiver Analysis  
**Reiner Buck<sup>1</sup>, Hannes Stadler<sup>1</sup>, Ralf Uhlig<sup>1</sup>, Birgit Gobereit<sup>1</sup>**  
<sup>1</sup> *German Aerospace Center (DLR)*
- P-02** Scaling Campo to Commercial Solar Tower Plants  
**Francisco J. Collado<sup>1</sup>, Jesus Guallar<sup>1</sup>**  
<sup>1</sup> *Universidad de Zaragoza*
- P-03** Training Simulator for Molten Salt Parabolic Trough Test Plant  
**Jan Fabian Feldhoff<sup>1</sup>, Timo Hirsch<sup>1</sup>, Tobias Hirsch<sup>1</sup>**  
<sup>1</sup> *German Aerospace Center (DLR)*
- P-04** Dynamic Analysis of Extraordinary Operations of MS Central Receiver  
**Matteo Losito<sup>1</sup>, Andrea Maggi<sup>1</sup>, Alessandro Sani<sup>1</sup>, Robert Fleisch<sup>2</sup>, Peter Schwarzbözl<sup>2</sup>**  
<sup>1</sup> *TransientGroup*; <sup>2</sup> *German Aerospace Center (DLR)*
- P-05** Deterministic Thermo Hydraulic Model for Preliminary Sizing of Solar Fields Composed by Line-Focusing Concentrating Collectors  
**José Neto, Centro Federal de Educação Tecnológica de Minas Gerais**
- P-06** Sensitivity Analysis of the Absorber Optical Properties on the Annual Thermal Product of CSP Plant  
**Olivier Raccurt<sup>1</sup>, Christian Tantolin<sup>1</sup>, Pierre-Jean Marchais<sup>2</sup>, Francis Bourguignon<sup>2</sup>**  
Presented by Estelle Le Baron<sup>1</sup>  
<sup>1</sup> *CEA*; <sup>2</sup> *Salzgitter Mannesmann Precision*
- P-07** Round Robin Test for the Comparison of Emittance Measurement Apparatuses  
**Olivier Raccurt<sup>1</sup>, Philémon Giraud<sup>1</sup>, Javier Barriga<sup>2</sup>, Patrick Echegut<sup>3</sup>, Domingos De Sousa Meneses<sup>3</sup>, Claudio Capianni<sup>4</sup>, Diletta Sciti<sup>4</sup>, Audrey Soum-Glaude<sup>5</sup>, Christophe Escape<sup>5</sup>, Ivan Jerman<sup>6</sup>, Rikke Larsen<sup>7</sup>, Jeppe Nørgaard<sup>7</sup>, Gabriel Alejandro Lopez<sup>8</sup>, Telmo Echaniz<sup>8</sup>, Manuel Tello<sup>8</sup>, Francesca Matino<sup>9</sup>, Augusto Maccari<sup>9</sup>, Luca Mercatelli<sup>10</sup>, Elisa Sani<sup>10</sup>**  
Presented by Estelle Le Baron<sup>1</sup>  
<sup>1</sup> *CEA*; <sup>2</sup> *IK4-TEKNIKER*; <sup>3</sup> *CNRS-CEMHTI*; <sup>4</sup> *CNR ISTECH*; <sup>5</sup> *PROMES-CNRS*; <sup>6</sup> *National Institute of Chemistry*; <sup>7</sup> *Polyteknik AS*; <sup>8</sup> *Applied Physics II, University of the Basque Country*; <sup>9</sup> *Archimede Solar Energy*; <sup>10</sup> *CNR INO*
- P-08** Optimization of an Integrated Solar Combined Cycle  
**Miguel A. Reyes-Belmonte<sup>1</sup>, Francisco Javier Pino<sup>2</sup>, Manuel Romero<sup>1</sup>, Christian Suarez<sup>3</sup>, José Julio Guerra Macho<sup>2</sup>**  
<sup>1</sup> *IMDEA Energy*; <sup>2</sup> *University of Sevilla*; <sup>3</sup> *AICIA*
- P-09** 24h Dynamic Simulation of a CSP Solar Tower Demo Plant  
**Alessandro Sani<sup>1</sup>, Andrea Maggi<sup>1</sup>, Matteo Losito<sup>1</sup>**  
<sup>1</sup> *TransientGroup*
- Q-01** Ultra Lite Solar Concentrator Significantly Reduces Cost of Solar Collection  
**James Beck, Ultra Lite Solar Inc.**
- Q-02** Hybrid-Solution for Solar Process Heat Supply in the Mining and Lithium Industry  
**Andreas Burger<sup>1</sup>, Michael Berger<sup>1</sup>, Jürgen Peterseim<sup>2</sup>, Christian Zahler<sup>1</sup>**  
<sup>1</sup> *Industrial Solar GmbH*; <sup>2</sup> *Eckrohrkessel GmbH*

## Wednesday

**Q-03** Integration of Solar Thermal Technologies in the Chilean Metallurgical Industry to Improve its Competitive Advantages

**Gustavo Caceres**<sup>1</sup>, Andrea Durán<sup>1</sup>, Maria Teresa Cerda<sup>1</sup>

<sup>1</sup> *Universidad Adolfo Ibáñez*

**Q-04** Techno-Economic Analysis of a Central Receiver Power Plant with Different Levels of Storage Capacity and Hybridization

**Daniel Costa**<sup>1</sup>, *Jose Neto*<sup>1</sup>

<sup>1</sup> *CEFET-MG*

**Q-05** Heat Exchangers for CSP Systems with Gas Micro Turbines - Review and Simulations

**Pedro Henrique de Faria Guarnieri**<sup>1</sup>, Celso Eduardo Lins de Oliveira<sup>1</sup>, Gilles Maag<sup>1</sup>, Pedro Henrique Silva Bezerra<sup>1</sup>

<sup>1</sup> *University of São Paulo*

**Q-06** ORC-PLUS Project: an Innovative Middle-CSP Plant for Smart Grids

**Walter Gaggioli**<sup>1</sup>, Bernhard Seubert<sup>2</sup>, Thomas Fluri<sup>2</sup>, Martin Karl<sup>2</sup>, Theda Zoschke<sup>2</sup>, Abdessamad Faik<sup>3</sup>, Michele Scandellari<sup>1</sup>, Alessandro Prati<sup>4</sup>

<sup>1</sup> *ENEA*; <sup>2</sup> *Fraunhofer ISE*; <sup>3</sup> *CIC EnergiGUNE*;

<sup>4</sup> *ENERRAY SPA*

**Q-07** Hot Air Preheating: Concept and Validation At the PROTEAS Facility

**Marios C Georgiou**<sup>1</sup>, Costas N Papanicolas<sup>1</sup>, Aristides M. Bonanos<sup>1</sup>, Konstantinos Stokos<sup>1</sup>, Constantinos Roussos<sup>1</sup>

<sup>1</sup> *The Cyprus Institute*

**Q-08** An Organic Rankine Cycle as Technology for Smaller Concentrated Solar Powered Systems

**Louis Karsten**<sup>1</sup>, Frank Dinter<sup>1</sup>, Jaap Hoffmann<sup>1</sup>

<sup>1</sup> *Stellenbosch University*

**Q-09** Solar Thermal Treatment of Phosphate Ore, a Key Target of the SOLPART EU Project

**Hamid Mazouz**<sup>1</sup>, Mohammed Nohair<sup>1</sup>, Gilles Flamant<sup>2</sup>, Daniel Gauthier<sup>2</sup>, Hadrien Benoit<sup>2</sup>, Jan Baeyens<sup>3</sup>

<sup>1</sup> *Office Chérifien des Phosphates*; <sup>2</sup> *PROMES-CNRS*; <sup>3</sup> *European Powder and Process Technology*

**Q-10** Cost Evolution of Components and Services in the STE Sector: a Two-Factor Learning Curve

**Jorge Servert**<sup>1</sup>, Eduardo Cerrajero<sup>2</sup>, Diego Lopez<sup>1</sup>, Alfonso Rodríguez<sup>1</sup>

<sup>1</sup> *Solar Technology Advisors S.L. (STA)*;

<sup>2</sup> *Investigacion, Desarrollo e Innovacion energetica S.L.*

**07:30 pm - 11:30 pm**

**Conference Dinner**

The Conference Dinner is sponsored by SQM. **Thank You!**



## Thursday, September 28, 2017

### 08:30 am - 10:00 am **Plenary: Beyond Power Solar Fuels, Green Mining, Process Heat**

ROOM: GREAT ROOM 2+3  
 Chair: Markus Haider, University of Vienna

- 08:30 am Towards the Productive Transformation of Chile based on Solar and Mining Industries  
**Eduardo Bitran**, CORFO (Chilean Economic Development Agency)
- 08:50 am Desert Farming and District Heating with CSP  
**Jens Taggart Pelle**, Aalborg CSP
- 09:10 am Fostering Solar Heat for Industrial Processes (SHIP) in Spain  
**Diego Crespo**, Solar Concentra
- 09:30 am High-Temperature Solar Thermal Energy Recovery and Utilization System Development for Energy Carrier Productions  
**Yukitaka Kato**, Tokyo Institute of Technology

10:00 am - 10:30 am **Coffee Break**

### 10:30 am - 12:30 pm **Central Receiver Systems**

ROOM: GREAT ROOM 1  
 Chair: Reiner Buck, German Aerospace Center (DLR)

- 10:30 am Some Details About the Third Rejuvenation of the 1000 kWth Solar Furnace in Odeillo: Extreme Performance Heliostats  
**Emmanuel Guillot**, PROMES-CNRS
- 10:50 am Synlight - A New Facility for Large-Scale Testing in CSP and Solar Chemistry  
**Kai Wiegardt**<sup>1</sup>, Dmitrij Laaber<sup>1</sup>, Volkmar Dohmen<sup>1</sup>, Patrick Hilger<sup>2</sup>, Daniel Korber<sup>1</sup>, Karl-Heinz Funken<sup>1</sup>, Bernhard Hoffschmidt<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> Heliokon GmbH
- 11:10 am Numerical Investigation of a Novel Solar Receiver Combining Manifold, Micro-Pin-Fin, and Chessboard Nozzle-Jet Concept  
**Xing Ju**<sup>1</sup>, Chao Xu<sup>1</sup>, Xiaoze Du<sup>1</sup>, Zhirong Liao<sup>1</sup>, Yiting Zhou<sup>1</sup>, Feng Ye<sup>1</sup>, Ye Shi<sup>1</sup>, Hongjuan Hou<sup>1</sup>  
<sup>1</sup> North China Electric Power University
- 11:30 am Sensitivity Study on the Off-Ideal Design and Off-Design Operation of Tubular Solar Receivers  
**Jin-Soo Kim**<sup>1</sup>, Daniel Potter<sup>1</sup>, Yen Chean Soo Too<sup>1</sup>  
<sup>1</sup> CSIRO
- 11:50 am Optical Performance Comparison Between Heliostat Field Generation Algorithms  
**Iñigo Les**<sup>1</sup>, Amaia Mutuberria<sup>1</sup>, Peter Schöttl<sup>2</sup>, Peter Nitz<sup>2</sup>, Erminia Leonardi<sup>3</sup>, Lorenzo Pisani<sup>3</sup>  
<sup>1</sup> CENER; <sup>2</sup> Fraunhofer ISE; <sup>3</sup> CRS4
- 12:10 pm Stress Analysis of External Molten Salt Receiver  
**Ralf Uhlig**<sup>1</sup>, Cathy Frantz<sup>1</sup>, Andreas Fritsch<sup>1</sup>, Robert Flesch<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR)



