Main impacts

Higher share of variable output renewables

The ASTERIx-CAESar approach guarantees 24/7 renewable energy supply by offering grid stability through storage capacity. Moreover, the concept improves performance regardless of start-up, shutdown and load variations.

Higher efficiency of CSP plants

The peak solar-to-electric conversion efficiency is targeted at up to 40% (double the current state-of-the-art). This can be achieved by novel volumetric receiver approach as well as by using cheap off-peak electricity to boost conversion efficiency.

Reduced operation and maintenance costs of CSP plants

Using air instead of molten salts or synthetic oils as heat transfer fluid brings down significantly the maintenance costs and lowers various risks, too. Operational costs will be reduced thanks to AI-based heliostat control requiring less personnel on site.

Achieving EU targets for Global Leadership in CSP

Development of the next generation CSP/STE (Concentrated Solar Power/Solar Thermal Electricity) technology that provides cheap energy storage (low LCOS — Levelised Cost of Storage) for stabilising the power grid.

Consortium

CENER | NATIONAL RENEWABLE ENERGY CENTRE

CIEMAT PSA

UNIVERSIDAD D SEVILLA 1505

DOOSAN Škoda Power

ROMA TRE – INGEGNERIA INDUSTRIALE ELETTRONICA E MECCANICA – DIPARTIMENTO DI ECCELLENZA 2023-2027

Fraunhofer IKTS

EURIDA Research Management

AALBORG CSP - Changing Energy

ETN Global

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Nova Therm Tech

HEDNO

Keramikblech® Walter E. C. Pritzkow Spezialkeramik

engionic

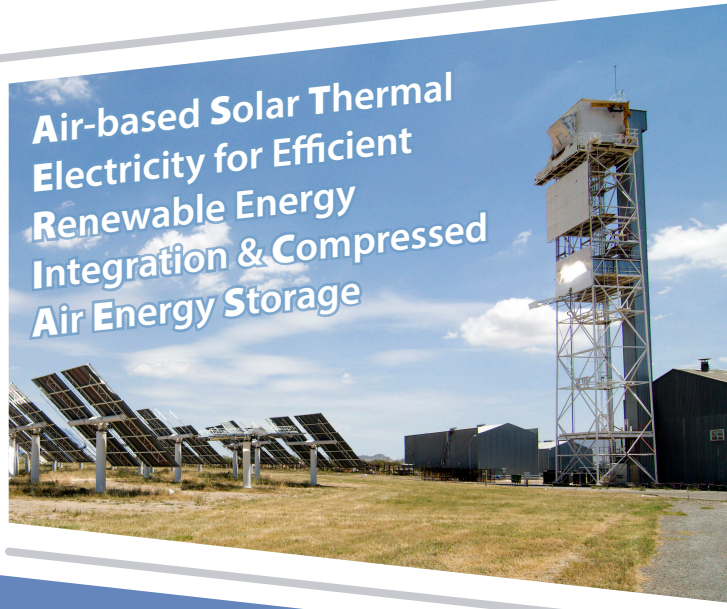
apria

SoftInWay Switzerland GmbH

Bluebox Energy Ltd Beyond Net Zero Carbon

Project Budget:	EUR 7,213,534.50
Funding EU:	EUR 5,270,925.38
Duration:	4 years (Oct 23 – Sept 27)

ASTERIX CAESAR



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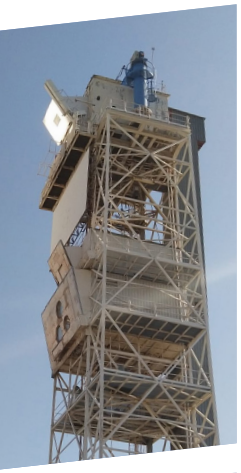
Charging

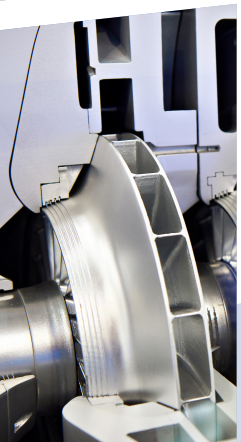


Advanced high-efficiency solar receiver

During sunny hours, a highly efficient solar receiver heats air to high temperature (800 °C). The high-temperature heat is stored using cost-effective heat storage technology.

Advanced sensor technology and AI-based solar flux control

New fiber-optic sensors and advanced AI-based heliostat field/solar flux control and monitoring system for CSP central receiver plants guarantee a stable and safe solar flux distribution on the receiver and reduce O&M effort.

