

Overview of the IEEE Tutorial on Probabilistic T&D System Reliability Planning

Historically the development of transmission and distribution systems was largely undertaken using deterministic planning and design criteria. Though easy to use, the drawback of deterministic criteria is that they results in the expensive design of power systems that can be under-utilized except for very short periods of high electricity demand. The deterministic criteria served electric utility industry well in the past when the utilities provided bundled services to customers. In the current era of intense price and service reliability competition under the deregulated market environment, the deterministic transmission and distribution system reliability planning criteria are no longer valid. In order to be able to provide customers with the optimum service reliability at the right cost, the movement towards reliability based planning criteria and models are inevitable. Consequently, a tutorial related to this area is very timely and is expected to attract a large attendance.

This tutorial brings together instructors from academia and industry, who are able to provide a wide range of expertise on reliability techniques and applications. It summarizes the transmission and distribution systems reliability concepts and models that have been developed over the past forty years. Further, this tutorial presents the basic concepts and the recent developments in quantitative value based evaluation of transmission and distribution systems, and illustrate the practical applications of these techniques by utilities. The basic requirements of equipment outage and customer interruption cost data, and mathematical models in performing system reliability assessments are extensively covered in an easy to understand manner. The theories and models are illustrated using practical system examples. This tutorial would prove useful to anyone interested in gaining deeper understanding of transmission and distribution systems reliability and engaged in the business of electric energy systems- practicing engineers, regulators, transmission service providers, energy traders, students and academics. The materials presented in the tutorial strike a balance between basic reliability theories and their practical applications, and are presented by some of the renowned experts in the power system reliability field.

Program

<i>Introduction</i> Dr. Ali Chowdhury
<i>Application of Reliability Techniques in Transmission System Planning and Analysis</i> Dr. Ali Chowdhury
<i>Monte Carlo Simulation Techniques for Transmission System Reliability Analysis</i> Dr. Chanan Singh
<i>Predictive Distribution Reliability and Risk Assessment</i> Dr. Richard Brown and Dr. Mani Venkata
Lunch
<i>Data Concepts and Requirements for Value Based T&D Reliability Planning</i> Dr. Roy Billinton
<i>Estimating Component Reliability Indices for Electric Transmission Decision Problems</i> Dr. Jim McCalley
<i>Use of the Probabilistic Value-Based Approach in Transmission Planning and Asset Management</i> Dr. Gomma Hamoud
<i>Assessment of Economic Impacts of Reliability in Transmission Planning</i> Dr. George Gross
<i>Concluding Remarks</i> Dr. Ali Chowdhury

All presentations are of 50 minutes with 10 minutes for Q&A sessions, except for the opening and closure remarks. The Q&A sessions are an essential part of the tutorial for which IEEE offers Continuing Education Units (CEUs). For this tutorial, 0.8 CEUs are being offered. This is equivalent to 8 Professional Development Hours (PDHs).

BIOGRAPHIES OF INSTRUCTORS

Roy Billinton (F'78) came to Canada from England in 1952. Obtained B.Sc. and M.Sc. Degrees from the University of Manitoba and Ph.D. and D.Sc. Degrees from the University of Saskatchewan. Worked for Manitoba Hydro in the System Planning and Production Divisions. Joined the University of Saskatchewan in 1964. Formerly Head of the Department of Electrical Engineering, and Associate Dean of Graduate Studies, Research and Extension and Acting Dean of the College of Engineering. Presently Emeritus Professor of Electrical Engineering.

Author or co-author of eight books on reliability and over 850 papers on power system analysis, stability, economic system operation, and reliability. Fellow of the Institute of Electrical and Electronic Engineers, the Engineering Institute of Canada, the Royal Society of Canada, the Canadian Academy of Engineering and a Professional Engineer in the Province of Saskatchewan.

Richard E. Brown (F'07) is vice president for the technology division of InfraSource. He has published more than 70 technical papers related to power system reliability and asset management; is a regular instructor on these topics; is author of the book *Electric Power Distribution Reliability*; and is a registered professional engineer. He is a senior member of the IEEE, vice-chair of its Planning and Implementation Committee, and recipient of the Walter Fee Outstanding Young Engineer award. Richard earned his BSEE, MSEE, and PhD from the University of Washington in Seattle, and his MBA from the University of North Carolina at Chapel Hill.

