

## **Dr. Ray D. Zimmerman**

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### **Education**

- Ph D, Cornell University, Ithaca, NY, USA, 1995.  
Major: Electrical & Computer Engineering  
Supporting Areas of Emphasis: Power Systems  
Dissertation Title: Comprehensive Distribution Power Flow: Modeling, Formulation, Solution Algorithms and Analysis
- MS, Cornell University, Ithaca, NY, USA, 1992.  
Major: Electrical & Computer Engineering  
Supporting Areas of Emphasis: Power Systems  
Dissertation Title: Network Reconfiguration for Loss Reduction in Three-Phase Power Distribution Systems
- BS, Magna cum laude, Drexel University, Philadelphia, PA, USA, 1989.  
Major: Electrical Engineering  
Supporting Areas of Emphasis: Computer Engineering, Signal Processing

## **RESEARCH**

### **Presentations Given**

- Zimmerman, R. D., "What's New in MATPOWER 8?", MATPOWER Webinar, Feb 22, 2023, Available online: <https://matpower.org/2023/02/13/webinar-whats-new-in-matpower-8/>.
- Zimmerman, R. D., "New Developments in MATPOWER", Open-Source Bulk Power System Operations Models Panel, 2020 IEEE PES General Meeting, Aug 4, 2020.
- Zimmerman, R. D., "Introduction to MATPOWER," Student/Young Professional Webinar for IEEE PES Day 2019, April 20, 2019.
- Zimmerman, R. D., "MATPOWER: An Optimization and Simulation Tool for Power Grid Research," CompSust-2016, 4th International Conference on Computation Sustainability, July 6-8, 2016, Cornell University.
- Zimmerman, R. D., Murillo-Sánchez, C., Muñoz-Álvarez, D., Lamadrid, A., "From Deterministic Economic Dispatch to Secure Stochastic Unit Commitment/Optimal Power Flow with MOST, the new MATPOWER Optimal Scheduling Tool," FERC Technical Conference on Increasing Market and Planning Efficiency through Improved Software, June 27-29, 2016, Washington, DC.

- Zimmerman, R. D., Murillo-Sánchez, C., Shin, H., Mount, T., Thomas, R. J., "MATPOWER Optimal Scheduling Tool (MOST) and Future Directions for MATPOWER," CERTS Review, June 9-10, 2016, Washington, DC.
- Zimmerman, R. D., "MATPOWER: Evolution of an Open Source Optimal Power Scheduling Tool," SCAN Seminar, May 2, 2016, Cornell University.
- Zimmerman, R. D., Murillo Sánchez, C. E., Lamadrid, A. J., Muñoz Álvarez, D., Mount, T. D., Thomas, R. J., 2015 CERTS-DOE Reliability and Markets Review, "Developing and Testing Improved Tools for Power System Planning and Operation under Uncertainty", Invited, Cornell University, Ithaca, NY. (August 5, 2015).
- Zimmerman, R. D., Lamadrid, A. J., Muñoz-Álvarez, D., Murillo-Sánchez, C. E., Thomas, R. J., FERC Technical Conference on Increasing Market and Planning Efficiency through Improved Software, "Scheduling of Commitment, Energy and Reserves Under Uncertainty in a Two-Settlement Framework", Federal Energy Regulatory Commission, Washington, DC USA. (June 23, 2015).
- Lamadrid, A. J., Shawhan, D., Murillo-Sanchez, C., Zimmerman, R. D., Tylavsky, D., "Cost-Benefit Analysis of Five Power System Changes Using Hybrid Stochastic-Robust Optimized Dispatch of Storage, Generation, and Loads", FERC Workshop/Trans-Atlantic Infraday. (November 6, 2014).
- Zimmerman, R. D., Murillo-Sánchez, C., Muñoz-Álvarez, D., Thomas, R. J., 2014 CERTS-DOE Reliability and Markets Review, "MATPOWER and Tools for Planning and Operation of Power Systems under Uncertainty", Cornell University, Ithaca, NY. (August 5, 2014).
- Zimmerman, R. D., Murillo-Sánchez, C., Anderson, C. L., Thomas, R. J., 2013 CERTS-DOE Reliability and Markets Review, "Tools for Secure Planning and Operations of Systems with Stochastic Sources, Energy Storage and Active Demand", Cornell University, Ithaca, NY USA. (August 2013).
- Zimmerman, R. D., Murillo-Sánchez, C. E., Anderson, C. L., Thomas, R. J., FERC Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software, "Secure Planning and Operations of Systems with Stochastic Sources, Energy Storage and Active Demand", Federal Energy Regulatory Commission, Washington, DC USA. (June 24, 2013).
- Lamadrid, A. J., Mount, T. D., Zimmerman, R. D., Fourth ACM International Conference on Future Energy Systems, IEEE Workshop on Modeling and Simulation of Cyber-Physical Energy Systems, "On the Capacity Value of Renewable Energy Sources in the presence of Energy Storage and Ramping Constraints", Accepted, Association for Computing Machinery, Berkeley, CA. (May 2013).
- Zimmerman, R. D., Schuler, R., Schulze, W. D., Taber, J., Zhang, M., Yan, J., Marquet, C., Smith, K., Shawhan, D., A Kindle, D. Tylavsky, Shi, D., FERC Workshop on the Next Generation of Transmission Planning Models, "Mapping Energy Futures: The SuperOPF Planning Tool", Washington, DC USA. (March 20, 2013).
- Zimmerman, R. D., Murillo-Sánchez, C., Anderson, C. L., Thomas, R. J., Gupta, A., Muñoz-Álvarez, D., 2012 CERTS-DOE Reliability and Markets Review, "Tools for Multi-period Stochastic Optimization with Evolving Information.", Cornell University, Ithaca, NY. (August 2012).
- Zimmerman, R. D., Murillo-Sánchez, C., Anderson, C. L., Thomas, R. J., Gupta, A., Muñoz-Álvarez, D., 2012 CERTS-DOE Reliability and Markets Review, "Tools for Multi-period

