TUTORIAL SESSIONS

Tutorial 1:

Power Quality

Dr Alex McEachern, Power Standards Lab, United States

Speaker's Biography

Dr Alex McEachern is in world-wide demand as a speaker at power quality conferences. Known for his lively and practical presentation style, he brings a tremendous depth of experience to this tutorial: he is the co-author of many IEEE and IEC standards as well as several important texts on power quality; he is the Chair of IEC 61000-4-30, the power quality measurement standard; he is the co-founder of Dranetz-BMI and the founder of Power Standards Lab; and he has been personally awarded 28 patents related to power quality. He has solved hundreds of power quality problems in Asia, Europe, Africa, and North America. Recently, he has been concentrating his efforts on power quality in the semiconductor industry. In 2001, he was honored with the Mungenast Award for lifetime contributions to the power quality industry.

Synopsis:

This tutorial is for electrical engineers working at industrial, commercial, and electric power organizations. Some familiarity with power quality problems will be helpful, but not required. We will look closely at practical, hands-on problems and solutions, and we will avoid theoretical discussions as much as possible. Introduction to power quality problems (disturbances, harmonics, flicker); how big is the power quality problem, and how is it changing; exactly how power quality affect various technologies; practical and political problems with power quality; power quality measurements and surveys; international power quality standards (IEEE, IEC, regional, industry-specific); system-level power quality solutions; and end-use and design-level power quality solutions.

Tutorial 2:

Planning And Operation
In A Restructured Electric Power Industry
Professor Bruce F. Wollenberg , University of Minnesota, U.S.A

Speaker's Biography

Professor Bruce F. Wollenberg received his Bachelors degree in Electrical Engineering and Masters degree in Electric Power Engineering from Rensselaer Polytechnic Institute, Troy New York in 1964 and 1966 respectively. He received a Ph.D. in Systems Engineering from the University of Pennsylvania, Philadelphia Pennsylvania in 1974.

Dr. Wollenberg worked at Leeds and Northrup Company in Philadelphia, Pennsylvania from 1966 to 1974, he worked at Power Technologies Incorporated in Schenectady New York from 1974 to 1984, and he worked at Control Data Corporation's Energy Management Systems Division in Plymouth Minnesota from 1984 to 1989.

In 1989 he was appointed to a professorship at the University of Minnesota in Minneapolis Minnesota where his current interests involve the development of large scale network solution algorithms using vector processing supercomputers, the extension of traditional power system control techniques to incorporate spot pricing algorithms and distributed computing technologies, the application of expert systems to enhance the information presented to power system operators using real time computers.

He is the coauthor with Allen Wood of the Wiley textbook **Power Generation Operation and Control**.

Professor Wollenberg received the HKN Outstanding Teaching Professor Award (2002-03), the IEEE PES Outstanding Power Engineering Educator Award (2002), the IEEE Third Millennium Medal (2000), he is a Fellow of the IEEE (1988), he received the Control Data Corporation Technical Excellence Award (1987) and was inducted into Tau Beta Pi, Eta Kappa Nu, and Sigma Xi honorary fraternities (1964). He is the former Chair of the Power Systems Engineering Committee of the IEEE Power Engineering Society.

Synopsis:

This tutorial is for engineers working in the electric power industry. The tutorial shall cover both planning for new transmission and generating facilities as well as operation of transmission systems and power plants owned by independent companies. We will include material on how the new open markets for electric energy operate as well as some details of the difficult problems involved in allocating transmission capacity. We shall look closely at maintaining the reliability of the power system under new rules of operation and how risk assessment can begin to play a role. Lastly we review some of the implications of new technologies that may impact power system planning and operation.

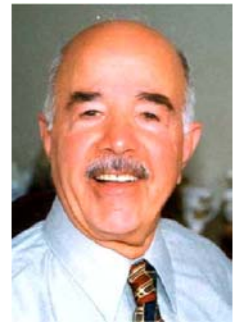
1) Introduction: What has changed with restructuring of electric power systems?
   a. Who owns what in today's power systems?
   b. How do we make these separately owned parts operate together?
   c. Advantages and disadvantages of restructuring the power system
2) Building and Operating Merchant Power Plants
   a. What are the essential operating needs if you own power plants?
   b. Power plant marketing – buying and selling
   c. Plant operations, maintenance, and scheduling
3) Building and Operating Independent Transmission Systems
   a. How should owners of transmission systems plan for expansion?
   b. Who should pay for transmission system expansions?
   c. Should transmission systems be regulated or unregulated?
4) Buying and Selling Electric Energy in the open marketplace
   a. Buying and selling energy in open markets versus regulated markets
   b. Bilateral transactions
   c. Selling into a spot market
   d. Allocating transmission capacity to users
   e. Buying and selling transmission capacity to guarantee access
5) Maintaining Power System Reliability
   a. Whose job is it to maintain reliability?
   b. Will reliability suffer in an open marketplace?

    c. What part must governments play in power system reliability?
    d. Risk assessment versus contingency analysis

6) What new technologies should be under development
    a. Transmission technologies
    b. Power generation technologies
    c. Energy storage
    d. Renewable energy

Tutorial 3:

Power System Restoration
Mr M M Adibi, IRD Corporation, U.S.A.



