

110 kV gas-insulated ring busbar installation Stadtwerke Lübeck, Substation Rothebek, Germany



‘Stadtwerke Lübeck’ ranks among Germany’s leading regional energy providers. They supply approximately 135,000 households in the Hansa city of Lübeck, plus surrounding communities, with electricity, gas, water and district heating.

The subsidiary ‘Stadtwerke Lübeck Netz GmbH’ (SWLN) is responsible for operating the supply networks. The network territory for electricity covers the Lübeck city limits, while for gas and water, plus district heating, it also includes the surrounding region.

The 3,758 kilometers of cable and piping networks comprise the following:

- Electricity: 2,215 km cables and power lines
- Gas: 1,037 km of piping network
- Water: 721 km of piping network

In the firm’s power supply operations, annual sales volume (2007) totals around 900 GWh at almost 50,000 network connections, with 143,000 meters. The municipal utilities purchase most of their electricity from the transmission network operator E.ON, but also have options for generating their own power, predominantly from combined heat and power facilities (approx. 12 MW).

The task

Deregulation of the German electricity market has created new conditions for the 'Stadtwerke Lübeck', and indeed for other power utilities as well, requiring increased flexibility in terms of network operations. In addition, over the course of time the network's load centers have altered. So in view of the new situation in 2006 the SWLN decided to adapt Lübeck's energy supply from the grid of the transmission network operator E.ON in order to ensure optimum future-compatibility.

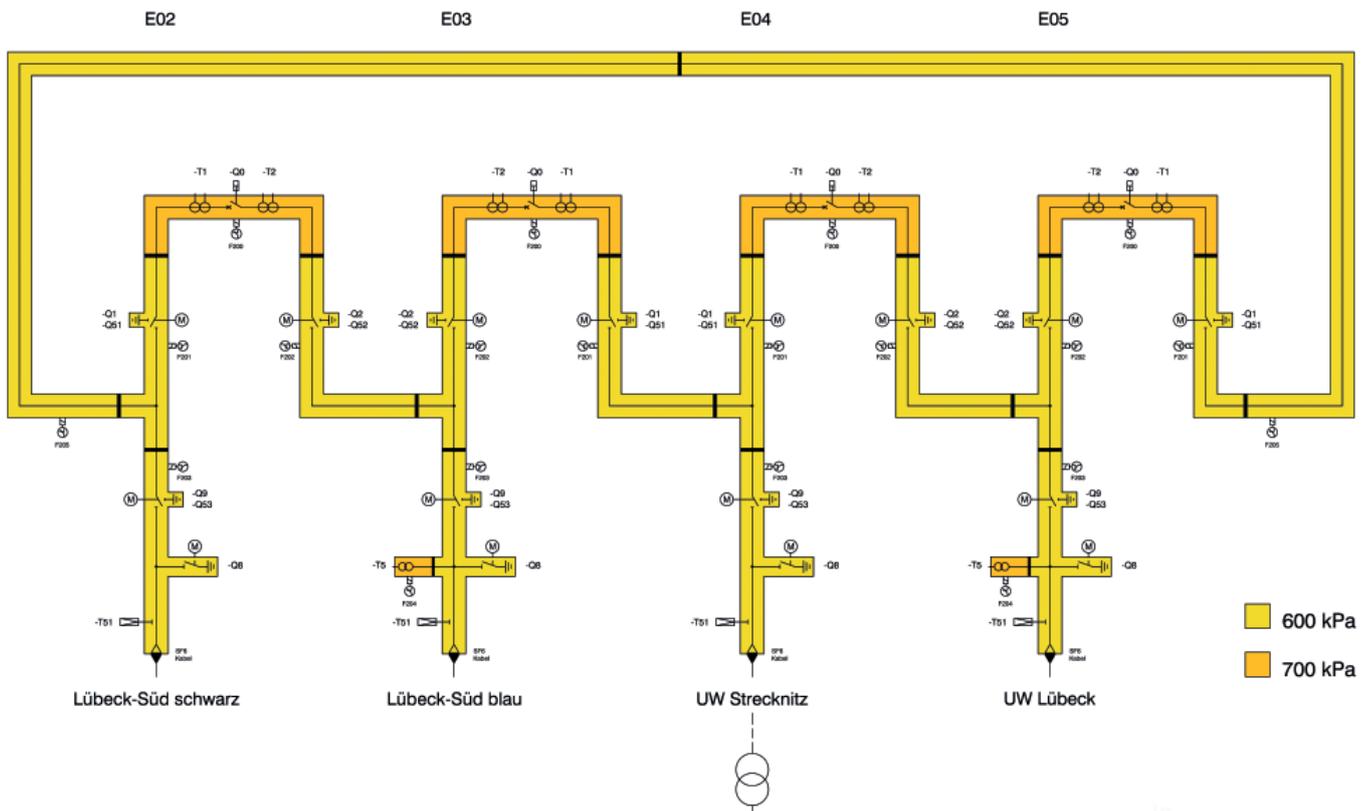
As the first step in the context of purposeful medium- and long-term network planning, the infeed situation had to be matched to the new requirements. Several different planning variants were considered, and possible solutions selected, with a clear focus on maximized return from the capital invested. Existing network and system components were to continue in use, and be skillfully combined with the new additions: the number of infeed points was to be minimized, but without compromising the quality of supply. At the same time, workload downsizing was required for older parts of the system and network sections with altered load centers in the supply operation were to be optimized.

