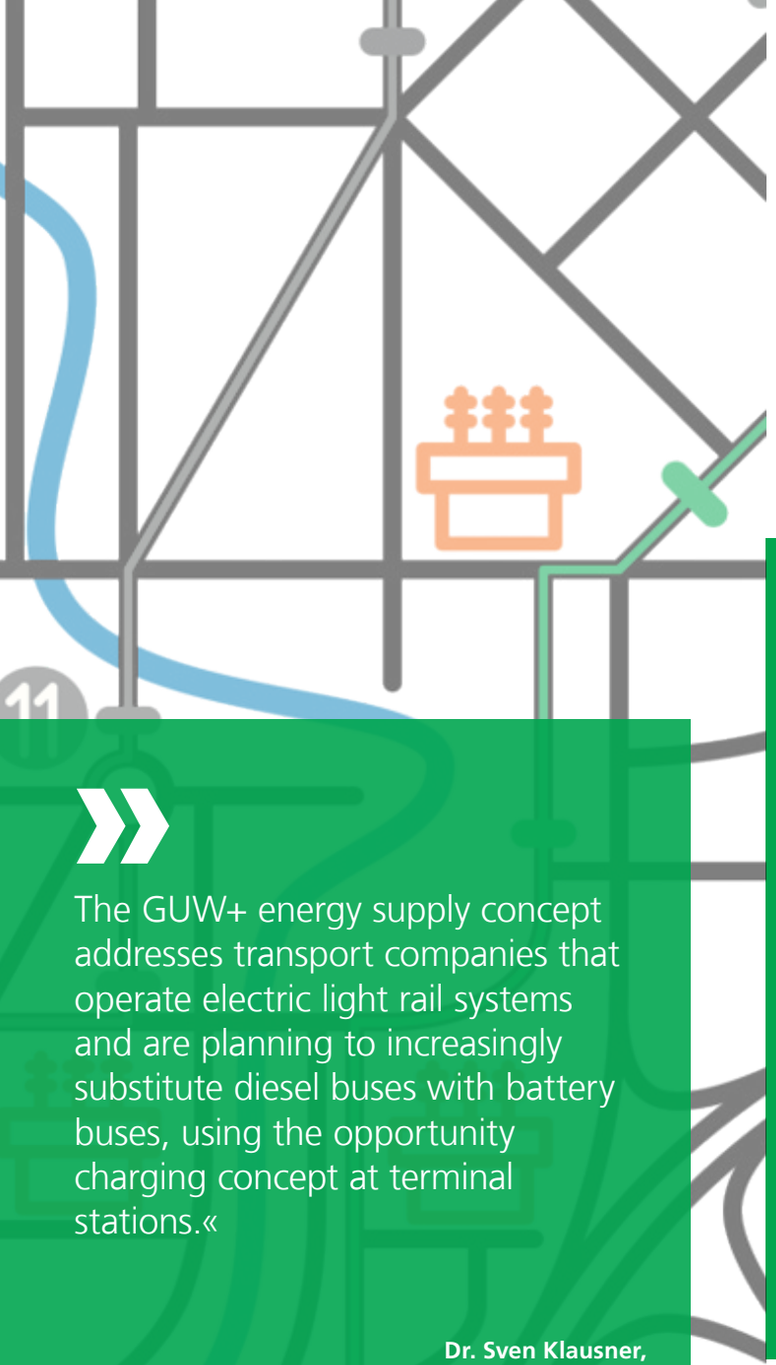

»The GUW+ energy supply concept addresses transport companies that operate electric light rail systems and are planning to increasingly substitute diesel buses with battery buses, using the opportunity charging concept at terminal stations.«

