

PAUL A. DOLLOFF, PH.D.

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EDUCATION

Virginia Polytechnic Institute and State University Blacksburg, Virginia 24061 <u>Doctor of Philosophy (Ph.D.), Electrical Engineering</u>	1996
Dissertation Title: <i>Optimization in Electrical Distribution Systems: Discrete Ascent Optimal Programming</i>	
<u>Master of Science (M.S.), Electrical Engineering</u>	1995
Thesis Title: <i>A Microprocessor Based Bus Relay Using Dissimilar Current Transformers</i>	
Tennessee Technological University Cookeville, Tennessee 38505 <u>Bachelor of Science (B.S.), Electrical Engineering</u>	1987
Morehead State University Morehead, Kentucky 40351 <u>Masters of Business Administration (MBA)</u>	2007

EXPERIENCE

<u>East Kentucky Power Cooperative</u>	Winchester, KY
<u>Research and Development – Program Manager</u>	2007
<u>Research and Development – Engineering Technology Consultant</u>	1997 - 2007
<ul style="list-style-type: none">▪ Direct the Power Delivery portion of the East Kentucky Power Cooperative (EKPC) research and development (R&D) program, including project and technology implementation on the EKPC transmission and distribution systems.▪ Leverage EKPC's memberships in the Electric Power Research Institute (EPRI) and the Cooperative Research Network (CRN) of the National Rural Electric Cooperative Association (NRECA).▪ Explore, join, and engage other research institutes, universities, government, professional societies, and industry for additional sources of technology.▪ Develop project scopes, justifications, budgets, schedules, contracts, administer funding, and supervise installations.▪ Investigate issues and solve a variety of power delivery related problems for EKPC and the Member Systems.	

Research and Development

Build and maintain a comprehensive research program for EKPC and the Member Systems consisting of assessments and demonstrations of new technologies aimed at improving efficiencies, reliability, and reducing operating and maintenance expenditures. Major projects include:

- Substation automation
- Dissolved gas analysis
- Dynamic thermal circuit ratings
- Distributed generation
- Stimulus proposal development under the Smart Grid Initiative
- Fault locators
- Power quality
- EMF and stray voltage
- EPRI DayCor – daytime corona camera

Failed equipment investigations include:

- Non-ceramic insulators
- Lightning arresters
- Conductor and splices
- Substation corona
- Pole fires
- Power station transformer

EXPERIENCE (CONTINUED)

NRECA Transmission and Distribution Planning Subcommittee

Representative on the Planning subcommittee of the NRECA Transmission and Distribution Engineering Committee. This committee works in conjunction with the Rural Utilities Services (RUS) of the U.S. Department of Agriculture, which oversees and governs all engineering standards and practices for the electric cooperative community, nationwide.

IEEE

Representative of NRECA on IEEE Standards Coordinating Committee 21 (SCC21) that wrote the distributed resources interconnection standard, document 1547. Served on a 20 member writing committee (SCC21 has over 450 members) at the request of the SCC21 chairman. There are approximately 950 electric cooperatives in 43 states that collectively own 49 percent of the nation's electrical distribution system. The safe and reliable interconnection of distributed generation to electric cooperative owned assets is paramount.

CRN Transmission and Substation Asset Member Advisory Group

Member of the Transmission and Security Member Advisory Group of the Cooperative Research Network. Formed in 2006, this committee proposes, develops, and directs the funding of transmission and security related projects on behalf of all CRN members. Represent this committee on IPIC (Georgia Tech), NEETRAC, and CEATI research organizations.

United States Department of Energy

Individual Technical Evaluator and a Technical Merit Review Committee member for a Smart Grid DOE funding opportunity announcement (FOA) under the American Recovery and Reinvestment Act (ARRA) regarding renewable energy systems; (FOA # is confidential).

Individual Technical Evaluator for an Internal Revenue Credit Program led by the DOE as part of the Smart Grid Initiative under the American Recovery and Reinvestment Act (ARRA) regarding emission and pollution reduction; (Notice # is confidential).

