

Development and Integration of Thermal Systems

Department of Solar Energy Technologies and Storage



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NATIONAL RENEWABLE
ENERGY CENTRE

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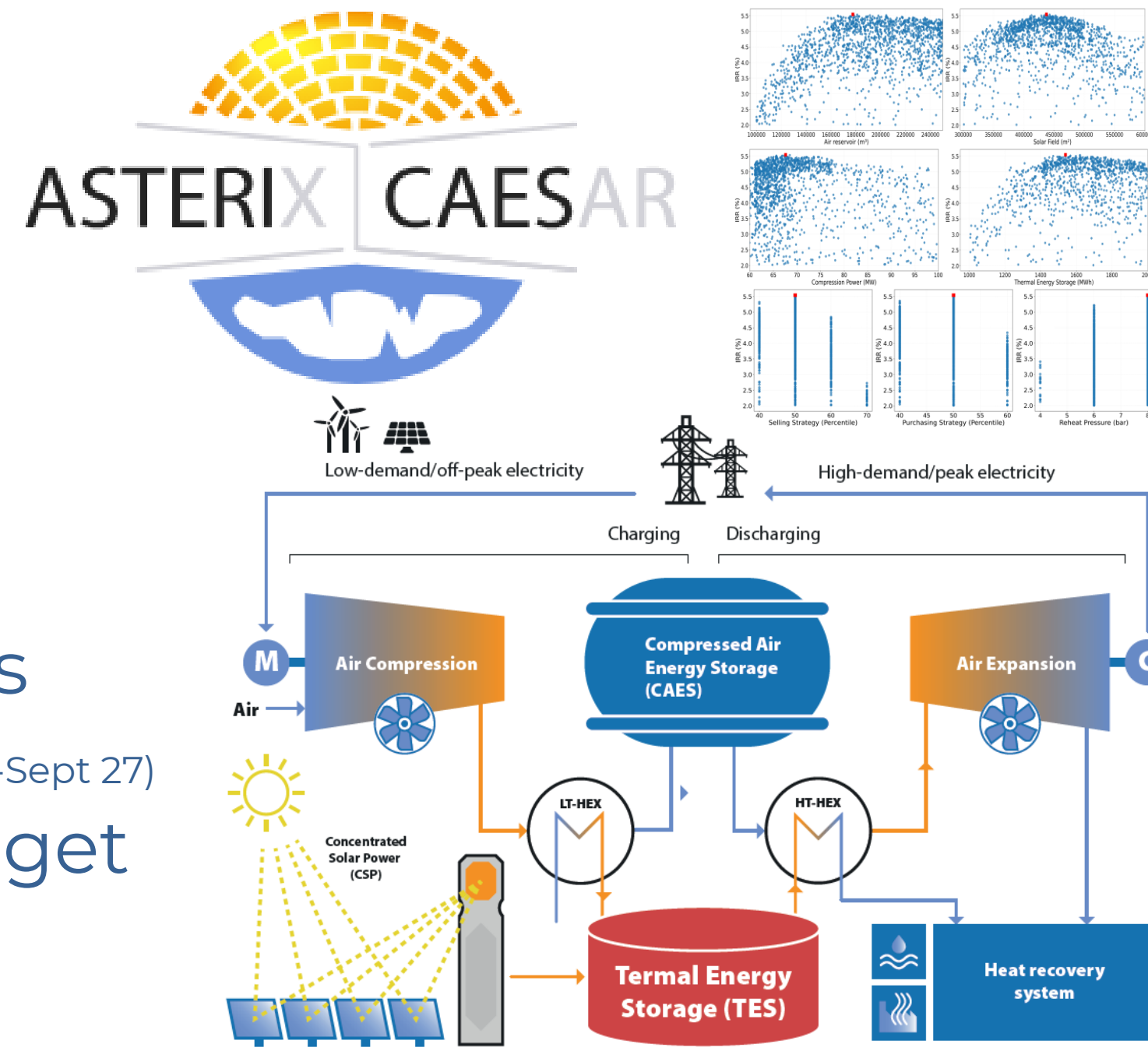
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Red TES
Red española de almacenamiento
de energía térmica

