



## STORAGE RESEARCH INFRASTRUCTURE ECO-SYSTEM

### RI Information sheet 2022

ENEA, ZECOMIX&ThESI

Technologies of Energy Storage: Thermal (that can be assign to the facility, e.g. electrochemical, chemical, thermal, cross-cutting, ....)

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|                     |                  |
|---------------------|------------------|
| Project Acronym     | StoRIES          |
| Call                | H2020-LC-GD-2020 |
| Grant Agreement No. | 101036910        |
| Project Start Date  | 01-11-2021       |
| Project End Date    | 31-10-2025       |
| Duration            | 48 months        |

1. Photo

...



2. Geographical coordinates (°, ′, ... N/S, E/W)

ENEA Casaccia Research Centre (Rome, Italy)

3. Description of the research infrastructure for the webpage

**ThESI:** (Thermal Energy Storage Infrastructure) is a multi-purpose experimental platform devoted to the development and characterization of new material and components for thermal storage applications in the temperature range 150-550°C. The infrastructure is composed of different outdoor and indoor installations, which supports the ENEA’s research activities on TES from the laboratory scale to the pilot scale, working both under controlled and real operating conditions. Particularly ThESI is composed of the following installations: **1. PCS:** out-door experimental facility to test, under real operating conditions, the full-scale key components of concentrating solar systems that use molten salts as heat transfer fluid. The main components of the system are a molten salt storage tank (containing 5.8 m<sup>3</sup>/10 t of a mixture of sodium and potassium nitrates) and a 100 m parabolic solar collector, which collects and transfers concentrated solar power (about 200 kW) to the thermal fluid (“solar” salt mixture). The PCS facility has been recently integrated with two additional experimental installations, mainly focused on the development and validation of innovative TES concepts: i) the *ORC-PLUS* circuit, which is equipped with a thermocline thermal storage unit (200 kWh) using a low melting molten salt mixture as HSM, integrated with two oil/salt heat exchangers to load and release the thermal energy stored in the tank; ii) the *RESLAG* system, which is a pilot out-door circuit to study the behaviour of a packed bed thermocline TES system using molten salts as HTF and HSM. The charging and discharging operations of the thermocline tank are monitored varying different operating parameters, like

molten salt flow rate (0.3 kg/s - 1.1 kg/s) and temperature (290-550°C). **2. SOLTECA** (SOLare TERMico CALcestruzzo): bench-scale experimental facility (20 kW), aimed at supporting the development of innovative thermal storage materials and systems at medium temperature, up to 400°C. The facility is applied to test different solid-based thermal storage modules in order to determine their performance in terms of stored and released thermal energy, as well as the characteristic times of the different operating phases. Particularly the facility is currently used to verify the thermal performance of medium-size concrete thermal storage modules (3 meters long), as well as Phase Change Material (PCM) based-systems (100 kg), under the operating conditions that are characteristic of medium temperature CSP plants. **3. ATES** (Advanced Thermal Energy Storage): lab-scale facility (5 kW) aimed at the analysis and characterization of heat transport phenomena occurring in materials and components for TES systems. Currently, the system is used for the analysis of storage modules containing PCMs (solar salts mixtures) added with nanoparticles. The facility can be applied for the analysis of innovative materials/component designs for thermal storage systems, considering both sensible heat and phase change storage media, at different operating temperatures (up to 400°C), and in efficient and alternative configurations (for example PCMs in cascade).

#### 4. Availability of the research infrastructure

(Please indicate time periods in which infrastructure will not be available for StoRIES in the next 2 years – if already known)

The facilities will not be available in the period 1<sup>st</sup>-31<sup>st</sup> of August

5. Special considerations (confidentiality / NDA agreements, insurance requirement, special training, HSE training)

...

6. Energy storage technology that can be analysed/studied by using the research infrastructure

- Electrochemical
- Chemical
- Thermal
- Mechanical
- Superconducting Magnetic

- Cross-cutting  (Specifically: ... )

7. Key words for the webpage

Thermal Storage, Molten Salts based-storage, Sensible and Latent Heat Storage, packed bed thermocline tank,

8. TRL level (if applicable):

- 1-3
- 4-6
- Above