Smart Grid

Coordinator or key contributor to a number of Smart Grid grant and demonstration funding proposals:

- EKPC Direct Load Control (DLC)
- University of Kentucky Renewable Generating Demonstration
- Nationwide CRN Distribution Automation Demonstration
- Nationwide CRN Price Signals and In-Home Displays.

Governor's Scholars

Created an engineering curriculum for the Governor's Scholars Program (GSP) on a directive from the Kentucky Science and Technology Board as the EKPC representative on the Kentucky Engineering Industry Consortium. The other consortium members are from Toyota, Lexmark, and the Army Corps of Engineers. Through these efforts, the GSP now accepts 60 scholars with an engineering focus and includes a field trip to each of the four industry sponsors' facilities.

Kentucky Legislation

Representing the Kentucky Association of Electric Cooperatives (KAEC), worked with the Kentucky Department of Natural Resources and Public Safety to write Kentucky's "net metering" legislation for distributed resources. Prior to the bill was signed into law in July 2004, provided expert testimony during Kentucky house and senate committee meetings. Subsequently, wrote tariffs for EKPC and its Member Systems to address the net metering law, which addresses all interconnection safety concerns and requirements in addition to revenue related issues.

EXPERIENCE (CONTINUED)

Federal Legislation

On behalf of EKPC and its Member Systems, submitted two data requests, written testimony, and testified in informal and formal hearings in the matter of “Consideration of the Requirements of the Federal Energy Policy Act of 2005 Regarding Time-Based Metering, Demand Response, and Interconnection Service” before the Kentucky Public Service Commission. Complying with a KY PSC Order, currently developing and tariff for and directing the implementation of a real-time pricing effort for EKPC and its Member Systems.

Electric Operations – Engineer

1996 – 1997

- As a member of the Technical Services Team, responsible for maintenance and upgrades of the Energy Management System (EMS) – the computer system on which the 24-hour dispatch center depends.
- Responsible for all engineering duties associated with the daily operational issues of the EKPC transmission system.

24-hour Dispatch Center Responsibilities

- Provide support for Energy Control (24-hour dispatch center):
 - Participate in software changes and upgrades.
 - Troubleshoot EMS, PC display, and database problems.
 - Assist EMS technicians in troubleshooting hardware problems.
- Participate in the design and analysis required for the EMS migration, including:
 - Design and development of system application programs.
 - Translation of applications and databases.
 - Application of program interface design.
- Provide project management support for distribution SCADA.

Transmission and Generation Responsibilities

- Perform system load flow and voltage profile studies.
- Approve transmission line removal from service for maintenance.
- Analyze and update service restoration procedures.
- Perform switch arcing analysis.
- Review ratings for system interconnect and tie points.
- Identify system weak points and recommend upgrades to Transmission Planning.
- Perform outage analysis.
- Perform analysis of emission allowance strategy.
- Perform analysis of automatic generation control (AGC).
- On a daily basis, responsible for:
 - ATC / OASIS activities.
 - Analysis of unit commitment decisions (economic dispatch).
 - Analysis of daily and weekly load forecast results.

University Of Kentucky

Lexington, KY

Electrical and Computer Engineering Department - Faculty

2004 - present

- Develop and teach graduate level special topic courses in Electrical Engineering.
- Faculty sponsor for special topic courses.
- Academic advisor for senior level capstone design course.
- Industry advisor and judge for senior level capstone design course.
- Committee chairman and academic advisor for graduate students.
- ECE faculty representative on the DOE Solar Decathlon Competition, 2008 - 2009.
- Co-Principle Investigator for research funding proposals.
- Nominated and received an Adjunct Faculty position in 2005.
- Nominated and received Graduate Faculty status in 2008.
- Serve on the faculty search committee.
- Participated in UK’s ABET accreditation in 2004 - 2005.
- UK Affiliate Faculty Member for Project Lead the Way.

