

# PowerPlan: An Extensive PV Installation Planning Software for the Swiss Market

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The increasing demand for photovoltaic (PV) installations and the resulting complexity of project management present project managers with overwhelming challenges. Existing software solutions primarily focus on single aspects and do not fulfill the specific requirements of the Swiss market. This thesis proposes and develops a software solution supporting project managers' activities, from requirements documentation to realization, while also fulfilling Swiss requirements.

## Introduction and Objective

An increased effort in installing PV systems is vital for Switzerland's climate strategy 2050. At the same time, the PV installation industry is facing a shortage of skilled workers as the demand for new installations keeps rising. Effective planning is essential for efficient installation, but project managers struggle to coordinate schedules, register, and manage supply chain delays. Existing PV planning applications must improve to assist project managers throughout the process. The development of a comprehensive software solution to support project managers, automating manual steps throughout the entire PV installation process, is proposed.

## Research Design and Methods

This thesis aims to identify unmet needs in PV installations' planning and project management. It defines and develops a minimal viable product (MVP) application to address these needs. The research design includes a literature review, a survey of PV installation professionals, and an iterative development process. The survey collects information on existing tools, visualization options, administrative efforts, as well as challenges in the planning and quotation phases. The MVP is developed using Python and the Django web development framework. For the development of the graphical user interface (GUI), the 3D library three.js and the framework Bootstrap are used. The Python runtime is containerized with Docker, and Compose is used to orchestrate the different components, so execution on any Cloud or server is feasible.

## Results

The developed application features a dashboard showing recent projects and statuses. Users can create, manage, and delete projects. It supports address search, contact creation, and a catalog for parts, including current stock information and pricing. The project module documents on-site conditions with

comments and images. The installation planning can occur directly on an uploaded 3D model of the building. A parametrical configurator helps the planner find the project's most suitable layout based on customer needs. Furthermore, the app automatically generates a project report and an editable quotation from the installation layout. The app's responsive GUI can also be accessed on mobile phones. A peer review rates the app's performance considerably well, as planning a project takes only one-fourth of the time compared to other software. Moreover, the app demonstrates comparable accuracy in cost calculations and energy simulation compared to previous methods.



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## Implications and Recommendations

The developed functionalities provide a solid basis for further software development. The project will continue as a startup named PowerPlan. PowerPlan aims to advance to the beta test phase by September 2023. Until then, the configurator will be further improved, in-app purchasing implemented, and the connection to official registrations developed.

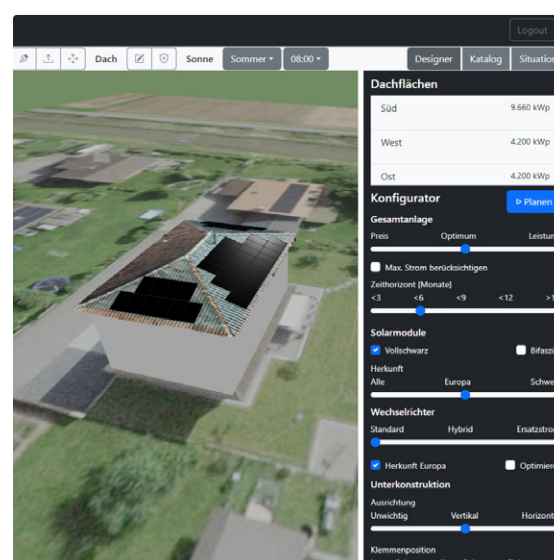


Figure1: PowerPlan's parametrical configurator