**10:30 am -  
12:30 pm**

## **Emerging Concepts**

ROOM: GREAT ROOM 2

Chair: Massimo Falchetta, ENEA

10:30 am

Nanoparticle Based Concentrating Photovoltaic/Thermal Hybrid Collector

**John Dale**, *The University of Tulsa*

10:50 am

AMADEUS: Next Generation Materials and Solid State Devices for Ultra High Temperature Energy Storage and Conversion

**Alejandro Datas**<sup>1</sup>, Ana Belén Cristobal<sup>2</sup>, Carlos del Cañizo<sup>2</sup>, Elisa Antolín<sup>2</sup>, Michel Beaughon<sup>2</sup>, Nikolaos Nikolopoulos<sup>3</sup>, Aris Nikolopoulos<sup>3</sup>, Myrto Zeneli<sup>3</sup>, Natalia Sobczak<sup>4</sup>, Wojciech Polkowski<sup>4</sup>, Merete Tangstad<sup>5</sup>, Jafar Safarian<sup>5</sup>, Daniele Trucchi<sup>6</sup>, Alessandro Bellucci<sup>6</sup>, Marco Girolami<sup>6</sup>, Roman Marx<sup>7</sup>, Dominik Bestenlehner<sup>7</sup>, Stephan Lang<sup>7</sup>, Nello Vitulano<sup>8</sup>, Gianfranco Sabbatella<sup>8</sup>, Antonio Martí<sup>2</sup>

<sup>1</sup> Instituto de Energía Solar - Universidad Politécnica de Madrid; <sup>2</sup> Technical University of Madrid;

<sup>3</sup> CETH; <sup>4</sup> Foundry Research Institute; <sup>5</sup> Norwegian University of Science and Technology;

<sup>6</sup> Istituto di Struttura della Materia (ISM-CNR); <sup>7</sup> University of Stuttgart; <sup>8</sup> Ionvac Process

11:10 am

Design and Test of a Concentrated Solar Powered Fluidized Bed Reactor for Ilmenite Reduction

**Thorsten Denk**<sup>1</sup>, Aurelio González-Pardo<sup>1</sup>, Inmaculada Cañadas<sup>1</sup>, Alfonso Vidal<sup>1</sup>

<sup>1</sup> PSA-CIEMAT

11:30 am

Design of a Solar Linear Particle Receiver Placed At the Ground Level

**Jesús Gómez-Hernández**<sup>1</sup>, Pedro Ángel González-Gómez<sup>1</sup>, Tao Ni-Song<sup>2</sup>, Javier Villa Briongos<sup>1</sup>, Domingo Santana<sup>1</sup>

<sup>1</sup> University Carlos III of Madrid; <sup>2</sup> Beijing Shouhang IHW Resources

11:50 am

Hybrid CSP/PV Receivers: Converting Optical Spillage to Electricity

**Clifford Ho**<sup>1</sup>, Clay McPheeters<sup>2</sup>, Paul Sharps<sup>2</sup>

<sup>1</sup> Sandia National Laboratories; <sup>2</sup> SolAero Technologies Corporation

12:10 pm

Testing of a Secondary Concentrator Integrated with a Beam-Down Tower System under Non-liquid Cooling Strategies

**Radia Lahlou**<sup>1</sup>, Peter R. Armstrong<sup>1</sup>, Nicolas Calvet<sup>1</sup>, Alexander H. Slocum<sup>2</sup>, Tariq Shamim<sup>1</sup>

<sup>1</sup> Masdar Institute; <sup>2</sup> Massachusetts Institute of Technology

**10:30 am -  
12:30 pm**

## **Parabolic Trough Systems**

ROOM: GREAT ROOM 3

Chair: Charles Kutscher, NREL

10:30 am

Economics of Solar Cogeneration

**Eyas Al Zadjali**<sup>1</sup>, Samah Al Saleh<sup>1</sup>, Marwan Chaar<sup>1</sup>, Siddiqa Al Lawati<sup>1</sup>

Presented by Justin Raade<sup>1</sup>

<sup>1</sup> GlassPoint Solar

10:50 am

Modeling and Simulating Diffused Aeration for Hydrogen Removal from Expansion Tanks of Parabolic Trough Solar Thermal Power Plants

**Koenraad Beckers**<sup>1</sup>, Greg Glatzmaier<sup>1</sup>

<sup>1</sup> NREL

11:10 am	Deploying Enclosed Trough for Thermal EOR at Commercial Scale <b>Ben Bierman</b> , <i>GlassPoint Solar</i>
11:30 am	Heat Flux and Temperature Measurements on Glass Envelope and Bellows of Parabolic Trough Receivers <b>Simon Caron</b> <sup>1</sup> , Marc Röger <sup>1</sup> , Johannes Pernpeintner <sup>1</sup> <sup>1</sup> <i>German Aerospace Center (DLR)</i>
11:50 am	Design of a Molten Salt Parabolic Trough Power Plant with Thermal Energy Storage and a Novel Freezing Protection <b>Frank Dinter</b> <sup>1</sup> , Schirin Tolksdorf <sup>1</sup> <sup>1</sup> <i>Stellenbosch University</i>
12:10 pm	Heat Losses Model for Standardized Testing of Receiver Tubes for Parabolic Troughs <b>Fabienne Sallaberry</b> <sup>1</sup> , Loreto Valenzuela Gutiérrez <sup>2</sup> , Rafael López-Martín <sup>2</sup> , Alberto García de Jalón <sup>1</sup> , David Perez <sup>1</sup> <sup>1</sup> <i>CENER</i> ; <sup>2</sup> <i>CIEMAT</i>

## 10:30 am - 12:30 pm Process Heat

ROOM: STUDIO 4 & 5  
Chair: Markus Haider, TU Wien

10:30 am	Effect of Meteorological Data Resolution on the Yield Estimation for a Dish Thermal Solar Park <b>Wajahat Ali</b> <sup>1</sup> , Umer Jamil <sup>1</sup> <sup>1</sup> <i>ZED Solar Ltd.</i>
10:50 am	Techno-Economical Evaluation of Parabolic Trough Collectors Systems for Steam Processes in the Chilean Industry <b>Felipe Cortes</b> <sup>1</sup> , Mercedes Ibarra <sup>1</sup> , Francisco Moser <sup>2</sup> , Ivan Muñoz <sup>1</sup> , Alicia Crespo <sup>1</sup> , Clare Murray <sup>1</sup> <sup>1</sup> <i>Fraunhofer Chile Research</i> ; <sup>2</sup> <i>Technische Universität Berlin</i>
11:10 am	Solar Live Steam Generation for South African Sugar Mills <b>Willem Krog</b> <sup>1</sup> , Stefan Hess <sup>2</sup> , Jaap Hoffmann <sup>1</sup> , Frank Dinter <sup>1</sup> <sup>1</sup> <i>Stellenbosch University</i> ; <sup>2</sup> <i>Karlsruhe Institute of Technology</i>
11:30 am	Volume Changes in DSG-Solarfield and Steam Drum Due to Changes in Evaporation Conditions from Experience <b>Lisa Willwerth</b> <sup>1</sup> , Michael Berger <sup>2</sup> , Marwan Mokhtar <sup>2</sup> , Dirk Krüger <sup>1</sup> , Christian Zahler <sup>2</sup> <sup>1</sup> <i>German Aerospace Center (DLR)</i> ; <sup>2</sup> <i>Industrial Solar GmbH</i>
11:50 am	Evaluation of Solar Process Heat Systems in Switzerland <b>Mercedes Rittmann-Frank</b> <sup>1</sup> , Andreas Häberle <sup>1</sup> , Jana Möllenkamp <sup>1</sup> , Marco Caflisch <sup>1</sup> <sup>1</sup> <i>SPF Institute for Solar Technology</i>
12:10 am	Heating, Cooling and Cogeneration with a an Advanced Cycle by Flowing the Working Fluid in a Medium Temperature Solar Collector <b>Antonio Lecuona</b> <sup>1</sup> , Antonio Famiglietti <sup>1</sup> , José Nogueira <sup>1</sup> , Hugo Cachafeiro <sup>2</sup> Presented by Hugo Cachafeiro <sup>2</sup> <sup>1</sup> <i>University Carlos III of Madrid</i> ; <sup>2</sup> <i>ÅF Aries</i>

12:30 pm - 02:00 pm Lunch Break

# Thursday

## 02:00 pm - 04:00 pm Central Receiver Systems

ROOM: GREAT ROOM 1

Chair: Abdulaziz Alobaidli, Shams Power Company

- 02:00 pm 3rd Generation Rim Drive Heliostat with Monolithic Sandwich Panel  
**Phillip-Jonathan Liedke**<sup>1</sup>, Andreas Pfahl<sup>1</sup>, Juan Felipe Vásquez-Arango<sup>1</sup>, Lars Muschalski<sup>1</sup>, Erwin Hölle<sup>2</sup>  
Presented by Fabian Gross<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> SOLTEC
- 02:20 pm Performance Prediction of the SCRAP Pressurized Air Receiver  
**Matti Lubkoll**<sup>1</sup>, Thomas M Harms<sup>1</sup>, Theodor W. von Backström<sup>1</sup>  
<sup>1</sup> Stellenbosch University
- 02:40 pm Evaluation of Aim Point Optimization Methods  
**Daniel Maldonado**<sup>1</sup>, Robert Flesch<sup>1</sup>, Andreas Reinholz<sup>1</sup>, Peter Schwarzbözl<sup>1</sup>  
<sup>1</sup> Institute of Solar Research
- 03:00 pm Annualized Thermal Performance of Intermediate-Scale Falling Particle Receivers  
**Brantley Mills**<sup>1</sup>, Clifford Ho<sup>1</sup>  
<sup>1</sup> Sandia National Laboratories
- 03:20 pm Development of an Open Volumetric Air Receiver for a Rock-Bed Thermal Energy Storage System  
**JC Nel**<sup>1</sup>, Frank Dinter<sup>1</sup>, Theodor W. von Backström<sup>1</sup>  
<sup>1</sup> Stellenbosch University
- 03:40 pm Point-Focus Multi-Receiver Fresnel Loop – Exploring Ways to Increase the Optical Efficiency of Solar Tower Systems  
**Clotilde Corsi**  
Australian National University

## 02:00 pm - 04:00 pm Thermal Energy Storage

ROOM: GREAT ROOM 2

Chair: Ángel Fernández, Universidad de Antofagasta

- 02:00 pm Parametric Analysis and Optimization of a Combined Latent-Sensible Packed Bed Energy Storage System  
**Ana Belén Hernández Sánchez**<sup>1</sup>, Iñigo Ortega-Fernández<sup>1</sup>, Irantzu Uriz<sup>1</sup>, Asier Ortuondo<sup>1</sup>, Iñaki Loroño<sup>1</sup>, Javier Rodríguez-Aseguinolaza<sup>1</sup>  
<sup>1</sup> CIC EnergiGUNE
- 02:20 pm Phase Change Material Thermal Storage with Constant Heat Discharge  
**Christoph Lang**<sup>1</sup>, Colmar Wocke<sup>1</sup>  
<sup>1</sup> Dow Chemical
- 02:40 pm Commissioning and Experimental Testing of a Cost Effective Prototype Rock Bed Thermal Energy Storage  
**Hendrik Frederik Laubscher**<sup>1</sup>, Theodor Willem Von Backström<sup>1</sup>, Frank Dinter<sup>1</sup>  
<sup>1</sup> Stellenbosch University

