

## **Tutorial on Distribution Automation**

The concept of distribution automation dates back to the 1970s. The main motivation was to use evolving computer and communications technology to improve operating performance of distribution systems. Initially, a few small pilot projects were implemented by a few utilities to test the concept. In the 1980s, we saw several major pilot projects. By the 1990s the technology had matured and that resulted in several large and many small projects at various utilities. It was expected that most of the utilities would embark on large-scale distribution automation. However, many utilities found it difficult to justify distribution automation based on hard cost-benefit numbers. Business uncertainties due to deregulation and restructuring of the power industry slowed implementation of distribution automation. Now, there is renewed interest in distribution automation due to emergence of new technologies, specifically new measuring devices and sensors, more powerful and refined communication equipment, highly advanced computing equipment, advanced power electronics equipment, and new control and protection ideas.

The Distribution Automation Working Group offered tutorials on Distribution Automation in 1988 and in 1998. A tutorial on Distribution Automation was offered at the General Meeting in Tampa in June 2007. About 20 people registered for the tutorial. Feedback from the participants was very positive. To build upon the success of the tutorial of 2007, we would like to offer it again in June 2008 with some modifications to make it better.

A tentative schedule of the tutorial and resumes of some the speakers are provided in this document. We already have a text that was prepared for the tutorial in 2007, but it did not have written material for some of the chapters. We plan to add these chapters to the text. We will also provide PowerPoint slides for the sections for distribution to the participants.

### **Speakers:**

- Anil Pahwa – Kansas State University
- N.D.R. Sarma – ERCOT
- Georges Simard – Hydro Quebec
- Charles Williams – S&C Electric
- Dan Nordell – Xcel Energy
- Mark McGranaghan – EPRI
- Sioe Mak - TWACS
- Robert Uluski – Quanta Technology

## **Distribution Automation Tutorial**

### **Tentative Schedule:**

- Introductions
- Distribution Automation Fundamentals - Anil Pahwa
- Demand Side Management - N.D.R. Sarma
- Break
- Communication System Selection - Dan Nordell
- Communication System Performance - Sioe Mak
- Break
- Integrated Voltage-var Control – Robert Uluski
- Economic Evaluation Methods and Case Studies
- Part A: Development and Evaluation of Alternate Plans - Mark McGranaghan
- Economic Evaluation Methods and Case Studies
- Part B: Economic Comparison of Alternate Plans - Georges Simard
- Break
- Using Distribution Automation to Improve Service Reliability
- Part A: Fundamentals - Dan Nordell
- Using Distribution Automation to Improve Service Reliability
- Part B: Case Studies - Charlie Williams

## Anil Pahwa

### (i) Professional Preparation

Birla Inst of Tech. & Sc., Pilani, India	Electrical Engineering	B.E. (Honors), 1975
University of Maine – Orono	Electrical. Engineering	M.S., 1979
Texas A&M University	Electrical. Engineering	Ph.D., 1983

### (ii) Appointments

**Professor**, Elec. & Comp. Eng. Department (EECE), Kansas State University (KSU), July 1994 – Present

**Interim Head**, EECE, KSU, July 2004 – July 2007

**Graduate Program Coordinator**, EECE, KSU, Aug 2000 – Aug 2004

**Advisory Engineer**, ABB, Inc, Raleigh, NC, Aug 1999 – Aug 2000 (Sabbatical)

**Associate Prof**, EECE, KSU, July 1989 – June 1994

**Assistant Prof**, EECE, KSU, Aug 1983 – June 1989

**Grad Research/Teaching Asst.**, Texas A&M University, June 1979 – July 1983

**Grad Research/Teaching Asst.**, University of Maine - Orono, Sept 1977 – May 1979

### (ii) Synergistic Activities

1. Chair, Awards Subcommittee of Power Engineering Education Committee (IEEE Power Engineering Society) – selection of the Prize Paper Award for the Power Engineering Education Committee (PEEC) and review of Fellow nominations for PEEC.
2. Member of editorial board of Electric Power Components and Systems Journal – Review papers.
3. Member of Technical Advisory Board of the DistribuTECH Conference and Exposition – Review papers and advice in selection of technical program.
4. Past Chair, Working Group on Distribution Automation of IEEE Power Engineering Society – Provide leadership in selecting technical activities relevant to the group.
5. Participant in K-State Engineering LEA/RN since 1998. This is a workshop for enhancement of learning based teaching. Implemented several interactive and assessment techniques in classes.

