Micro Stockage Intelligent Distribué (MSID)

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Summary
The Swiss Federal Office of Energy (SFOE) MSID is a three-year project that brings together the interests of 4 distribution service operators (DSO). Their objectives include remote network stabilization (use cases 1 and 2), optimization of self-consumption and co-creation of new business models to make photovoltaic storage profitable (use cases 3 and 4). This project aims to aggregate micro-storage systems (electric vehicles, batteries, heat-pumps, hotwater), test and demonstrate flexibility services. The SEIC-Teledis use case is highlighted in this poster. The objective is to optimise the self-consumption of production PV and manage remotely aggregated batteries.

Introduction
A three-phase inverter and an Apollion Cube 6kWh battery (6kW of power) from Leclanché were installed at two private customers of our partner SEIC-Teledis (Figure 1). A microcomputer was also installed at each site and connected to the inverter's Modbus with an RS 485 cable. An information system controls the inverter but also to retrieve data from smart meter and local meteo station to predict PV.

Figure 1 : Installation of SEIC Teledis in the context of the MSID project with the meteo station concept

Project methodology
A Two Tracks Unified Process (2TUP) methodology with technical and functional branch helped us to define the business needs and explore IT technologies. To implement the platform, we opted for a scrum agile methodology with short iterations called “Sprints” to develop and deploy product increment regularly. The artefacts that were created allowed us to setup essential elements for the the Release Roadmap (Figure 2) where we see COVID impact.

The Proof-of-Concept created in the technical branch of 2TUP works well in the laboratory. During the Scrum implementation in the pilot sites over more than a year, we have detected problems with data collection (Figure 3). On this example, we can see that the data collected for the grid current L1 has a lot of noise and is unusable for the Machine Learning Prediction Algorithm without cleaning. Several iterations were needed to clean up the collected data and try to optimise the data collection with the help of an automatised python cleaning Algorithms and a second time series instance to keep original data and be able to visualise cleaned data.

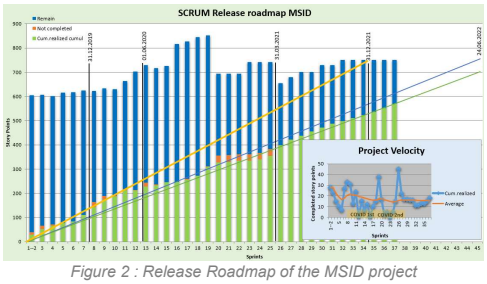

Figure 2 : Release Roadmap of the MSID project

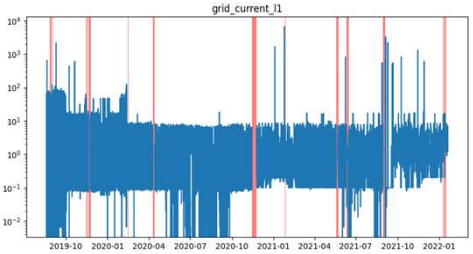

Figure 3 : RAW data collected for the grid current L1

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Results
The DSO can visualise a virtual power plant (VPP) with the batteries of his customers and control them individually or aggregated in order to optimise the power he offers to the end customers.

Figure 4 : Visualisation on the DSO side

Figure 5 : Action available for the automated algorithm

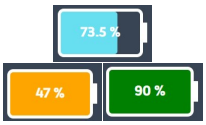

Figure 6 : Possible status of a battery

Figure 7 : Battery control and diagnostic button

Figure 8 : Hot water relay management

The DSO has three control buttons and one diagnostic button. He can manage different strategies and parametrize the logic to optimize micro-storage services (Figure 5), he can choose individually for each battery to charge, discharge or pause (Figure 7) it’s also possible to choose the number of hot water relay active (Figure 8) and define new devices. The end customer can visualise his personal battery as well as collected data (production power and energy, consumption power and energy, SOC of the battery) (Figure 9) on an online platform.

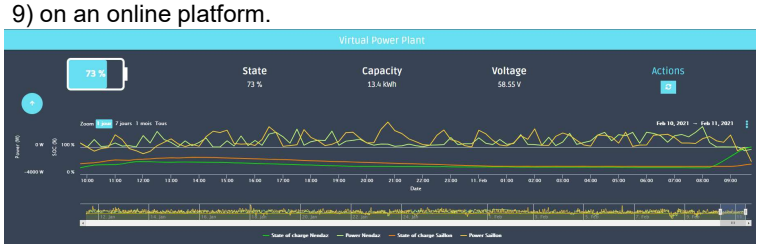

Figure 9 : Visualisation platform, end-customer side

The end user can also observe the status of the battery (Figure 6). When the battery is orange, it means that it is being discharged. If it is blue, it is neither discharging nor being discharged and finally if it is green, it is charging. A prediction algorithm based on machine learning is in development and will be deploy soon. With this prediction, we will be able to predict future production according to the weather and thus optimize the decision making of our management algorithm.

Conclusions
We aggregated micro-storage to build a virtual power plant for our partner (SEIC-Teledis). The final objective is the control of several inverters in order to promote self-consumption and to allow the DSO to optimize the supply of power to prosumers regarding's their predictions.

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