

Project 1019 - TWO REVERSIBLE HIDROELECTRIC PLANTS: GIRONES & RAIMATS IN SPAIN

The two Pumped Hydroelectric Storage stations, GIRONES & RAIMATS, have their common take on the right bank of the reservoir named Riba-roja, at the EBRO river, 1.5 km upstream of the dam. They are located on the Terres de l'Ebre, Tarragona (Spain). Its online design will allow to build them in two phases depending of the demand scenario. Its online design will allow to build them in two phases depending of the demand scenario. The total flow requested of 762 m³/s comes to pump the volume of water between the elevation 70 (normal maximum level of the Riba-roja's reservoir) and a decrease of 1.5 m over a period of 8 hours on continued operation. This is driven by two parallel low pressure galleries with 10 m indoor diameter, underground toward the Girones's cavern. Two alternatives with the same 3 Gw installed power are developed: A) UNIQUE OPERATOR (selected layout): a single cavern in GIRONÉS is projected to house the teams of the two PHS with only one tunnel for access into it. Each of the 6 groups of GIRONES (90 m³/s, 370 Mw pumping / 300 Mw turbine) are connected to the bottom of the upper raft (Hm³ 21,50; 22196 Mwh stored) by a high pressure water well of 6 m inside diameter. The 4 RAIMATS's groups (55 m³/s, 295 MW pumping / 239 MW turbine) will do so at their upper raft (8,55 Hm³; 10179 Mwh stored energy) through a rack composed by 4 pipes of 4 m diameter each one. Budget without VAT: 2.007 M €. B) TWO OPERATORS: Each plant can operate independently of the other. One of the low-pressure galleries stretches 4,5 km underground until the second RAIMATS's cavern, needing a second road tunnel as an access to it. With a total budget of 1.899 M€, the capacity of the GIRONES's raft is reduced to 13,8 Hm³.

According to the preliminary and informative REE's report, the GIRONES 400 kV network connection is foreseen in SE NEW MEQUINENZA from 2020 and RAIMATS (2nd phase) in the SE of PEÑALBA and OSERA

Boundary	Spain
Promoted by	Grupo Romero Polo

Project Details

Commissioning Date	2024	Type of Storage	Pure Pumping
Max Active Power (MW)	3400		Storage
Capacity (GWh)	24.5		

Storage Analysis

Privileged Location:

Near France, near 3 nuclear reactors within 60 km radius, near large consumption centres (minimize transport losses) SOCIAL AND INSTITUTIONAL SUPPORT TECHNICALLY FEASIBLE:

Enough water column in Ribarolja's reservoir, independently of the evolution of climate change and alternation of dry/wet years.

Enough backpressure in pumps. Few materials in suspension, which could wear impellers at pressures of 40 atmospheres.

Environmentally Viable

No effects to environmental protected areas, cultural or archaeological heritage, either residential areas in case of breakage of higher rafts.

Minimum impact on the landscape.

Economically Viable : M€ investment / Mw installed < 0,7

Additional Information

Ideal to future offshore wind farm project associated to the Zèfir Project, allowing energy denuclearization of the area.

General CBA indicators

Delta GTC contribution (2030)	Pumping	1470
[MW]	Turbine	820

Cost [Meuros]

1900

Scenario specific CBA	EP2020	Vision 1	Vision 2	Vision 3	Vision 4 indicators
B2 SEW (MEuros/yr)	<10 +/-	20 +/- 10	10 +/- 10	10 +/- 10	60 +/- 10
B3 RES integration (GWh/yr)	<10 +/-	<10	60 +/- 10	20 +/- 10	210 +/- 40
B4 Losses (GWh/yr)	<10	<10	<10	<10	<10
B4 Losses (Meuros/yr)	20 +/- 10	20	20 +/- 10	20 +/- 10	20 +/- 10
B5 CO2 Emissions (kT/year)	-100 +/- 100	600 +/- 100	-100 +/- 100	+/-100	-300 +/- 100

Capability for ancillary services

Important role in secondary regulation in the System's frequency.

According to ENTSO's CBA analysis, the pumping / turbinate ratio will be approximately 2. To provide storage capacity in rafts, a continuous supply is raised at some time intervals to the main consumers at Petrochemical

Polygon of Tarragona, as a closed network electric distribution (2009/72 / EC) thereby increasing their competitiveness by lowering the price of Mw

Supply of Passive Safety to nuclear reactors Asco I and II, by having available 10 Hm3 of water at 45 atm pressure less than 10 Km of distance. Important role in secondary regulation in the System's frequency.

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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 197 - 246 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	++