Lucerne University of
Applied Sciences and Arts

HOCHSCHULE
LUZERN

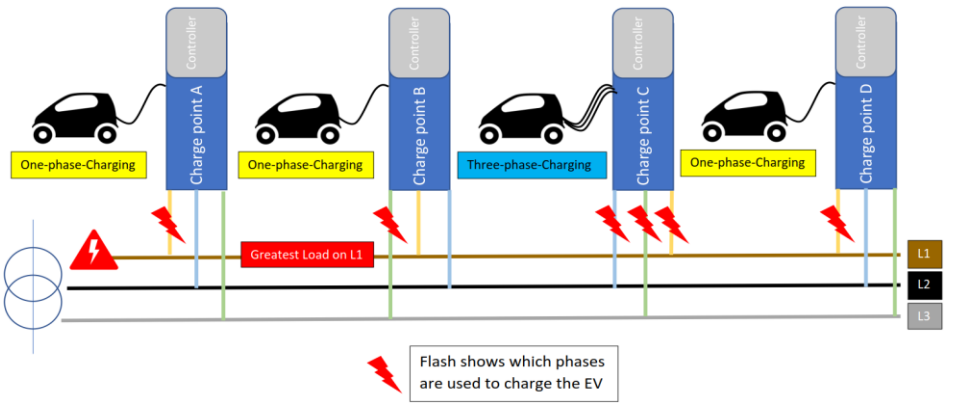
Technik & Architektur

Bachelor of Science in Energy Systems Engineering - Industrial Project

# Business Case for Charging Solution in Switzerland

**Theory**

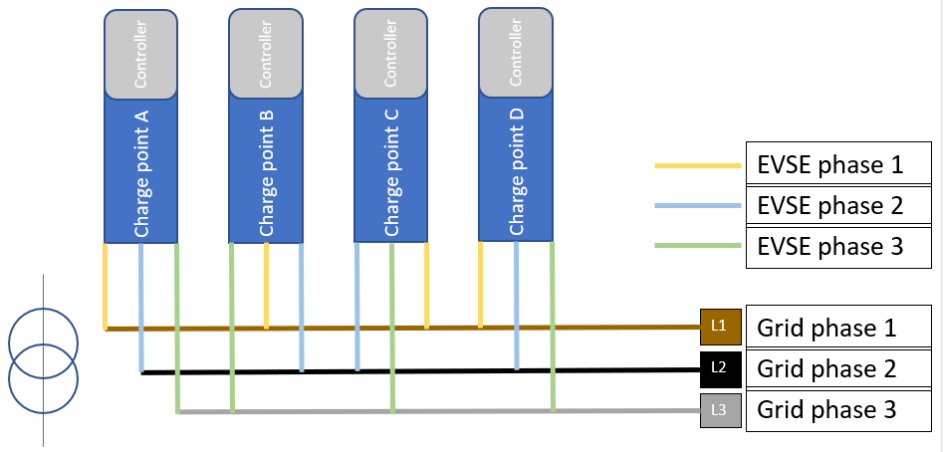
Most **electric vehicles (EV)** are charged with one or three phases at a charging point. A **large amount of one phase charging EVs** in one place can create **load imbalances** on the electric grid.




