Introduction
Due to the massive penetration of new renewable energies (NRE), energy storage is required to stabilize the Swiss electrical power network. Among the various available solutions, pump storage power plant (PSPs) represents 99% of the world storage capacity.

- 477 MW - Compressed Air Energy Storage
- 140'000 MW Pump Storage
- 400 MW - Sodium-Sulfur Battery
- 45 MW - Lead-Acid Battery
- 40 MW - Nickel-Cadmium Battery
- 45 MW - Lithium-Ion Battery
- 3 MW - Redox Flow Battery

Small PSPs, with a capacity below 10 MW, to provide local voltage control and line congestion management to low-voltage and medium-voltage active distribution networks is one of the competitive solution among the decentralized storage technical options.

Hydraulic potential study in Wallis
Wallis counts lots of lakes and artificial reservoirs used for tourism, drinking water, irrigation, artificial snow cover or hydro-electricity production. For the study, only the sites with an existing reservoir and a potential of 250 kWh are considered.

Potential clients
Interviews of distribution system operators (DSO) have been conducted to identify and discuss their potential interest. An economic model for such a storage system is not straightforward to design, however the main interest is for:

A global storage capacity of half a day for a cycle of 6 hours and at least a power of 5MW

Technologies
Several options are available for PSPs : reversible pump-turbines with variable speed, ternary groups or separated units. For small power, a study on the suitable technical and economic options according to the hydraulic potential is on-going. A focus on medium head situations is proposed in this project by assessing the possibility to use a double regulated Diagonal pump-turbines with moving guide vanes and runner blades.

Fig. 2 – Schematic representation of a medium voltage electrical network including NRE.

Fig. 4 – Lakes and artificial in Wallis

Fig. 5 – Operating ranges covered by Pelton, Francis and Diagonal turbines (left) and design of the diagonal turbine produced by Mhylab (right).