

## Electric Mobility Studies with NEPLAN®

Increasing 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 well-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

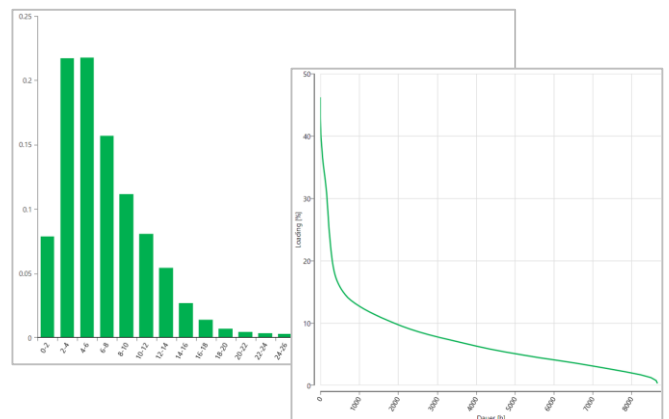
- Can the required charging power be delivered in the normal operation case?
- Is the extreme case (maximum load / minimum generation) still permissible?
- Are there regional bottlenecks caused by concentrated high charging power of electric vehicles?
- Is the grid reliability changing as a result of 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 load flow time simulation - histogram and duration curve of the loading of a line

## Hosting Capacity

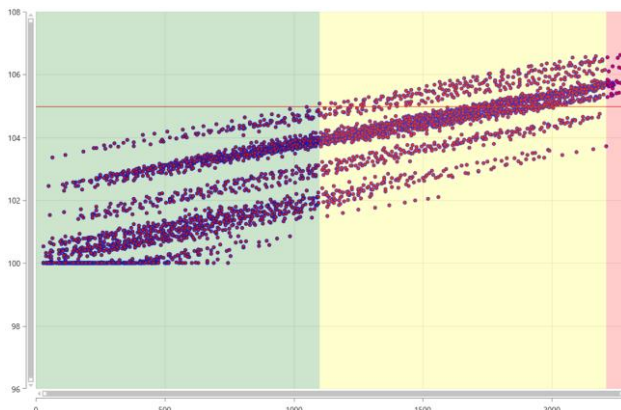
- Rated power and locations of future charging stations are unknown
- Simulation of various network loads based on stochastic methods
- Detects critical or invalid ranges of installed power
- Detects bottlenecks in the network

## Loadflow Time Simulation

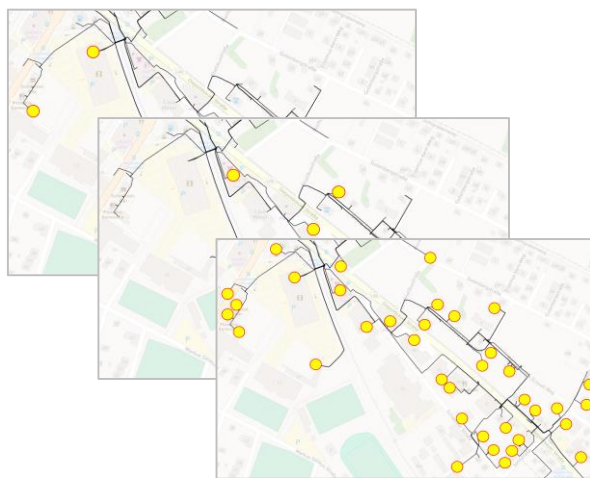
- Provides a realistic image of the network loading e.g. with a simulation of a year
- Measured time series as input data
- Various results available, such as minimum / maximum / average values, duration curves, histograms, time-dependent gradients

## Loadflow 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.



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



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