Electric Mobility Studies with NEPLAN®

Increased penetration of electric vehicles creates new challenges for distribution system operators. The power to charge the batteries should be delivered without violating any technical limits.

Challenges	Is the distribution grid able to supply the required charging power for the increasing number of electric vehicles?
Customer	Distribution system operators, network planning and strategic network development service providers, universities
Advantages	NEPLAN with its user-friendly interface and powerful calculation modules is generally best-suited for network studies.
Solution	NEPLAN with the modules Load Flow calculation, Load Flow Time Simulation (Load Flow with Time Series), Hosting Capacity (e-mobility)

Issues

- Can the required charging power be delivered in the normal operation case?
- Is the extreme case (maximum load / minimum generation) still permissible?
- Are there regional bottlenecks caused by concentrated high charging power of electric vehicles?
- Is the grid reliability changing as a result of the new load situation?
- From which e-mobility penetration do problems arise?
- How can peak loads be avoided?

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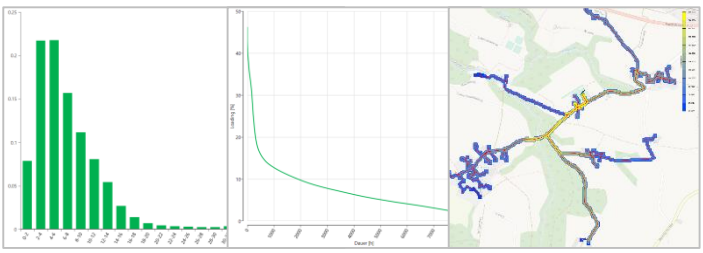
Possible Solutions

- Reactive power control / voltage control
- Control of loading times to avoid peak loads
- Use of decentralized energy storage
- Network expansion



Result of a Time Simulation – Histogram, duration curve and Heat Map of the loading

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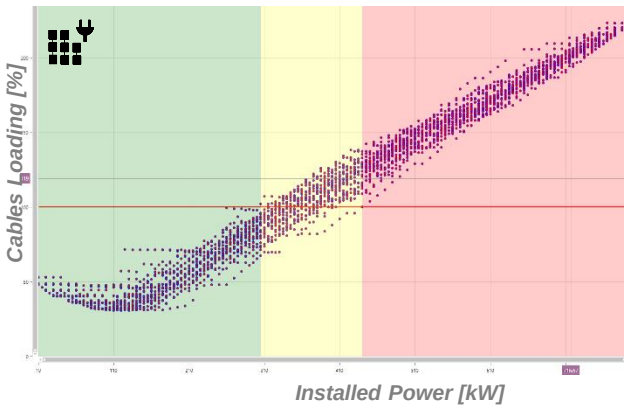
Hosting Capacity

- Rated power and locations of future charging stations are unknown
- Simulation of various network loads based on stochastic methods
- Detects critical or invalid ranges of installed power
- Detects bottlenecks in the network



Result of the module hosting capacity: maximum loading depending on the additional charging power

Load Flow Time Simulation

- Provides a realistic image of the network loading e.g. with a simulation of a year
- Measured time series as input data
- Various results available, such as minimum / maximum / average values, duration curves, histograms, time-dependent gradients

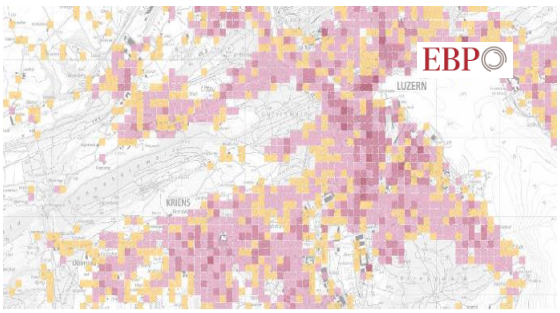
Load Flow Calculation

- Evaluation of certain operating cases, such as normal, minimum and maximum load
- Compliance with voltage limits
- Compliance with permissible loadings
- Extensive models available, such as energy storage, various types of active and reactive power control, etc.

Analysis of module hosting capacity - Different penetration levels of charging stations in a distribution network

More accurate predicted scenarios

- Socio-economic data with spatial distribution are evaluated
- Assignment of socio-economic data to the NEPLAN network model through a direct interface
- Hosting Capacity calculation are performed based on the more accurate penetration scenarios



Spatial representation in GIS of predicted penetration scenarios