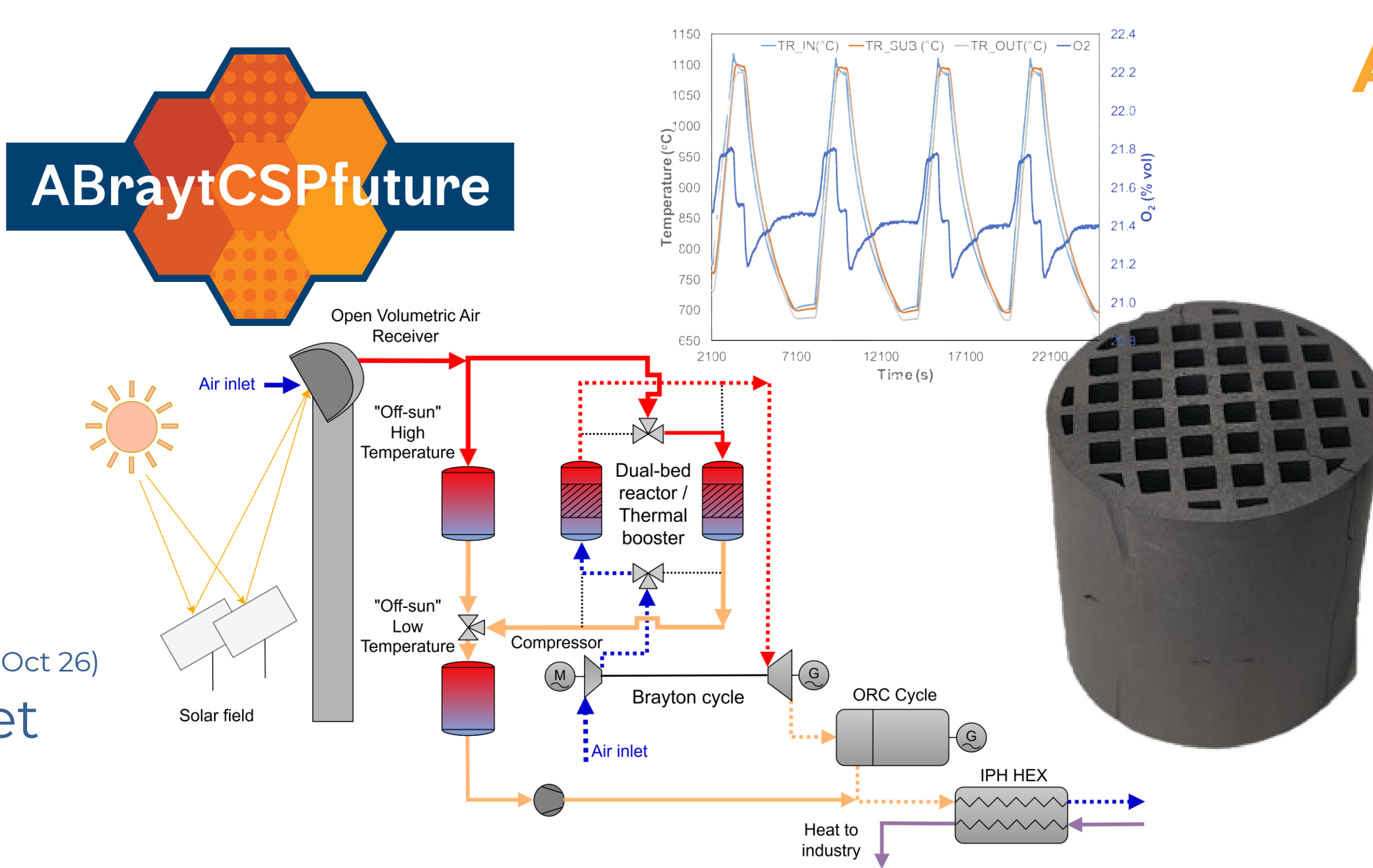
Main Ongoing Projects in Thermal Energy Storage



ASTERIX-CAESar: CSP + Compressed Air Energy Storage (CAES)

