SolarPACES
Solar Power & Chemical Energy Systems

MOSAICO and SFERA III PROJECTS

EVORA , 24th October 2023

The EMSP Facility

(CER-UEvora)

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UNIVERSIDADE DE ÉVORA

RENEWABLE ENERGIES CHAIR

MINISTERIO DE CIENCIA E INNOVACIÓN

Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

U23

PSA

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CER Infrastructure & Cooperation

Renewable Energies Chair / October 2023

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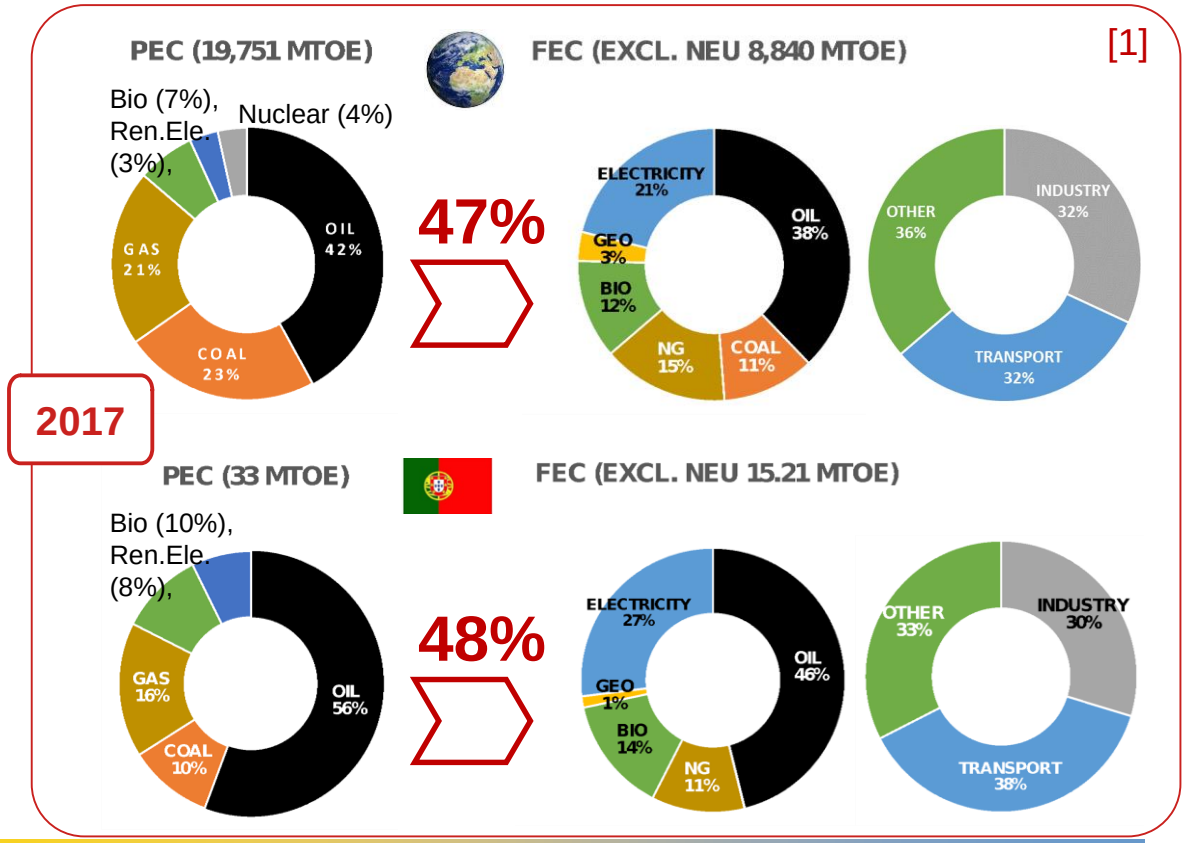
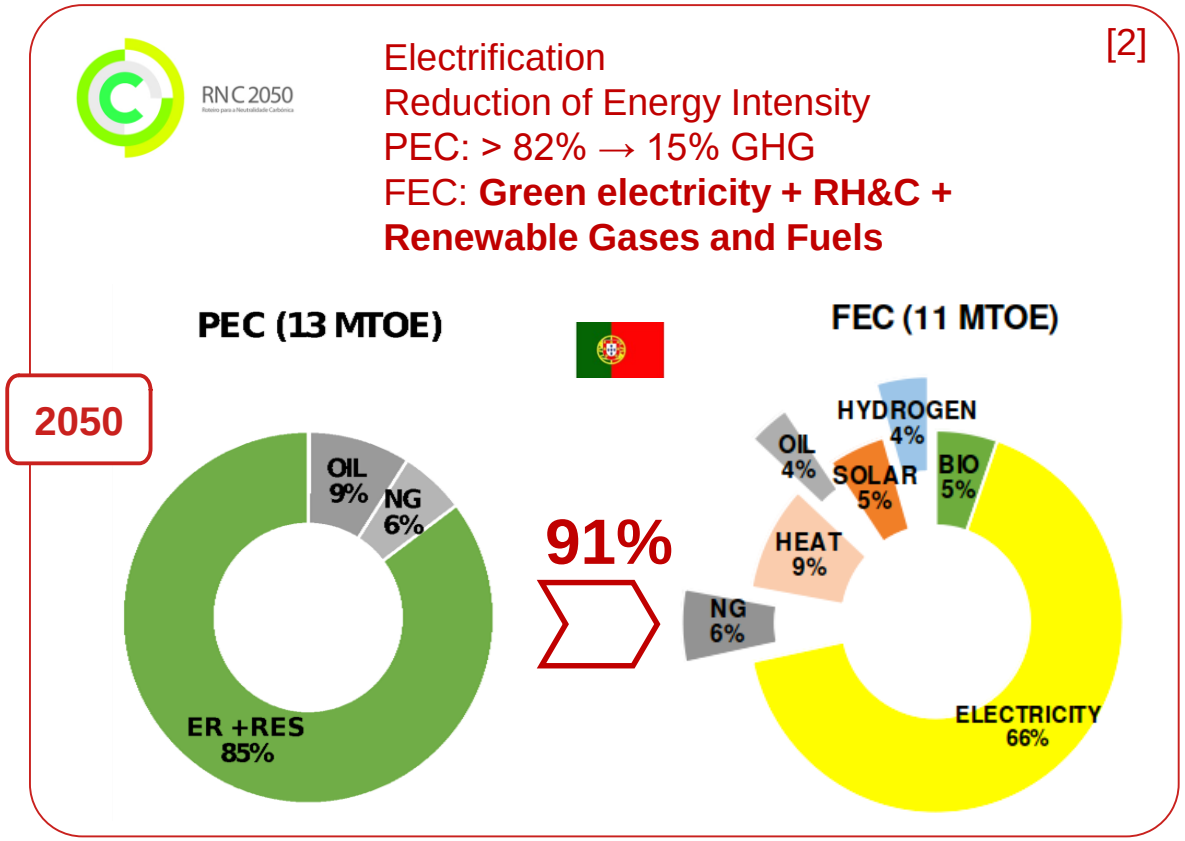
Ciemat PSA