03:00 pm Demonstration of a Thermosyphon Thermal Valve for Controlled Extraction of Stored Solar Thermal Energy

**Christopher Oshman**<sup>1</sup>, Jonatahn Rea<sup>1</sup>, Corey Hardin<sup>2</sup>, Abhishek Singh<sup>1</sup>, Jeff Alleman<sup>3</sup>, Michele Olsen<sup>3</sup>, Greg Glatzmaier<sup>3</sup>, Phil Parilla<sup>3</sup>, Nathan Siegel<sup>4</sup>, David Ginley<sup>3</sup>, Eric Toberer<sup>1</sup>

<sup>1</sup> Colorado School of Mines; <sup>2</sup> SLAC National Accelerator Laboratory; <sup>3</sup> NREL; <sup>4</sup> Bucknell University

03:20 pm Operational Experience in an Experimental Molten Salt Thermal Storage. The MOSA Facility

**Margarita M. Rodriguez-Garcia**<sup>1</sup>, Esther Rojas<sup>1</sup>

<sup>1</sup> CIEMAT-PSA

## 02:00 pm - Parabolic Trough Systems

04:00 pm

ROOM: GREAT ROOM 3

Chair: Werner Platzer, Fraunhofer CSET

02:00 pm Hydrogen Sensor for Parabolic Trough Expansion Tanks

**Greg Glatzmaier**

NREL

02:20 pm Second Generation Linear Focus Sun Simulator to Test Optical Performance of Parabolic Trough Receivers - OptiRec

**Christoph Happich**<sup>1</sup>, Nicole Janotte<sup>1</sup>, Johannes Pernpeintner<sup>1</sup>, Björn Schiricke<sup>1</sup>, Eckhard Lüpfer<sup>1</sup>

<sup>1</sup> German Aerospace Center (DLR)

02:40 pm Parabolic Trough Powerplants Nearing PPA End: Retrofit or Replace?

**Hannah O'Hern**<sup>1</sup>, Matthew Orosz<sup>1</sup>

<sup>1</sup> The University of Tulsa

03:00 pm Outcomes and Features of the Inspection of Receiver Tubes (ITR) System for Improved O&M in Parabolic Trough Plants

**Xabier Olano**<sup>1</sup>, Alberto García de Jalón<sup>1</sup>, David Pérez<sup>1</sup>, Javier García Barberena<sup>1</sup>, Javier López<sup>1</sup>, Martín Gastón<sup>1</sup>

<sup>1</sup> CENER

## 02:00 pm - Reliability and Service Life Prediction of Components

04:00 pm

ROOM: STUDIO 4 & 5

Chair: Keith Lovegrove, ITP Renewables

02:00 pm FREDA - An Automated Field Reflectance and Degradation Assessment System for Central Receiver Systems

**Gregor Bern**<sup>1</sup>, Thomas Schmidt<sup>1</sup>, Nicola Celentano<sup>2</sup>, Anna Heimsath<sup>1</sup>

<sup>1</sup> Fraunhofer ISE; <sup>2</sup> University of Naples Federico II

02:20 pm Accelerated Ageing of High Solar Absorptance Receiver Coatings: Experimental Results for T91 and VM12 Steel Substrates

**Simon Caron**<sup>1</sup>, Florian Sutter<sup>1</sup>, Niels Algner<sup>1</sup>, Marcos Esteller<sup>1</sup>, Yaniv Binyamin<sup>2</sup>, Mubeen Baidossi<sup>2</sup>, Avraham Kenigsberg<sup>2</sup>, Alina Agüero<sup>3</sup>, Diana Fähsing<sup>4</sup>, Christina Hildebrandt<sup>5</sup>

<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> BrightSource Energy; <sup>3</sup> Instituto Nacional de Technica Aeroespacial (INTA); <sup>4</sup> DECHEMA Forschungsinstitut; <sup>5</sup> Fraunhofer ISE

# Thursday

02:40 pm	<p>Accelerated Aging Tests of Solar Reflectors According to New AENOR Standard – Results of a Round Robin Test</p> <p><b>Aránzazu Fernández-García</b><sup>1</sup>, Lucía Martínez-Arcos<sup>1</sup>, Florian Sutter<sup>2</sup>, Johannes Wette<sup>2</sup>, Fabienne Sallaberry<sup>3</sup>, Raquel Erice<sup>3</sup>, Teresa Diamantino<sup>4</sup>, Maria João Carvalho<sup>4</sup>, Olivier Raccurt<sup>5</sup>, Anne-Claire Pescheux<sup>5</sup>, Gorka Imbuluzqueta<sup>6</sup>, Maider Machado<sup>6</sup></p> <p><sup>1</sup> CIEMAT-PSA; <sup>2</sup> German Aerospace Center (DLR); <sup>3</sup> CENER; <sup>4</sup> LNEG; <sup>5</sup> CEA; <sup>6</sup> TECNALIA</p>
03:00 pm	<p>Degradation of Solar Mirrors Paints At Marine Outdoor Site</p> <p><b>Mohamed Guerguer</b><sup>1</sup>, Olivier Raccurt<sup>2</sup>, Mounia Karim<sup>1</sup>, Zineb Edfouf<sup>3</sup></p> <p><sup>1</sup> MASCIR; <sup>2</sup> CEA; <sup>3</sup> Mohamed Vth University of Rabat, Faculty of Sciences</p>
03:20 pm	<p>Study and Comparison of Naturally-Aged and As-Received Silvered-Glass Reflectors</p> <p><b>Radia Lahlou</b><sup>1</sup>, Kholoud Al Naimi<sup>1</sup>, Hajer Al Yammahi<sup>1</sup>, Johannes Wette<sup>2</sup>, Florian Sutter<sup>2</sup>, Aránzazu Fernández-García<sup>3</sup>, Peter R. Armstrong<sup>1</sup>, Nicolas Calvet<sup>1</sup>, Tariq Shamim<sup>1</sup></p> <p><sup>1</sup> Masdar Institute; <sup>2</sup> German Aerospace Center (DLR); <sup>3</sup> CIEMAT</p>
03:40 pm	<p>Spatial Distribution of Microstructure of Solar Receivers Exposed to High Solar Fluxes</p> <p><b>Eneko Setien Solas</b><sup>1</sup>, Jesús Fernández-Reche<sup>1</sup>, María Jesús Ariza-Camacho<sup>2</sup>, Mónica Álvarez-de-Lara<sup>1</sup></p> <p><sup>1</sup> CIEMAT-PSA; <sup>2</sup> University of Almería</p>

04:00 pm -  
04 :30 pm

**Coffee Break**

## 04:30 pm - 06:30 pm

### Central Receiver Systems

ROOM: GREAT ROOM 1  
Chair: Seo Taebeom, Inha University

04:30 pm	<p>Identification of Required Cost Reductions for CSP to Retain its Competitive Advantage as Most Economically Viable Solar-Dispatchable Technology</p> <p><b>Albert Payaro</b><sup>1</sup>, Ankit Anurag Naik<sup>1</sup>, Rafael Guedez<sup>1</sup>, Björn Laumert<sup>1</sup></p> <p><sup>1</sup> KTH Royal Institute of Technology</p>
04:50 pm	<p>Reduced to Minimum Cost: Lay-Down Heliostat with Monolithic Mirror-Panel and Closed Loop Control</p> <p><b>Andreas Pfahl</b><sup>1</sup>, Phillip Liedke<sup>1</sup>, Johannes Hertel<sup>1</sup>, Jens Rheinländer<sup>1</sup>, Siddhant Mehta<sup>1</sup>, Juan Felipe Vásquez-Arango<sup>1</sup>, Stefano Giuliano<sup>1</sup>, Reiner Buck<sup>1</sup></p> <p>Presented by Fabian Gross<sup>1</sup></p> <p><sup>1</sup> German Aerospace Center (DLR)</p>
05:10 pm	<p>Dispatchable Solar Power Plant</p> <p><b>Hank Price</b><sup>1</sup>, David Kearney<sup>2</sup>, Frederick Redell<sup>3</sup>, Robert Charles<sup>4</sup>, Frederick Morse<sup>5</sup></p> <p><sup>1</sup> Solar Dynamics LLC; <sup>2</sup> Kearney &amp; Associates; <sup>3</sup> BlüNebü LLC; <sup>4</sup> Sargent &amp; Lundy LLC; <sup>5</sup> Morse Associates, Inc.</p>
05:30 pm	<p>Techno-Economic Optimization of Molten Salt Solar Tower Plants</p> <p><b>Michael Puppe</b>, German Aerospace Center (DLR)</p>
05:50 pm	<p>Non-Immersion Ultrasonic Cleaning for Heliostats</p> <p><b>Jon Ander Sarasua</b><sup>1</sup>, Alejandro Sanda<sup>1</sup>, Cristobal Villasante<sup>1</sup>, Estibaliz Aranzabe<sup>1</sup></p> <p>Presented by Estibaliz Aranzabe<sup>1</sup></p> <p><sup>1</sup> IK4-TEKNIKER</p>

## 04:30 pm - Thermal Energy Storage

06:30 pm

ROOM: GREAT ROOM 2

Chair: Esther Rojas, CIEMAT

04:30 pm Experimental Demonstration of a Latent Heat Storage System for Dispatchable Electricity

**Jonathan Rea**<sup>1</sup>, Christopher Oshman<sup>1</sup>, Corey Hardin<sup>2</sup>, Abhishek Singh<sup>1</sup>, Jeff Alleman<sup>3</sup>, Greg Glatzmaier<sup>3</sup>, Philip Parilla<sup>3</sup>, Michele Olsen<sup>3</sup>, Eric Toberer<sup>1</sup>, Nathan Siegel<sup>4</sup>, Jeff Sharp<sup>5</sup>, David Ginley<sup>3</sup>

<sup>1</sup> Colorado School of Mines; <sup>2</sup> SLAC National Accelerator Laboratory; <sup>3</sup> NREL; <sup>4</sup> Bucknell University; <sup>5</sup> Marlow Industries, Inc

04:50 pm Thermal Energy Storage with Integrated Heat Exchangers Using Stratified Molten Salt System for 1 MWe CSP

**Valeria Russo**<sup>1</sup>, Domenico Mazzei<sup>1</sup>, Raffaele Liberatore<sup>1</sup>

<sup>1</sup> ENEA

05:10 pm Numerical Analysis of Granular Bed Behaviour in Thermocline Storage Tank and Bed/Wall Interactions

**Nahia Sassine**<sup>1</sup>, Arnaud Bruch<sup>1</sup>, Barthelemy Harthong<sup>2</sup>, Frederic-Victor Donze<sup>2</sup>

<sup>1</sup> CEA; <sup>2</sup> 3SR

05:30 pm Experimental Investigations on a 280 kWth Fluidized Bed Heat Exchanger

**Peter Steiner**<sup>1</sup>, Karl Schwaiger<sup>1</sup>, Markus Haider<sup>1</sup>, Heimo Walter<sup>1</sup>, Lyuben Krassini<sup>1</sup>, Josef Gatterer<sup>1</sup>