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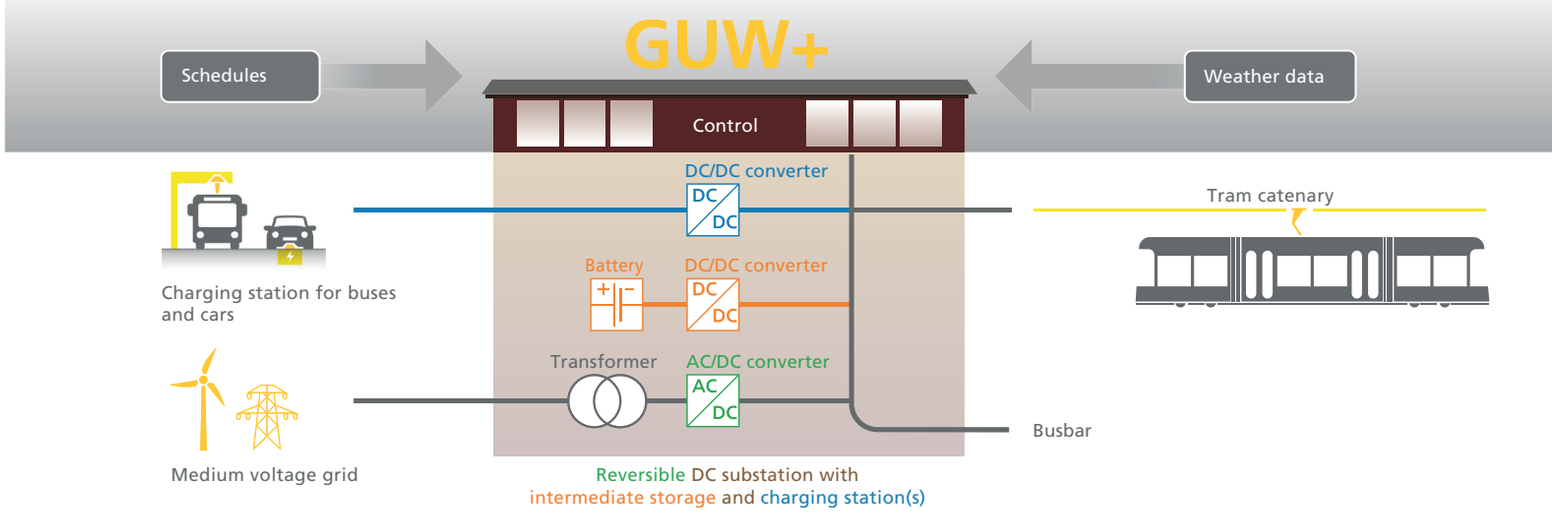
Substation Localisation

Intelligent DC Substation GUW+

GUW+ Concept

The innovative GUW+ energy supply concept uses light rail substations in parallel to bus charging at terminal stations. Through the second use of bus batteries as stationary energy storage, even more positive economic effects can be achieved.

Through the substation localisation, the possibilty of expanding substations that are intended for modernization can be examined and compared to the conventional renovation of substations and the separate installation of charging stations.



GUW+ Substation Localisation

Input Data

Substation

- Site information (e.g. available space, connected load)
- Accounting mode
- Annual performance 15-minutes performance

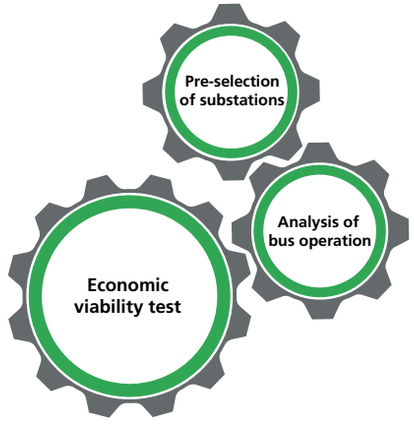
Bus Lines

- Geographical description bus operation
- Description of bus operation (VDV 452 or Excel)
- Local reference of the terminals to the medium voltage grid
- Effort estimation for connection to the medium voltage grid

General Conditions

- Estimation of potential unused braking energy
- price per kilowatt and kilowatt-hour rate for light rail supply
- Desired sites

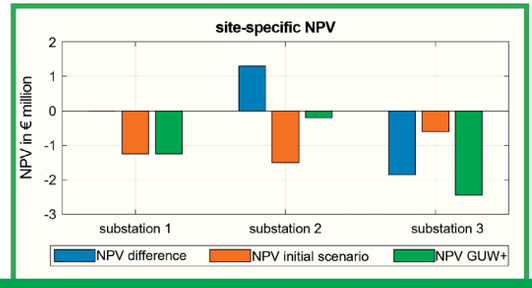
Process



- **Pre-selection of substations:** Substations are excluded if, among other things, their power reserve is too low, if they are not to be modernized soon, and if they do not have local connection to a bus terminal.
- **Analysis of bus operation:** The necessary charging infrastructure is determined at the terminal stations of respective bus routes and the energy and power requirements are calculated.
- **Economic viability test:** Costs are determined and savings and revenues are compared with the reference scenario.

Results

Identification of potential sites suitable for an upgrade to GUW+



Forecast of the prospects of economic success for the selected sites and examination of investment security