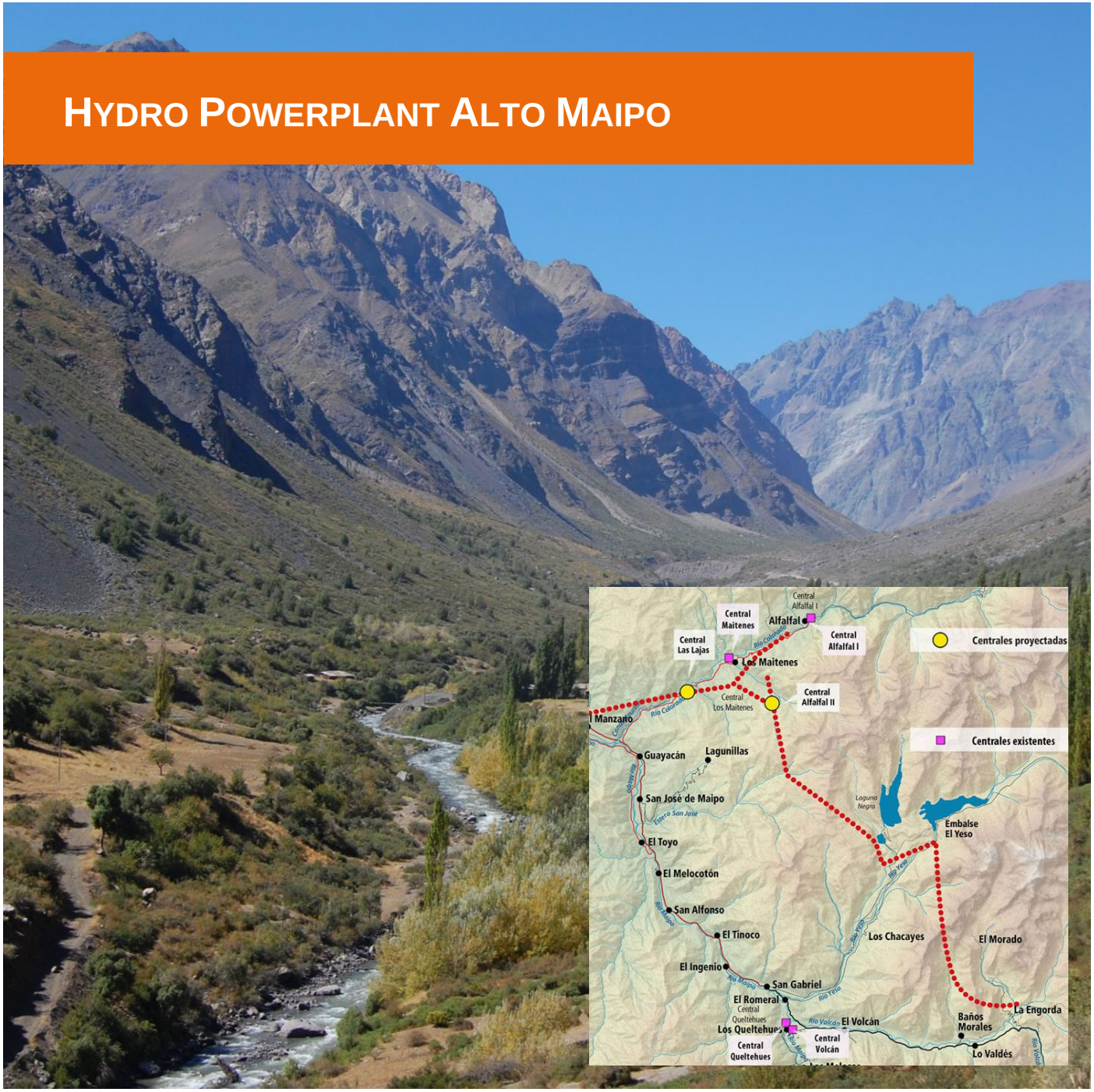
HYDRO POWERPLANT ALTO MAIPO



Hydro power project Alto Maipo, Chile

The Alto Maipo Hydropower Project comprises two hydropower plants in the Maipo River Basin, 50 km southeast of Santiago, with a total capacity of 531MW. Two new underground powerhouses and around 67km of pressure tunnels, pressure shafts, and adits are built in the Chilean Andes under overburden of up to 2,000 m. Amberg Engineering has the mandate of detailed design and validation of the already excavated underground structures for the contractor STRABAG.

