Project 1005 - CAES Cheshire, UK

Compressed air energy storage using air storage caverns to be developed in salt deposits. Technical capability, per 24 hrs: 230 MW compression x 6 hrs, 268 MW generation x 6 hrs, 230 MW compression x 6 hrs, 268 MW generation x 6 hrs. Envisaged operation over 24 hrs = 250 MW compression 4-6 hrs; generation 50-268 MW over 6-10 hrs

Boundary	Great Britain
Promoted by	Gaelectric Energy Storage Ltd

Project Details

Commisioning Date	2022
Type of Storage	Compressed air energy storage
Max Active Power (MW)	268
Storage Capacity (GWh)	1.608

Storage Analysis

Balancing of generation & demand profile. Provision of system services to support integration of variable renewables. Potential to provide balancing services to mitigate wind/solar forecast error.

Additional Information

Start-up time to full output: Compression, 5 mins; Generation, 10 mins. Min stable level: 10% of max MW output. Ramp rate: 20% of max MW output per minute. Additional: ENTSO-E regional/Europe system-wide CBA may underestimate substantially the benefits of the project as compared to project-specific, local system-specific analysis using industry-standard tools such as PLEXOS.

General CBA indicators

Cost [Meuros]	275

Scenario specific CBA

EP2020 Vision 1	Vision 2	Vision 3	Vision 4 indicators		
B2 SEW (MEuros/yr)	<10	<10	<10	<10	<10
B3 RES integration (GWh/yr)	<10	110 +/- 20	40 +/- 20	30 +/- 30	70 +/- 20
B4 Losses (GWh/yr)	<10	<10	<10	<10	<10
B4 Losses (Meuros/yr)	<10	<10	<10	<10	<10
B5 CO2 Emissions (kT/year)	-100	+/-100	+/-100	+/-100	-100 +/- 100

Capability for ancillary services

Frequency regulation: Response time = approx 1 minute; Duration = minutes; Cycle = minutes. Spinning reserves: Response time = Seconds to <10 minutes; Duration = 10-120 minutes; Cycle = days. Electricity supply reserve capacity: Response time, Duration & Cycle = Varies. Load Following: Response time = Varies, within minutes; Duration = 120-240 minutes in increments as short as 5 minutes; Cycle = Varies. Black Start: Duration = Varies, hours to days; Cycle = Varies. Synchronous inertial response: Response time = within minutes; Duration & Cycle = Varies. Capable of providing Primary Operating Reserve, Secondary Operating Reserve and Tertiary Operating Reserve in both Compression and Generation Modes. Capable of providing Fast Frequency Response in Generation Mode.

As the project is based on the storage technology, it can also contribute to the power and frequency control and earn revenues that are not valued in this assessment This storage project of Great Britain enables saving in generation capacity of 9 - 11 Meuro/year

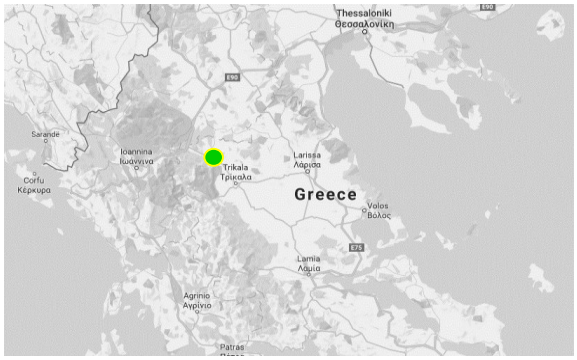
Complementary Information

This additional information has been provided based on a preliminary version of the CBA 2.0, in coordination with the European Association or Storage of Energy (EASE). Each of the four below KPIs are scored from 0 to ++ based on the technical characteristics provided by each project promoter.

Response time to activate Frequency Containment Reserves	++
Response time to reach the available power	+
Total time during which available power can be sustained	++
Power that is continuously available within the activation time	++

Project 1006 - Pumped Storage Complex with two independent upper reservoirs: Agios Georgios & Pyrgos

The project consists of two upper reservoirs, Ag. Georgios & Pyrgos. As lower reservoir of the complex, it is considered the existing, artificial reservoir of Kastraki (PPC ownership). The purpose of the project is to absorb wind, photovoltaic or thermal energy for pumping in order to store water to the upper reservoirs during low load consumption or renewables overproduction periods. Subsequently, energy is recovered via turbine mode during the peak load. The electromechanical equipment will be installed in two independent power houses, on the right banks of the Kastraki reservoir. Total installed capacity is 680 MW.



Boundary Greece

Promoted by TERNA ENERGY S.A

Project Details

Commisioning Date	2021
Type of Storage	Hydro (pumped storage)
Max Active Power (MW)	594
Storage Capacity (GWh)	3436

Storage Analysis

1) Market integration

Pumped storage schemes play a key role in enabling energy systems develop low-carbon electricity production. They supply more flexibility and balancing to the grid, providing a back-up to intermittent renewable energy, facilitating the entrance of renewables, accelerating the de-carbonization of the electricity grid, improving the security and efficiency of electricity transmission and distribution (reducing unplanned loop flows, grid congestion, voltage and frequency variations), stabilizing market prices for electricity, while also ensuring a higher security of energy supply. This project offers significant assistance in the accomplishment of the above target. 2) Sustainability

Considering recent evolution of off-shore wind power, which together with solar are currently considered to hold most promise in the next few decades in Europe, an immense storage capacity is required. A solution enabling sustainability of future energy supply, is the construction of additional pumped-hydro storage