Ali Asraf Chowdhury (F'06) received his M. Sc. Degree with Honors in electrical engineering from the Belarus Polytechnic Institute, Minsk, Belarus, the M. Sc. and Ph. D. degrees in electrical engineering with specialization in power systems reliability and security from the University of Saskatchewan, Saskatoon, Canada, and an MBA degree from the St. Ambrose University, Davenport, IA, USA. He has over 26 years of electric utility, electric equipment manufacturing industry, consulting, teaching, and R&D experience in power system reliability and security assessments, planning, and analysis. He is actively involved in the development of probabilistic models, criteria and software for use in power system planning, operating and maintenance. He has given invited lectures on power system reliability and security nationally and internationally. He has published over 110 peer reviewed technical papers including four 'Best Prize Paper Awards' on the power system reliability and value-based utility system planning and design topics.

Dr. Chowdhury has received the IEEE Region 4 '2003 Outstanding Engineer of the Year Award' for contributions to power system reliability and value-based system facility planning. He also has received 2005 IEEE RAB Achievement Award for his contributions to IEEE. Dr. Chowdhury is a Fellow of the British Institution of Engineering and Technology (IET), a Chartered Engineer in the United Kingdom, a Registered Professional Engineer in the State of Texas, USA and in the Province of Alberta, Canada.

George Gross (F'88) Is Professor of Electrical and Computer Engineering and Professor, Institute of Government and Public Affairs, at the University of Illinois at Urbana-Champaign. His current research and teaching activities are in the areas of power system analysis, planning, economics and operations and utility regulatory policy and industry restructuring. In the 1999-2000 academic year, he was invited to be a Visiting Professor at a number of Italian institutions including University of Pavia, Politecnico di Milano and Politecnico di Torino. His undergraduate work was completed at McGill University, and he earned his graduate degrees from the University of California, Berkeley. He was previously employed by Pacific Gas and Electric Company in various technical, policy and management positions. Dr. Gross won the Franz Edelman Management Science Achievement Award in 1985 and several prize paper awards. He has consulted widely to organizations in North and South America, Europe and Asia.

Gomaa Hamoud obtained his B.Sc. degrees in Electrical Engineering and Applied Mathematics from Cairo University in 1970 and 1972 respectively. He came to Canada in 1974 and received the following degrees from the University of Saskatchewan: M.Sc. in Applied Mathematics (1976), M.Sc. (1978) and Ph.D. (1981) in Electrical Engineering. He joined Hydro One (formerly Ontario Hydro) in 1981 and is currently a senior network management engineer in the Transmission System Development Department of the System Investment Division. His areas of interests include reliability modelling and evaluation of power systems, transfer capability assessment, asset criticality assessment, risk assessment and power system planning. He is a member of the Ontario association of Professional Engineers.

James D. McCalley (F'04) received the B.S., M.S., and Ph.D. from Georgia Tech in 1982, 1986, and 1992, respectively. He is Professor of Electrical and Computer Engineering at Iowa State University where he has been since 1992. He was with Pacific Gas and Electric Company, San Francisco, CA, from 1985 to 1990 and is a registered professional engineer in California. Dr. McCalley is editor for the IEEE Power Engineering Society Letters, and he is an IEEE Fellow.

Chanan Singh (F'91) is currently Regents Professor and J.W. Runyon Professor, Electrical Engineering at Texas A&M University, College Station. He served as Director of the NSF Power System Program from 1995 to 1996. His research and consulting have been focused on power system reliability. He is author/coauthor of two books, several book chapters and numerous publications. He is a Fellow of IEEE and recipient of the IEEE 1998 Outstanding Power Engineering Educator Award. In 1997, the University of Saskatchewan awarded his DSc for his contributions to research and education in power system reliability.

S.S. (Mani) Venkata (F'89) is the vice president for T&D planning and design for KEMA. He has published more than 300 papers; authored the book *Introduction to Electric Energy Systems*; and is a registered professional engineer. He is a fellow of the IEEE, was recipient of the Outstanding Power Engineering Educator Award (1996), and was recipient of the Third Millennium Award (2000). Before joining KEMA, Dr. Venkata was the dean of engineering at Clarkson University, department chair and Palmer Chair professor at Iowa State University, and has held faculty positions at the University of Washington and at West Virginia University. He received his BSEE and MSEE degrees from India, and his PhD degree from the University of South Carolina.