Mission

Solar energy for a decarbonized economy

- Promote the **development of solar energy technologies for the Energy Transition**

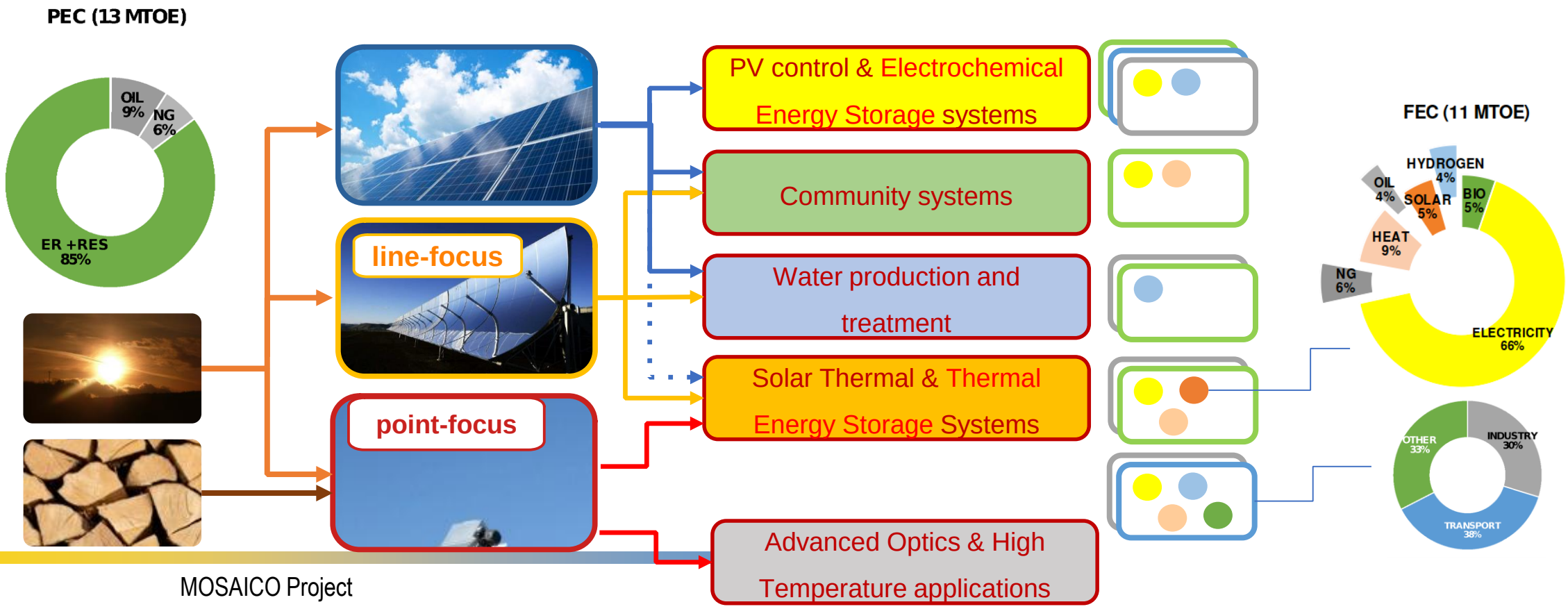




Team

Research units and research topics and scope

- **22+ members organized in 5 thematic units**
  (9 Researchers – 6 PhDPV, 7 Technicians, 4 PhD + 2 MSc students) <u>+ 23 hiring positions '23</u>



Infrastructure

Applied research for increased competitiveness and scope

- Research Infrastructure **organized within INIESC** – National Research Infrastructure for Solar Energy Concentration (Évora Pole), **part of National RI Roadmap** (Roteiro) [3]

[3, 4]

INIESC
National Research Infrastructure on Solar Energy Concentration

Évora (leader)

UNIVERSIDADE DE ÉVORA

Lisbon

LNEG

PECS

Two axis sun tracking platform

EMSP

Molten Salts CSP Plant (3.6 MWth, 560°C)

PV/EES

PV microgrid & advanced batteries

DNI

Resource monitoring network

[5]

Germany (HPS2)

Bundesministerium für Wirtschaft und Energie

DLR

INIESC Infrastructure – Évora Pole

Medium and High temperature thermal conversion @ EMSP

- **Évora Molten Salt Platform (co-managed infrastructure (UNIVERSITY OF ÉVORA, RENEWABLE ENERGIES CHAIR_10 YEARS + DLR)**

HelioTrough® 2.0: 684 m, 4,500 m²
HTF: Molten Salts
Power: **3.5 MW_{th}**
Tmax: **565 ºC**

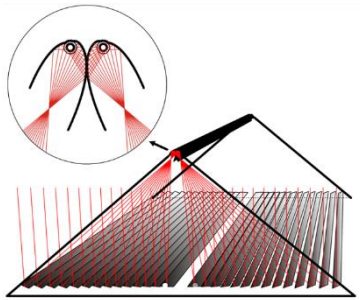
Power: **1.8 MWth @ 14.0 Mpa / 560 ºC**
Economizer/evaporator, air cooled condenser, pressure reducing station

