



# SWEET Call 1-2020: EDGE

## Deliverable report

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## Summary

This deliverable is related to a technical plan of solar renewable energy production plan for the Muttsee reservoir dam. The corresponding Innosuisse project is up and running and all technical details are available from the corresponding proposal and plan. The project investigates the performance, operation and snow – panel interaction at such an high-Alpine environment. The main goal is to know about factors that influence production and operation of such a PV plant at high elevation compared to a low-land installation. In particular, the focus of the work is on understanding the influence of terrain, snow and elevation on the radiative fluxes and potential disturbances through snow on the panels or snow that piles up from below.



## 1 Introduction

The leading idea of the EDGE project is to promote de-centralized installations of renewable energy sources such that specific landscape characteristics (Alps, Midlands, Cities) are optimally respected and such that local to regional demand is best served. Generally, in mountain regions, more energy is produced than consumed. Also in a fully renewable Switzerland, models predict that energy needs to be transferred from mountains to cities. In this context, Alpine PV is very valuable for winter electricity production. While a current focus is on large free-standing installations, installations on existing infrastructure are more compatible with aspects of landscape protection and acceptance. Therefore, the Muttsee installation is seen to be an important test-case of benefitting from existing carrying and electric infrastructure.

## 2 Deliverable content

The Technical Plan of Muttsee secures the scientific analysis of the Muttsee plant operation. It is formulated as a separate Innosuisse project but part of SWEET-EDGE WP6. It serves to test and develop models that predict radiative fluxes and production in such an environment and to investigate potential problems with snow accumulation on and below the panels. These questions have never been analyzed in detail but are important to better plan future installations in such terrain. The main work is executed by a PhD student (Yaël Frischholz) and has the following main tasks:

- Analyze the production at Muttsee and compare to typical low-land production installations to quantify the factors that explain the differences
- Develop and validate models of radiative fluxes in such terrain and provide methods for accurate on-sight prediction of PV production
- Investigate accumulation of snow on PV panels and predict total production loss as a function of environmental conditions
- Quantify snow accumulation on the ground below the panels and develop a model to predict snow pile height as a function of environmental conditions
- Test models and their transferability to other sites

These tasks are described in more detail in the PhD research plan of the PhD student on the basis of the Innosuisse project description.

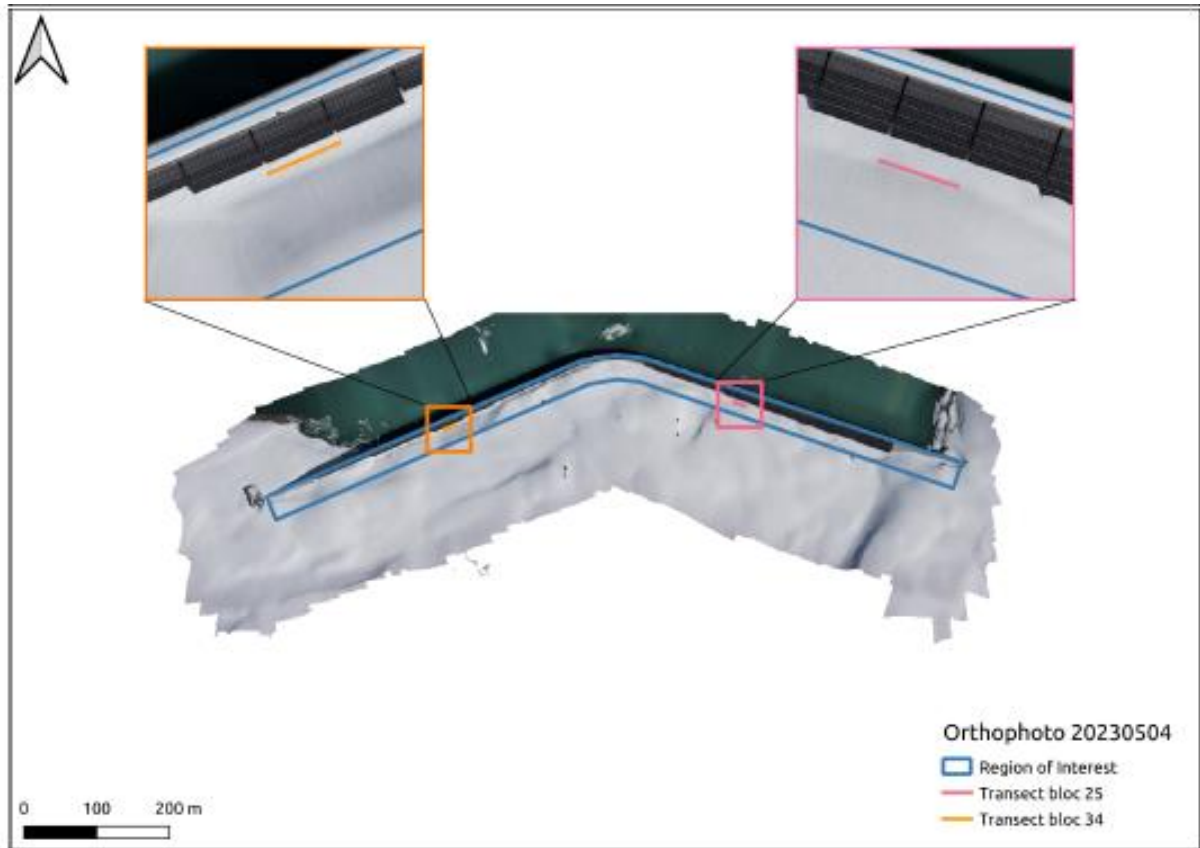


Figure 1: Orthophoto of the Mutsee installation. Insets show two transects, for which snow accumulation on panels can be investigated in detail.

### 3 Conclusion

First experiences during the operation of the Mutsee plant have confirmed that the high-Alpine location is a favourable environment for PV electricity production but that it has also challenges with snow accumulation. The outcome of the Mutsee project will provide the scientific basis for a full understanding, which then is transferable to other sites. With the installation of the Mutsee high-Alpine plant, the project has started successfully and allows to systematically investigate the behaviour of a real production plant in the high-Alpine environment. It will give valuable insight into potential pitfalls of such installations and a sound basis for aspects to be considered in similar such installations in future.

### 4 References

### 5 Appendix