

E2S Power TWEST - a superior energy storage solution

Company overview

E2S Power Shareholders

SS&A Power, an engineering group with deep power technical and market expertise, developed the technology and IP.



WIKAI is a family-run business and a market leader in pressure and temperature measurement with € 1bn revenues and 10,000 employees worldwide.

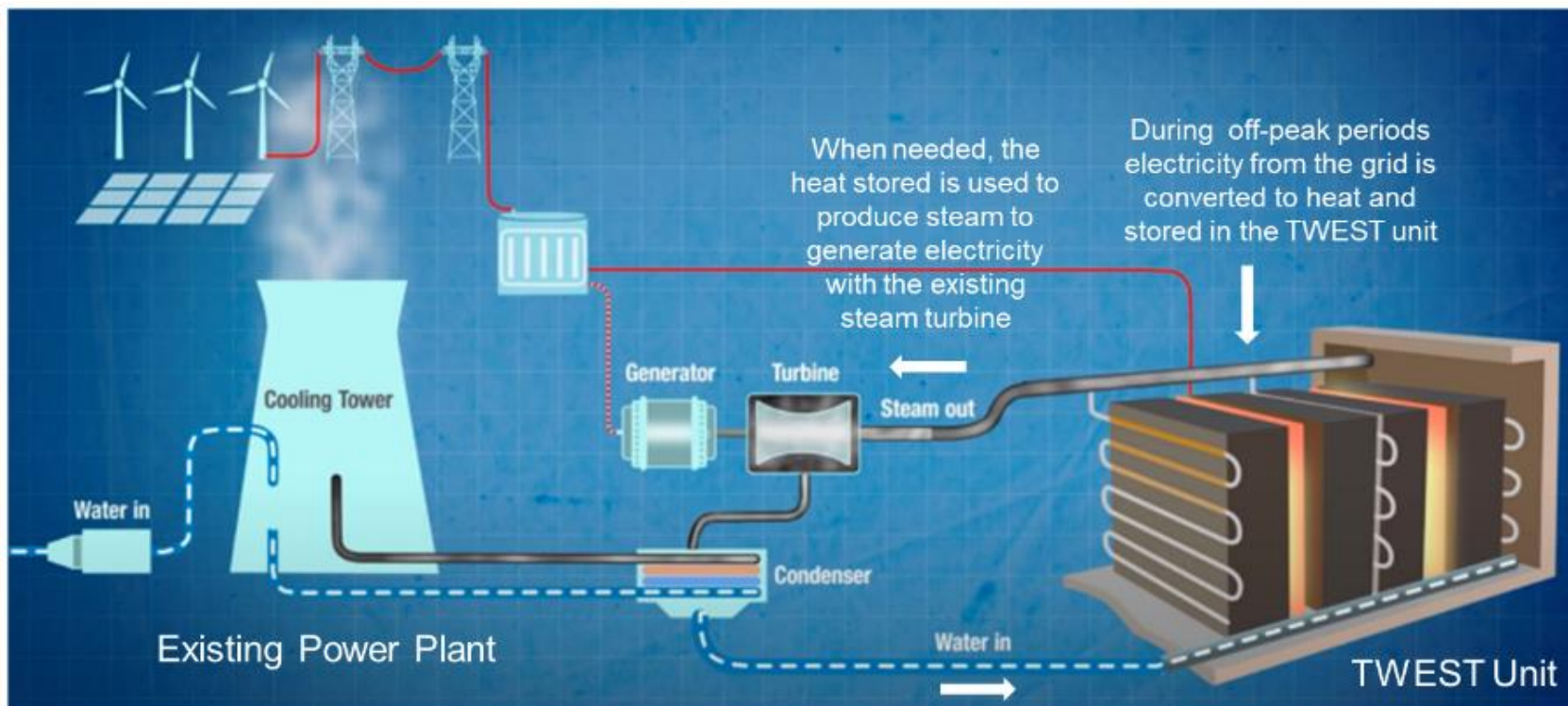
TWEST - a breakthrough thermal battery enabling transition to Net Zero Power

TWEST is

- ✓ A plug-in long duration energy storage solution ready for immediate deployment to enable fast transition to Net Zero
- ✓ A breakthrough technology which matches the intermittent renewable energy generation and continuous energy demand – charged when wind and solar energy generation exceeds the energy demand and discharging when demand is higher than renewable generation

