



# SWEET Call 1-2020: Integration of Renewables into a Sustainable and Resilient Swiss Energy System

## Deliverable report

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## Abstract

The increasing deployment of distributed generators, electric vehicles, and heat pumps, among other technologies, creates challenges for low-voltage (LV) grids. These grids were not initially designed to host these technologies. Therefore, it is essential to analyze to which extent grid reinforcements are required for their reliable and economical operation in the energy transition pathways. However, real LV grid data is usually unavailable due to privacy concerns. Therefore, a scalable framework for inferring countrywide models of LV grids that uses publicly accessible information is developed. The framework estimates a grid infrastructure layout at a high spatial resolution utilizing the street map and power demand data. One of the main components of the tool is a method that locates medium-to-low voltage transformers. After the zones supplied by transformers are identified, the LV grids are routed using computational geometry and optimization techniques. The suitability of our framework is demonstrated in a Swiss case study.

## Keywords

Synthetic grid, distribution grid, low-voltage grid, distributed generation.

## Conclusions

The main challenge while analyzing the impact of distributed generation and smart loads in LV grids is that their characteristics are confidential data managed by different DSOs. Moreover, modeling these grids is essential to plan reliable and economical energy transition pathways. In this regard, we have developed and presented a framework that allows the countrywide inference of LV networks based on publicly available information.

This report provides the results of our framework for the Swiss city of Geneva and demonstrates that the developed approach accurately approximates real LV grids. As for the remaining work, we will extend the framework to include the inference of medium-voltage (MV) grids. Furthermore, we will infer all the MV and LV grids for Switzerland to characterize the power distribution systems of the country entirely.

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