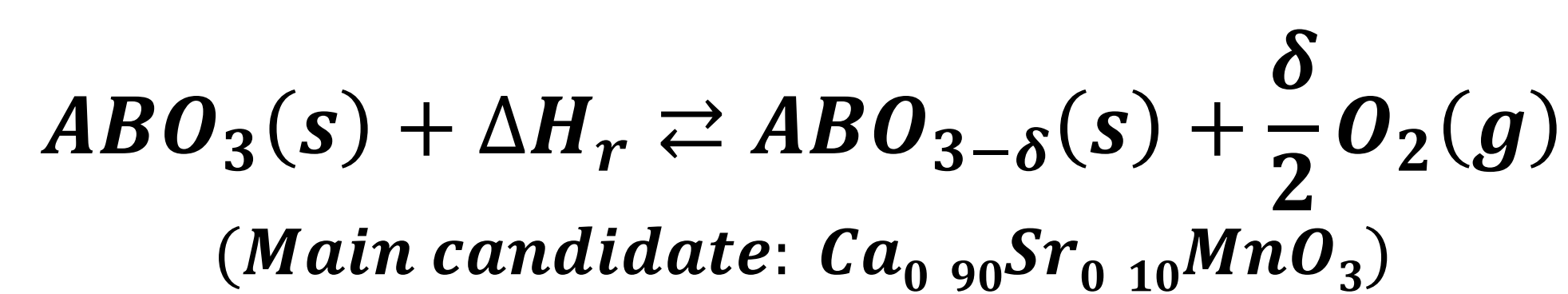
- Experimental testing of an advanced **open volumetric air receiver**
- Detailed modeling of the complete system
- **Techno-economic optimization** for several use cases
- Installation of a **500 kW_{th} prototype** at the Plataforma Solar de Almería (PSA)

Funded by
the European Union
No. 10097908

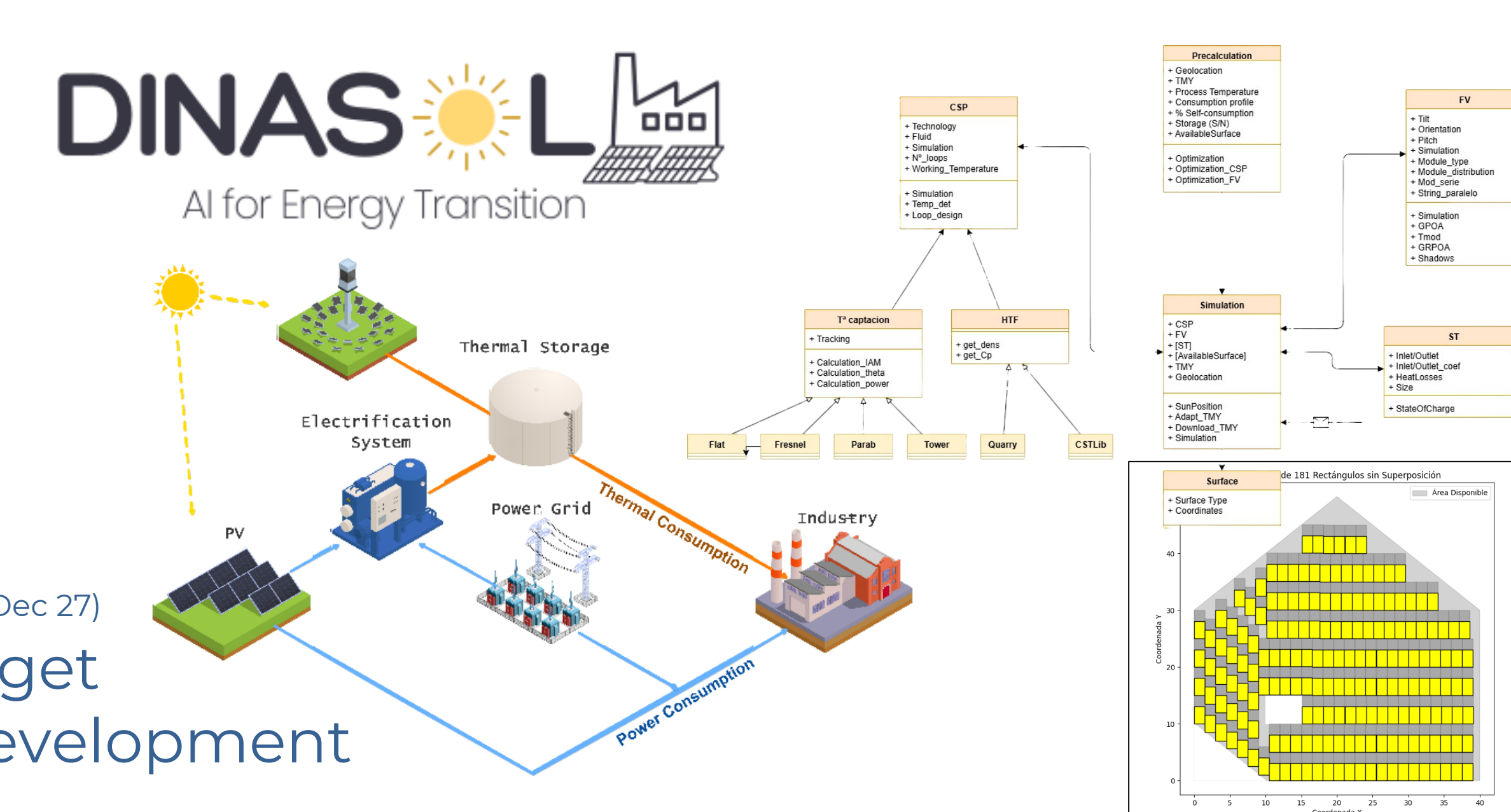


ABraytCSPfuture: CSP + Redox Thermochemical Energy Storage (TCES)