Speaker's Biography

Mr M M Adibi earned the B.Sc.E.E. (honors) from the University of Birmingham, U.K., the M.E.E. from Polytechnic Institute of Brooklyn, New York City, and Nuclear Engineering at the University of Santa Clara, California. He has spent over 50 years in the service of electric utilities, assuming various responsibility including; manufacturing and testing of heavy electrical equipment at General Electric Company, U.K.; operation and maintenance of large thermal power plants at British Petroleum, Iran, where he was promoted to power plant superintendent; and power system planning at Ebasco International, New York, where he was in charge of developing 10-year construction programs for several South and Central American Utilities.

Later, Mr. Adibi joined IBM Corporation, developing computer applications in the engineering and operation of electric utilities. As the industry consultant, he conducted and participated in many R&D projects related to operation of power system and power plant operation, and advanced network functions. He was the recipient of the IBM Industry Grant to study the computer-based fuel model for the power industry.

Since 1980 he has assumed industry leadership by founding and chairing the IEEE System Restoration Working Group. He has addressed many restoration issues in the 27 IEEE Transaction papers in which he is the principal author, and he has organized many paper and panel sessions at the meetings of the IEEE Power Engineering Society. His effort culminated with the publication of a book on "Power System Restoration – Methodologies and Implementation of Strategies," by the IEEE Press in alliance with John Wiley & Sons. Mr. Adibi is the recipient of the IEEE Power Engineering Society's prize for his paper on "Power System Restoration Planning." He is an IEEE Life Fellow.

Mr. Adibi is currently president of IRD Corporation, Chartered Engineer, Institute of Electrical Engineers (IEE), U.K., and a registered professional engineer in the state of Maryland, USA.

Synopsis:

A review of recent major power system disturbances shows extended duration for power outages. For instance, in a review covering 24 recent power failures, 7 failures had lasted more than 6 hours. This clearly indicates a need for development of system restoration plans. In the past, the electric utility industry has undertaken considerable efforts developing and implementing preventive measures and corrective actions to minimize the frequency and the extent of power outages. However, relatively less effort has gone into system restoration for minimizing duration of an outage. It is the intent of this tutorial to cover the significant restoration topics.

The primary objectives are reduction of outage duration, minimization of the unserved loads, and avoidance of equipment damage. The process depends on power system characteristics as related to real and reactive power balance, and the installed control and protective systems. It is also a function of pre-disturbance conditions, post-disturbance status, and post-disturbance target systems.

The system restoration is characterized in terms of six groups of tasks - system status determination, plant preparation, network preparation, network energization, system rebuilding, and logistics. The overall intent of the tutorial is to identify, to the extent possible, commonalities in the restoration process across the wide variety of individual utility characteristics. Several case studies supported by field tests will also be presented.

The restoration procedure typically spans over three stages; interconnections of the individual "initial sources of power" with the "critical requirements for power", integration of generation and transmission to achieve the post-restoration target system, and minimization of the unserved customers. These stages correspond respectively, to sectionalization and restoration of subsystems, establishment and achievement of the post-restoration target system, and minimization of unserved loads.

A study of major disturbances indicates that they have occurred at random, and each one has had somewhat different restoration problems. These problems can be divided into several group:(a) the time frames for hot and cold restart of the variety of the generating units, and prime movers frequency *response to sudden increase in load or to loss of an on-line generator, (b) the sustained overvoltages, switching transients, harmonic resonance, and over-and under-excitation capabilities of generators, (c) black-start of steam-electric units, and correct operation of protective relays, and finally (d) constant awareness of the probable effects of each action on the rest of the system and on subsequent planned actions.* The tutorial attempts to synthesize the results of two decades of work on power system restoration planning and implementation. The restoration plan covers a number of activities including: formation of a planning team, review of system characteristics, formulation of assumptions, establishment of goals, development of strategy and tactics, validation of the draft plan, iteration of the planning process to overcome deficiencies, documentation of the completed plan, and training in deployment of the plan.