<sup>1</sup> TU Wien

05:50 pm Numerical Analysis of the Packed Bed TES System Integrated into the First Parabolic Trough CSP Pilot-plant Using Air as Heat Transfer Fluid

**Simone A. Zavattoni**<sup>1</sup>, Giw Zanganeh<sup>2</sup>, Andrea Pedretti<sup>3</sup>

<sup>1</sup> SUPSI; <sup>2</sup> ALACAES; <sup>3</sup> pquadrum engineering SA

## 04:30 pm - Parabolic Trough Systems

06:30 pm

ROOM: GREAT ROOM 3

Chair: Loreto Valenzuela, Plataforma Solar de Almeria

04:30 pm Airborne Characterization of the Complete Andasol 3 Solar Field

**Christoph Prah**<sup>1</sup>, Laura Porcel Sendrós<sup>2</sup>, Marc Roeger<sup>1</sup>, Niels Algner<sup>1</sup>

<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> Marquesado Solar

04:50 pm Identification of Optimum Molten Salts for Use as Heat Transfer Fluids in Parabolic Trough Plants. A Techno-Economic Comparative Optimization

**Christoph Adrian Pan**<sup>1</sup>, Davide Ferruzza<sup>2</sup>, Rafael Guédez<sup>3</sup>, Frank Dinter<sup>1</sup>, Björn Laumert<sup>3</sup>, Fredrik Haglind<sup>2</sup>

<sup>1</sup> Stellenbosch University; <sup>2</sup> Technical University of Denmark; <sup>3</sup> KTH Royal Institute of Technology

05:10 pm The Design of Dust Barriers to Reduce Collector Mirror Soiling in CSP Plants

**Christopher Sansom**<sup>1</sup>, Peter King<sup>1</sup>, Aránzazu Fernández-García<sup>2</sup>, Heather Almond<sup>1</sup>, Talib Kayani<sup>1</sup>, Houssame Boujjat<sup>3</sup>

<sup>1</sup> Cranfield University; <sup>2</sup> CIEMAT-PSA; <sup>3</sup> CEA

05:30 pm Achievement of the \$100/m<sup>2</sup> Parabolic Trough

**Nathan Schuknecht**<sup>1</sup>, Jennifer McDaniel<sup>1</sup>, Harrison Filas<sup>1</sup>

<sup>1</sup> SkyFuel

05:50 pm Dynamic Performance Evaluation of Line-Concentrating Steam Collectors

**Annie Zirkel-Hofer**, Fraunhofer ISE

# Thursday

## 04:30 pm - 06:30 pm Reliability and Service Life Prediction of Components

ROOM: STUDIO 4 & 5  
Chair: Peter Heller, German Aerospace Center (DLR)

- 04:30 pm Impact: A New Device for Thermo-Mechanical Investigation on Central Receiver Materials  
**Yasmine Lalau**<sup>1</sup>, Olivier Faugeroux<sup>1</sup>, Emmanuel Guillot<sup>1</sup>, Marc Huger<sup>2</sup>, Alain Proust<sup>3</sup>, Thierry Chotard<sup>2</sup>, Bernard Claudet<sup>1</sup>  
<sup>1</sup> CNRS-PROMES; <sup>2</sup> CNRS SPCTS; <sup>3</sup> MISTRAS Group SA
- 04:50 pm Compatibility of Structural Materials with Lead and Lead Bismuth Eutectic for CSP Applications  
**Marta Navas**<sup>1</sup>, Rebeca Hernández<sup>1</sup>  
<sup>1</sup> CIEMAT
- 05:10 pm Accelerated Ageing Test for Durability Study of Solar Absorber Coating on Metallic Substrate for Solar Thermal Energy (STE) Application  
**Olivier Raccurt**<sup>1</sup>, Angela Disdier<sup>1</sup>  
Presented by Estelle Le Baron<sup>1</sup>  
<sup>1</sup> CEA
- 05:30 pm Solar Aging of Receivers Made of Nickel Super Alloys  
**Eneko Setien Solas**<sup>1</sup>, Jesús Fernandez-Reche<sup>1</sup>, María Jesús Ariza-Camacho<sup>2</sup>, Mónica Alvarez de Lara<sup>1</sup>  
<sup>1</sup> CIEMAT-PSA; <sup>2</sup> University of Almería
- 05:50 pm Standardizing Accelerated Aging Testing Conditions for Silvered-Glass Reflectors  
**Johannes Wette**<sup>1</sup>, Florian Sutter<sup>1</sup>, Aránzazu Fernández-García<sup>2</sup>, Peter Armstrong<sup>3</sup>, Radia Lahlou<sup>3</sup>  
<sup>1</sup> German Aerospace Center (DLR); <sup>2</sup> CIEMAT; <sup>3</sup> Masdar Institute

## 06:30 pm - 07:30 pm Poster Session 3

The poster numbers are based on the topics:

R	Solar Fuels and Chemical Commodities	U	Thermochemical Energy Storage
S	Solar Resource Assessment	V	Water Desalination and Detoxification
T	Thermal Energy Storage		

- |      |   |      |   |
|------|---|------|---|
| R-01 | Fabrication of ZnO Nanoplates for Photocatalytic Degradation of Roxarsone<br><b>Katherine Acuña</b> <sup>1</sup> , Claudio Sandoval <sup>1</sup> , Eimmy Ramírez <sup>1</sup> , Suresh Ranganathan <sup>1</sup> , Jorge Yanez <sup>1</sup><br><sup>1</sup> University of Concepción | R-03 | Hydrogen Production by Water Splitting Via Modified Sulphur-Iodine Thermochemical Cycles<br><b>Alberto Giaconia</b> <sup>1</sup> , Salvatore Sau <sup>1</sup> , Mariarosaria Ferrara <sup>1</sup> , Natale Corsaro <sup>1</sup> , Claudio Tragambi <sup>2</sup> , Piero Salatino <sup>2</sup> , Roberto Solimene <sup>3</sup><br><sup>1</sup> ENEA; <sup>2</sup> University of Naples Federico II; <sup>3</sup> CNR |
| R-02 | Numerical Study of Heat Transfer in 3 kWth Scale CeO <sub>2</sub> Coated Foam Device Solar Reactor for Thermochemical Two Step Water Splitting Cycle<br><b>Hyunseok Cho</b> , Niigata University  | R-04 | Heliostat Aiming Strategy Optimization of 3 Cylindrical Cavity-Receivers Integrated in a 750 kW Solar Tower Hydrogen Plant<br><b>Aurelio González-Pardo</b> <sup>1</sup> , Thorsten Denk <sup>1</sup> , Alfonso Vidal <sup>1</sup><br><sup>1</sup> CIEMAT-PSA   |

- R-05** Insights on the Thermal Effect of Geometric Parameters of a Multi-Channel Monolithic Zirconia Absorber with Supported  $\text{ZnFe}_2\text{O}_4$  Thin-Film Under Concentrated Solar Irradiance  
**Aldo Javier Guadarrama-Mendoza**<sup>1</sup>, Patricio Javier Valadés-Pelayo<sup>1</sup>, Camilo Alberto Arancibia-Bulnes<sup>1</sup>, David Riveros-Rosas<sup>1</sup>, Heranando Romero-Paredes<sup>2</sup>  
<sup>1</sup> *Universidad Nacional Autónoma de México*;  
<sup>2</sup> *Universidad Autónoma Metropolitana-Iztapalapa*
- R-06** Improvement of Oxide Ion Mobility on Cerium Oxide with  $\text{Gd}^{3+}$  Doping for Solar Hydrogen Production  
**Hiroshi Kaneko**, *University of Miyazaki*
- R-07** Using CSP to Boost Liquid Fuel Production in a BTL Process  
**Xinying Liu**<sup>1</sup>, Shahid Ansari<sup>1</sup>  
*University of South Africa*
- R-08** Roxarsone Sensing and Removal by Visible Light Active  $\text{Fe}_2\text{O}_3\text{-ZnO}$   
**Suresh Ranganathan**<sup>1</sup>, Jorge Yañez<sup>1</sup>, Eimmy Ramírez<sup>1</sup>, Claudio Sandoval<sup>1</sup>  
<sup>1</sup> *University of Concepción*
- R-09** Thermal Properties of Cerium (IV), Tin (IV) and Zirconium Oxides Applied in Solar Technology  
**Hernando Romero-Paredes R.**<sup>1</sup>, Carlos E. Arreola-Ramos<sup>2</sup>, Juan Daniel Macías<sup>3</sup>, Camilo A. Arancibia Bulnes<sup>4</sup>, Heidi Isabel Villafán Vidales<sup>4</sup>, Geonel Rodríguez Gattorno<sup>3</sup>, José Bante Guerra<sup>3</sup>, Oscar Arés Muzio<sup>3</sup>, Víctor Hugo Ramos Sánchez<sup>5</sup>, Juan José Alvarado Gil<sup>3</sup>  
<sup>1</sup> *Universidad Autónoma Metropolitana Iztapalapa*; <sup>2</sup> *Instituto de Energías Renovables, Universidad Nacional Autónoma de México*; <sup>3</sup> *Cinvestav*; <sup>4</sup> *Universidad Nacional Autónoma de México*; <sup>5</sup> *Facultad de Química, Universidad Autónoma de Chihuahua*
- R-10** Simulation of Heat Transfer of a Monolithic Solar Reactor of Heterogeneous Porous Medium with Zirconia Absorber Supported with  $\text{Mn}_{0.14}\text{Fe}_{1.86}\text{O}_3$   
**Hernando Romero-Paredes R.**<sup>1</sup>, Gilberto Espinosa-Paredes<sup>1</sup>, Javier Centeno Pérez<sup>1</sup>, Alejandro Vazquez-Rodriguez<sup>1</sup>, Heidi I. Villafán-Vidales<sup>2</sup>, David Riveros-Rosas<sup>2</sup>, Aldo J. Guadarrama-Mendoza<sup>2</sup>, Camilo A. Arancibia-Bulnes<sup>2</sup>, Juan José Alvarado Gil<sup>3</sup>  
<sup>1</sup> *Universidad Autónoma Metropolitana Iztapalapa*; <sup>2</sup> *Universidad Nacional Autónoma de México*; <sup>3</sup> *Cinvestav*
- R-11** Photocatalytic Degradation of Thimerosal by  $\text{ZnFe}_2\text{O}_4$  Nanoparticles  
**Claudio Sandoval**<sup>1</sup>, Suresh Ranganathan<sup>1</sup>, Jorge Yañez<sup>1</sup>, Eimmy Ramírez<sup>1</sup>  
<sup>1</sup> *University of Concepción*
- R-12** Solar Torrefaction of a Lignin-Rich Biogenic Waste in a Directly Irradiated Fluidized Bed Reactor  
**Roberto Solimene**<sup>1</sup>, Claudio Tregambi<sup>2</sup>, Fabio Montagnaro<sup>3</sup>, Piero Salatino<sup>2</sup>, Riccardo Chirone<sup>1</sup>  
<sup>1</sup> *Istituto di Ricerche sulla Combustione*;  
<sup>2</sup> *DICMAPI*; <sup>3</sup> *Sapienza Università di Roma*
- R-13** Hydrogen Production by Molten Carbonate Steam Electrolysis: Process Flowsheet and Integration with a CSP Plant  
**Luca Turchetti**<sup>1</sup>, Alessio Tiberi<sup>2</sup>, Domenico Mazzei<sup>1</sup>, Stefano Frangini<sup>1</sup>, Claudio Felici<sup>1</sup>, Maria Cristina Annesini<sup>2</sup>  
<sup>1</sup> *ENEA*; <sup>2</sup> *Sapienza Università di Roma*
- R-14** Parabolic Trough Plant Performance in China with Focus on Comparison of Heat Transfer Fluids HELISOL® 5A and Therminol VP-1  
**Theda Zoschke**, *Fraunhofer ISE*
- S-01** A First Approach of the Direct Normal Irradiance Forecasting in the Receiver of a Central Tower Combining Remote Sensing Techniques and Solar Power Plant Models  
**Joaquín Alonso-Montesinos**, *University of Almería*
- S-02** Geographic Information Systems and Economic Methods for the Evaluation of Solar Farms Sites: Case Study in Northeast of Brazil  
**Veronica Azevedo**<sup>1</sup>, Chigueru Tiba<sup>1</sup>, Marcos Paes<sup>1</sup>  
<sup>1</sup> *Federal University of Pernambuco*