- Stochastic Optimization with Evolving Information.", Cornell University, Ithaca, NY. (August 2012).
- Zimmerman, R. D. (Presenter & Author), Murillo-Sánchez, C. (Presenter & Author), Anderson, C. L. (Presenter & Author), Thomas, R. J. (Presenter & Author), 2011 CERTS-DOE Reliability and Markets Review, "Multi-period Optimization Under Uncertainty", Cornell University, Ithaca, NY. (August 2, 2011).
- Zimmerman, R. D., CERTS OE Transmission Reliability Peer Review, "Development and Testing of New Tools", US Dept of Energy, Washington, DC. (October 20, 2010).
- Zimmerman, R. D. (Presenter & Author), Murillo-Sánchez, C. E. (Presenter & Author), Chiang, H.-D., Anderson, C. L., Thomas, R. J., Zapata, C., CERTS Annual Review, "Development and Testing of New Tools", Cornell University, Ithaca, NY. (August 12, 2010).
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D., CRRRI 23rd Annual Western Conference, "Integrating Renewables into Electricity Markets: The Need for Smart Regulation", Monterey CA. (June 2010).
- Zimmerman, R. D., FERC Technical Conference on Increasing Market and Planning Efficiency Through Improved Software and Hardware - Enhanced Optimal Power Flow Models, "A SuperOPF Framework", Federal Energy Regulatory Commission, Washington, DC. (June 2010).
- Zimmerman, R. D., Presentation to NYISO Executives, "A SuperOPF Framework", Cornell University, Ithaca, NY. (April 8, 2010).
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D., IEEE HICCS-43, "The Hidden System Costs of Wind Generation in a Deregulated Electricity Market", Invited, Koloa, Kauai, Hawaii. (January 2010).
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D. (Author Only), PSERC Summer Workshop, "The Hidden System Costs of Wind Generation in Deregulated Electricity Markets", Breckenridge, CO. (August 10, 2009).
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D., CERTS Annual Review, "Integrating Wind Generation and the Effects on System Adequacy and Financial Adequacy", Cornell University. (August 6, 2009).
- Zimmerman, R. D. (Presenter & Author), Murillo-Sánchez, C. E. (Presenter & Author), Thomas, R. J., CERTS Annual Review, "The SuperOPF Framework", Cornell University, Ithaca, NY. (August 6, 2009).
- Zimmerman, R. D. (Presenter & Author), Murillo-Sánchez, C. E. (Author Only), Thomas, R. J. (Author Only), 2009 IEEE Power and Energy Society General Meeting, "MATPOWER's Extensible Optimal Power Flow Architecture", IEEE Power and Energy Society, Calgary, AB, Canada. (July 30, 2009).
- Zimmerman, R. D. (Presenter Only), Murillo-Sánchez, C. E., Thomas, R. J., Presentation to NYISO Executives and Staff, "A SuperOPF Framework", Cornell University, Ithaca, NY. (July 14, 2009).
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D. (Author Only), Fifth Annual Carnegie-Mellon Industry Electric Conference on Smart Grids, "AC or DC Transmission for a Remote Wind Farm?", Pittsburgh PA, (March 2009).

