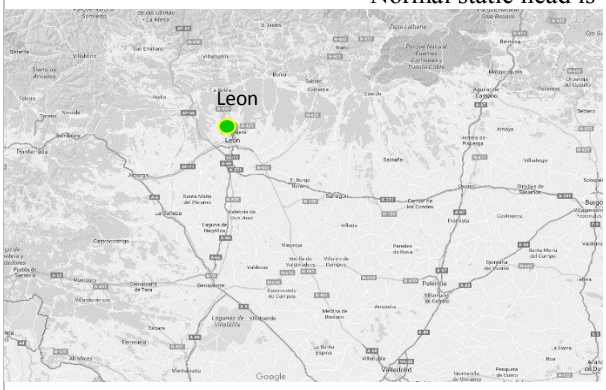
Project 1012 - Purifying -Pumped Hydroelectric Energy Storage (P-PHES Navaleo)

P-PHES NAVALEO in Leon, Spain, is pure pumped plant with an installed capàcity of 552 Mw. (3 x 184 Mw.) in generating mode and 548 Mw in pumping mode and generate an annual capacity between 700 - 1000 Gwh. The projects consists in two reservoirs with a volume of 2,23 Mio m3. The total rated flow are 90 m3/s in generating mode and 70 m3/s in pumping mode. Normal static head is 710 m. The cycle efficiency is up to 79%.



Boundary	Spain
CDR TREMOR Promoted by	S.L.

Project Details

Commisioning Date	2018
Type of Storage	Pure pumping plant
Max Active Power (MW)	541
Storage Capacity (GWh)	3.5

Storage Analysis

P-PHES NAVALEO use abandoned mine water that being the cause of the failure of "bad ecological status" under Directive 2000/60/CE Water Framework in the region of Castilla-León where more than 5.500 MW. of wind power are currently in operation with projects for another additional 1.500 MW. that can not be incorporated. P-PHES NAVALEO project reconciles energy storage with water purification. Furthermore has a guaranteed supply of 100% throughout the whole year.

Additional Information

The project has a high environmental force because all its elements (excavated reservoirs, roundhouse, ...) are located outside the rivers, so that they do not affect environmental flows or living fish species, neither detracts the necessary water from the rivers for other uses (water supply, irrigation, industrial, recreational, ...) and therefore it is not sensitive to periods in which it is necessary to modify the production/consumption to meet such uses

General CBA indicators

Delta GTC contribution (2020) [MW]	Pumping	541
	Turbine	541

Delta GTC contribution (2030) [MW]	Pumping	541
	Turbine	541
Cost [Meuros]		258

Scenario specific CBA	EP2020	Vision 1	Vision 2	Vision 3	Vision 4 indicators
B2 SEW (MEuros/yr)	10 +/-	10 +/- 10	10 +/- 10	<10 +/- 0	20 +/- 10
B3 RES integration (GWh/yr)	-10 +/-	<10 +/- 0	40 +/- 10	10 +/- 10	80 +/- 20
B4 Losses (GWh/yr)	<10	<10	<10	<10	<10
B4 Losses (Meuros/yr)	10 +/- 10	10	10 +/- 10	10 +/- 10	10 +/- 10
B5 CO2 Emissions (kT/year)	100 +/- 10	200 +/- 10	+/-100 +/- 0	-100 +/- 100	-200 +/- 100

Capability for ancillary services

Considering that the water starting time in the penstock of the power plant is lower than 2 s. , and the plant will be equipate with frecuency converters P-PHES NAVALEO will provide a very fast time response to activate frequency containment reserves, can participate in primary frequency control, helping to maintain the instantaneous balance between generation and demand and being used for both primary and secondary regulation in the electricity grid and can provide the full range of grid-stabilising services: Back-up,Black start capability, Load-frequency control (spinning and non-spinning reserve) and voltage control. furthermore, the plant would be equipated with variable speed technology.

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 Spain enables saving in generation capacity of
17 - 21 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	++