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SmallFlex: Demonstrator for flexible Small Hydropower Plant

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Context

The current project is integrated in the activities of the SCCER-SoE, which include for the period 2017-2020 **a demonstrator on small hydropower schemes** (SHPs). Small hydropower plants are expected to provide a large share of the production increase planned in the 2050 energy transition strategy.

Summary

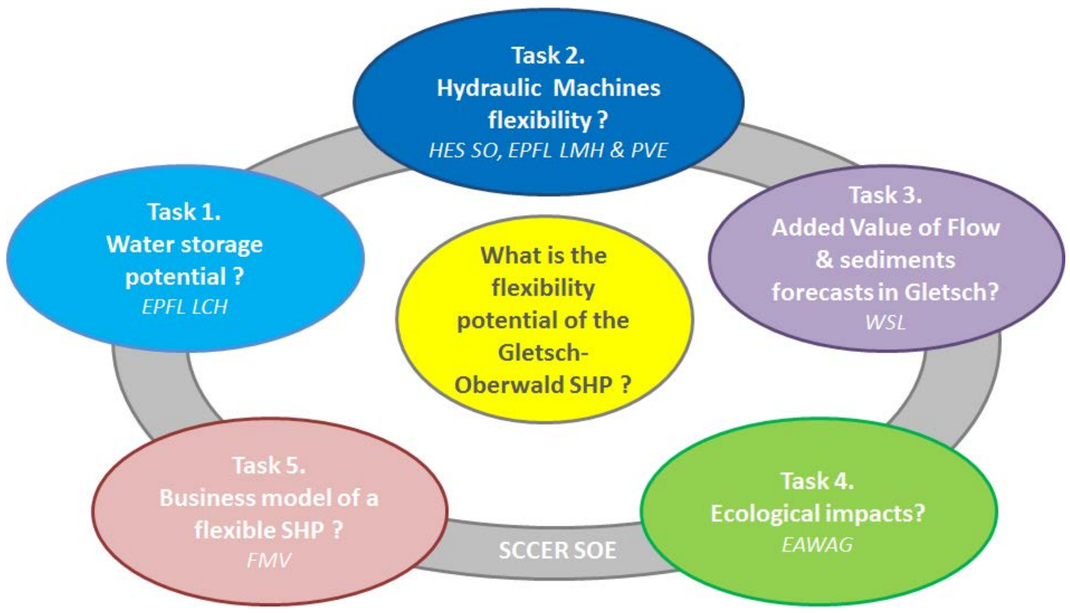
The aim of this project is to investigate how small-hydropower plants (SHP) can provide winter peak energy and ancillary services, whilst remaining eco-compatible.

The outcome of recent research by SCCER-SoE partners will be applied to a pilot facility provided by FMV with the goal of providing operational flexibility to the SHP owner and therefore harvest additional revenues.

The addition of flexibility will be done by testing infrastructure and equipment or operational adaptation measures, assessing their impact in terms of outflows, electricity output and revenues.

The lessons learned from this Demonstrator will be publically presented and used as a benchmark for the SHP sector.

Project activities & organisation

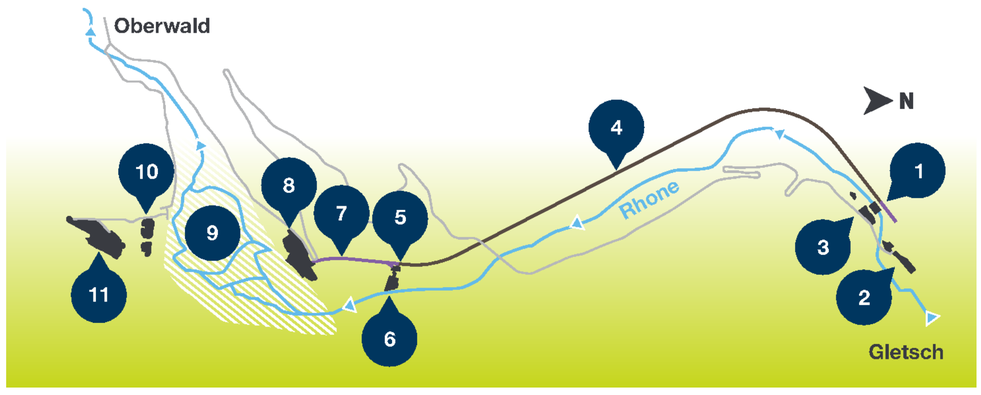


Overarching questions

- How can intra-day, intra-week or intra-monthly storage be added to a given run-of-the-river scheme, on the headrace side, on the tailrace side or both, in order to allow the scheme to generate peak energy and eventually contribute to grid regulation?
- What are the consequences of enlarging the operational range of the Pelton turbines in case of large head variations ?
- What's the added value of short and extended range inflow forecasts in Gletsch for the flexible operation of the new HP plant and for the management of sediments at the basins of decantation?
- What are the effects of short-term hydropeaks/ inter-dial fluctuations in discharge on the structure and function of alpine river ecosystems?
- What is the business model of the flexibility for small hydropower plants even in case of run-of-the-river plants with a priori small storage capacity?

Demonstrator site : The Gletsch-Oberwald SHP Project

With a installed discharge of 5.7 $m^3.s^{-1}$ and a net head of 288 m, this future SHP will produce 41 GWh with a mean gross capacity of 4.68 MW. The SHP is equipped with two Pelton turbines of 7 MW



1. **Zugangstollen Fassung** *Galerie d'accès à la prise d'eau*
2. **Installastionsplätze Gletsch** *Place de chantier de Gletsch*
3. **Wasserfassung** *Prise d'eau*
4. **Triebwasserstollen** *Centrale souterraine*
5. **Zentrale unterirdisch** *Centrale souterraine*
6. **Rückgabestollen** *Galerie en charge*
7. **Zugangsstollen Zentrale** *Galerie d'accès à la centrale*
8. **Installationsplatz St. Niklaus** *Place de chantier de St. Niklaus*
9. **Umweltmassnahmen** *Mesures de compensation environnementale*
10. **Materialaufbereitung Kieswerk** *Valorisation des matériaux à la gravière*
11. **Ablagerung Grie** *Dépôt des matériaux*

Pictures of demonstrator site

Expected results

The methods developed in this project may be applicable to affect positively **several hundred high-head plants** with no or little storage, resulting in an annual revenue increase of 5-10% from increased value of the winter production. A small increase in energy production (< 5%) is foreseen, due to an improved use of excess waters at high-altitude intakes above the residual discharge releases.

Research partners :

FMV · Hes·so · EPFL École Polytechnique Fédérale de Lausanne · WSL · eawag aquatic research · Power Vision Engineering