EXPERIENCE (CONTINUED)

Adjunct Faculty Position

Responding to a request by the University of Kentucky's Electrical and Computer Engineering Department, developed and taught electric power special topics courses. Using the EE599 graduate level course assignment, 3 credit hour courses that have never been taught at UK can and have been successfully introduced into the electrical and computer engineering curriculum. These courses have been enthusiastically received, enjoy extremely high enrollment, and have received nearly perfect course and teacher evaluations. These courses are:

EE 599, Electrical Distribution Systems

A course on electric power distribution systems was developed and offered in 2004, 2007 and 2009. The semester long, 3 credit hour course had 25, 30, and 24 students, respectively, and covered the following topics:

- Electric utility distribution systems and associated switchgear
- Load flow
- Capacitor placement – system design
- Protection
- Power quality

In 2008, this course was adopted by UK, assigned a permanent course number (EE539), and is included in the university catalogue.

EE 599, Power System Protection

A course on power system protection was developed and offered in 2005. The semester long, 3 credit hour course had 28 students and covered the following topics:

- Protection philosophy
- Various relaying schemes and associated equipment
- Coordination

EE 599, Alternate Energy Systems

A course on alternate energy systems was developed and offered in 2006 and 2008. The semester long, 3 credit hour course had 38 and 35 students, respectively, and covered the following topics:

- Photovoltaic systems
- Wind power systems
- Other renewable generating technologies and energy sources
- Interconnection issues
- Net metering

In 2008, this course was adopted by UK, assigned a permanent course number (EE531), and is included in the university catalogue.

All courses include a tour of EKPC's 24-hour dispatch center and lecture on economic dispatch. A mock rates hearing as would be presented by an electric utility to the KY PSC, has been held.

Graduate Faculty Standing

Honored with Graduate Faculty Standing at the University of Kentucky in 2008. This distinction allows the faculty member to serve as major advisor for Masters and Doctorate students. Graduate student and committee position served is given:

Graduate Student	Thesis Title	Position	Date
Vijaya Vamsi Krishna Reddy Alla	Study of Multi-Machine System Dynamics	Member	Sp 2008
Taylor Begley	Reduced Frequency Motor Starting for Third World Power Systems	Member	Sp 2009
Mohammad Museb Iftakhar	Thevenin Equivalent Circuit Estimation and Application for Power System Monitoring and Protection	Member	Sp 2009
Celia Judith John Joseph	A Novel Approach to Switch Placement for Distribution Power Systems	Chair	Sp 2009
Rakesh Reddy Kothakapu	Solar House Photovoltaic System Design	Chair	Fall 2008
Terri MacGregor	PV/UPS Hybrid Design for an Orphanage in Tamil Nadu, India	Chair	Sp 2009

EXPERIENCE (CONTINUED)

Graduate Student	Thesis Title	Position	Date
Mouna Maddali	PV Louver Design	Chair	Fall 2008
Alex Meece	Short-Circuit, Over-Current Coordination, and Arc Flash Hazard Analysis for St. Francis Hospital and Medical Center	Chair	Su 2009
Hiroshi Sako	Synchronous Generator Modeling and Parameter Estimation	Member	Sp 2008
Raghu Sundeep Telidevara	Exploring possible methods for integrating Power System Applications	Member	Su 2008
Arthi Vasudevan	Design of a Photovoltaic System for Living Hope Center, Mt. Zion, Tamil Nadu, India	Chair	Fall 2008
David Williams	Fault Location in Distribution Power Systems	Member	Sp 2009
Nuntapoom Vaidyakula	Techniques for Improving Underground Coal Mine High Resistance Grounding Systems	Member	Fall 2009

Project Lead The Way – University Affiliate Faculty

2007 - 2009

Receiving a grant from the KY Council on Post Secondary Education, UK was named the state's Project Lead The Way (PLTW) university affiliate. This effort is part of KY's comprehensive strategy to promote Science, Technology, Engineering, and Mathematics. PLTW has developed a sequence of high school courses which, when combined with preparatory mathematics and science courses, introduces students to the scope, rigor, and discipline of engineering prior to entering college. Honored by selection to participate in PLTW based on education, ties with industry, performance, and excellent student reviews at UK. Duties include teaching high school teachers the PLTW "Principles of Engineering" curriculum during a two week summer session. Through this initiative, PLTW training for high school teachers is available in Kentucky.