- Zimmerman, R. D. (Presenter & Author), PSERC Public Tele-Seminar, "A SuperOPF Framework for Improved Allocation and Valuation of System Resources through Co-optimization", Invited, PSERC, Ithaca, NY. (November 4, 2008).
- Zimmerman, R. D., CERTS Peer Review, "SuperOPF Framework", Washington, DC. (October 22, 2008).
- Zimmerman, R. D., CERTS Annual Review, "The SuperOPF Framework and Case Studies", Cornell University, Ithaca, NY. (September 18, 2008).
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D., Fourth Annual CMU Conference on the Electricity Industry, "The Economics of Reliability and the Importance of Events that didn't Happen", Carnegie Mellon University, Pittsburgh, PA. (March 10, 2008).
- Zimmerman, R. D., Presentation to NYISO Executives and Staff, "The SuperOPF", Cornell University, Ithaca, NY. (February 14, 2008).

## INTELLECTUAL CONTRIBUTIONS

### Published Intellectual Contributions – Journal Articles

#### Peer-Reviewed

- Kardoš, J., Kourounis, D., Schenk, O., Zimmerman, R. D., "BELTISTOS: A robust interior point method for large-scale optimal power flow problems," in *Electric Power Systems Research*, Volume 212, 2022, 108613, ISSN 0378-7796.
- Lamadrid, A. J., Muñoz-Álvarez, E., Murillo-Sánchez, C. E., Zimmerman, R. D., Shin, H., Thomas, R. J., "Using the MATPOWER Optimal Scheduling Tool to Test Power System Operation Methodologies Under Uncertainty," in *IEEE Transactions on Sustainable Energy*, vol. 10, no. 3, pp. 1280-1289, July 2019.
- Lamadrid, A. J., Shawhan, D. L., Murillo-Sanchez, C., Zimmerman, R. D., Zhu, Y., Tylavsky, D. J., Kindle, A. G., Dar, Z. (2015). Stochastically Optimized, Carbon-Reducing Dispatch of Storage, Generation, and Controllable Loads. *IEEE Transactions on Power Systems*, 30 (2), 1064-1075.
- Shawhan, D. L., Taber, J. T., Shi, D., Zimmerman, R. D., Yan, J., Marquet, C. M., Qi, Y., Mao, B., Schuler, R. E., Schulze, W. D., Tylavsky, D. J. (2014). Does a Detailed Model of the Electricity Grid Matter? Estimating the Impacts of the Regional Greenhouse Gas Initiative. *Resource and Energy Economics*, 36 (1), 191-207.
- Murillo-Sanchez, C., Zimmerman, R. D., Anderson, C. L., Thomas, R. J. (2013). A Stochastic, Contingency-Based Security-Constrained Optimal Power Flow for the Procurement of Energy and Distributed Reserve. *Decision Support Systems*, 56, 0.
- Murillo-Sánchez, C. E., Zimmerman, R. D., Anderson, C. L., Thomas, R. J. (2013). Secure Planning and Operations of Systems with Stochastic Sources, Energy Storage and Active Demand. *IEEE Transactions on Smart Grid*, 4 (4), 2220-2229.