2-Tank TES
34 m3 (ca. 92 tons salt)
Capacity: **5.4 MWh @ 565 °C / ΔT = 275 K**

INIESC Infrastructure – Évora Pole

Medium and High temperature thermal conversion @ EMSP

- **Évora Molten Salt Platform (co-managed infrastructure (UNIVERSITY OF ÉVORA, RENEWABLE ENERGIES CHAIR_10 YEARS + DLR)**



Advanced Linear Fresnel
440 m²
HTF: Molten Salts
Power: **0.3 MW_{th}**
Tmax: **560 ºC**

[7] ALFR Alentejo

Thermocline TES
28 m3 (Salt + Filler)
Capacity w/ filler: **2.9 MWh**
@ 500 °C / ΔT = 210 K

[6] NewSOL

INIESC Infrastructure – Évora Pole

Medium and High temperature thermal conversion @ EMSP

- **Évora Molten Salt Platform (co-managed infrastructure (UNIVERSITY OF ÉVORA RENEWABLE ENERGIES CHAIR_10 YEARS + DLR)**

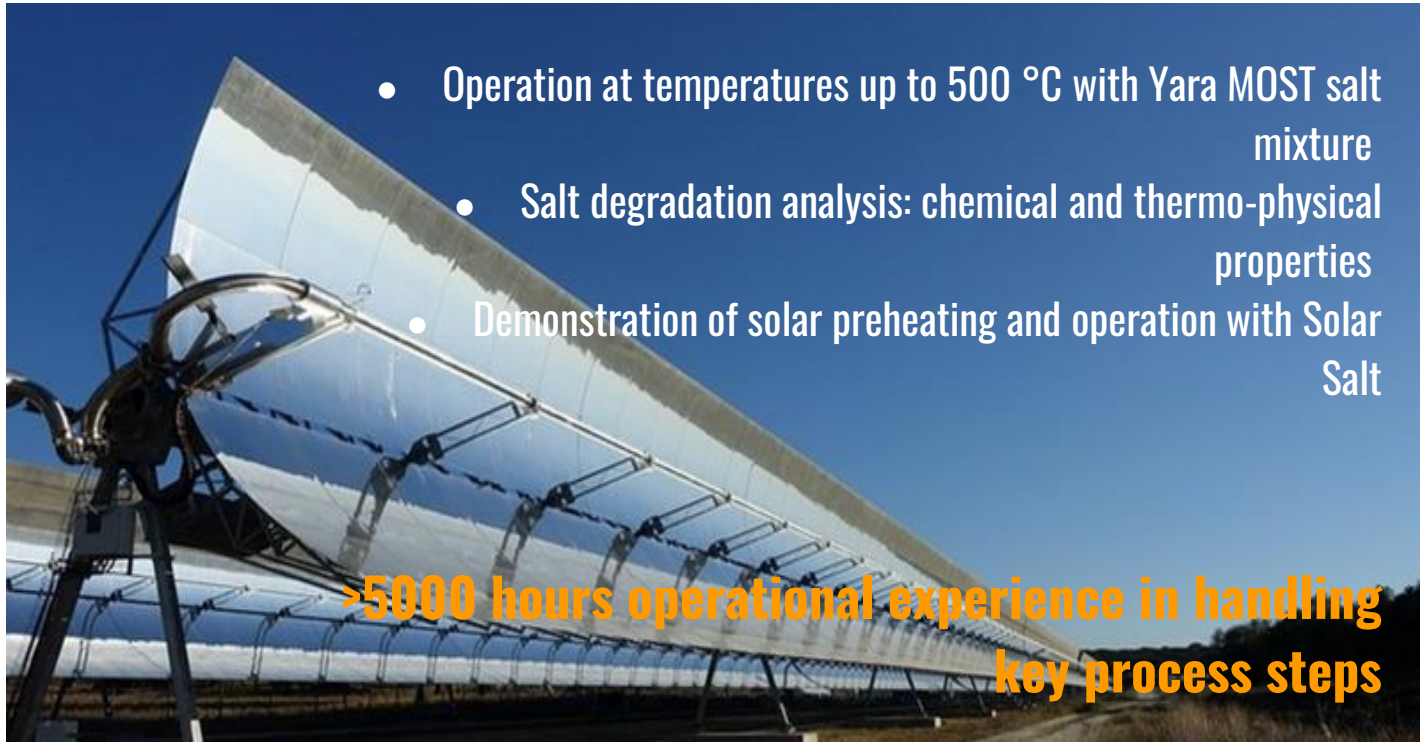
ACHIVEMENTS: Complementary roles of EMSP industrial and R&D partners Putting together a large puzzle