Virginia Polytechnic Institute and State University

Blacksburg, VA

Graduate Project Assistant

1992-1996

- Developed the Phase Balancing and Line Impedance applications for the Distribution Engineering Workstation (DEWorkstation) sponsored by the (EPRI).
- Developed and revised the entire on-line help system for all DEWorkstation applications and executive dialog boxes.
- Applications were developed in C for OS/2 and Windows.
- Performed circuit modeling and database entry and modifications.

Graduate Research Assistant

1989-1992

- Developed a microprocessor based bus relay for the Tennessee Valley Authority Olgethorpe 161kV Substation.
- The bus relay:
 - Incorporated conventional CTs with MOCTs.
 - Incorporated a novel CT saturation detection algorithm.
 - Employed the percentage differential technique for primary protection and modified the phase comparison scheme for secondary protection.
- The bus relay, substation, and associated transmission lines were modeled and tested in EMTP and on a real-time Transient Network Analyzer (TNA).
- Personal Computer Manager for the Power Systems Laboratory.

Graduate Teaching Assistant

1987-1992

- Taught the undergraduate power lab course in the Faraday Laboratory.
- Substitute taught in the electric motors course.
- Graded papers for various electrical engineering courses.

Baltimore Gas and Electric

Baltimore, MD

Student Engineer

1993

- Completed and updated the Calvert Cliffs Nuclear Power Plant CYME software electrical distribution model.
- Performed load flow analysis to investigate effects, performance, and settings for an installation of voltage regulators.

EXPERIENCE (CONTINUED)

- Performed motor starting analysis to determine degraded grid relay settings and voltage regulator response.
- Investigated Nuclear Regulatory Commission low voltage concerns within the plant for various first and second contingencies.

Westinghouse Idaho Nuclear Company

Idaho Falls, ID

Student Engineer

1988

- Verified and corrected plant and instrumentation drawings for a nuclear spent fuel reprocessing plant.
- Studied the fluidized bed employed on-site for process steam.
- Required a DOE level "L" security clearance.

Tennessee Technological University

Cookeville, TN

Student Instructor

1986-1987

One of four student proctors teaching and overseeing a self-paced undergraduate circuits and networks course.

Student Assistantship

1985-1986

Graded papers for various electrical engineering courses.

PRESENTATIONS

University of Louisville

Louisville, KY 2009

Guest speaker to members of the Conn Center for Renewable Energy Research and Environmental Stewardship and students on the Smart Grid and the integration of renewable generation.

Kentucky Cyberinfrastructure Strategic Planning Workshop

Lexington, Kentucky 2009

Energy Goals speaker and panelist; workshop sponsored by the Experimental Programs to Stimulate Competitive Research (EPSCoR) at the University of Kentucky.

EKPC Smart Grid Summit

Winchester, KY 2009

Coordinated the meeting and spoke on the federal Smart Grid Initiative.

University of Kentucky ECE Department Faculty Seminars

Lexington, Kentucky 2009

Made a presentation on the Smart Grid.

Kentucky Mesonet Workshop

Bowling Green, KY 2008

Made a presentation on EKPC's application of real-time weather data on dynamic circuit ratings.

EPRI Increased Power Flow Conference and Task Force Meeting

Boston, MA 2008

Made presentations on EKPC's implementation of EPRI's Dynamic Thermal Circuit Rating (DTCR) technology and was session chair on DTCR Technologies and Applications.

University of Kentucky Solar Decathlon House

Lexington, Kentucky 2008

Made two presentations to the UK student solar decathlon team during a series of workshops.

