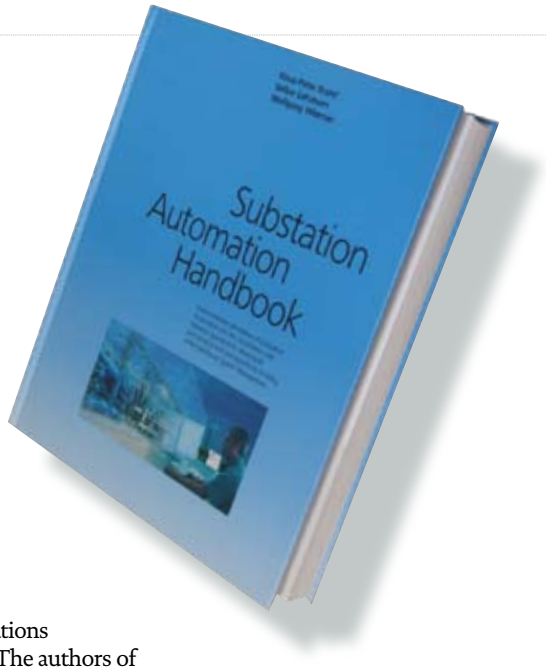
Substation Automation Handbook



THE ELECTRIC POWER INDUSTRY is going through a period of dramatic changes caused by restructuring, deregulation, downsizing, requirements for improved power quality and operation close to the stability limits. At the same time we have seen the significant improvements in multifunctional Intelligent Electronic Devices (IEDs) and the communications in substations. All of this makes open Substation Automation (SA) systems a key factor in the efficient operation of electric power system.

Successful design and implementation of Substation Automation Systems is possible only with a good understanding of their functionality, the hierarchy of the different functions, the devices being integrated and the tools used in the engineering process. There is a very limited number of books on this subject and that is why the Substation Automation Handbook can help many engineers and technicians working in the field of electric power systems protection, automation and control improve their knowledge and understanding about the role of SA.

One of the biggest challenges in the implementation of substation automation systems is the need for common understanding between engineers and technicians working in the electric power systems field and information technology or communications specialists. The authors of the book try to bridge this gap. Their combined experience is about 100 years and they have been involved in the development of substation automation systems since the late 1970ties. Their participation in many projects and interaction with customers in the process helps them present the complex material in a practical and easy to understand manner.

The almost 400 pages of the book are divided in 21 parts, including introduction, references, glossary and annex. After discussing the challenges with the introduction and acceptance of substation automation, as well as the justification of such systems, the authors switch their attention to the description of the primary substation equipment. This is followed by the description of the functions typically performed by substation automation systems, including process interface, protection, control, automation, monitoring and recording functions. Communications, system configuration and network operation related functions are discussed as well.

The parts of the book presenting substation automation systems structure and architecture highlight the functional hierarchy of the system, the role of communications, integration of different devices and the distribution of functions. The authors also talk about the support of asset management and some new roles that substation automation systems can play to achieve a more efficient operation of the system during different operating conditions. The interaction of substation automation systems with wide area monitoring and protection systems is analyzed also in the book.

The later chapters discuss standards and quality definitions related to substation automation, as well as the new standard IEC 61850 for substation communications that is already revolutionizing the industry. Benefits of substation automation and strategies to cope with the continuously changing technology are presented at the end of the book.

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