

Matthew K. Donnelly, Ph.D., P.E.

Position: Professor of Electrical Engineering

Education: Ph.D., Electrical Engineering/Montana State University (1991)
M.B.A., Business Administration/University of Washington (2004)
M.S., Electrical Engineering/Montana State University (1988)
B.S., Agricultural/University of Arizona (1981)

Summary: Dr. Donnelly is an experienced electrical engineer with in-depth technical knowledge in the electric power arena. He has served in key positions in transmission, energy R&D, renewable energy, process and bulk power control, and emerging forms of generation and storage. He is a Senior Member of the IEEE and a registered professional engineer.

Experience:

8/09 – present Montana Tech, Butte, MT

Professor — Professor of Electrical Engineering in the power engineering program at Montana Tech.

7/08 – 8/09 Quanta Technology, Raleigh, NC

Senior Director, Transmission R&D — Matt was responsible for developing Quanta's R&D portfolio and was actively engaged in the company's transmission group. In this capacity, he worked within a team to provide expertise, guidance, support, and training on best practices and technologies to help government, utility and industrial customers achieve optimal performance, better manage risks, and achieve reliability, financial, and regulatory goals.

1/06 – 1/08 Alpha Technologies, Bellingham, WA

Vice President — Matt had P&L and management responsibility for all aspects of the company's alternative energy business. Alpha Technologies is a world leading developer of broadband, data communication, AC UPS, commercial, and industrial powering systems. Together with a broad range of products, Alpha Technologies supports a global customer base with comprehensive installation and maintenance services.

4/02 – 1/06 Pacific Northwest National Lab, Richland, WA

9/92 – 6/98

Staff Research Engineer — Here, Matt performed engineering research involving energy delivery and utilization, and managed projects and budgets for the US Department of Energy's R&D portfolio. He was co-convenor and manager of DOE "Eastern Interconnection Phasor Project" (now the North American Synchrophasor Initiative, www.naspi.org) with participation from over 280 interested parties representing more than 85 utilities, universities and government agencies and manager of the Northwest Center for Electric Power Technologies, a northwest regional R&D coordinating organization. PNNL is a multi-program government laboratory under the auspices of the US Department of Energy.

6/00 – 12/01 Sustainable Energy Technologies, Calgary, AB
Sr. VP and Chief Technology Officer — Responsible for oversight of all engineering and product development operations in this electronics company. Involved in finance and investor relations functions. Launched rigorous product development, safety, and QA processes. Direct report to Board of Directors in capacity as Chief Technical Officer. SET trades on the TSX Venture Exchange under the symbol “STG”.

1981, 1999 & 2008 Consultant and Electrical Contractor
Small Business Owner — At various times throughout his career, Matt has also worked as an independent consultant and as an electrical contractor in utility and industrial settings. Companies have included T & D Consulting Engineers, Control Technologies Corp., Shannon-Donnelly Electric, and Infield Electric.

Professional & Industry

Past and Present Affiliations and Honors:

Institute of Electrical and Electronics Engineers (IEEE)

- Senior Member
- Member, Power Engineering Society
- Member, IEEE-USA Energy Policy Committee
- Past Section president

Professional Engineer (P.E.) in Montana and Washington

Visiting Scholar, Montana State University, 1992

Phi Kappa Phi and Alpha Zeta Honor Societies

Research and Mentoring:

In the past three years at Montana Tech Dr. Donnelly has been PI or co-PI on the following funded research:

“Time Sequence Power Flow,” Bonneville Power Administration

“Modal Analysis Software,” Peak Reliability

“Synchronphasor Applications for Wind Energy,” US Dept of Energy

“Load Modeling for Autonomous Response,” Pacific Northwest National Lab

Graduate Advisor for: Paul Pertile, Shea Mattix, Steve Moodry, Matt Stajcar

Graduate Committee Member for: Echo Brown, Chelsea Carter, Greg Smelich, Ryan Myers, Patrick Bald, Ruichio Xie, James Colwell, Isaac West

Service:

Chair, Montana Tech Scholarship Committee.

Member, Montana Tech Research Advisory Committee.

Chair, Board of Directors of Midwest Assistance Program—A nonprofit with \$5M/year in revenues, serving a nine-state region, dedicated to helping rural communities with water, wastewater and solid waste infrastructure issues.

Volunteer, Gallatin Gateway County Water & Sewer District (GGCWSD)—The GGCWSD is an agency of local government dedicated to bringing water and sewer infrastructure to

the community of Gallatin Gateway. In my role with GGCWSD I am responsible for bond elections and all other aspects of financing this governmental agency.

Patents:

“Electrical power system sensor devices, electrical power system monitoring methods, and electrical power system monitoring systems,” U.S. Patent #8,560,256, U.S. Patent Office, October 15, 2013.