# Thursday

- S-03 Evolution of the Aerosol Extinction Coefficient At 100 m Above Ground During an Episode of Saharan Dust Intrusion as Derived from Data Registered by a Ceilometer in Almería (SE Spain)  
**F. Javier Barbero**, *University of Almería*
- S-04 Solar Irradiance Measurements for the Monitoring and Evaluation of Concentrating Systems  
**Mattia Battaglia**<sup>1</sup>, Andreas Häberle<sup>1</sup>, Jana Möllenkamp<sup>1</sup>, Mercedes Rittmann-Frank<sup>1</sup>  
<sup>1</sup> *SPF Institute for Solar Technology*
- S-05 Progresses in DNI Measurements in Southern Portugal  
**Afonso Cavaco**<sup>1</sup>, Hugo Silva<sup>2</sup>, Paulo Canhoto<sup>2</sup>, Tiago Osório<sup>2</sup>, Manuel Collares-Pereira<sup>2</sup>  
<sup>1</sup> *IPES - Portuguese Solar Energy Institute;*  
<sup>2</sup> *University of Évora*
- S-06 Impact of DNI Nowcasting on Annual Revenues of CSP Plants  
**Jürgen Dersch**<sup>1</sup>, Stefan Wilbert<sup>1</sup>, Natalie Hanrieder<sup>1</sup>, Marion Schroedter-Homscheidt<sup>1</sup>, Tobias Sirch<sup>1</sup>  
<sup>1</sup> *German Aerospace Center (DLR)*
- S-07 Radiation Cooling Resource Assessment for Concentrating Solar Power  
**Ana Dyreson**<sup>1</sup>, Franklin Miller<sup>1</sup>  
<sup>1</sup> *University of Wisconsin - Madison*
- S-08 Instrumental Set-Up to Estimate the Atmospheric Attenuation Along the Slant Path of Concentrated Solar Plants  
**Thierry Elias**<sup>1</sup>, Didier Ramon<sup>1</sup>, Charles Bourdil<sup>2</sup>, Geoffrey Rachinel<sup>2</sup>, Laurent Dubus<sup>2</sup>, Jean-Florian Brau<sup>2</sup>  
<sup>1</sup> *HYGEOS;* <sup>2</sup> *EDF*
- S-09 Solar Power Systems Environmental Impact and Diffuse Radiation Data Tool: Measurement vs. Simulation  
**Aymeric Girard**<sup>1</sup>, Mathieu Giordano<sup>2</sup>, Hector Galleguillos Castr<sup>2</sup>  
<sup>1</sup> *University of Chile;* <sup>2</sup> *Universidad Adolfo Ibáñez*
- S-10 A New Approach to the Intra-Hour Forecasting of Direct Normal Irradiance Using Sky-Imaging Data  
**Stéphane Grieu**<sup>1</sup>, Julien Nou<sup>1</sup>, Rémi Chauvin<sup>1</sup>, Stéphane Thil<sup>1</sup>  
Presented by Stéphane Thil<sup>1</sup>  
<sup>1</sup> *PROMES-CNRS*
- S-11 Generating High Dynamic Range Images Using a Sky Imager  
**Stéphane Grieu**<sup>1</sup>, Rémi Chauvin<sup>1</sup>, Julien Nou<sup>1</sup>, Stéphane Thil<sup>1</sup>  
*Presented by Stéphane Thil<sup>1</sup>*  
<sup>1</sup> *PROMES-CNRS*
- S-12 Coating Optimization for CSP with Different Solar Spectra  
**Antoine Grosjean**<sup>1</sup>, Audrey Soum-Glaude<sup>1</sup>, Laurent Thomas<sup>1</sup>, Pierre Neveu<sup>1</sup>  
<sup>1</sup> *PROMES-CNRS*
- S-13 Atmospheric Extinction in CSP Tower Plants in Morocco and Spain  
**Natalie Marie Hanrieder**<sup>1</sup>, Abdellatif Ghennioui<sup>2</sup>, Florian Wiesinger<sup>1</sup>, Stefan Wilbert<sup>1</sup>  
<sup>1</sup> *German Aerospace Center (DLR);* <sup>2</sup> *IRESEN*
- S-14 Evaluation of Direct Normal Irradiance Derived by COMS Satellite Imagery Over the Korean Peninsula  
**Chang K. Kim**<sup>1</sup>, Hyun-Goo Kim<sup>1</sup>, Chang-Yeol Yun<sup>1</sup>, Sang-Nam Lee<sup>1</sup>  
<sup>1</sup> *Korea Institute of Energy Research*
- S-15 Long-Term Variability of Solar Direct Irradiance in South Korea  
**Jin-Young Kim**<sup>1</sup>, Chang-Yeol Yun<sup>1</sup>, Chang Ki Kim<sup>1</sup>, Sang-Nam Lee<sup>1</sup>, Hyun-Goo Kim<sup>1</sup>  
<sup>1</sup> *Korea Institute of Energy Research*
- S-16 Towards an In-Situ Calibration of Rotating Shadowband Irradiometers (RSI) Using Simultaneous Pyranometer Measurements  
**Jorge Lezaca**<sup>1</sup>, Richard Meyer<sup>1</sup>, Detlev Heinemann<sup>2</sup>  
<sup>1</sup> *Suntrace GmbH;* <sup>2</sup> *University of Oldenburg*
- S-17 Sunbelt Spectra Comparison with Standard ASTM G173: the Chilean Case  
**Aitor Marzo**<sup>1</sup>, Jesús Polo<sup>2</sup>, Stefan Wilbert<sup>3</sup>, Christian Gueymard<sup>4</sup>, Wilko Jessen<sup>3</sup>, Pablo Ferrada<sup>1</sup>, Joaquín Alonso-Montesinos<sup>5</sup>, Jesús Ballestrín<sup>6</sup>  
<sup>1</sup> *University of Antofagasta;* <sup>2</sup> *Photovoltaic Solar Energy Unit (CIEMAT);* <sup>3</sup> *German Aerospace Center (DLR);* <sup>4</sup> *Solar Consulting Services;* <sup>5</sup> *University of Almería;* <sup>6</sup> *CIEMAT-PSA*
- S-18 Global and Direct Radiation Gridded Satellite Data Comparison in a Subtropical Climate  
**Luis Mazzora-Aguilar**<sup>1</sup>, Felipe Díaz<sup>1</sup>  
<sup>1</sup> *Electrical Engineering Department Las de Gran Canaria University*

- S-19 Effect of Daily Features of DNI Curves on the Energy Yield of CSP Plants  
**Sara Moreno-Tejera**<sup>1</sup>, Miguel Larraneta<sup>2</sup>, Isidoro Lillo-Bravo<sup>1</sup>, Manuel Silva-Perez<sup>1</sup>  
<sup>1</sup> *University of Sevilla*; <sup>2</sup> *AICIA*
- S-20 Measurement of DNI Angular Extent and Distribution with a Sunshape Profiling Irradiometer—Initial Test Results from Different Climates  
**Waleed Najy**<sup>1</sup>, Peter Armstrong<sup>1</sup>  
<sup>1</sup> *Masdar Institute*
- S-21 SolarPACES Project “Solar Radiation Products for the End-Users”  
**Kristian Nielsen**<sup>1</sup>, Lourdes Ramirez<sup>2</sup>, Frank Vignola<sup>3</sup>, Manuel Blanco<sup>4</sup>, Philippe Blanc<sup>5</sup>, Richard Meyer<sup>6</sup>  
<sup>1</sup> *DMJ*; <sup>2</sup> *CIEMAT*; <sup>3</sup> *University of Oregon*; <sup>4</sup> *The Cyprus Institute*; <sup>5</sup> *MINES ParisTech*; <sup>6</sup> *Suntrace GmbH*
- S-22 Life Cycle Assessment of the Fluids Used in a Concentrated Solar Power Plant  
**F.J. Pérez**<sup>1</sup>, E. Batuecas<sup>1</sup>, V. Encinas-Sánchez<sup>1</sup>, M.I. Lasanta<sup>1</sup>, M.T. de Miguel<sup>1</sup>, G. García-Martín<sup>1</sup>, C. Mayo<sup>1</sup>, R. Díaz<sup>1</sup>  
<sup>1</sup> *Complutense University of Madrid*
- S-23 Modelling Atmospheric Attenuation At Different AOD Time-Scales in Yield Performance of Solar Tower Plants  
**Jesús Polo**, *Plataforma Solar de Almería-CIEMAT*
- S-24 Optimized DNI Forecast using Combinations of DNICast-Project Nowcastings Outputs  
**Lourdes Ramirez**<sup>1</sup>, Natalie Hanrieder<sup>2</sup>, Luis F. Zarzalejo<sup>1</sup>, Tomas Landelius<sup>3</sup>, Stefan Müller<sup>4</sup>, Marion Schroedter-Homscheidt<sup>2</sup>, Stefan Wilbert<sup>2</sup>, Jean Dubrana<sup>5</sup>, Jose María Vindel<sup>1</sup>, Rita X Valenzuela<sup>1</sup>  
<sup>1</sup> *CIEMAT*; <sup>2</sup> *German Aerospace Center (DLR)*; <sup>3</sup> *SMHI*; <sup>4</sup> *Meteotest*; <sup>5</sup> *ARMINES*
- S-25 Solar Resource for High Penetration and Large Scale Applications – A New Joint Task of IEA PVPS and IEA SolarPACES  
**Lourdes Ramirez**<sup>1</sup>, Jan Remund<sup>2</sup>, Stefan Wilbert<sup>3</sup>, Philippe Blanc<sup>4</sup>, Elke Lorenz<sup>5</sup>, Dave Renne<sup>6</sup>  
<sup>1</sup> *CIEMAT*; <sup>2</sup> *Meteotest*; <sup>3</sup> *German Aerospace Center (DLR)*; <sup>4</sup> *ARMINES*; <sup>5</sup> *Fraunhofer ISE*; <sup>6</sup> *Clean Power Research*
- S-26 New Reference Solarimetric Network for Mexico  
**David Riveros-Rosas**<sup>1</sup>, Adriana Gonzalez-Cabrera<sup>1</sup>, Mauro Valdes-Barron<sup>1</sup>, Roberto Bonifaz<sup>1</sup>, Giovanni Carabali<sup>1</sup>, Hector Estevez<sup>1</sup>  
<sup>1</sup> *Universidad Nacional Autonoma de Mexico*
- S-27 Analysis of Linke Turbidity Index from Solar Measurements in Mexico  
**David Riveros-Rosas**<sup>1</sup>, Adriana Gonzalez-Cabrera<sup>1</sup>, Mauro Valdes-Barron<sup>1</sup>, Luis Fernando Zarzalejo<sup>2</sup>  
<sup>1</sup> *Universidad Nacional Autonoma de Mexico*; <sup>2</sup> *Plataforma Solar de Almería-CIEMAT*
- S-28 Solar Thermal Electric Potential in Argentina. Comparison of Satellite DNI Models and On-Site Measurements  
**Yenni Roa**<sup>1</sup>, M. Fernanda Montero<sup>1</sup>, Jesus Fernandez-Reche<sup>2</sup>  
<sup>1</sup> *Universidad Nacional de La Plata (UNLP)*; <sup>2</sup> *CIEMAT-PSA*
- S-29 ANN to Optimize Calibration on Fisheye Cameras  
**M Henriques Sa Campos**<sup>1</sup>, Chigueru Tiba<sup>1</sup>, Sergio Leal<sup>1</sup>  
<sup>1</sup> *UFPE*
- S-30 Measuring Installation for Inspection of Solar Sensor-Actinometers and Piranometers  
**Yuldash Sobirov**<sup>1</sup>, Shavkat Fayziev<sup>1</sup>  
<sup>1</sup> *Academy of Sciences of Uzbekistan*
- S-31 Device for Data Collection from Solar Activity Sensors  
**Yuldash Sobirov**  
*Academy of Sciences of Uzbekistan*
- S-32 Comparison of Soiling Rate Data from Two Sites and its Application to Yield Analysis  
**Fabian Wolfertstetter**<sup>1</sup>, Stefan Wilbert<sup>1</sup>, Simon Dieckmann<sup>1</sup>, Jürgen Dersch<sup>1</sup>, Philipp Bellmann<sup>1</sup>, Abdellatif Ghennioui<sup>2</sup>, Roman Affolter<sup>3</sup>  
<sup>1</sup> *German Aerospace Center (DLR)*; <sup>2</sup> *IRESEN*; <sup>3</sup> *CSP Services*
- T-01 High Temperature Oxidation Protective Coatings for Solar Concentration Power Plants Receivers  
**Alina Agüero**<sup>1</sup>, Ignacio Baraibar<sup>1</sup>, Paloma García<sup>1</sup>, Raúl Muelas<sup>1</sup>, Luis Alberto Angurel<sup>2</sup>, Xermán de la Fuente<sup>2</sup>  
<sup>1</sup> *National Institute for Aerospace Technology*; <sup>2</sup> *Institute of Materials Science of Aragón*

