SolarPACES
Solar Power & Chemical Energy Systems

MOSAICO PROJECT

Evora 24th October 2023

TOWARDS THE STANDARDIZATION OF MOLTEN SALT LOOPS' INSTRUMENTATION AND COMPONENTS

SolarPACES Project

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Motivation and objectives

Motivation:

- Interest in TES R&D activities dramatically increasing since thermal storage is a key component in commercial CSP plants
- Cost reduction, new concepts for latent, sensible and thermochemical storage, innovative configurations and designs

Objective:

- Promote **collaboration** for improving TES reliability and CSP integration
- Develop a common language

Current TES WG activity lines

- **Characterization of specific equipment for commercial TES**
- **Survey of R&D&i Activities on TES**
- Web page at SolarPACES

https://www.solarpaces.org/csp-research-tasks/task-iii-solar-technology-and-advanced-applications/

Previous Activity Lines:

- Storage Materials
- Prototype Testing

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NEWS ROOM | ABOUT | WORLDWIDE CSP

Operating Agent:

Peter Heller, DLR, Germany

Published Task Reports

Silicone-Based Heat Transfer Fluids Guidelines
2016 Aluminum Reflector Durability (pdf)
Particle Reflectance Guideline (pdf, 2022)

Subtasks and Working Groups

Thermal Energy Storage Working Group
Optical Properties Working Group

Nature of Work & Objectives

Previous Activity lines

- **Storage Materials**

Coordinators: J. Nieto (Tecnalia/Spain), J. González (IMDEA Energía/Spain)

Main Achievements: 3 Round Robin Tests performed:

- Specific heat capacity of sensible materials (Solar salt with nanoparticles) 9 participants, including industry; Achieved agreement in accurately measuring cp with DSC, according to normalized methods ASTM E1269 and MDSCTM in the range of temperatures 200 and 400ºC (SolarPACES 2016).
- Reaction enthalpy of thermochemical materials.
- Cobalt oxide: 7 participants, including industry; there was no coherency and agreement in the results obtained by different partners (SolarPACES2016).
- Perovskites: 7 participants; Some discrepancies in results (SolarPACES2018).

- **Prototype Testing**

Coordinator: P. Garcia, CEA, France

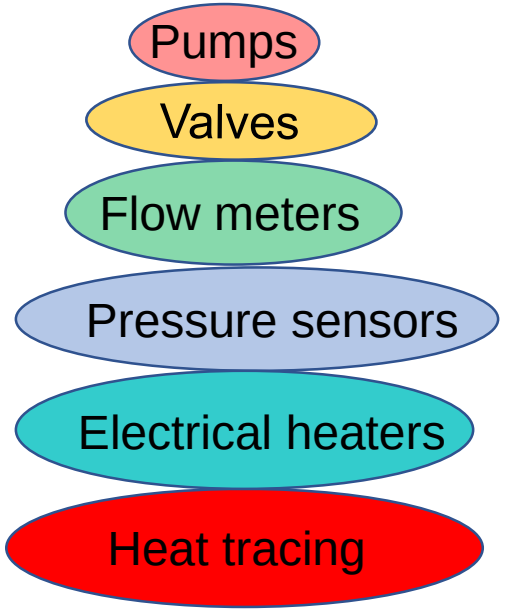
Main Achievements:

- Report *Definition of common procedures for testing thermal storage prototypes for STE plants* (2016).
- Aligned with task 6.3 of the European project SFERA-III: *D6.3 Protocol for testing sensible and latent storage*

Molten salt equipment testing: Motivation and objectives

THE PROBLEM:

- **Necessity of characterization:**
  - Components reliability is not proved before installing them at plants.
  - In commercial plants if one of these components presents a malfunction, it will just be repaired (often by component replacement)



Molten salt equipment testing: Involved institutions

Institutions involved

Invited institution (collaboration with SFERA III)

Task 6.4 Establishment of standard procedures for the characterization of components for commercial TES (using sensible and molten solar salts) (*CYI*, CIEMAT, ENEA, UEVORA, FRA)

Molten salt equipment testing: Facilities

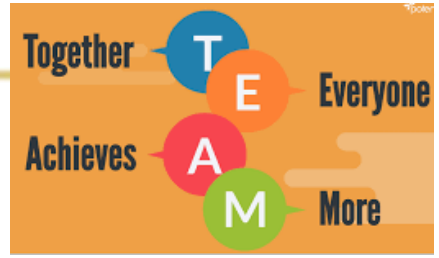
MOSA & BES-II (Ciemat-PSA)

TESIS at DLR

Molten salt loop for gravimetric calibration of flow meters at FRAUNHOFER ISE

NEWSOL Loop
at Universidade de Evora

The working plan



Current situation and future activities

- 2018: Identification of problems is finished (open to new problems that may arise in commercial plants)
- 2019: Tests definition almost ready
- 2020 & 2022: New tests performed and continuation of test definition
  - Collaboration with SFERA-III project
  - Test of valves, flow meters and flanges
  - An online meeting held periodically.
  - Invitation of interested manufacturers
- 2023: Project dissemination
- 2024 → Guidelines publication

Other activity lines

Activity	Contributions from *(≥3 to go on)*
Equipment testing	CIEMAT, DLR, Sandia, ENEA, Fraunhofer, Evora
Tanks	CIEMAT, NREL, Solar Dynamics, DLR
MATERIALS AND COATINGS	CIEMAT, Sandia, DLR, Universidad Complutense
Carnot batteries	CIEMAT, DLR, COSIN SOLAR, Solar Institute Julich, NREL

Industry participation is necesary !!!


Thank you for
your attention!