Adiabatic Compressed Air Energy Storage

Your challenges

- Absorbing renewable energy that might otherwise be curtailed
- Regulatory requirements of black-start capabilities, resulting in bound capital and resources
- Balancing load with new mix of generating assets and end client expectations
- Volatile fossil prices cause increase in OPEX

Our storage systems enable

- Energy and ancillary services without CO2 and NOX emissions
- Increased grid capacity utilization, balancing and reserve services
- Decarbonization by high utilization of renewable energy sources
- Flexible cycling operations by independent operation for compression and expansion train
- District heating and process heat supply

Our offerings

- Entire surface plant scope including CAES cycle, balance of plant, and construction
- Future-ready design: Deep decarbonization by unlocking synergies between thermal storage and traditional compressed air energy storage
- GWh-scale energy storage solution
- Proven components coupling together for unlocking a new market

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* Power range is per expansion train

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Diabatic Compressed Air Energy Storage

Your challenges

- Absorbing renewable energy that might otherwise be curtailed
- Long duration energy storage for supporting load management
- Balancing load with new mix of generating assets and end client expectations
- Regulatory requirements of black-start capabilities, resulting in bound capital and resources

Our storage systems enable

- Energy and ancillary services with low fuel consumption
- Increased grid capacity utilization, balancing and reserve services
- High flexible operating modes, including simultaneous charging and discharging
- Excellent load-following capacity and part-load efficiency
- Decarbonization by high utilization of renewable energy sources

Our offerings

- Entire surface plant scope including CAES cycle, balance of plant, and construction
- Future-ready design: Further CO2 reduction via co-firing with H2 based fuels
- GWh-scale energy storage solution
- Proven components coupling together for unlocking a new market

Typical properties

- Power range: 140–160 MW at per Unit
- Discharge time: 8–24 hours
- Reaction time: <10–15 min
- Storage size: > 4,000 MWh
- Storage period: Multiple days/ weeks

Benefits

- Efficiency: low, Impact, high
- Availability: low, Impact, high
- Flexibility: low, Impact, high
- CO2 reduction: low, Impact, high

* Power range is per expansion train

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A-CAES Power Plant

Characteristics

• Round trip efficiency up to 65 to >70% (Power to Power)

• Approx. 200-250 €/kWh calculated with 6h discharge time (incl. Civil, excluding Air storage, no fuel needed)

• Train size 50 to 250 MW, multiple trains possible

• Discharge duration as per customer request (modular system)

• ZERO Greenhouse Gas Emission ➔ No NOx and no CO2

• 25 … 30+ years expected useful life

• 10,000+ cycles

• Negligible annual degradation

• No commodity risk

• operation at high / cold ambient temperature

• Frequency response, reactive power, voltage management

• Rotating Inertia / Short circuit power

• Black start capability

• District heat application possible
D-CAES Power Plant

Characteristics

- Round trip efficiency up to approx. 60% (Power to Power)
- Approx. 200-250 €/kWh calculated with 6h discharge time (incl. civil, excluding Air storage, excl. fuel)
- Typical Power Train size 160 MW, multiple trains possible
- Discharge duration as per customer request (modular system)
- No CO2 emission when operation with H2
- 25 … 30+ years expected useful life
- 10,000+ cycles
- Negligible annual degradation
- No commodity risk
- operation at high / cold ambient temperature
- Frequency response, reactive power, voltage management
- Rotating Inertia / Short circuit power
- Black start capability
- Continuous / parallel operation can be specified (no Storage!)