- Mount, T. D., Maneevitjit, S., Lamadrid, A., Zimmerman, R. D., Thomas, R. J. (2012). The Hidden System Costs of Wind Generation in a Deregulated Electricity Market. *The Quarterly Journal of the IAEE's Energy Economics Education Foundation*, 33 (1), 161-186.
- Zimmerman, R. D., Murillo-Sánchez, C. E., Thomas, R. J. (2011). MATPOWER: Steady-State Operations, Planning and Analysis Tools for Power Systems Research and Education. *IEEE Transactions on Power Systems*, 26 (1), 32-29.
- Thomas, R. J., Mount, T. D., Schuler, R. E., Schulze, W. D., Zimmerman, R. D., Alvarado, F., Lesieutre, B. C., Overholt, P. N., Eto, J. H. (2008). Efficient and Reliable Reactive Power Supply and Consumption: Insights from an Integrated Program of Engineering and Economic Research. *The Energy Journal*, 21 (1), 70-81.
- Wang, H., Murillo-Sánchez, C. E., Zimmerman, R. D., Thomas, R. J. (2007). On Computational Issues of Market-Based Optimal Power Flow. *IEEE Transactions on Power Systems*, 22 (3), 1185-1193.
- Chapman, D., Vossler, C. A., Mount, T. D., Barboni, V., Thomas, R. J., Zimmerman, R. D. (2004). Market efficiency, competition, and communication in electric power markets: experimental results. *Ecological Economics*, 48 (3), 317-327.
- Gan, D., Thomas, R. J., Zimmerman, R. D. (2000). Stability-Constrained Optimal Power Flow. *IEEE Transactions on Power Systems*, 15 (2), 535-540.
- Ethier, R., Zimmerman, R. D., Mount, T. D., Schulze, W. D., Thomas, R. J. (1999). A Uniform Price Auction with Locational Price Adjustments for Competitive Electricity Markets. *International Journal of Electrical Power and Energy Systems*, 21 (2), 103-110.
- Zimmerman, R. D., Thomas, R. J., Gan, D., Murillo-Sánchez, C. (1999). A Web-Based Platform for Experimental Investigation of Electric Power Auctions. *Decision Support Systems*, 24 (3-4), 193-205.
- Zimmerman, R. D., Chiang, H.-D. (1995). Fast Decoupled Power Flow for Unbalanced Radial Distribution Systems. *IEEE Transactions on Power Systems*, 10 (4), 2045-2052.

## Published Intellectual Contributions – Other Publications

### Conference Proceeding

- Burchett, S. Chow, J. H., Kar, K., Zimmerman, R. D., Swider, M., Marwalli, M., Zhang, G., "Investigation of Generator Ramp Rates in High Renewable Penetration Systems using an Academic New York Network Model", 2018 PMAPS Conference, June 24-28, 2018, Boise, ID.
- Mao, B., Shawhan, D., Zimmerman, R. D., Yan, J, Zhu, Y., Schulze, W. D., Schuler, R., Tylavsky, D., "The Engineering, Economic and Environmental Electricity Simulation Tool (E4ST): Description and an Illustration of its Capability and Use as a Planning/Policy Analysis Tool." *Proceedings of the 49th Hawaii International Conference on System Sciences (HICSS)*, Koloa, HI, 2016, pp. 2317-2325.  
**won best paper award for Electric Energy Systems**
- Shawhan, D., Taber, J., Zimmerman, R. D., Yan, J., Marquet, C., Schulze, W. D., Schuler, R., Thomas, R., Tylavsky, D., Shi, D., Li, N., Jewell, W., Hardy, T., Hu, Z. (2015). "A Detailed Power System Planning Model: Estimating the Long-Run Impact of Carbon-Reducing