# Thursday

T-02	<p>Material Based-Design for High Temperature Heat Storage Systems</p> <p><b>Camila Barreneche</b><sup>1</sup>, Alejandro Calderón<sup>1</sup>, Anabel Palacios<sup>1</sup>, Mercè Segarra<sup>1</sup>, Ana Inés Fernández<sup>1</sup></p> <p><sup>1</sup> <i>University of Barcelona</i></p>	T-09	<p>Molten Silicon Storage of Concentrated Solar Power with Integrated Thermophotovoltaic Energy Conversion</p> <p><b>Alejandro Datas</b><sup>1</sup>, Myrto Zeneli<sup>2</sup>, Carlos del Cañizo<sup>3</sup>, Ilias Malgarinos<sup>2</sup>, Aris Nikolopoulos<sup>2</sup>, Nikolaos Nikolopoulos<sup>2</sup>, Sotirios Karellas<sup>2</sup>, Antonio Martí<sup>3</sup></p> <p><sup>1</sup> <i>Instituto de Energía Solar - Universidad Politécnica de Madrid</i>; <sup>2</sup> <i>CERTH</i>; <sup>3</sup> <i>Technical University of Madrid</i></p>
T-03	<p>Rotating Drum Latent Heat Thermal Energy Storage for CSP</p> <p><b>Dan Bauer</b><sup>1</sup>, Henning Jockenhöfer<sup>1</sup>, Maike Johnson<sup>1</sup>, Markus Seitz<sup>1</sup></p> <p><sup>1</sup> <i>German Aerospace Center (DLR)</i></p>	T-10	<p>Molecular Dynamics Simulations of the Thermodynamic Properties and Local Structures on Molten Alkali Carbonate K<sub>2</sub>CO<sub>3</sub></p> <p><b>Lichan Du</b></p> <p><i>School of Engineering, Sun Yat-Sen University</i></p>
T-04	<p>Analysis of Packed-Bed Thermocline Storage Tank Performance by Means of a New Analytical Function</p> <p><b>Rocio Bayon</b><sup>1</sup>, Esther Rojas<sup>1</sup></p> <p><sup>1</sup> <i>CIEMAT-PSA</i></p>	T-11	<p>Experimental Investigation of the Solid Filler Influence in Thermocline Storage Systems Through the Comparison of Two Different Setups</p> <p><b>Thibaut Esence</b><sup>1</sup>, Thomas Fasquelle<sup>2</sup>, Arnaud Bruch<sup>1</sup>, Quentin Falcoz<sup>2</sup></p> <p><sup>1</sup> <i>CEA</i>; <sup>2</sup> <i>PROMES-CNRS</i></p>
T-05	<p>Influence of Different Atmospheres on Molten Salt Chemistry and its Effect on Steel Corrosion</p> <p><b>Alexander Bonk</b><sup>1</sup>, Markus Braun<sup>1</sup>, Andrea Hanke<sup>1</sup>, Jochen Forstner<sup>1</sup>, Dagmar Rückle<sup>2</sup>, Stefanie Kaesche<sup>2</sup>, Veronika Sötz<sup>1</sup>, Thomas Bauer<sup>1</sup></p> <p><sup>1</sup> <i>German Aerospace Center (DLR)</i>; <sup>2</sup> <i>Materialprüfungsanstalt (MPA)</i></p>	T-12	<p>Effects of Nanoparticle and Humidity on the Corrosion of Carbon and Stainless Steels by Molten Nitrate Nanocomposite HitecXL Salts</p> <p><b>Abdessamad Faik</b><sup>1</sup>, Yaroslav Grosu<sup>1</sup>, Nithiyantham Udayashankar<sup>1</sup>, Luis González-Fernández<sup>1</sup>, Abdessamad Faik<sup>1</sup></p> <p><sup>1</sup> <i>CIC EnergiGUNE</i></p>
T-06	<p>Experimental Characterization of a Prototype-Scale Dual-Media Thermocline TES and Ways to Enhance its Numerical Simulation</p> <p><b>Arnaud Bruch</b>, <i>CEA</i></p>	T-13	<p>Opportunities of Lithium Nitrate as TES Material in CSP Plants: Thermal Characterization and LCOE Projection</p> <p><b>Angel G. Fernández</b>, <i>Antofagasta University</i></p>
T-07	<p>Molten Salts Tanks with Thermal Concrete: Heatek®RC</p> <p><b>Juan Manuel Caruncho</b><sup>1</sup>, Veronica Fuentes<sup>1</sup>, Angel Freire<sup>1</sup>, David Ramirez<sup>2</sup></p> <p><sup>1</sup> <i>ARRAELA</i>; <sup>2</sup> <i>increscendo</i></p>	T-14	<p>A Comparison of Corrosion Measurements in High Temperature Molten Salt Environments</p> <p><b>Kaleb John Fisher</b><sup>1</sup>, Stuart Bell<sup>1</sup>, Geoffrey Will<sup>1</sup>, Ted Steinberg<sup>1</sup></p> <p><sup>1</sup> <i>Queensland University of Technology</i></p>
T-08	<p>Sensitive Heat Storage System: Heatek®TES</p> <p><b>Juan Manuel Caruncho</b><sup>1</sup>, Veronica Fuentes<sup>1</sup>, Angel Freire<sup>1</sup>, Ana Santiago<sup>1</sup>, David Ramirez<sup>2</sup></p> <p><sup>1</sup> <i>ARRAELA</i>; <sup>2</sup> <i>increscendo</i></p>	T-15	<p>Prediction of Eutectic Point in the LiNO<sub>3</sub> + NaNO<sub>3</sub> + Ca(NO<sub>3</sub>)<sub>2</sub> System</p> <p><b>Héctor Galleguillos</b>, <i>University of Chile</i></p>
		T-16	<p>Pressure Drop Through Random and Structured Beds of Ellipsoidal Particles</p> <p><b>Jaap Hoffmann</b>, <i>Stellenbosch University</i></p>

