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## Preface

Electrical power delivery systems are undergoing tremendous change under the impact of economic, environmental, organizational, and technological factors. This change spreads across the whole landscape of power generation, transmission, distribution, supply and consumption, bringing together these previously distinct domains into closely related processes requiring substantial exchange of information.

At the same time, energy deregulation is breaking the unique government-owned monopolistic “Vertically Integrated Utility” into separate organizations, many of which are privately controlled and operating in a competitive electricity market. This competitive environment implies a permanent quest for cost optimization through optimal usage of assets, new service provisioning processes and enhanced value proposition. It also creates the need for new coordination and control of the system operation and new regulating authorities controlling the reliability and the security of the power supply and its underlying infrastructure.

Information exchange is no longer limited to the collect of information in a unique control center and dispatch of commands to the field, but a complex inter-exchange of information between all actors of the power generation, delivery, supply, and consumption process. These actors include transmission and distribution control centers, regional and national system operators, market platforms and regulating authorities, electrical substations, bulk power plants and energy farms, distributed energy generation and storage plants, service providers, and energy consumers.

Such a complex multi-actor environment assures that the produced energy matches the consumed energy, the electrical power is transported and distributed in an optimal manner, the power system assets are used in a secure manner and maintained correctly, that energy producing entities are compensated accordingly, and that the power consumer adapts its power consumption to the realities of the generation capability at any time.

Information exchange also enables the system to adapt to any faults or anomalies in the power system in order to avoid grid instabilities and consequent power outages, assuring hence the continuity of power supply. Protection relaying of electrical transmission lines is increasingly interacting across the grid, exchanging information for higher dependability, security and selectiveness, while evolving to a more adaptive and more “grid-aware” behavior. Restoring power system assets still

requires the intervention of field workers who have to detect anomalies and react rapidly to restore the system with more limited workforce and often to solve a much wider range of technical issues implying remote technical support.

A common denominator to all the mentioned changes in the power system landscape is abundant communications: between field devices, information and control platforms and utility staff, in field sites, in operational centers, or in engineering and technical support offices.

This present book is prepared with the ambition of describing the operational telecommunication networks and services of electrical power utility, the present and near-future applications for which they must assure the interconnections, their communication constraints and requirements, as well as the way they could be planned, designed, deployed and operated in a rapidly changing environment. It is based on the works of several CIGRE D2 working groups in which I have been involved in recent years and have had as a common thread the same question “how can the operational telecom network adapt to new power system communication requirements, the change of scale of the network, new communication technologies, and new organizational realities?” It is therefore the result of many contributions, discussions and experiences of a large number of utility and industry experts from many countries to whom I am particularly indebted and who are acknowledged.

It should be noted that the present book is not a textbook on telecommunications and networking technologies, for which excellent books exist already. The objective has rather been to produce in a same volume a coherent compilation of technical material, practical guidelines, process modeling and organizational principles necessary for an understanding of the communication issues in the new power utility context and orientations that have been taken or are being examined by the power system communication community worldwide.

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