Kraftwerk Juchli
Exploitation of Juchli waterfall with a small hydropower plant

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Introduction

The small hydropower plant project Kraftwerk Juchli, proposed by Kraftwerke Oberhasli AG (KWO), would allow using the potential created by the construction in the 1950’s of the underground gallery to transfer the water collected from the river Bächlibach to the lake of Grimsel. The project is situated on the territory of the municipality of Guttannen in the canton of Bern, near the pass of Grimsel (see Figure 1).

The adduction gallery concerned by this project is represented in Figure 1. It allows connecting the Bächli lake with the Aar valley at the level of the Grimsel lake by passing under Juchlistock. The tunnel has a total length of 1'348 meters and a slope of 0.75%.

The existing facilities located in the Bächli valley are represented in Figure 2. The area located upstream of the Bächlibach dam is a protected alluvial zone with a national level of importance, forbidding any modification of the environment.

Methods

1. Modelling of the Bächlibach and Grubenbach Oben watersheds on the software RS Minerve. The results of the modeling will supply the discharge data at the exit of the watershed.
2. Study of various alternatives of exploitation of the waters from the Bächli river.
3. The most interesting alternative is chosen for a more thorough study which contains the dimensioning of the hydraulic elements.
4. Study of the project’s impact on the environment.
5. Estimation of the cost for the construction of the small hydropower plant.

Concepts of exploitation and alternatives

- Concept of exploitation : Run-of-river.
- Storage and turbine-and-pump are not practicable because of their impact on the environment.

Pre-project of the small hydropower plant

With a designed discharge of 1.7 m³/s, 19.1 GWh/year of net power can be produced by means of one Pelton turbine.

Hydraulic structures :

- Efficiency of the sandtrap : 0.2 mm
- Length of the penstock pipe : 1'830 m
  - 1'355 m : polystyrene reinforced with fiberglass (PRV)
  - 475 m : stainless steel
- Turbine Pelton : 2 injectors and a vertical axe of rotation (see Figure 4)

The engine room is installed in the assembly cave of the Grimsel 1 hydropower plant.

Conclusion

- Installed capacity : 5.8 MW
- Investment cost : 12.2 million CHF
  - Civil works : 8 million CHF
  - Hydromechanical equipment : 1 million CHF
  - Other costs (engineer, capital cost, etc.) : 3.2 million CHF

Economic evaluation

Return period : 25 years, till the end of the actual concession.
Interest rate : 3 %
- Generation cost : 4.4 cts/kWh

The profitability of the project is guaranteed if it benefits from the compensatory feed-in remuneration (RPC). Without the RPC, the project can be profitable if the electricity selling price is a bit higher than the actual market price. A renewable energy label could ensure a bonus of 1 ct/kWh.