Net Metering: An Update

Lake Barkley, KY 2008

Gave three presentations on net metering: The Kentucky Association of Electric Cooperatives conference, the EKPC Member Services conference, and the EKPC Power Supply conference.

Real-Time Transmission Software Solutions

Winchester, KY 2007

Gave a presentation on the results of adopting a new transmission planning and operations software tool at EKPC during a nationwide, CRN sponsored webcast.

DayCor Users' Group Conference

Orlando, FL 2007

Key note speaker and gave presentation on the differences between corona and arcing.

EKPC Supervisors' Training

EKPC, KY 2005

Gave a presentation on a recent work in EKPC's R&D Department to all EKPC supervisors.

DayCor Users' Group Conference

Charlotte, NC 2005

Recognized as an expert, gave a presentation on pole fires.

PRESENTATIONS (CONTINUED)

- Engineers/Operations Conference Sunset Beach, NC 2003
Made a presentation on a utility's perspective of installing an Advanced Static VAR Compensation device to mitigate power quality problems to the North Carolina Association of Electric Cooperatives.
- EPRI Overhead Transmission Line Equipment, Inspection and Maintenance Practices Conference Monterey, CA 2002 & 2004
In 2002, presented a paper on non-ceramic insulator research conducted at EKPC and was session chair on Insulators, Fiber Optic Cables, and Lightning Performance. In 2004, was session chair on Conductors, Splices, Dampers, and Line Hardware.
- NRECA Annual TechAdvantage Conference Dallas, TX, 2002
Presented a paper and was session chair on distributed generation interconnection issues. The IEEE P1547 standard and the NRECA interconnection guide was presented.
- IEEE SCC21 P1547 Distributed Generation Interconnection
Presented the status of IEEE P1547, provided clarification of key points, outlined areas requiring additional work, discussed NRECA's role, and fielded questions.
- EPRI/CRN Fuel Cell Technology Demonstration Users' Group 2001
 - NRECA T&D Engineering Planning Subcommittee 2000 & 2001
 - TechAdvantage Conference 2000 & 2002
 - CRN Power Supply Task Force (twice) 2000
 - CRN Distribution Operations Task Force 2000
- EKPC Power Delivery Business Unit Meetings Winchester, KY 1999 - 2008
Gave presentations on R&D Power Delivery projects:
- Corrosion problems at Inland Container substation
 - Fault locator program
 - Non-ceramic insulator failures
 - Lightning arrester failures
 - Catastrophic auxiliary transformer failure investigation at Cooper Power Station
- EKPC Annual Engineering Conference Winchester, KY
Provide, annually, an update on EKPC's Power Delivery R&D efforts to the EKPC Member Systems and EKPC personnel.
- EPRI Power Delivery Business Area Council Orlando, FL 1999
Described the portfolio of products and research projects in EPRI's transmission insulator area including applications at EKPC.
- Kentucky's Governor's Scholars Program (GSP), Winchester, KY 2001
Promoted the GSP to potential scholars (high school students) in a five county region.
- Interdisciplinary Center for Applied Mathematics (ICAM), Blacksburg, VA 1994
Presented and worked with ICAM personnel in developing the Discrete Ascent Optimal Programming algorithm.
- EPRI DEWorkstation
- Consultant to BSG Inc. to design, debug, and complete DEWorkstation.
 - EPRI product demonstration expos.
 - DEWorkstation seminar instructor and utility presentations.
 - East Kentucky Power Co-op Winchester, KY 1995
 - Arkansas Power and Light Hot Springs, AR 1992 & 1995
 - Central Louisiana Electric Pineville, LA 1995
 - Duke Power Charlotte, NC 1994
 - Allegheny Power Systems Greensburg, PA 1994
 - Virginia Power Richmond, VA 1993
 - Xerox Washington DC, MD 1993

