

## **Thomas E. McDermott, Ph. D., P.E., FIEEE**

### **EDUCATION**

B.S.E.P.E., Rensselaer Polytechnic Institute, 1980

M.E.E.P.E., Rensselaer Polytechnic Institute, 1981

Ph.D., Electrical Engineering, Virginia Polytechnic Institute & State University, 1998

### **CERTIFICATIONS**

Registered Professional Engineer, State of Pennsylvania, License # PE035275-E

### **PROFESSIONAL EMPLOYMENT HISTORY**

2009 – present President, MelTran, Inc.

2012 – present Assistant Professor, University of Pittsburgh

2004 – 2009 Sr. Consulting Engineer, EnerNex Corporation

2002 – 2004 Sr. R&D Engineer, Ansoft Corporation

1997 – 2002 Project Engineer, Electrotek Concepts

1994 – 1997 Development Engineer, Ansoft Corporation

1988 – 1994 Sr. Engineer, Power Technologies

1981 – 1988 Sr. Engineer, Westinghouse Electric Corporation

1978 – 1980 Coop Engineer, American Electric Power

### **AWARDS**

2014 IEEE Fellow, “for contributions to modeling and analysis of electric power distribution systems and lightning protection”

2013 IEEE PES Pittsburgh Chapter Outstanding Engineer Award

2002 IEEE Industry Applications Magazine Prize Article

2000 IEEE Third Millennium Medal

1984 Westinghouse Engineering Achievement Award

1980 IEEE Fortescue Fellowship

### **PROFESSIONAL EXPERIENCE – POWER AND ENERGY**

Tom McDermott specializes in circuit simulation, distribution systems, distributed wind and solar interconnection, lightning protection and insulation coordination, power quality data analysis, and the development of software tools to assist in these tasks. He has recently been the principal investigator for several funded research projects:

- EPRI/NYSERDA/Con Edison – green circuit, plug-in electric vehicle, and AMI data usage for urban distribution systems with secondary networks
- EPRI – advanced feeder design for strategic use of distributed generation, enhancement of their *OpenDSS* simulation software (new sparse matrix solver, distribution automation algorithms) and *OpenEtran* transient analysis software
- EPRI – gap analysis for modeling North American feeders in the IEC Common Information Model (CIM), participation in 2011 Distribution CIM interoperability tests
- U. S. Department of Energy (SBIR Grant) – distribution system load estimation
- U. S. Department of Energy (SBIR Grant) – distribution system data exchanges
- Utility Wind Integration Group – Distributed Wind Feeder Simulator and Impacts Project
- California Institute for Energy and Environment (CIEE) – feeder state estimation for outage management

- CEA Technology Institute (CEATI) – worker protection on de-energized distribution lines, arc flash hazards on open-air utility distribution systems, power factor correction capacitor software tools, meter phase identification by state estimation, distributed wind project evaluation, solar power variability impacts on distribution systems

Over the past few years, Tom has performed analytical power system studies for several clients:

- National Grid – Over 20 distributed wind and solar interconnection studies, including the impacts of voltage fluctuation, operating requirements, overcurrent protection, overvoltage protection, and islanding detection. 345-kV harmonic filter evaluation for Sandy Pond HVDC, current-limiting reactor TRV.
- Williston Associates – fault current and voltage calculations for a PV project using micro-inverters, simulations to verify overcurrent protection settings
- Oak Ridge National Lab – transformer protection and grounding evaluation.
- Sandia National Lab – distribution feeder modeling and solar power variability simulations
- Dominion Virginia Power – evaluation of line trip-outs during thunderstorms
- Dynalectric – transformer and vacuum switchgear transients, RC snubber evaluation
- Southport Power – feasibility analysis of distributed wind and solar projects
- Naval Surface Warfare Center – training in use of Alternative Transients Program (ATP)
- ISO New England – large-scale temporary overvoltage (TOV) studies for the southwest Connecticut 345-kV cable projects. System impact studies for Norwalk Harbor expansion.
- Northeast Utilities – TOV studies for the New England East-West Transmission System (NEEWS) 345-kV cable projects. TOV analysis of one vs. two HPFF cable segments in the Bethel-Norwalk corridor. Transient recovery voltage (TRV) and TOV studies at 115 kV.
- United Illuminating – comprehensive insulation coordination review of 115-kV system, including a gas-insulated substation (GIS).
- NSTAR – Cape Wind system impact studies, southeast Massachusetts harmonics investigation, 345-kV cable switching studies, current-limiting reactor TRV, and black start restoration.
- American Transmission Company – hybrid overhead/underground 345-kV line study. Transformer inrush current mitigation study.
- LIPA/KeySpan – telephone interference study for Neptune HVDC project.
- PacifiCorp – capacitor switching, harmonics, and failure analysis at 138 kV and 345 kV. Harmonic analysis and training for a 46-kV industrial load.
- Alliant & GE Wind – insulation coordination, capacitor switching, and temporary overvoltage studies for several wind plants.
- Oak Creek Energy – transient recovery voltage study for Tehachapi wind plant
- University of Massachusetts – integration study of 12-MW offshore wind plant for Hull (MA) Municipal Light and Power.
- Florida Power & Light – insulation coordination, TRV, and harmonic analysis of 230-kV shunt capacitor banks.