- T-17 Using Thermal Energy Storage to Replace Natural Gas in Commercial/Industrial Applications  
**Rhys Jacob**<sup>1</sup>, Martin Belusko<sup>1</sup>, Ming Liu<sup>1</sup>, Wasim Saman<sup>1</sup>, Frank Bruno<sup>1</sup>  
<sup>1</sup> *The University of South Australia*
- T-18 Numerical Analysis of Effects of Void Factor, Inlet Temperature, Initial Fluid Flow-Rate, and Particle Size for Solar Thermal Energy Storage in Packed Pebble Bed  
**Sumit Khadka**<sup>1</sup>, Rijan Karkee<sup>1</sup>  
<sup>1</sup> *Kathmandu University*
- T-19 Modelling of Thermal Tatcheting Using the Drucker-Prager-Cap Model: Parametrization with the Discrete Element Method  
**Philipp Knödler**<sup>1</sup>, Volker Dreißigacker<sup>1</sup>, Stefan Zunft<sup>1</sup>  
<sup>1</sup> *German Aerospace Center (DLR)*
- T-20 Concentrated Solar Tower Power Plant Using Slag as Inventory Material for a Thermal Energy Storage (TES)  
**Michael Krüger**<sup>1</sup>, Jürgen Haunstetter<sup>1</sup>, Stefan Zunft<sup>1</sup>  
<sup>1</sup> *German Aerospace Centre (DLR)*
- T-21 Thermal Insulation of an Ultra-High Temperature Thermal Energy Store for Concentrated Solar Power  
**Stephan Lang**<sup>1</sup>, Dominik Bestenlehner<sup>1</sup>, Roman Marx<sup>1</sup>, Harald Drück<sup>1</sup>  
<sup>1</sup> *University of Stuttgart*
- T-22 Molten Salt Thermal Storage Model in MATLAB  
**Zhi Li**<sup>1</sup>, Qiangqiang Zhang<sup>1</sup>  
<sup>1</sup> *Chinese Academy of Sciences*
- T-23 Investigation of the Thermo-Physical Properties of NaCl-KCl-MgCl<sub>2</sub> as a High-Temperature Sensible Heat Storage Medium  
**Gowtham Mohan**<sup>1</sup>, Mahesh Venkataraman<sup>1</sup>, Judith Vidal<sup>2</sup>  
<sup>1</sup> *Australian National University*; <sup>2</sup> *NREL*
- T-24 Single-Tank TES for CSP Using Chilean Raw Materials: Molten Nitrates and Mining Solid Wastes from Copper as Candidates for Filler Materials  
**Macarena Montané**<sup>1</sup>, Martin Karl<sup>1</sup>, Thomas Fluri<sup>1</sup>, Gustavo Cáceres<sup>2</sup>  
<sup>1</sup> *Fraunhofer ISE*; <sup>2</sup> *Universidad Adolfo Ibáñez*
- T-25 A Simple Numerical Simulation of Experimental T-History Curves of Phase Change Materials for Solar Energy Storage  
**Luar Moreno-Alvarez**<sup>1</sup>, Jose Maria Serrano-Cornelio<sup>2</sup>, Claudio Estrada<sup>2</sup>  
<sup>1</sup> *TecNM/Instituto Tecnológico de la Laguna*; <sup>2</sup> *Universidad Nacional Autónoma de México*
- T-26 Evaluation of Thermal Conductivity of Commercial Nitrate Salts for Thermal Energy Transfer and Storage in Concentrated Solar Power Generation  
**Belén Muñoz-Sánchez**<sup>1</sup>, Ana García-Romero<sup>2</sup>, Nuria Navarrete<sup>3</sup>, José Enrique Juliá<sup>3</sup>, Helena Navarro<sup>4</sup>, Yulong Ding<sup>4</sup>  
<sup>1</sup> *TECNALIA*; <sup>2</sup> *University of the Basque Country (UPV/EHU)*; <sup>3</sup> *Universitat Jaume I*; <sup>4</sup> *University of Birmingham*
- T-27 Analysis of the Potential Application of CO<sub>3</sub><sup>2-</sup> and Cl<sup>-</sup> as High Temperature Molten Salt  
**F.J. Pérez**<sup>1</sup>, M.T. de Miguel<sup>1</sup>, V. Encinas-Sánchez<sup>1</sup>, G. García-Martín<sup>1</sup>, M.I. Lasanta<sup>1</sup>  
<sup>1</sup> *Complutense University of Madrid*
- T-28 Simulations and Experiments of Melting of Encapsulated Phase Change Materials  
**Antonio Manuel Puertas López**<sup>1</sup>, Manuel Servando Romero Cano<sup>1</sup>, Sabina Rosiek Pawlowska<sup>1</sup>, Francisco Javier Batlles Garrido<sup>1</sup>  
<sup>1</sup> *University of Almería*
- T-29 Numerical Study of a Two Pass Shell and Tube Latent Heat Energy Storage System  
**Soheila Riahi**<sup>1</sup>, Wasim Saman<sup>1</sup>, Robert de Boer<sup>2</sup>, Frank Bruno<sup>1</sup>, Simon Smeding<sup>2</sup>, Ivar de Visser<sup>2</sup>  
<sup>1</sup> *Barbara Hardy/University of South Australia*; <sup>2</sup> *ECN*
- T-30 Inverse Heat Transfer Analysis of Porous Materials for Isolating the Foundation of Solar Thermal Storage Systems  
**Margarita M. Rodriguez-Garcia**<sup>1</sup>, Giovanni Giansiracusa<sup>2</sup>, Pierluigi Leone<sup>2</sup>, Andrea Lanzini<sup>2</sup>, Eduardo Zarza<sup>1</sup>  
<sup>1</sup> *CIEMAT-PSA*; <sup>2</sup> *Politecnico di Torino*
- T-31 Techno-Economic Analysis of a Polygeneration System with Latent Heat Storage  
**Sabina Rosiek**<sup>1</sup>, Francisco Javier Batlles Garrido<sup>1</sup>, Manuel Servando Romera Cano<sup>1</sup>, Antonio Manuel Puertas López<sup>1</sup>  
<sup>1</sup> *University of Almería*

## Thursday

- T-32 The Inhibitory Effects of SiO<sub>2</sub> and TiO<sub>2</sub> Nanoparticles on Isothermal Decomposition Rates of the Eutectic Alkali Nitrate Salts Used for Thermal Energy Storage  
**John Shelton<sup>1</sup>**, Shalini Pogula<sup>1</sup>  
<sup>1</sup> Northern Illinois University
- T-33 Prototype Testing of MgCl<sub>2</sub>/Graphite Foam Latent Heat Thermal Energy Storage System  
**Dileep Singh<sup>1</sup>**, D. France<sup>1</sup>, W. Yu<sup>1</sup>, W. Zhao<sup>1</sup>, T. Kim<sup>1</sup>  
<sup>1</sup> Argonne National Laboratory
- T-34 Buoyancy-Driven Direct Contact Heat Exchange Between a Sodium HTF and a Molten Salt Storage Media for Solar Thermal Applications  
**Mahesh Venkataraman<sup>1</sup>**, Gowtham Mohan<sup>1</sup>, Joe Coventry<sup>1</sup>  
<sup>1</sup> Australian National University
- T-35 Alumina-Forming Alloys for Containment of High-Temperature Molten Salts in Next-Generation Concentrating Solar Power Systems  
**Judith Vidal<sup>1</sup>**, Angel G. Fernández<sup>2</sup>  
<sup>1</sup> NREL; <sup>2</sup> University of Antofagasta
- T-36 Effect of TiO<sub>2</sub> Nanoparticle Dispersion on Enhancing the Specific Heat Capacity of Ternary Nitrate for Concentrated Solar Power Application  
**Yihao Wang<sup>1</sup>**, Xuhui An<sup>1</sup>, Jinhui Cheng<sup>1</sup>, Peng Zhang<sup>1</sup>  
<sup>1</sup> Shanghai Institute of Applied Physics, Chinese Academy of Science
- T-37 Investigation of Storage Characteristic of Compositing Sensible-Latent Packed Bed Thermal Energy Storage System  
**Yan Wang**, Chinese Academy of Sciences
- T-38 The Large-Scale Cylindrical Line-Focusing Fresnel Lens Design Based on Otcg and its Application on Solar Steam Generator  
**Ma Xinglong**, Beijing Institute of Technology
- U-01 Techno-Economic Analysis of Molten Salt Tower Plants with Integrated Thermochemical Energy Storage Systems Based on CaO Hydration  
**Katerine Antil Martini**  
KTH Royal Institute of Technology
- U-02 An Experimental Study for the Thermal Characterization of a 10 kW Solar Reactor Based on a Porous Volumetric Absorber  
**Carlos Ernesto Arreola Ramos**  
Universidad Nacional Autonoma de Mexico
- U-03 Thermochemical Energy Storage with CaO/Ca(OH)<sub>2</sub> – Development of a Continuous Fluidized Bed Reactor  
**Moritz Becker<sup>1</sup>**, Manuel Würth<sup>1</sup>, Annelies Vandersickel<sup>1</sup>, Ralf Sonnen<sup>2</sup>, Stephan Gleis<sup>1</sup>, Hartmut Spliethoff<sup>1</sup>  
<sup>1</sup> Technical University of Munich; <sup>2</sup> Schwing Technologies GmbH
- U-04 Composite Particles as Active Catalysts for the SO<sub>3</sub> Dissociation Reaction of the Thermochemical Storage Scheme Based on Elemental Sulfur  
**George Karagiannakis**, CERTH/APTL
- U-05 A Screening Method Based on Projection Pursuit and Analytic Hierarchy Process for Solar Thermochemical Metal Oxides Fuel Production Cycles  
**Hao Li**, Chinese Academy of Sciences
- U-06 High-Temperature Calcium-Based Thermochemical Energy Storage System for Use with CSP Facilities  
**Andy Muto<sup>1</sup>**, Kevin McCabe Muto<sup>1</sup>, Daniel Real<sup>1</sup>  
<sup>1</sup> Southern Research
- U-07 sCO<sub>2</sub> Power Cycles with Integrated Thermochemical Energy Storage Using an MgO-Based sCO<sub>2</sub> Sorbent in Direct Contact with Working Fluid  
**Andy Muto**, Southern Research
- U-08 Material Screening for Two-Step Solar Thermochemical Decomposition of H<sub>2</sub>S Using Metal Sulfide  
**Osahon Osasuyi<sup>1</sup>**, Khalid Al-Ali<sup>1</sup>, Mohammad Abu Zahra<sup>1</sup>, Dang Quang<sup>1</sup>, Ryan Gillis<sup>2</sup>, William Green<sup>2</sup>  
<sup>1</sup> Masdar Institute; <sup>2</sup> Massachusetts Institute of Technology
- U-09 A Novel Concept of a Fluidized Bed “Thermochemical Battery” for Concentrated Solar Power Applications  
**Claudio Tregambi<sup>1</sup>**, Fabio Montagnaro<sup>1</sup>, Piero Salatino<sup>1</sup>, Roberto Solimene<sup>2</sup>  
<sup>1</sup> University of Naples Federico II; <sup>2</sup> Istituto di Ricerche sulla Combustione

V-01 The Importance of Location on Photo-Fenton Efficiency and Treatment Cost

**Lorena Cornejo Ponce**<sup>1</sup>, Alejandro Cabrera<sup>1</sup>, Sara Miralles<sup>1</sup>

<sup>1</sup> *Universidad de Tarapacá*

V-02 Economic Consideration for CSP Solar Thermal Industrial Process Heat and Desalination in the United States

**Drew Dejarnette**<sup>1</sup>, Abraham Shultz<sup>1</sup>

<sup>1</sup> *US Department of Energy*

V-03 Solar Advanced Oxidation Processes at Pilot Plant Scale at Natural pH: Assessment of Iron Species and Oxidant Agents (H<sub>2</sub>O<sub>2</sub> and S<sub>2</sub>O<sub>8</sub><sup>2-</sup>)

**Sara Miralles**<sup>1</sup>, Ana Ruíz<sup>2</sup>, Alejandro Cabrera<sup>1</sup>, Lorena Cornejo<sup>1</sup>, Sixto Malato<sup>2</sup>, Isabel Oller<sup>2</sup>

<sup>1</sup> *Universidad de Tarapacá*; <sup>2</sup> *PSA*

V-04 Solar Polygeneration for Electricity, Cooling and Freshwater Production: Integration of an Absorption Chiller and an MED Unit into a CSP Plant

**Patricia Palenzuela**<sup>1</sup>, Luca Cortinovis<sup>2</sup>, Simone Finassi<sup>2</sup>, Diego-César Alarcón-Padilla<sup>1</sup>, Giuseppe Franchini<sup>2</sup>

<sup>1</sup> *CIEMAT-PSA*; <sup>2</sup> *University of Bergamo*

## Friday, September 29, 2017

### 08:30 am - Plenary: CSP Technology Innovation

10:00 am

ROOM: GREAT ROOM 2+3

Chair: *Avi Shultz, US Department of Energy*

08:30 am Dispatchable Solar Power: Adapting CSP to Modern Grid Needs

**Hank Price**, *Solar Dynamics LLC*

08:50 am The Power of Particles: Overview of Worldwide Research Efforts on Developing Particle-based CSP Systems

**Hany Al-Ansary**, *King Saud University*

09:10 am High Efficiency Phase Change Thermal Energy Storage with Chloride Salts – Perspectives on Current Status and Future Directions

**Dileep Singh**, *Argonne National Laboratory*

09:30 am Review of Supercritical Carbon Dioxide Power Cycles for CSP Applications

**Klaus Brun**, *Southwest Research Institute*

09:50 am Solar Energy Research Center Chile: Advances in Solar Resource Assessment, Power Systems and Thermal Energy Storage