- Evaluation and synthesis of **novel redox oxide materials**, including the preparation of oxide-based porous structures
- Techno-economic optimization for several use cases
- **Design, manufacturing and testing** of proof-of-concept dual-bed unit at Synlight



Funded by
the European Union
No. 101084569



DINASOL: AI development of solar decarbonization systems for the industry

- Assessment of industrial thermal and electrical demand and available decarbonization technologies
- Development of an **AI-based tool for the optimal design of hybrid solar plants**
- **Validation through three industrial case studies** in Navarra, targeting fossil-fuel reduction and economic performance

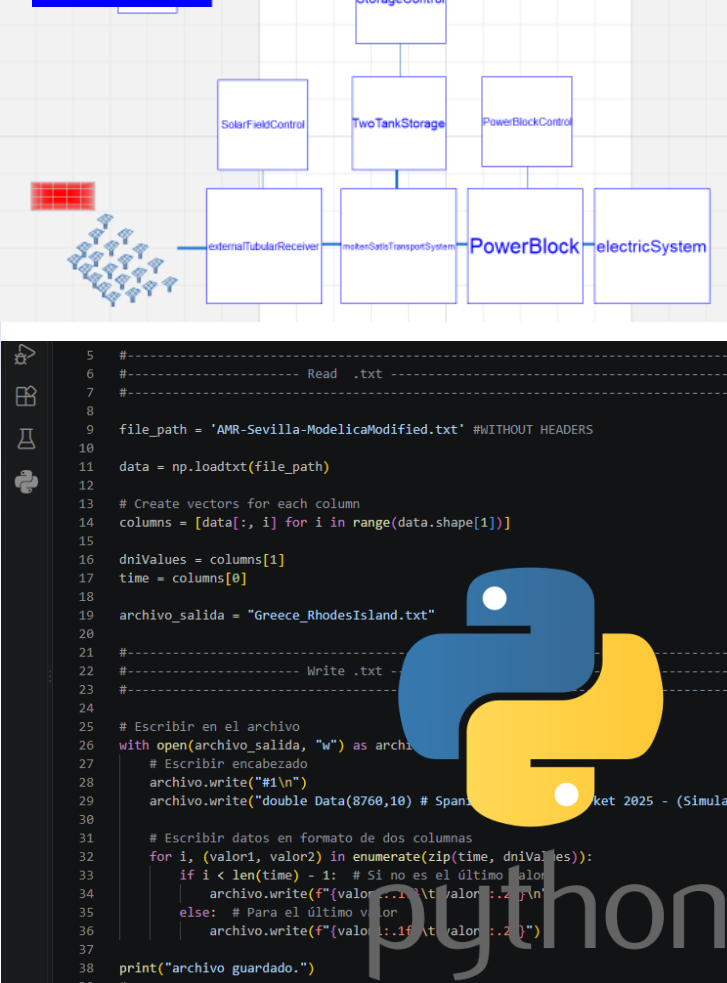
Proyectos de I+D
colaborativos (2024) Gobierno de Navarra
Nafarroako Gobernua