## **Dr. N. D.R. SARMA**

Dr. Sarma obtained his BTech and MTech degrees from REC Warangal in 1983 and 1986 respectively. He obtained his PhD degree from Indian Institute of Technology, Delhi in 1995. Dr. Sarma has about eight years of experience in Design, Development, Testing and Implementation of Application Functions for various Energy Management Systems (EMS) and Distribution Automation System (DAS) Projects in CMC Limited (an Information Technology Company in India, which is involved in the development of IT based solutions for various sectors like Power, Banking, Transportation, Government. In power sector, CMC has executed several EMS, DA and SCADA projects). At CMC, he headed a team that was responsible for designing, developing, testing and field implementation of application functions for EMS and Distribution Automation Systems. He was involved in various Technology Development projects in the area of Distribution Automation which were funded by Government of India and various utilities. At CMC, he was actively involved in setting up ISO (International Organization for Standardization) procedures and was an active member of the Internal Auditing team.

Dr. Sarma had also worked at Texas A&M University, College Station, USA, as Post Doctoral Research Associate in the Power System Automation Lab of the Department of Electrical Engineering, where in he had worked in the area of Reconfiguration Studies for Shipboard Power Systems. He had worked at Texas A&M University from October 1997 – June 1999 and from November 2000 to June 2003. From June 2003 to 15<sup>th</sup> Feb 2006, he had worked as the Head of Power Systems Research Center and an Associate Professor at the International Institute of Information Technology (IIIT), Hyderabad, which is a deemed University in India. He had focused in the area of 'IT for Power' at IIIT. He joined Texas A&M University in October 2006 to work on a Project funded by ONR in the area of Shipboard Power Systems in the Department of Electrical Engineering. Currently, he is working at ERCOT in Austin, Texas.

He had published over 34 papers of which about 13 are in reputed journals.

Dr. Sarma is a senior member of IEEE. He was the Secretary of the IEEE Power Engineering Society Distribution Automation Working Group for the period July 2004-June 2006. Currently he is the Vice Chairman of the Working Group.

## **Georges Simard, P. Eng. M. Eng.**



Georges Simard is a senior engineer of the Distribution Network Development for Hydro-Québec's Distribution Strategic Planning. This department is responsible for defining the future technical developments for the distribution network and for the writing of the in-house technical standards of Hydro-Québec's distribution network.

Before coming to the Distribution Network Strategic Planning department, he worked for Hydro-Québec's sales department where he helped solved Power Quality problems for industrial and commercial customers. He made almost all of his career, since 1982, as a Distribution planning engineer where he developed all the technical aspects of Distribution including planning, system protection, Independent Power Producer integration and Power Quality. Since 2002 he has been deeply involved in Hydro-Québec's Distribution automation project and Hydro-Québec's Distribution Roadmap. He is also secretary of the IEEE Distribution Automation working group.

Mr Simard received his BSEE in 1978 from "École Polytechnique de Montréal". He got his Master degree in Engineering in 1998 from "École Polytechnique de Montréal".

# Charles W. Williams, Jr. - P.E., C.P.Q.

## Summary Of Qualifications

Thirty three years experience in a Fortune 500 Investor Owned Utility with experience in Distribution Engineering, Operations, Reliability, Material Standards, System Design, Power Quality, Reliability and Management. My career has included 14 years of field engineering and operations experience combined with 19 years of high level technical engineering work including Transformer Loading and Analysis, Distribution Overcurrent Protection and Relaying, Power Quality, Harmonics Studies, Surge Protection, Reliability Studies, and Special Projects and Problem solving. I supervised a field engineering office of 18 employees for 4 years and directed engineering and operations activities for a 30,000 customer district of an electric utility for 8 years. My experience includes work with EMTP in modeling power system transient studies and use of SuperHarm in modeling and solving field harmonics problems. I have extensive experience in development of optimized targeted reliability improvement programs. I created a multiple initiative, targeted reliability improvement programs that improved distribution system SAIDI from 123 to 78 in a 4 year period at minimum cost. I have been a member of the IEEE Transformers Committee and of the IEEE Surge Protective Devices Committee. I am actively involved in several standards working groups of the IEEE T&D committee and was a key contributor to the IEEE 1366 standard on reliability definitions. I was one of the utility technical advisors to the EPRI Rocket Triggered Lightning Research Project and continue to assist as a utility consultant to the University of Florida Lightning Research Laboratory. I have been instructor for Power Systems Engineering at the University of Central Florida as well as many classes for IEEE on power quality and lightning protection of power systems. I have also been the lead engineer for resolving stray voltage issues, railroad induction problems and other power system issues. I joined S&C Electric Company in 2005 as a Senior Consultant. I have made several presentations on reliability and distribution automation. I also have taught courses on Power Quality.