INIESC Infrastructure – Évora Pole

Medium and High temperature thermal conversion @ EMSP

- Évora Molten Salt Platform (co-managed infrastructure (UNIVERSITY OF ÉVORA RENEWABLE ENERGIES CHAIR_10 YEARS + DLR)

ACHIVEMENTS in molten salt operation: Solar demonstration started in October 2021

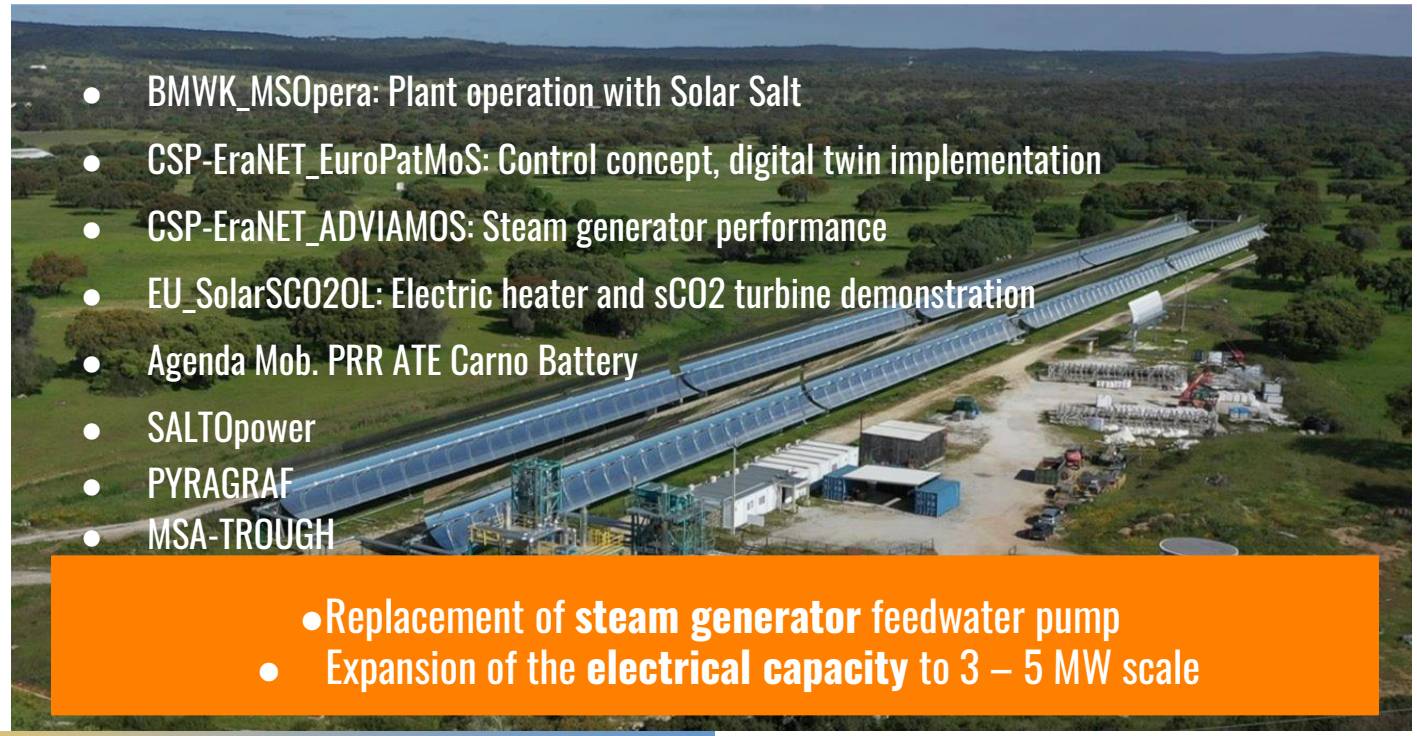


INIESC Infrastructure – Évora Pole

Medium and High temperature thermal conversion @ EMSP

- **Évora Molten Salt Platform (co-managed infrastructure (UNIVERSITY OF ÉVORA RENEWABLE ENERGIES CHAIR_10 YEARS + DLR)**

ACHIVEMENTS: Large-scale test site for molten salt research and demonstration part of ERIC EU-SOLARIS hosts several new projects and undergoes major upgrades



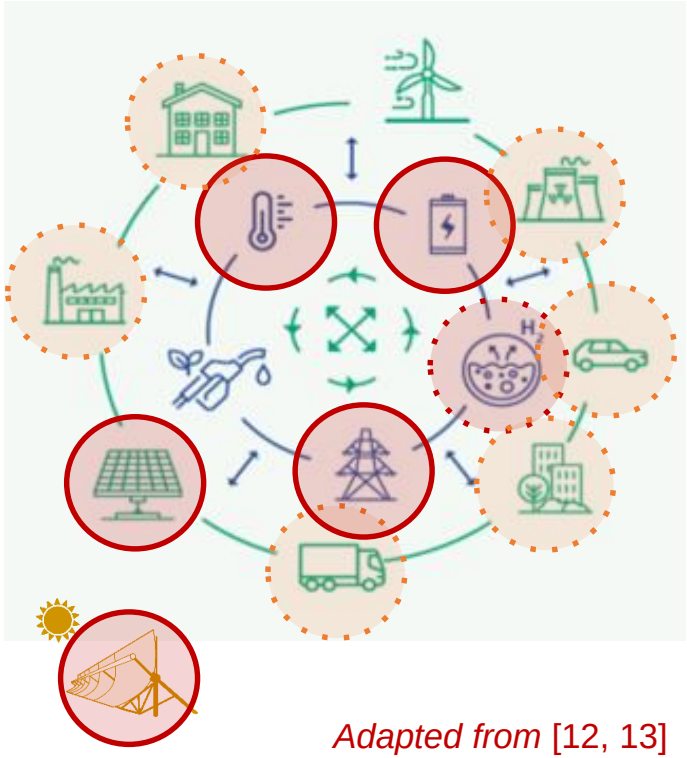
- BMWK_MSOpera: Plant operation with Solar Salt
- CSP-EraNET_EuroPatMoS: Control concept, digital twin implementation
- CSP-EraNET_ADVIAMOS: Steam generator performance
- EU_SolarSCO2OL: Electric heater and sCO2 turbine demonstration
- Agenda Mob. PRR ATE Carno Battery
- SALTOpower
- PYRAGRAF
- MSA-TROUGH

- Replacement of **steam generator** feedwater pump
- Expansion of the **electrical capacity** to 3 – 5 MW scale

INIESC Infrastructure – Évora Pole

Emulate the future energy system

- **Ongoing / foregoing** activities



Adapted from [12, 13]

Power2Heat Ongoing (Q3 2022)

Carnot Battery Foregoing (2023)

Solar driven electrolysis Concept (2023)

Autonomous Solar grid Foregoing (proposal 2022)

MSc and PhD tutorships

Technology development

Components qualification

O&M training

Technology demonstration

EMSP @ Academia and Industry

INIESC Infrastructure – Évora Pole

Emulate the future energy system

Icons adapted from [12]

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3. Portuguese Roadmap of Research Infrastructures, FCT / MCTES (2020)
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Thank you for your attention

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