PUBLICATIONS

- Evaluate Real-Time System Reliability Using Boundary-Based Concept for EKPC System*, 2008 IEEE Power Engineering Society General Meeting, Pittsburgh, PA, July 20-24, 2008.
- Eliminating Voltage Sags Economically with Automatic Static VAr Compensation*, CRN Briefs, Project 01-16, 2002.
- EPRI's Polymer Insulator Research, Inspections and Testing Helped East Kentucky Power Cooperative Avoid an Outage to a Major Industrial Customer*, EPRI Innovators with EPRI Technology, 2002.
- Minimum Loss Optimization in Distribution Systems: Discrete Ascent Optimal Programming*, Electric Power Systems Research International Journal, 1995.
- EPRI Distribution Engineering Workstation and Measurement Data*, Proceedings of the 4th International Symposium on Distribution Automation and Demand Side Management, Orlando, FL, January 17-20, 1994.
- EPRI Distribution Engineering Workstation Design Concepts*, EPRICON Conference Proceedings, Scottsdale, AR, December 9-11, 1992.
- A Microprocessor Based Bus Relay Using a Current Transformer Saturation Detector*, Proceedings of the Twenty-Second North American Power Symposium, Auburn, AL, October 15-16, 1990.

PROFESSIONAL MEMBERSHIPS

- IEEE – Senior Member
- IEEE Standards Association Member
- NRECA Engineering Planning Subcommittee
- CIGRÉ
- EPRI, Working Groups and Task Forces
 - Insulators Overhead Transmission Inspection and Maintenance
 - Metering Substation Inspection and Maintenance
 - DayCor Increased Power Flow
 - Airborne Inspection Transformers and HVCT

COMPUTER SKILLS

- Software:
EMTP, DOS/Windows based software packages, Microsoft products, multiple power engineering tools.
- Languages:
BASIC, FORTRAN, C, Assembly, and SQL.
- Hardware / Operating Systems:
IBM PC/DOS/Windows, VAX/VMS UNIX, and Motorola 68020.

HONORS AND ACTIVITIES

- Eta Kappa Nu.
- 2002 Winner of an EPRI Innovator Award.
- 1999 Winner of EPRI's Power Delivery Technology Champion Award.
- 1999 Winner of CRN Best Research Idea Award.
- Sponsored Power Quality Systems, Inc. for associate membership in NRECA.
- Featured in *Engineering with a Bow*, Rural Electrification Magazine, Vol. 58, No. 3, December 1999.
- Featured in *Heart Strings*, Focus Magazine, Spring 1998.
- Sterling British Motoring Society.
 - President, 2004 & 2005.
- Bluegrass Austin Healey Club.
- Professional violinist and violist:
 - EKU Symphony Orchestra.
 - EKU String Quartet.
 - Winchester Chorale.
 - Appeared with Ray Price, Renfro Valley, KY, 1999 & 2000.

HONORS AND ACTIVITIES (CONTINUED)

- Full Music Scholarship at TTU (5 years).
- Concerto Competition winner, TTU 1986.
- Music Camp, University of the South, Sewanee, TN, 1979 – 1983.
- Music Scholarship, Blair School of Music, Vanderbilt University, 1981 & 1982.
- Honorary member of the Governor's Scholars Program.
- Volunteer supervising electrician for the Ichthus Christian Music Festival.
- Horse Farm – Iroquois Hunt Club.
- Woodworker.

REFERENCES

Ms. Shiela Medina – Assistant Director, Center for Applied Energy Research, University of Kentucky
374 Crescent Avenue
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(859) 749-4317

Dr. Lawrence Holloway – Department Chair, Electrical and Computer Engineering
453 Anderson Hall
University of Kentucky
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(859) 323-8523

Mr. Robert Miller – EKPC VP (retired)
President of the UK Alumni Association
409 Lynnway Drive
Winchester, KY 40391
(859) 744-0240

Mr. Dale Bradshaw - Senior Program Manager
Cooperative Research Network, National Rural Electric Cooperative Association
6128 Shady Way Lane
Chattanooga, TN 37416
(423) 238-4052

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Electric Power Research Institute
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Charlotte, NC 28262
(704) 595-2234

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