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Intelligence replaces copper – making power grids ready for the future

Niederstetten, Germany

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Integration of renewable energy sources in the area around the city of Niederstetten

Niederstetten's intelligent grid controller

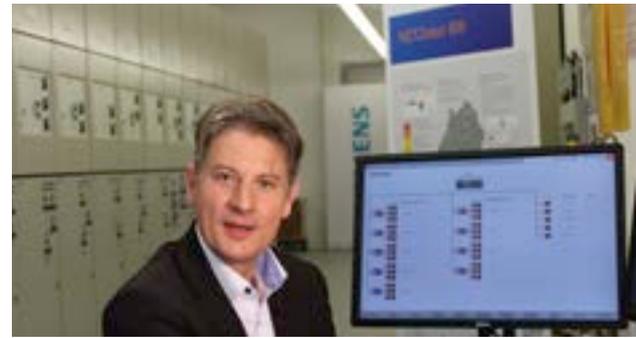
The transition to a new energy mix is moving at full speed, and Niederstetten, in the German state of Baden-Württemberg, is an example of how to successfully adapt to it. Distribution grid operator Netze BW and Siemens are implementing a grid automation solution for the catchment area around the city, which will serve as a model for future projects. The aim is to allow the existing distribution grid to operate with maximum autonomy by equipping it with as much decentralized intelligence as possible and using as few additional medium-voltage cables as necessary. The solution will be based on proven Siemens energy automation technology, which is to be used in a new configuration.

Overview of project objectives:

- Implementation of decentralized intelligence with a self-healing functionality ("self-healing grid")
- Improvement to voltage stability, including voltage optimization
- Development of standardized solutions to automate secondary substation
- Reliable fault management to reduce the SAIDI value (System Average Interruption Duration Index)

"We're supporting the development of a clever, predictive power grid infrastructure in Germany. We're not only trying to actively help shape the new energy policy, but enable local implementation of this policy at the communal and municipal level in the first place."

Dr. Martin Konermann, Technical Director at Netze BW GmbH



The challenge for Netze BW

Multiple renewable energy sources – such as wind power and photovoltaics – in the catchment area of the Niederstetten transformer substation feed electricity into the grid, and this volume is increasing. Sometimes the grid, comprising two circuits with more than 80 secondary substations and almost 87 kilometers of cable, comes up against the limit of its loading capacity. When this happens, both the electricity supply and consistency of power quality must be assured.

For grid operator Netze BW, a cost-intensive expansion of the distribution grid is only the second-best option. Dr. Jan Mrosik, CEO at Siemens, summarizes the more attractive alternative: “We won’t be able to transition to a new energy mix in Germany without intelligent power supply grids. The technology for this has long existed – and Siemens has the most comprehensive product portfolio industry-wide. In Niederstetten, we will demonstrate how existing distribution grids can be made ready for the future with proven products from our smart-grid modular system.”

Our solution

Netze BW decided to rely on intelligent systems, in combination with proven automation technology from Siemens. The main emphasis is on grid monitoring and fault management with intelligent measuring technology and long-range control for active voltage stability. For this purpose, nine of the 84 secondary substations located at the most important nodal points are to be equipped with energy automation technology, and five substations in the dead-end feeders equipped with voltage measurement systems. The measured data can be monitored and transferred by remote transmission. The core element of the modernization project is a regional grid controller in the Niederstetten substation, based on a Siemens SICAM energy automation system. This is responsible for voltage control and fault management and provides the communications connection. By acting as a link between the central SCADA (Supervisory Control and Data Acquisition) system and the intelligent field devices, it also enables the controller to restore affected grid sections in case of a fault without human intervention. Two medium-voltage in-phase regulators are to be installed for long-range voltage control. Over the entire project run time, the voltage controllers will receive their tap changes from the grid area controller on the basis of the distributed voltage measurement in the medium-voltage grid.

The benefits for Netze BW

The decentralized grid intelligence makes operation of the distribution grid very energy- and cost-efficient, since the installed automation solution means there is no need for a costly grid expansion. Improved fault detection and rapid troubleshooting result in a significant reduction in SAIDI value and thus substantial cost savings.

Power quality is optimized and a reliable energy supply system in the Niederstetten region remains assured. The results obtained and the experience gained during this project will be taken into account in future Netze BW projects.

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