Scope

- 2 underground powerhouses
- Overall tunnel Length: 67'000 m
- Diameter TBMs: 4 to 8 m
- Shape: Circular (TBM), Horseshoe (D&B)
- Tunnel cross-section: up to 57 m^2
- cable and utility shafts with various diameter
- surge shaft length: 400 m
- penstock shaft length: 500 m

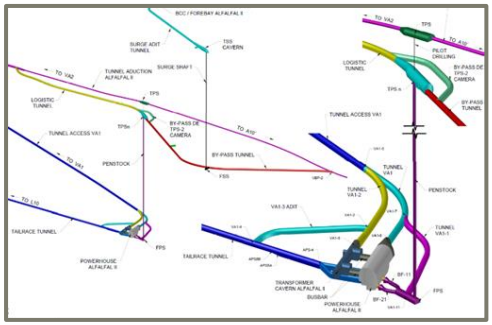
Challenges

- very heterogenous rock mass conditions
- tuffitic rocks prone to swelling and dissolution in water contact
- headrace tunnel design for surge pressure
- Scandinavian design philosophy with the final support composed only of shotcrete and bolts

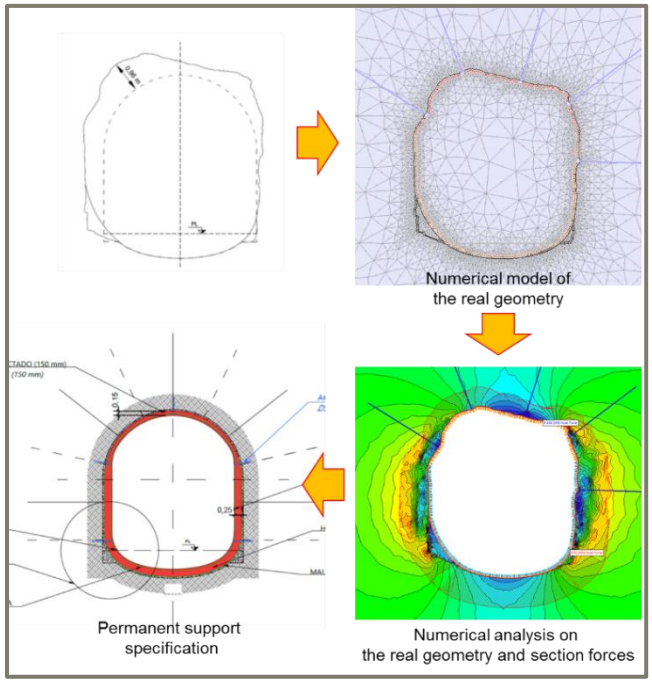
Amberg Services

- ground characterization and analysis of mapped data
- detailed design of two advances and support application criteria definition
- detailed design of final support for all operational situations

AMBERG ENGINEERING



- 3D overview of the ALFALFAL II penstock situation



- Simplified geological profile

AMBERG FACTS

Contracted value Amberg

- Total Amberg CHF 0.8 Mio.

Project Phases & Duration

- Design: 2007 – 2015
- Realization: 2013 – 2018
- Restructured with STRABAG partnership: since 2018
- Beginning of AE detailed design mandate: 11/2018

Project details

- ground characterisation for all tunnels within the scope
- temporary support design for:
  - L1 tailrace tunnel (TBM with a diameter of 7.9 m)
  - VA2 headrace tunnel (TBM with a diameter of 4.5 m)
- cable shaft (diameter 3 m)
- Aucayes intake shaft (diameter 2.6 m)
- VL8 headrace tunnel validation and final support design (D&B, with a cross section of 50 m²)
- VA2 headrace tunnel final support design
- L1 tailrace tunnel final support design
- L1 tailrace spillway
- Various access tunnels
- All niches and operational widenings in the designed tunnels
- Junction with the bypass tunnels and bulkhead design at the end of the headrace tunnel
- on site presence, expert services and coordination with the client

CLIENT FACTS

Overall costs

- Total EUR 2 billion

Overview project

- The Alto Maipo HPP is a project of outstanding complexity, using all available water sources to be put together in one large HPP scheme. The waters from the HPP Alfalfal I is led by a bypass to the VL8 headrace tunnel and joints the waters from Aucayes creek and tailrace waters from Alfalfall II before the powerhouse cavern of the Las Lajas plant. The hydrostatic water head at the Alfalfal II plant equals 1’100 m, while the Las Lajas plant is designed for higher water quantities and less pressure.

Geology

- Abanico formation, composed of tuffs and andesites. Major hazards posed by squeezing, swelling and rock burst

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