**Power quality and energy management**

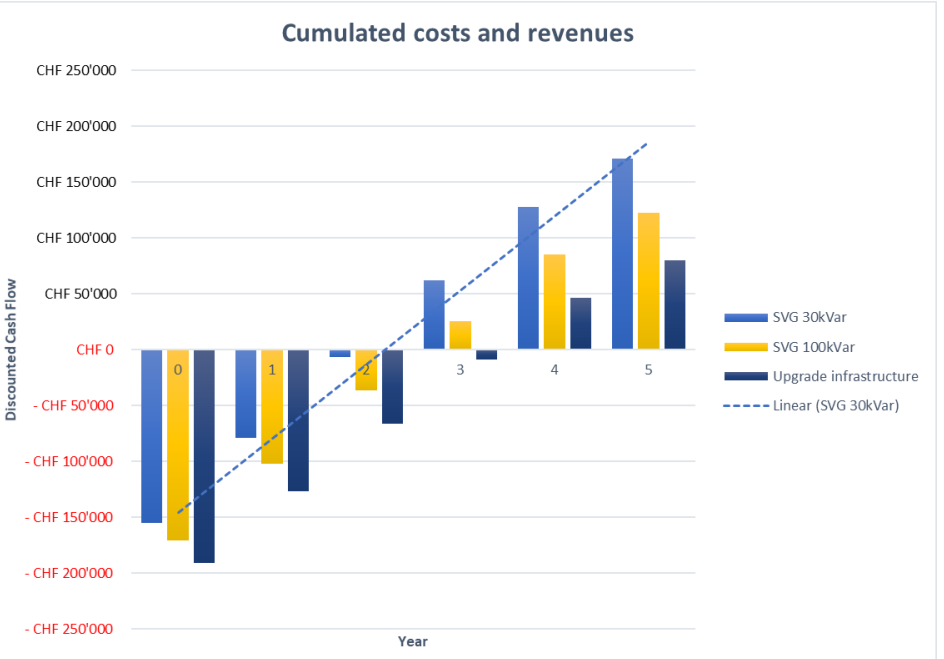
The growing number of electric vehicles requires more charging infrastructure. Charging stations need high grid capacities to fulfil the needs of EV drivers when they want to charge their electrified cars. The energy demand and uneven load distribution caused through charging EVs poses a new challenge for energy providers and grid operators. Power quality can suffer from reactive powers in the grid and managing energy becomes increasingly complex.

Load imbalances can be avoided by **connecting charging stations (EVSE)** to the electric grid in a **rotary order.**

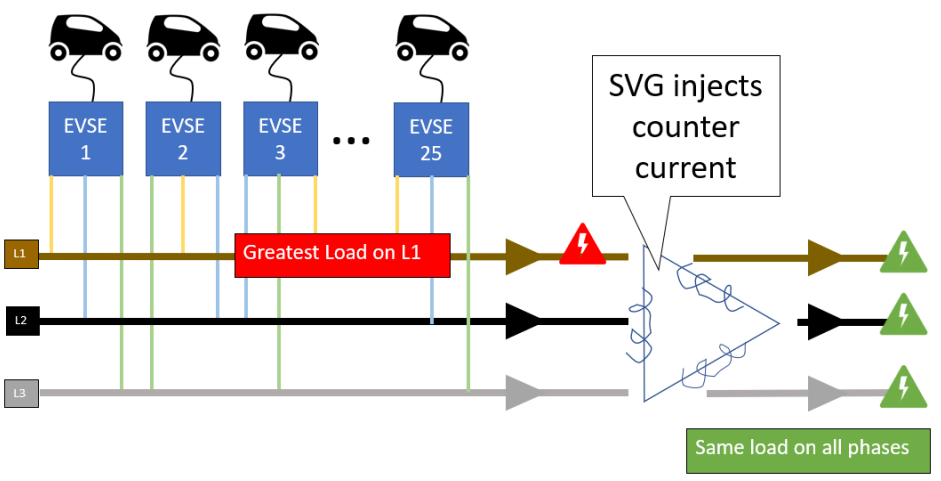



Order of connection of charging stations on the three grid phases. Adopted from GreenFlux

Efficient load balancing can **save costs and increases the power quality** in the electric grid.




A **static var generator (SVG)** can distribute loads evenly on all three phases. It **injects currents** to balance the phase loads.




**Cost savings**

Buying a SVG to compensate load imbalances can avoid costs of wasted capacities. Energy that could be sold is wasted by one phase charging EVs. An investment into load balancing equipment can save those costs and create a greater revenue for charging station operators. A business case calculation helps comparing different investment options and to see possible benefits from installing a load balancing device rather than adopting the electric infrastructure.

**Want to know more?**

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