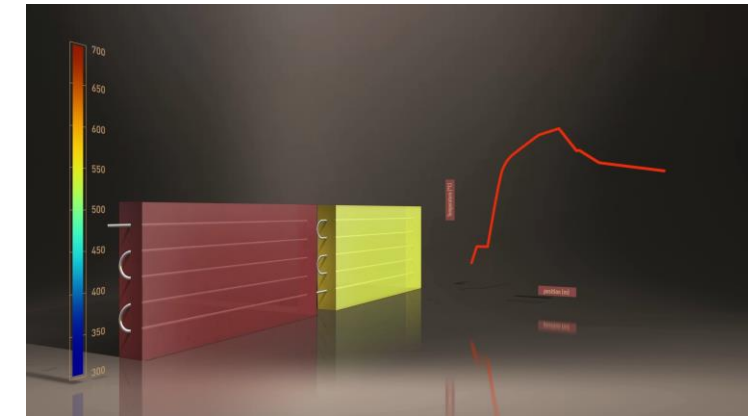
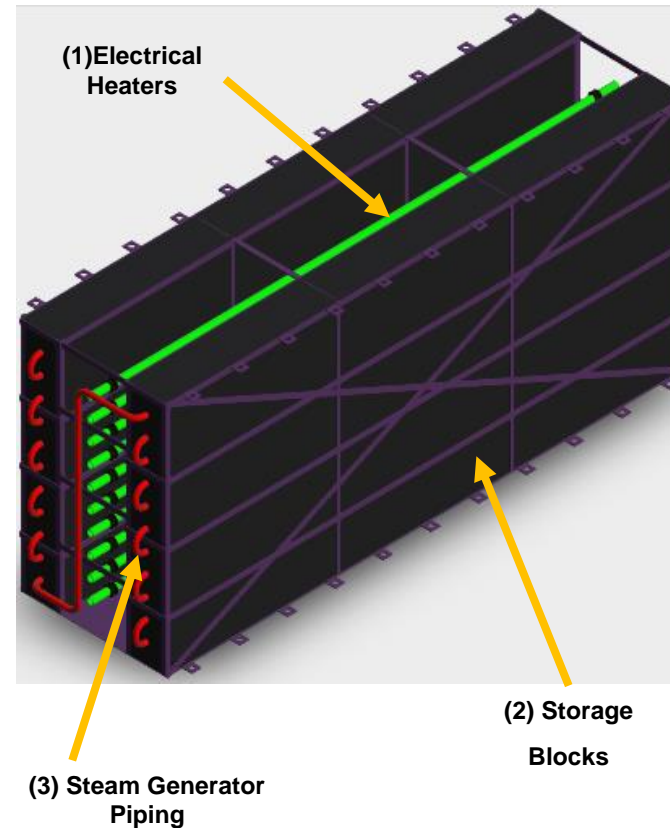
Asset Functions




- TWEST can be integrated into any steam turbine plant by replacing fossil fuel (coal, oil, gas) powered boilers
- TWEST charges through storing electricity as heat in a thermal store with minimal losses
- TWEST discharges by generating steam at constant pressure and temperature to be used by existing (or new) turbine generator
- TWEST decarbonizes and extends life of existing valuable assets
- TWEST offers additional stability and ancillary services to the grid which are not available by Li Ion batteries (inertia, reactive power) because of use of synchronous generator
- TWEST can charge and discharge at the same time



TWEST Unique Technology – How does it work?

- Proprietary Design Electric heaters (1) heat graphite storage blocks (2) by radiation to 700°C → charging
- Steam generator piping (3) embedded in storage blocks converting the high-pressure feedwater into superheated steam → discharge
- High thermal conductivity of graphite is a key to efficient charge and discharge process
- Proprietary travelling wave energy storage technology (TWEST) enables constant temperature at the inlet to the steam turbine
- This is a unique and smart way to overcome one of the biggest challenges of all bulk thermal energy storage systems and keep constant temperature for the whole duration of the discharge
- TWEST improves the existing Steam Plant Efficiency (no boiler loss which is typically ca. 15%) and Operational Flexibility (can be started within minutes unlike boilers which need many hours)



99% Charging Efficiency	X	45% steam cycle efficiency	=	44.5% round trip efficiency
				
TWEST Thermal energy storage		Steam turbine		Cycle efficiency

Key Differentiators

- Footprint is a major issue for all storage technologies → TWEST footprint 2 to 5 times smaller compared to all other storage systems.



TWEST (1.8 ha)

Li-Ion Batteries (4.1 ha)

Molten salt (9.2 ha)

Footprint required
from Case Study
for 2.3 GWh
Storage

- Simple system design and integration
- Low capital & O&M cost
- Higher IRR than any other storage technology
- Abundant, safe and recyclable materials
- Inherently fail-safe design
- Fast implementation/ speed to market – using existing grid connections, site, permits etc... project execution time ca. 1 year
- Long life (25 years) with minimum maintenance requirements

Possible Applications

○ Integration with existing fossil fuel plants, including reheat cycles.

Up to 600°C (1,100°F)

- Operation alongside boiler for improved flexibility – load following (first phase)
- Repurpose steam plant with thermal energy storage (second phase)

○ Integration with gas turbine combined cycle

- Improve operational flexibility - reduce gas turbine part load operation and cycling
- Peak power without supplementary firing
- Provide process steam independently from power production

○ Industrial applications where process steam is needed

- Refineries
- Breweries
- Chemical, pulp & paper
- Combined heat and power
- Waste to energy, Biomass

E2S Power TWEST - investment highlights



- CHF 5 Million already invested to complete the development - results are **proven system** and a **first standalone pilot** ready for shipment to our first customer/partner in India
- **Energy storage market is predicted to grow at exponential rate – EUR 100+ Billion Market in the next 10 years**
- The introduction of renewable power and immediate shut down of coal-fired and mid-term departure from fossil fuel generation creates a huge need for energy storage systems to maintain the stability and reliability of electricity supply.
- **The E2S Power TWEST is the first utility scale solution to provide decarbonization of existing fossil fuel power plants converting them into CO2-free Energy Storage Plants**
- E2S solution is unique thermal energy storage based on utilization of graphite, enabling cost effective and most compact storing of energy whilst reusing the existing power infrastructure and extending useful life of stranded assets such as steam turbines, high-voltage transformers and power lines, cooling towers and site.
- **Technology demonstrator tests successful as a final step of 2.5 year's Product Development**
A number of comprehensive patent applications have been filed and technology demonstrator successfully tested. Market analysis is very promising with negotiations for first industrial deployment with Europe's largest Power Companies is ongoing. Negotiations of 50 MWh field applications ongoing with some of the EU's largest utilities

Contact us



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