Tom was previously employed at EnerNex, Ansoft Corporation, Electrotek Concepts, Siemens/Power Technologies, and Westinghouse Electric Corporation. In those roles, he has taught short courses in EMTP usage, simulation for power electronics, and lightning protection. He served as a principal investigator for the Electric Power Research Institute's early efforts to enhance the EMTP, producing the *EMTP Primer* and the *EMTP Application Guide* as the first in a series of new user documentation. He performed switching surge measurements in the field at voltage levels up to 500 kV. He also performed

studies of power quality, subsynchronous resonance (SSR), static VAR generator product applications, shunt capacitor switching, and series capacitor protection.

#### **PROFESSIONAL EXPERIENCE – SIMULATION SOFTWARE**

Tom is proficient in several programming languages and Internet technologies on both Windows and Linux platforms. At Virginia Tech, his doctoral work involved the development and testing of a new algorithm for distribution system reconfiguration, which has been used by several utilities as part of the EPRI DEWorkstation. He has been the lead developer or co-administrator for several commercial, research-funded and open-source software products, including the following:

- Electrotek PQWeb
- Electrotek TOP 2000
- Electrotek SuperHarm
- Ansoft Electromechanical System Simulator
- Ansoft Schematic Capture Module
- Ansoft FEA Link (time-domain co-simulation between circuits and finite elements)
- EPRI Lightning Protection Design Workstation
- EPRI Power Quality Planning Software for Distribution Systems
- EPRI Substation Design Workstation – Surge Analysis Module
- EPRI Power Quality Diagnostic System – Lightning Surge Simulator
- Utility Wind Integration Group – Distributed Wind Feeder Simulator
- CEATI Power Factor Correction Capacitor Applications (PFC Tool)
- IEEE Flash – Lightning performance of overhead power lines (open source)
- OpenDSS – distribution system simulator (open source, co-administrator on SourceForge)
- OpenEtran – electromagnetic transient analysis (open source)

#### **PROFESSIONAL TEACHING EXPERIENCE**

- University of Pittsburgh (adjunct), ECE 3778: Power System Transients 2, 3-credit course, Fall 2011.
- Utility Wind Integration Group: Distributed Wind and Solar Integration, 0.85-CEU seminar, Ten Offerings, January 2006 – June 2014.
- Naval Surface Warfare Center, Alternative Transients Program (ATP) with Shipboard Applications, 15-PDH seminar, Four Offerings, January and June 2011, August 2012 and 2013
- Penn State-McKeesport (extension), Probability & Statistics for Power System Engineers, 3-credit course, Fall 1985.

#### **PROFESSIONAL ORGANIZATIONS**

- Fellow Member, IEEE Power and Energy Society, Industry Applications Society
- Member, International Council on Large Electric Systems (Cigre)
- Member, American Society for Engineering Education
- Member, American Society of Naval Engineers
- IEEE/PES Distribution System Subcommittee
- IEEE/PES WG on Distributed Resource Integration (Chair)
- IEEE/PES WG on Wind & Solar Power Plants, System Impacts, and Interconnection Requirements (Chair)

- IEEE/PES Distribution System Analysis Subcommittee (past Chair)
- IEEE/PES P1729 WG on Recommended Practice for Distribution System Analysis (past Chair)
- IEEE/PES WG on the Lightning Performance of Overhead Lines (task force leader)
- IEEE/PES WG on Estimating the Lightning Performance of Transmission Lines (past Chair)
- IEEE P1547.8 WG developing a Recommended Practice for High Penetration of Distributed Resources (writing group leader, ballot resolution team member)
- IEEE P1547 WG revising the standard for distributed resource interconnections
- IEEE/PES Power System Analysis, Computing, and Economics Committee (Standards Representative)
- Pittsburgh Section IEEE (past Chair, Treasurer for 2008 General Power Meeting)
- IEC TC57 WG14, "System Interfaces for Distribution Management", IEC Std. 61968 (parts 5, 7, 11, and 13), Transformer Modeling Task Force
- Cigre WG C4.502 on "Power System Technical Performance Issues Related to the Application of Long HVAC Cables" (past task force leader)
- Cigre WG CIGRE JWG C4-C6.35/CIRED on "Modeling and dynamic performance of inverter based generation in power system transmission and distribution studies"