“Uninterruptible power supplies, solar power kits for uninterruptible power supplies and related methods,” U.S. Patent #8,227,937, U.S. Patent Office, July 24, 2012.

“Electrical Power Distribution Control Methods, Electrical Energy Demand Monitoring Methods, and Power Management Devices,” U.S. Patent #8,073,573 U.S. Patent Office, December 6, 2011.

“Electrical Appliance Energy Consumption Control Methods and Electrical Energy Consumption Systems,” U.S. Patent #7,420,293, U.S. Patent Office, September 2, 2008.

“Electrical Power Distribution Control Methods, Electrical Energy Demand Monitoring Methods, and Power Management Devices,” U.S. Patent #7,149,605, U.S. Patent Office, December 12, 2006.

“Electrical Appliance Energy Consumption Control Methods and Electrical Energy Consumption Systems,” U.S. Patent #7,010,363, U.S. Patent Office, March 7, 2006.

“Step Wave Power Converter,” U.S. Patents #6,979,916, U.S. Patent Office, December 27, 2005.

“Step Wave Power Converter,” U.S. Patents #6,608,404, U.S. Patent Office, August 19, 2003.

“Step Wave Power Converter,” U.S. Patents #6,198,178, U.S. Patent Office, March 6, 2001.

“Multiple DC, Single AC Converter With Switched DC Transformer,” U.S. Patent #5,631,820, U.S. Patent Office, May 20, 1997.

Publications (Montana Tech grad students are indicated in bold-face font):

Dmitry Kosterev, Jim Burns, Nick Lietschuh, John Anasis, Ashley Donahoo, Dan Trudnowski, Matt Donnelly, and John Pierre, “Implementation and Operating Experience with Oscillation Detection Application at Bonneville Power Administration,” Proceedings of the CIGRE National Committee Grid of the Future Symposium, October 2016.

Matt Stajcar, Matt Donnelly, Dan Trudowski, John Pierre, “Mixed-Mode Simulation Framework for Power System Dynamics,” Proceedings of the North American Power Symposium 2016, September 2016.

Tianzhixi Yin, Shaun Wulff, John Pierre, Dongliang Duan, Dan Trudnowski and Matt Donnelly, “Initial Investigation of Data Mining Applications in Event Classification and Location Identification Using Simulated Data from MinniWECC,” Proceedings of the North American Power Symposium 2016, September 2016.

Ricky Concepcion, Ryan Elliott, Matt Donnelly, and Juan Sanchez-Gasca, "On Extended-Term Dynamic Simulations with High Penetrations of Photovoltaic Generation," Proceedings of the IEEE Power & Energy Society General Meeting, July 2016.

Matt Donnelly, Dan Trudnowski, **James Colwell**, John Pierre and Luke Dosiek, "RMS-Energy Filter Design for Real-Time Oscillation Detection," Proceedings of the IEEE Power & Energy Society General Meeting, July 2015.

R. Byrne, D. Trudnowski, J. Neely, R. Elliot, D. Schoenwald, and M. Donnelly, "Optimal Locations for Energy Storage Damping Systems in the Western North American Interconnect," Proceedings of the IEEE Power & Energy Society General Meeting, July 2014.

Eric Heredia, Dmitry Kosterev and Matt Donnelly, "Wind Hub Reactive Resource Coordination and Voltage Control Study by Sequence Power Flow," Proceedings of the IEEE Power & Energy Society General Meeting, July 2013.

J. Neely, R. Byrne, R. Elliott, C. Silva-Monroy, D. Schoenwald, D. Trudnowski, and M. Donnelly, "Damping of Inter-area Oscillations Using Energy Storage," Proceedings of the IEEE Power & Energy Society General Meeting, July 2013.

M. Glavic, M. Donnelly et. al., "Real-Time Voltage Control Under Stressed Conditions," IEEE Power & Energy Magazine, Vol. 10, No. 4, July/August 2012.

J. Pierre, D. Trudnowski, M. Donnelly et. al., "Overview of System Identification for Power Systems from Measured Responses," accepted for the Sysid 2012, 16th IFAC Symposium on System Identification, Brussels, July 11-13, 2012.

S. Mattix, M. Donnelly, D. Trudnowski and J. Dagle, "Autonomous Demand Response for Frequency Regulation on a Large-Scale Model of an Interconnected Grid," paper 2012GM0786 accepted for the Proceedings of the 2012 IEEE Power Engineering Society General Meeting, San Diego, July 2012.

M. Donnelly, **D. Harvey**, **R. Munson** and D. Trudnowski, "Frequency and Stability Control using Decentralized Intelligent Loads: Benefits and Pitfalls," Proceedings of the 2010 IEEE Power Engineering Society General Meeting, Minneapolis, July 2010.

D. Trudnowski, M. Donnelly and E. Lightner, "Power System Frequency and Stability Control using Decentralized Intelligent Loads," Proceedings of the 2005/2006 IEEE T&D Conference and Expo, Dallas, May 2006.