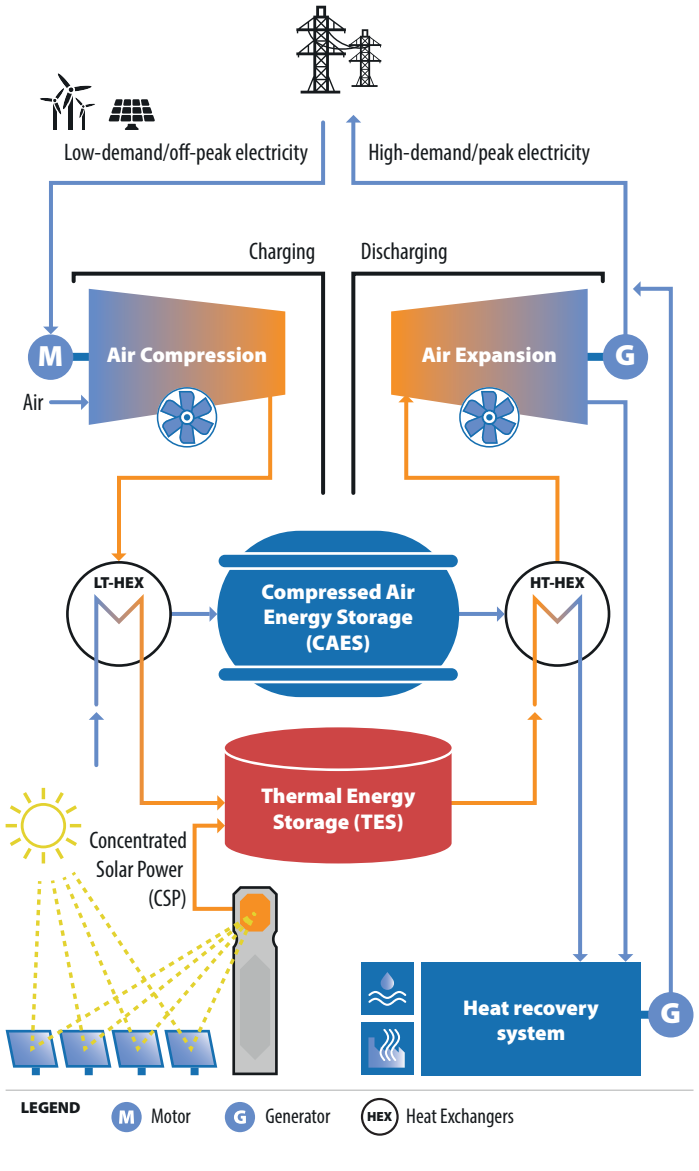


Tailored air compressor technology

During off-peak hours, very cheap or even negatively-priced electricity is used to compress air to a high pressure. The air is then stored in underground caverns, closed mines or artificial pressure vessels. The heat of compression is also stored, to be used again during discharging (adiabatic CAES).

Concept

The project focuses on the development of a novel high-efficiency solar thermal power plant concept with an integrated electricity storage solution. The project combines air-based central receiver Concentrated Solar Power (CSP) and Compressed Air Energy Storage (CAES) to maximize conversion efficiency and power grid energy management, enabling a new operation strategy and business model.



Discharging

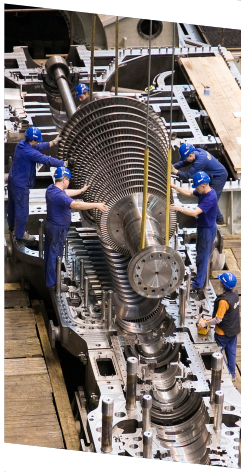
Advanced heat exchanger technology

During peak hours, the stored compressed air is heated to a high temperature using heat from the thermal energy storage unit.

An optimised air to air heat exchanger design guarantees a high conversion efficiency.

Tailored air expander technology

During peak hours, the compressed air is heated to high temperature and then expanded in air turbines, generating power. Turbomachinery architecture will be optimized for small-scale as well as for large scale applications, covering a wide range of rated power outputs, between 1 and 150 MW electric.



Effective exhaust heat recuperation & integration with desalination

Clever use of exhaust heat aims at generating additional electricity (Rankine steam, ORC) or decarbonising industry via process heat supply. The project also analyses the integration of desalination.