Our Capabilities

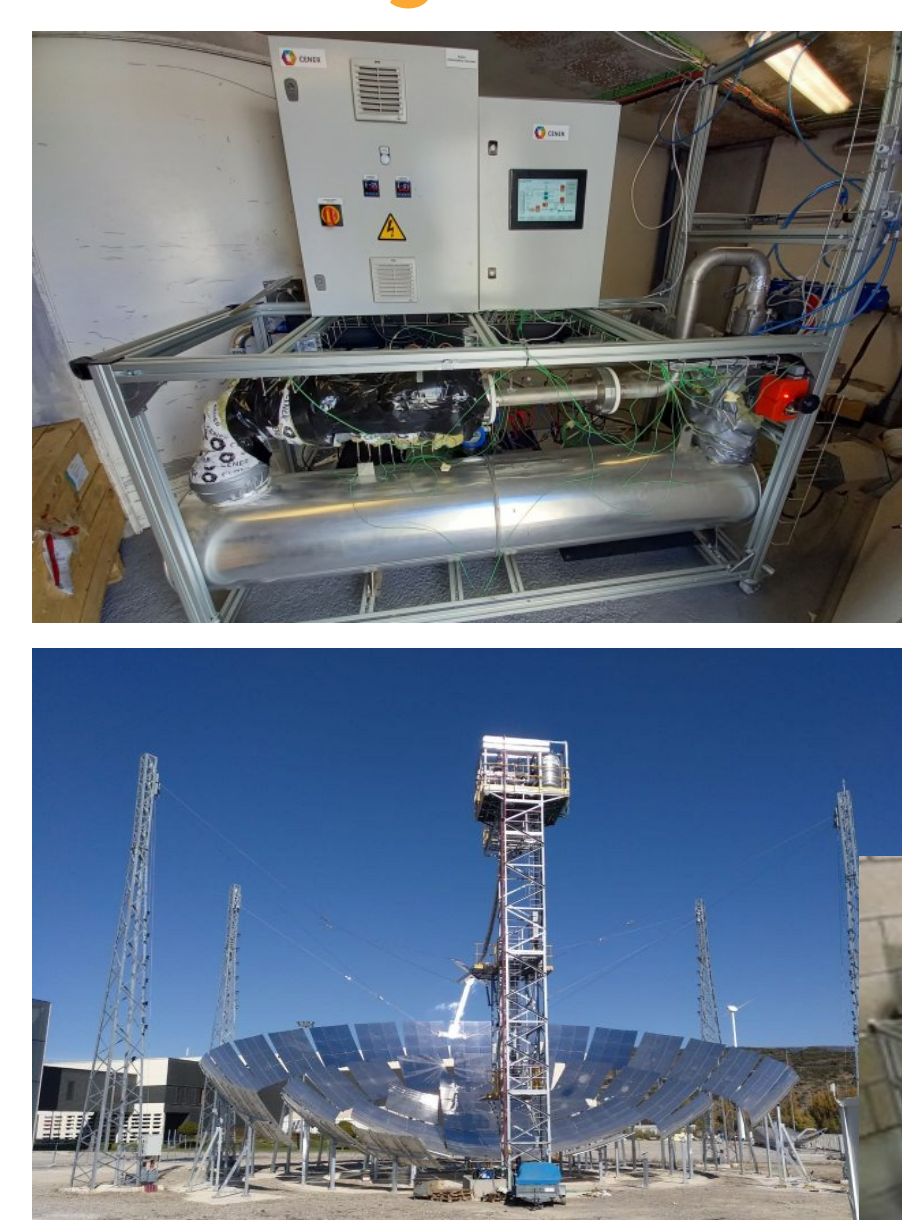
Software capabilities



- Proprietary **Dymola** library developed over more than 15 years
- **CFD and FEM** modeling
- Thermodynamic simulation of power plants
- **AI-based software** development in Python
- Detailed **techno-economic modeling** of innovative thermal systems



Systems testing and characterization



- **TES materials** for **air-based** packed beds **up to 600 °C**
- **Medium- and low-temperature** solar thermal systems
- **Parabolic-trough receiver** tubes
- **On-site characterization** of CSP and TES systems

Latest Journal Publications

Evaluating a compressed air energy storage (CAES) system with high-temperature concentrated solar power (CSP): Techno-economic and sensitivity analysis

Journal of Energy Storage,
Volume 180, Part A, 2026

J. Baigorri, P. Rodríguez-deArriba, T. Kubikova, T. Du Toit, J. Romani, A. L. Ávila-Marín, D. Sánchez, F. Zaversky

High-temperature open volumetric air receiver integrated with compressed air energy storage: Design of experimental prototype

Applied Sciences 16
(2026) 6633

J. Baigorri, X. Rández, R. Pérez, L.C. Alonso-Pardo, A.L. Ávila-Marín, F. Zaversky

Massive grid-scale energy storage for next-generation concentrated solar power: A review of the potential emerging concepts

Renew. Sustain. Energy
Rev. 185 (2023)

J. Baigorri, F. Zaversky, D. Astrain

Analysis of steel making slag pebbles as filler material for thermocline tanks in a hybrid thermal energy storage system

Solar Energy, Volume 188 (2019)
Pages 1221-1231, ISSN 0038-092X

F. Cabello Núñez, J. López Sanz, F. Zaversky