Grid planning for DER

Open-source plugin for automated quantification of PV hosting capacity

With the growing demand of residential PV systems, distributed system operators (DSO) are experiencing an increasing amount of interconnection requests on their network. Combining this with the lack of proper tools to assess the potential adverse effects of PV generation, installations are generally undersized which leads to a very conservative deployment of renewable energy sources (RES). With this problem in mind, CSEM has developed an open-source tool able to quantify the PV hosting capacity of a given network in an automated fashion.

CSEM's solution is a program called PVHC, which acts as a plugin to **DIgSILENT PowerFactory** and is able to compute the maximum amount of PV power one can install on a particular network before grid limitations are reached and without affecting existing control and infrastructure configurations. The algorithm behind PVHC consists in intelligently incrementing the power of PV systems throughout the electrical network and autonomously identifying the limit under user-defined grid requirements. The hosting capacity is accurately determined by applying a modified bisection method, which converges to the final installable power at a one-panel precision.

Tests were performed by simulation on a benchmark grid with high PV penetration, suggesting 83 kW of total installed power. **PVHC** successfully computed the PV hosting capacity under the requirements of two standards (D-A-CH-CZ and EN 50160), then deploying an in-house load scheduler. A relative increase of 147 % (122 kW) from the base case was reached utilizing EN 50160 followed by 41 kW and 111 kW of additional installable power using the aforementioned strategies.
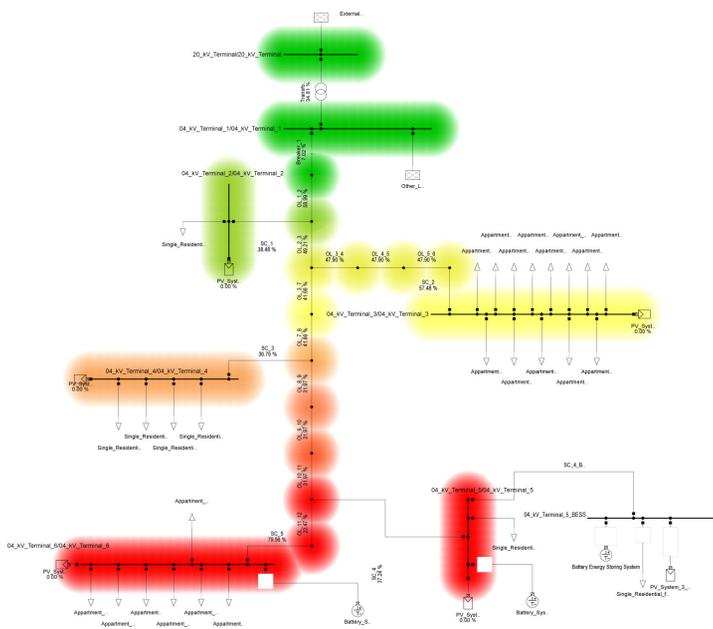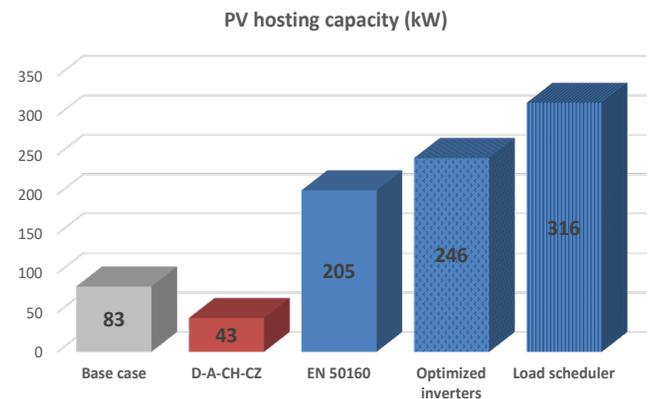
PV hosting capacity (kW)

Figure 2: Computed PV hosting capacity in kW

PVHC was created in hope of helping network operators with decision-making and optimizing PV output, thus paving the way for a more sustainable future by unlocking the full potential of electrical networks. **PVHC** is freely available on the CSEM website https://www.csem.ch/PVHC and is released under the terms of the GNU GPL.

Figure 1: Simulation of a low-voltage grid with a high PV penetration; in red: reached limitations

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