The planning variant finally chosen was to build a new 110 kV distribution station in Rothebek with two transformer infeeds for the south of Lübeck, to provide a 110 kV bay at the connection point to the E.ON grid in Stockelsdorf and to connect and lay a 110 kV cable from the Stockelsdorf connection point of the E.ON network to Rothebek.

The site for the Rothebek substation was chosen to provide favorable options for supplying major consumers and also for optimizing the quality of supply throughout the entire network territory.

The paramount requirement for the new 110 kV distribution facility was that it should provide SWLN with the flexible switching options it needs, within the framework of an affordable, space-saving overall solution.





The solution

SWLN opted for a three phase gas insulated substation from ABB with a rated voltage of 145 kV in a ring busbar configuration. The reasons for choosing this variant included not only the flexible switching capabilities it provides, assuring all the requisite infeed and tap-changing options for operating the transformer substation, but also its increased availability compared to a single busbar.

In the early phases of the project, ABB, as a complete-system vendor, was already providing consultancy assistance to 'Stadtwerke Lübeck' when it came to proposing and choosing between alternative technical variants.

ABB's delivery package also included the station control system, based on the new communication standard IEC 61850. SWLN has thus opted for an up-to-the-future solution. The principal components are the REC670 control units and the RTU560 remote terminal unit. The integrated control unit of the RTU560 serves for local control. The system concept involved offers a modularized system architecture for scalability and expandability, plus flexible communication with a redundancy function. The protection devices provided, moreover, have been seamlessly integrated into the system concept concerned using IEC 61850.

The delivery package also included the auxiliary station-service equipment, plus integration of all system components into a holistically functioning entity. Besides project management, ABB also took responsibility for erection and commissioning.

The implementation phase was time-critical, due to its dependence on completion of a converter station for the German Railways, including the 110 kV double infeed from the municipal utilities. Thanks to the modularized construction of the three-phase-gas-insulated substation, there were no problems in getting the job done within a tight time schedule.

The ring bus installation with the station control system, plus all erection and commissioning work, were completed on time in just 6 short months. Meticulous advance planning, with a carefully formulated concept and punctual provision of the building by SWLN, underpinned by a mutually supportive approach to technical clarification between the customer and ABB, provided optimum preconditions for success.

The three-phase metal-enclosed gas-insulated substation:

Number of bays: 4
Site and environmental conditions: indoor, down to -25°C

Rated values:

Rated voltage: 145 kV
Operating voltage: 110 kV
Power-frequency withstand voltage: 275 kV
Lightning impulse withstand voltage: 650 kV
Rated current, busbar: 2,500 A
Rated current, feeders: 2,000 A
Short-circuit breaking current: 40 kA



The product

The gas-insulated switchgear, completely metal-enclosed in three phases, constitutes the ideal solution for a dependable, eco-friendly power supply. Its space-saving modularized construction and its high reliability mean it can be efficiently used directly where the energy is actually needed. The modularized system scores in terms of its ability to image a wide diversity of technical requirements using a small number of modules. This applies not only to the primary components, like circuit-breakers, disconnectors and earthing switches, but also their operating mechanisms. This ensures optimum customization of the GIS substations for different rated voltages, the rated values for short-circuit currents, and the rated currents. The standardized module portfolio, moreover, guarantees easy, affordable expansion of old gas-insulated installations, and is also advantageously suited for simple replacement of conventional outdoor installations by gas-insulated substation modules.

Since the system components are prefabricated and tested in the factory, transport, erection and commissioning can be simply and swiftly completed. High availability levels coupled with reduced operating and maintenance costs guarantee superlative system productivity. ABB's GIS station thus offers maximized cost-efficiency over its entire useful lifetime.

ABB – your partner

ABB, with its Power Systems Division, is a system partner with long years of global experience in all kinds of substation projects. Our cost-optimized, dependable solutions are purposefully customized in a process of mutually supportive collaboration. Optimized project time-frames, right-on-time project management, plus innovative technologies in the field of substations and substation automation all rank among our key corporate competences.

ABB's portfolio for GIS high-voltage switchgears from its High-Voltage Products Division includes several modularized series for rated voltages ranging from 52 kV to 1100 kV. More than 14,000 high-voltage bays in almost 2,500 stations, in 70 different countries, are already proving their worth in reliable operation, day in, day out. This in-depth experience constitutes an invaluable foundation for developing and producing our gas-insulated switchgear.

As a complete-system vendor, ABB has a comprehensive portfolio of products and systems to draw upon, enabling it to eliminate the integration risk for the customer. Single-sourced job packages offer the customer an individually tailored solution, and reassuringly dependable project execution.

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