

Solar Particle Technology for Dispatchable Power and Heat Generation

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Live Seminar Time and Date: 12:00-13:00 (Turkish time / GMT + 3)
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Recorded Seminar: [Link](#)

Abstract: Solid ceramic particles are considered a promising new heat transfer and storage medium for concentrating solar power applications. The use of such particles has several advantages: operation temperatures up to 1000°C are possible, and there is no danger of freezing like in molten salt systems. Particle systems can operate at a high temperature spread, yielding much higher storage densities than state-of-the-art technologies. In consequence a significant cost reduction is predicted for solar particle systems. The presentation will report mainly on two ongoing projects that rely on solar particle technology. In the HIFLEX project a complete solar subsystem will be built in Italy, consisting of a particle receiver, a thermal storage system and a steam generator. Process heat will be delivered to a pasta plant for pasta drying. The PreMa project will demonstrate the use of solar high temperature process heat in a metallurgic process, the production of manganese. The solar heat will be used to preheat the ore and to perform a prereduction step, thus reducing the greenhouse gas footprint.



Short Bio: Dr.-Ing. Reiner Buck is Mechanical Engineer and has received his PhD in 2000 from the University of Stuttgart on "Mass Flow Instabilities in Volumetric Receiver-Reactors". He has worked with DLR since 1986 on different solar thermal technologies, with focus on solar tower systems. Since 2011 he is leading the department "Point Focusing Systems" within the DLR Institute of Solar Research, which in 2020 became the department "Solar High Temperature Technologies". His expertise is on solar thermal systems including receivers, heliostats and simulation tools. He developed several simulation tools for solar power systems (ray-tracing tools for heliostat fields, thermal performance analysis for various types of receivers). He also has a sound experience in testing of

receivers and innovative concentrators. He also led and participated in numerous national and international collaboration projects on CSP.

About ODAK_{TR}: ODAK_{TR} is a national CST initiative led by METU-GÜNAM with objectives to

1. Support Turkey's energy transition through the development & commercialization of CST technologies;
2. Catalyze domestic CST economic activity by supporting growth in markets, industrial capacities, and industrial activities;
3. Strengthen Turkey's CST Research and Innovation (R&I) capacities, including by creating globally competitive CST research opportunities at Turkish universities.

One of ODAK_{TR}'s main strategies to achieve these objectives is through harmonization of national activities with EU CST initiatives by strengthening and exploiting synergies created by METU-GÜNAM's role as Turkey's National Node for the CST European Research Infrastructure Consortium (ERIC) EU-SOLARIS, and participation in 5 EU H2020 projects: 1. SolarTwins; 2. HORIZON-STE; 3. SFERA-III; 4. INSHIP; and 5. GeoSmart.

About the ODAK_{TR} Seminar Series: Through the ODAK_{TR} Seminar Series, leading CST experts from METU-GÜNAM's strategic CST partners CIEMAT-PSA (Spain) and DLR (Germany) and other CST experts will give seminars targeting the Turkish CST community and tailored to support realization of ODAK_{TR}'s objectives. The ODAK_{TR} Seminar Series is being executed within the framework of the H2020 Project SolarTwins. The current ODAK_{TR} Seminar Series schedule is as follows, with all seminars from 12:00-13:00 Turkish time:

