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Self-healing grid for improved reliability of power supply

Rotterdam, The Netherlands



Local control unit for self-healing grid

“The self-healing algorithm is elegant, simple, and robust and works for almost all grid structures. The applied RTUs and the developed software are very stable.”

Dr. E. J. Coster, Expert Asset Manager Stedin

High grid stability through improved outage management

The increased energy demand – in conjunction with strict regulations on the quality and reliability of supply – intensifies the pressure on distribution network operators to keep grid networks in a faultless operating mode.

In addition to the high penalty costs paid by network operators in the event of a power outage, there are also safety factors to be considered for particular customers (for example, hospitals).

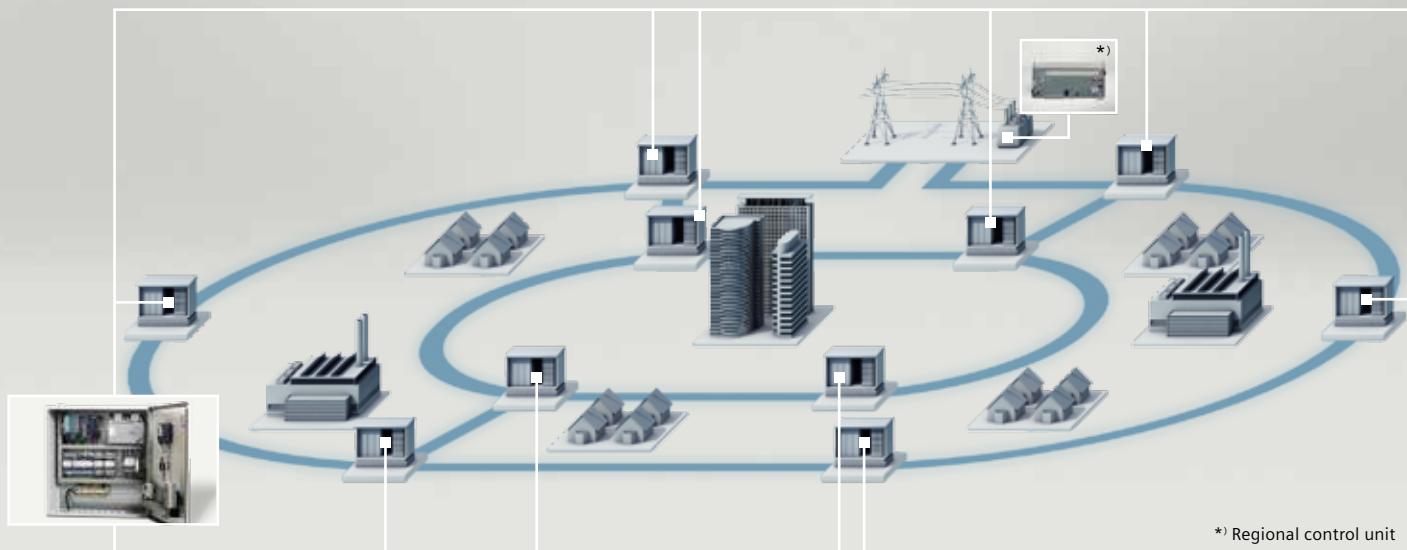
Stedin, one of the largest distribution network operators in The Netherlands, has a total of 21,240 secondary substations in service and serves approximately two million customers in the Randstad region, one of the largest conurbations in Europe.

The Rotterdam harbor district lies within this region and is one of Stedin's primary customers – and so naturally it is of the utmost importance that they deliver an uninterrupted energy supply to ensure undisturbed operations.

However, the possibility of a failure cannot be completely eliminated, and therefore it is necessary to minimize the impact on customers as much as possible and keep outage times as few and as brief as possible.

Stedin's chief goal must always be the prompt location of a faulty section in the distribution grid and a fast restoration so as to reduce the impact on all its customers.

Answers for infrastructure and cities.



Example of a distribution network with local control units in each secondary substation

Stedin's challenges

In the past, Stedin has experienced power failures in its distribution grid. In addition to displeased customers, those events entailed expensive compensation payments for Stedin. Reliable energy distribution has always been Stedin's core task, and so their main objective is to significantly reduce the SAIDI (system average interruption duration index) in their medium-voltage grids.

Today there are several self-healing distribution grids in operation worldwide, but they are usually built for overhead distribution feeders, primarily by applying automatic reclosers. The Dutch MV distribution grid, however, consists of underground cables, which cannot be quickly repaired in the event of faults, nor can they be fixed with automatic reclosers. Therefore a solution had to be developed that would work for the Dutch network system.

Our solution

Working with Stedin, Siemens developed a self-healing network solution that consists of extending the primary substation level with new functionalities for distribution automation. The primary substation level acts as a gateway that collects information from the distribution grid, hosts the regional, centralized applications of Stedin's self-healing grid, and acts as the interface to the control center. It is based on a regional controller at the primary substation level and handles fault location, isolation, and restoration automatically. The regional control unit communicates via a GPRS network with local control units that execute the switching operations.

The solution also comprises ring main units with integrated automation, local automation upgrade kits for intelligently modernizing old type RMUs, and new intelligent motorized RMUs for new substations.

Benefits for Stedin

With the innovative self-healing grid solution installed, Stedin will significantly reduce its SAIDI and re-supply most of its customers with power in less than a minute in the event of a power outage.

This fast restoration will lead not only to satisfied customers but also to significant cost savings, because Stedin will now be able to avoid high contractual compensation payments for power outages.

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