#### SELECTED PUBLICATIONS

Tom has authored or co-authored 8 refereed journal papers, 3 book chapters, 60 refereed conference papers, 10 non-refereed articles, 12 EPRI technical reports, and 4 CEATI technical reports. A selected list follows:

1. T. E. McDermott, T. A. Short, J. G. Anderson, "Lightning Protection of Distribution Lines," *IEEE Transactions on Power Delivery*, vol. 9, no. 1, pp. 138-152, January 1994.
2. T. McDermott, P. Zhou, J. Gilmore, Z. Cendes, "Electromechanical System Simulation with Models Generated from Finite Element Solutions," *IEEE Transactions on Magnetics*, vol. 33, no. 2, pp. 1682-1685, March 1997.
3. T. E. McDermott, I. Drezga, R. P. Broadwater, "A Heuristic Nonlinear Constructive Method for Distribution System Reconfiguration," *IEEE Transactions on Power Systems*, vol. 14, no. 2, pp. 478-483, May 1999. (Ph.D. Thesis Research)
4. R. C. Dugan, T. E. McDermott, "Distributed Generation", *IEEE Industry Applications Magazine*, vol. 8, no. 2, pp. 19-25, March/April 2002. (Prize Article for 2002)
5. T. E. McDermott, "Line Arrester Energy Discharge Duties", *2006 IEEE/PES T&D Conference and Exposition Proceedings*, 21-26 May 2006, Dallas.
6. T. E. McDermott, "Designing and Maintaining a Pollution-Resilient Electric Power System", *2008 IEEE/PES T&D Conference and Exposition Proceedings*, 20-23 April 2008, Chicago.
7. M. Baran, T. McDermott, "Distribution System State Estimation Using AMI Data", *2009 IEEE Power System Conference and Exposition Proceedings*, 15-18 March 2009, Seattle.
8. T. E. McDermott, "Voltage Control and Voltage Fluctuations in Distributed Resource Interconnection Projects", *IEEE / PES 2010 T&D Conference Proceedings*, April 19-22, 2010, New Orleans, LA.
9. R. C. Dugan, R. Arritt, T. E. McDermott, S. M. Brahma, K. Schneider, "Distribution System Analysis to Support the Smart Grid", *IEEE / PES 2010 General Meeting Proceedings*, July 25-29, 2010, Minneapolis, MN.
10. J. G. Cleary, T. E. McDermott, J. Fitch, D. J. Colombo, J. Ndubah, "Case Studies: Interconnection of Wind Turbines on Distribution Circuits", *IEEE Conference on Innovative*

- Technologies for an Efficient and Reliable Electricity Supply, September 27-29, 2010, Waltham, MA, 5 pp.
11. T. E. McDermott, T. A. Short, F. G. Velez, J. S. McDaniel, "Open Source Lightning Protection and Electromagnetic Transients Software", IEEE / PES 2013 General Meeting Proceedings, July 21-25, 2013, Vancouver, BC, 5 pp.
  12. J. Schoene, T. E. McDermott, R. Walling, C. Pallem, "Evaluating the Response of Surge Arresters to Temporary Overvoltages", Insulator News and Market Report (INMR) World Congress, September 11, 2013, Vancouver, BC, 11 pp.
  13. L. Wieserman, T. E. McDermott, "Fault current and overvoltage calculations for inverter-based generation using symmetrical components", IEEE Energy Conversion Conference & Exposition, September 14-18, 2014, Pittsburgh, PA, 6 pp.
  14. A. P. Reiman, T. E. McDermott, G. F. Reed, B. Enayati, "Guidelines for High Penetration of Single-Phase PV on Power Distribution Systems", IEEE PES General Meeting, July 26-30, 2015, Denver, CO, 5 pp.
  15. S. R. Abate, T. E. McDermott, M. Rylander, J. Smith, "Smart Inverter Settings for Improving Distribution Feeder Performance", IEEE PES General Meeting, July 26-30, 2015, Denver, CO, 5 pp.
  16. T. E. McDermott, "Surge Arresters" in *CRC Electric Power Engineering Handbook: Power Systems*, 2<sup>nd</sup> ed., 2007, 3<sup>rd</sup> ed., 2012.
  17. T. E. McDermott, "Transient Recovery Voltage" in *CRC Electric Power Engineering Handbook: Power Systems*, 3<sup>rd</sup> ed., 2012.