D. Chassin, Z. Huang, M. Donnelly, et.al., "Estimation of WECC System Inertia Using Observed Frequency Transients," IEEE Transactions on Power Systems, vol. 20, no. 2, pp. 1190-1192, May 2005.

M. Donnelly, M. Ingram and J.R. Carroll, "Eastern Interconnection Phasor Project", Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS), pp. 245, Jan. 2006.

M. Donnelly et.al., "Progress Toward a High-Speed Data Network for the Eastern Interconnection – The Eastern Interconnection Phasor Project," Proceedings of the Georgia Tech Fault and Disturbance Analysis Conference, Atlanta, April 26-27, 2004.

J. Hauer, M. Donnelly et.al., "Direct Analysis of Wide Area Dynamics," Materials for CRC Electric Power Engineering Handbook, Section 11.8: pp 11-82 through 11-120, CRC Press, 2001.

J. Pierre, D. Trudnowski and M. Donnelly, "Initial Results in Electromechanical Mode Identification from Ambient Data," IEEE Transactions on Power Systems, vol. 12, no. 3, pp. 1245-1251, Aug. 1997.

D. Trudnowski, M. Donnelly and J. Hauer, "Estimating Damping Effectiveness of BPA's Thyristor Controlled Series Capacitor by Applying Time and Frequency Domain Methods to Measured Response," IEEE Transactions on Power Systems, vol. 11, no. 2, pp. 761-766, May 1996.

M. Donnelly, J. Dagle, D. Trudnowski and G. Rogers, "Impacts of the Distributed Utility on Transmission System Stability," IEEE Transactions on Power Systems, vol. 11, no. 2, pp. 741-746, May 1996.

D. Erickson, M. Donnelly et. al., "Value Engineering A Dynamic Information Technology Package for Power System Applications," Precise Measurements in Power Systems Conference, Arlington, VA, Nov. 8-10, 1995.

D. Erickson and M. Donnelly, "Multifunction Data Acquisition and Analysis and Optical Sensors -- A BPA Update," Proceedings of the T & D World Expo '95, session 10-03, New Orleans, LA, March 1995.

M. Donnelly and R. Johnson, "Power System Applications for PASC Converter Systems," IEEE Transactions on Power Delivery, vol. 10, no. 1, pp. 439-444, January 1995.

J. Hauer, M. Donnelly et. al., "Test Results and Initial Operating Experience for the 500 kV Thyristor Controlled Series Capacitor Unit at Slatt Substation: Part II -- Modulation, SSR, and Performance Monitoring," Proceedings of the Flexible AC Transmission (FACTS 3) Conference, Baltimore, MD, October 1994.

D. Trudnowski, M. Donnelly and J. Hauer, "A Procedure for Oscillatory Parameter Identification," IEEE Transactions on Power Systems, vol. 9, no. 4, pp. 2049-2055, November 1994.

R. Johnson, M. Donnelly and K. Marcotte, "A Pulse Amplitude Synthesis and Control (PASC) Inversion System for Single Source Diagonally Connected MHD Generators," IEEE Transactions on Energy Conversion, vol. 8, no. 4, pp. 653-659, December 1993.

D. Trudnowski, M. Donnelly and J. Hauer, "Advances in the Identification of Transfer Function Models using Prony Analysis," Proceedings of the 1993 American Control Conference, San Francisco, CA, June 24, 1993.

R. Johnson, M. Donnelly et. al., "Pulse-Amplitude Synthesis and Control (PASC) Power Converter for Power System Connection of a Diagonally Connected MHD Generator," 1993 Symposium on Engineering Aspects of Magnetohydrodynamics (SEAM), Whitefish, MT, July 6-9, 1993.

R. Johnson, M. Donnelly and K. Marcotte, "A Pulse Amplitude Synthesis and Control (PASC) Consolidation/Inversion System for Faraday Connected MHD Generators," IEEE Transactions on Energy Conversion, vol. 8, no. 3, pp. 448-454, September 1993.

M. Donnelly et. al., "Control of a Dynamic Brake to Reduce Turbine Generator Shaft Transient Torques," IEEE Transactions on Power Systems, vol. 8, no. 1, pp. 67-73, February 1993.

M. Nehrir, M. Donnelly and R. Adapa, "Thyristor Based Damping of Turbine Generator Shaft Torsional Oscillations Resulting from Power System Disturbances and Subsynchronous Resonance, A Review," Proceedings of the North American Power Conference, Auburn, AL, Oct. 15 16, 1990.

R. Johnson, M. Donnelly et. al., "A Feasibility Demonstration Experimental Facility of a PASC Consolidation/Inversion System for Faraday Connected MHD Generators," Proceedings of the 28th Symposium on Engineering Aspects of Magnetohydrodynamics (SEAM), Chicago, IL, June 28 30, 1990.