Date	Speaker, Institution	Seminar Title	Recorded Seminar Links
18 Dec. 2020	Prof. Dr. Eduardo Zarza, CIEMAT-PSA, Spain	An Introduction to Concentrating Solar Thermal (CST) Technologies and Applications	Not Recorded
08 Jan. 2021	Dr. Yelda Erden-Topal, UPM & CIEMAT, Spain, and METU TEKPOL, Turkey	CST in Turkey: Current State and National Strategies to Exploit Opportunities	Link
15 Jan. 2021	Dr. Florian Wiesinger, DLR - Institute of Solar Research, Germany	Quality Assessment and Accelerated Aging Experiments of Optical Components for CSP Plants	Link
22 Jan. 2021	PhDc. Gkiokchan Moumin, DLR - Institute of Future Fuels, Germany	Calcination of Cement Raw Meal in a Solar Rotary Kiln and Heat Transfer Challenges	Link
5 Feb. 2021	Dr. Inmaculada Polo, CIEMAT-PSA, Spain	Antibiotic Resistant Bacteria: occurrence and removal from urban wastewater	Link
12 Feb. 2021	Dr. Reiner Buck, DLR - Institute of Solar Research, Germany	Solar Particle Technology for Dispatchable Power and Heat Generation	To Be Completed
19 Feb. 2021	Marcel Bial, ESTELA- The European Solar Thermal Electricity Association	First learnings from a multifold stakeholders position review regarding the deployment of CSP in Europe	To Be Completed
26 Feb. 2021	Dr. Isabel Oller, CIEMAT-PSA, Spain	Water-Energy-Food nexus in industrial and urban wastewater recovery	To Be Completed

About the H2020 SolarTwins Project: The aim of the SolarTwins project is to step-up the scientific excellence of the promising CST Research Division *ODAK* of METU-GÜNAM (Coordinator) in collaboration with the internationally leading CST institutions CIEMAT-PSA (Spain) and DLR (Germany). SolarTwins includes 4-weeks of CST summer schools at METU taught by leading experts from CIEMAT-PSA and DLR and METU graduate students co-advised by experts from CIEMAT-PSA and DLR. An expected impact is the establishment of competitively-funded METU-CIEMAT and METU-DLR Joint Research Lines.

Co-Sponsoring Projects:

- **HIFLEX:**



In the HiFlex project, a pre-commercial power plant based on Concentrating Solar Power will be developed, built and tested at a pasta plant in Italy. The EU co-funded project will demonstrate, that it is possible to run the plant 24/7 and continuously generate renewable energy. The plant will use a particle receiver with 2.5 MWt thermal power to provide hot particles at up to 1000°C. A high-density thermal storage system and a steam generator for 620°C will be demonstrated. In the pre-commercial plant the collected solar energy will be transferred to the pasta plant to support the pasta drying process. This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 857768. <http://hiflex-project.eu/>

- **PreMa:**



PREMA is a H2020 project aimed at demonstrating an innovative suite of technologies, involving utilization of industrial off-gases and solar thermal energy to reduce energy consumption and CO₂ emissions from manganese production as a means to obtain sustainable production of Mn-alloys and steel. The main concept of PREMA is to increase energy flexibility and allow the use of sustainable energy sources and reduce the overall energy consumption and CO₂ emission in Mn-alloy production. This will be done by dividing the Mn-alloy production, today done in submerged arc furnaces (SAF), into two separate units as illustrated below. A pretreatment unit will be added before the existing furnace. Within the project various pretreatment technologies using different energy sources like: CO-rich industrial off-gas, bio-carbon and solar thermal energy will be developed and demonstrated.

Integration of the novel PREMA pretreatment technologies with the process currently used by smelters will lead to a better flexibility in terms of raw materials leading to a 20% reduction in the consumption of fossil carbon, more energy efficient production processes giving a potential for a 20% reduction in overall energy consumption and a global reduction of operation costs by at least 10%. The ultimate ambition of PREMA is to scale the technology up to use in industrial manganese alloy production both in Europe and South Africa. This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 820561 <https://www.spire2030.eu/PREMA>

About METU-GÜNAM's CST Research Division ODAK: ODAK includes a diverse set of academics and post-doctoral researchers who are actively contributing to METU-GÜNAM's National and European CST activities:

Burcu AKATA KURÇ MNT, METU
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EU Projects and Activities Showcased by ODAKTR



ODAKTR Organizing Institutions



Funding Agencies Supporting Projects Showcased by ODAKTR



The European Union projects have received funding from the Horizon 2020 research and innovation program under grant agreements No 856619 (SolarTwins), 838514 (HORIZON-STE), 731287 (INSHIP), 823802 (SFERA-III), and 818576 (GeoSmart).



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