**Rodrigo Palma**, *Solar Energy Research Center (SERC Chile)*

10:00 am -  
10:30 am

Coffee Break

## Friday

10:30 am -  
12:30 pm

### Central Receiver Systems

ROOM: GREAT ROOM 1  
Chair: Alain Ferriere, CNRS-PROMES

- 10:30 am Experimental Methodology to Calculate Thermal Losses of a Molten Salt Cavity Receiver  
**Evgeny Votyakov**<sup>1</sup>, Marios C. Georgiou<sup>1</sup>, Elena Guillen<sup>1</sup>, Efstathios Stiliaris<sup>1</sup>, Costas N. Papanicolas<sup>1</sup>  
<sup>1</sup> *The Cyprus Institute*
- 10:50 am Fluidized Particle-In-Tube Solar Receiver and Reactor: a Versatile Concept for Particulate Calcinations and High Efficiency Thermodynamic Cycles  
**Jack Hoeniges**<sup>1</sup>, Inma Pérez López<sup>1</sup>, Hadrien Benoit<sup>1</sup>, Daniel Gauthier<sup>1</sup>, Gilles Flamant<sup>1</sup>  
<sup>1</sup> *PROMES-CNRS*
- 11:10 am Experimental Studies and Experience on a 1 MWe Superheated Steam Tower CSP Demonstrator  
**Zijiang Yang**, *EDF*
- 11:30 am CFD Modeling of Convective Losses from a Sodium-Cooled Billboard-Type Receiver for CSP Central Tower Systems  
**Roberto Zanino**<sup>1</sup>, Mattia Cagnoli<sup>1</sup>, Laura Savoldi<sup>1</sup>, Luca Vancheri<sup>1</sup>, John Pye<sup>2</sup>  
<sup>1</sup> *Politecnico di Torino*; <sup>2</sup> *Australian National University*
- 11:50 am Experimental Evaluation of Volumetric Solar Absorbers – Ceramic Foam vs. an Innovative Rotary Disc Absorber Concept  
**Fritz Zaversky**<sup>1</sup>, Marcelino Sánchez<sup>1</sup>, M. Isabel Roldán<sup>2</sup>, Antonio L. Ávila-Marín<sup>2</sup>, Alexander Füssel<sup>3</sup>, Jörg Adler<sup>3</sup>, Martin Knoch<sup>4</sup>, Andreas Dreitz<sup>4</sup>  
<sup>1</sup> *CENER*; <sup>2</sup> *CIEMAT-PSA*; <sup>3</sup> *Fraunhofer IKTS*; <sup>4</sup> *FCT Ingenieurkeramik GmbH*

10:30 am -  
12:30 pm

### Heat Transfer Fluids

ROOM: GREAT ROOM 2  
Chair: Hicham Bouzekri, MASEN

- 10:30 am Thermal and Rheological Behavior of Solar Salt Containing Highly Thermally Conductive Particles  
**Anabel Palacios Trujillo**<sup>1</sup>, Helena Navarro<sup>1</sup>, Yulong Ding<sup>1</sup>  
<sup>1</sup> *Birmingham Centre for Energy Storage*
- 10:50 am Thermal Performance of Solarized Supercritical CO<sub>2</sub> Brayton Cycles Using High-Temperature Molten Salts as Heat Transfer Fluids and Thermal Energy Storage Media  
**Yen Chean Soo Too**<sup>1</sup>, Rene Olivares<sup>1</sup>, Ricardo Padilla<sup>2</sup>, Jin-Soo Kim<sup>1</sup>  
Presented by Ricardo Padilla<sup>2</sup>  
<sup>1</sup> *CSIRO*; <sup>2</sup> *Southern Cross University*
- 11:10 am Material and Experimental Issues Related to the Use of Liquid Metals as Heat Transfer Media for CSP Tower Receivers  
**Alfons Weisenburger**<sup>1</sup>, Georg Müller<sup>1</sup>, Fabian Lang<sup>1</sup>  
<sup>1</sup> *Karlsruhe Institute of Technology*

## 10:30 am - 12:30 pm Solar Energy for the Mining Industry

ROOM: GREAT ROOM 3

Chair: Rodrigo Mancilla, Chilean Solar Committee

- 10:30 am Potential of Solar Power Tower Systems for Thermal Applications in the Production Chain of Copper by Pyrometallurgical Route  
**Irving Cruz Robles**<sup>1</sup>, Alfonso J. Vázquez Vaamonde<sup>2</sup>, Elisa Alonso<sup>3</sup>, Carlos Pérez Rábago<sup>1</sup>, Claudio A. Estrada<sup>1</sup>  
<sup>1</sup> Institute of Renewable Energy - UNAM; <sup>2</sup> National Center for Metallurgical Research (CENIM); <sup>3</sup> University of Antofagasta
- 10:50 am Solar-Powered Pyrolysis of Scrap Rubber from Mining Truck End-Of-Life Tires – A Case Study for the Mining Industry in the Atacama Desert, Chile  
**Gustavo Andrés Díaz Ferrán**<sup>1</sup>, Dimitrij Chudinzow<sup>2</sup>, Willy Kracht<sup>1</sup>, Ludger Eltrop<sup>2</sup>  
<sup>1</sup> University of Chile; <sup>2</sup> University of Stuttgart
- 11:10 am Solar Processing of Reactive Particles Up to 900°C, the SOLPART Project  
**Gilles Flamant**, PROMES-CNRS
- 11:30 am Performance of a SUNDISC Cycle CSP Plant for Off-Grid Baseload Applications in Chile  
**Lukas Heller**<sup>1</sup>, Jaap Hoffmann<sup>1</sup>  
<sup>1</sup> Stellenbosch University
- 11:50 am Solar Energy Alternatives for Copper Production  
**Simón Moreno-Leiva**<sup>1</sup>, Felipe Valencia<sup>1</sup>, Jannik Haas<sup>2</sup>, Dimitrij Chudinzow<sup>2</sup>, Ludger Eltrop<sup>2</sup>  
<sup>1</sup> University of Chile; <sup>2</sup> University of Stuttgart

## 10:30 am - 12:30 pm Solar Fuels and Chemical Commodities

ROOM: STUDIO 4 & 5

Chair: George Karagiannakis, CPERI/CERTH

- 10:30 am Commercial Development of Bio-Combustible Fuels from Hydrothermal Liquefaction of Waste using Solar Collectors  
**Matthew Pearce**<sup>1</sup>, Xavier Tonnellier<sup>2</sup>, Christopher Sansom<sup>3</sup>, Namrata Sengar<sup>4</sup>  
<sup>1</sup> Phycofeeds Ltd; <sup>2</sup> Precision Engineering Institute; <sup>3</sup> Cranfield University; <sup>4</sup> Kota University
- 10:50 am A Novel High-Temperature Solar Chemical Reactor for Syngas Production from Solar-Driven Thermochemical Gasification of Wood Biomass  
**Sylvain Rodat**<sup>1</sup>, Quentin Bellouard<sup>1</sup>, Stéphane Abanades<sup>2</sup>, Srirat Chuayboon<sup>2</sup>, Pierre-Eric Frayssines<sup>1</sup>, Serge Ravel<sup>1</sup>  
 Presented by Srirat Chuayboon<sup>2</sup>  
<sup>1</sup> CEA; <sup>2</sup> CNRS-PROMES
- 11:10 am Experimental Testing of Multi-Tubular Reactor for Hydrogen Production and Comparison with a Thermal CFD Model  
**Elvira Tapia Martin**<sup>1</sup>, Aurelio José González Pardo<sup>2</sup>, Alfredo Iranzo Paricio<sup>1</sup>, Alfonso Vidal Delgado<sup>2</sup>, Felipe Rosa Iglesias<sup>1</sup>  
<sup>1</sup> University of Sevilla; <sup>2</sup> CIEMAT-PSA



# Friday

- 11:30 am Experimental and Numerical Analysis of a Solar Rotary Kiln for Continuous Treatment of Particle Material  
**Stefania Tescari**<sup>1</sup>, Gkiokchan Moumin<sup>1</sup>, Brendan Bulfin<sup>1</sup>, Lamark de Oliveira<sup>1</sup>, Stefan Schaefer<sup>1</sup>, Nicolas Overbeck<sup>1</sup>, Christian Willsch<sup>1</sup>, Martin Thelen<sup>1</sup>, Carsten Spenke<sup>1</sup>, Martin Roeb<sup>1</sup>, Christian Sattler<sup>1</sup>  
<sup>1</sup> German Aerospace Center (DLR)
- 11:50 am Design, Fabrication, and Experimental Testing of a 5 kWth Windowless Packed-Bed Reactor for High-Temperature Solar Thermochemical Processing  
**Christian Wieckert**<sup>1</sup>, Nikolaos Tzouganatos<sup>2</sup>, Aldo Steinfeld<sup>2</sup>  
<sup>1</sup> Paul Scherrer Institute; <sup>2</sup> ETH Zürich
- 12:10 pm Solar Thermochemical Splitting of CO<sub>2</sub> Into Separate Streams of CO and O<sub>2</sub> with High Selectivity, Stability, Conversion, and Efficiency  
**Philipp Furler**<sup>1</sup>, Daniel Marxer<sup>1</sup>, Michael Takacs<sup>1</sup>, Aldo Steinfeld<sup>1</sup>  
<sup>1</sup> ETH Zürich

12:30 pm - 02:00 pm Lunch Break

02:00 pm - 04:00 pm **Closing Session**  
ROOM: GREAT ROOM 2+3

## Trends in CSP Technology

Point Focussing Systems

**Reiner Buck**, German Aerospace Center (DLR)

Line Focussing Systems

**Charles Kutscher**, National Renewable Energy Laboratory

Thermal and Thermochemical Storage

**Gustavo Caceres**, Universidad Adolfo Ibáñez

## Technology Innovation Award

Next Conference

Farewell



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## Conference Dinner

The SolarPACES 2017 Conference Dinner will take place at the beautiful venue “Botanico” in Santiago.

Enjoy a pleasant evening in a convivial and relaxed atmosphere with your colleagues and friends!

**Date:** Wednesday, September 27

**Start Time:** 7:30 pm pick up from W Hotel

**End Time:** TBD

**Fee:** Included in the conference fee, registration in advance is required. Fee for accompanying person: € 100

The Conference Dinner is sponsored by SQM. **Thank You!**



## General Information

### Conference Proceedings

Accepted papers will be published online with AIP, the American Institute of Physics. All papers published with AIP feature individual DOI numbers and are, therefore, fully citable.

### Conference Registration

Before attending the sessions, pre-registered participants have to present themselves in person at the registration desk to collect a conference bag and their name badge.

Regular conference registration (full ticket) includes:

- Access to all conference sessions and the poster area
- Access to the sponsoring and exhibition area during the conference
- The printed conference program
- Daily coffee breaks and lunches
- Free entrance to the Welcome Reception
- The Conference Dinner
- Access to a password-secured area on the website including the list of participants and all accepted abstracts. Presentations as well as papers will be published after the conference (if cleared for publication). Papers will be available on the website until publication with AIP.

### Currency

The local currency in Chile is Chilean Peso (CLP). On September 01, 2017, 1 US Dollar equaled 628.36 CLP; 1 Euro equaled 743.03 CLP. You are advised to check the conversion rate at [www.xe.com](http://www.xe.com) for the days of your visit.

### Language

The conference language is English.

### Name Badge

Delegates are requested to wear their official identification name tag at all time within the Conference Center and during the Conference Dinner.

### Venue

The SolarPACES 2017 Conference will take place at the Hotel W:

#### Address:

Hotel W  
Isidora Goyenechea 3000  
Las Condes,  
Santiago, Chile  
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