- Policies." *Proceedings of the 48th Annual Hawaii International Conference on System Sciences*, Computer Society Press.
- Lamadrid, A. J., Shawhan, D. L., Murillo-Sanchez, C. E., Zimmerman, R. D., Zhu, Y., Tylavsky, D. J., Kindle, A., Dar, Z. (2015). *Economic cost-benefit analysis for power system operations with environmental considerations* (pp. 1-6). PowerTech, 2015 IEEE Eindhoven.
- Shawhan, Daniel, John Taber, Ray Zimmerman, Biao Mao, Charles Marquet, Jubo Yan, Nan Li, William Schulze, and Daniel Tylavsky. "Internalizing the Environmental Externalities of Power Generation in the USA: Exploration of the Effects Using an Air Pollution Model and a New National Grid Model." In *Energy & the Economy*, 37th IAEE International Conference, June 15-18, 2014. International Association for Energy Economics, 2014.
- Lamadrid, A. J., Murillo, C., Mount, T. D., Anderson, L., Thomas, B., Zimmerman, R. D. (2014). A Stochastic Program with Recourse for Electricity Markets with a High Penetration of Renewables. *Proceedings of the 18th Power System Computation Conference (PSCC)*, 2014.
- Lamadrid, A. J., Mount, T. D., Zimmerman, R. D. (2013). On the Capacity value of Renewable Energy Sources in the presence of Energy Storage and Ramping Constraints. *IEEE Workshop on Modeling and Simulation of Cyber-Physical Energy Systems 2013*. Berkeley, CA, May 2013.
- Lamadrid, A. J., Mount, T. D., Zimmerman, R. D. (2013). Optimal energy storage usage for electricity market operations. *Proceedings of IEEE PowerTech 2013, Grenoble, France, June, 2013*.
- Lamadrid, A., Mount, T. D., Zimmerman, R. D., Munoz-Alvarez, D., Murillo-Sanchez, C. E. (2013). Optimization of stochastic resources in the electricity system. *Proceedings of the IAEE (Ed.), Allied Social Science Associations*. San Diego, CA. January 4th 2013.
- Taber, J., Shawhan, D., Zimmerman, R. D., Schulze, W., Schuler, R., Marquet, C., Zhang, K., Whitley, S. (2013). Mapping Energy Futures Using the SuperOPF Planning Tool: An Integrated Engineering, Economic and Environmental Model. *Proceedings of the 46th Annual Hawaii International Conference on System Sciences* (pp. 2020-2029). Grand Wailea, Maui, Hawaii: Computer Society Press.
- Alberto, L., Mount, T. D., Zimmerman, R. D., Anderson, C. L. (2012). Alternate Mechanisms for Integrating Renewable Sources of Energy into Electricity Markets. *Proceedings of the IEEE Power Engineering Society General Meeting*.
- Alberto, L., Mount, T. D., Zimmerman, R. D., Anderson, C. L. (2012). Alternate Mechanisms for Integrating Renewable Sources of Energy into Electricity Markets. *Proceedings of the IEEE Power Engineering Society General Meeting*.
- Shi, D., Shawhan, D., Li, N., Tylavsky, D., Taber, J., Zimmerman, R. D., Schulze, W. (2012). *Optimal Generation Investment Planning: Pt. 1: Network Equivalent* (pp. 6). Champaign Illinois: North American Power Symposium 2012.
- Li, N., Shi, D., Shawhan, D., Tylavsky, D., Taber, J., Zimmerman, R. D., Schulze, W. (2012). *Optimal Generation Investment Planning: Pt. 2: Application to the ERCOT System* (pp. 6). Champaign Illinois: North American Power Symposium 2012.
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Zimmerman, R. D., Thomas, R. J. (2011). Integrating Wind Power: Can Controllable Load Substitute for Transmission Upgrades?. *Proceedings of the 44th Hawaii International Conference on System Sciences* (pp. 9). Koloa, Kauai, Hawaii..

- Shawhan, D. L., Mitarotonda, D. C., Zimmerman, R. D. (2010). An Advanced Method of Predicting Electric Energy Policy Outcomes, with an Application to Carbon Dioxide Emission Reduction Policy. *Proceedings of the APPAM Fall Research Conference, November 5-7, 2009, Washington, DC.*
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D. (2010). The Hidden System Costs of Wind Generation in a Deregulated Electricity Market. *Proceedings of the 43th Hawaii International Conference on System Sciences* (pp. 10). Koloa, Kauai, Hawaii.
- Shawhan, D. L., Mitarotonda, D. C., Zimmerman, R. D. (2009). *An Economic and Engineering Analysis of Incentive-Based Carbon Dioxide Emission Reduction Policies in the Power Sector*. Washington, DC: 2009 AERE Workshop.
- Zimmerman, R. D., Murillo-Sánchez, C. E., Thomas, R. J. (2009). *MATPOWER's Extensible Optimal Power Flow Architecture* (pp. 7). Calgary, AB, Canada: 2009 IEEE Power and Energy Society General Meeting.
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zhang, M., Zimmerman, R. D. (2009). *A Symbiotic Role for Plug-in Hybrid Electric Vehicles in an Electric Delivery System*. Monterey, CA: Proceedings of the 22nd Western Conference of the Rutgers CRRI.
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zhang, M., Zimmerman, R. D. (2009). *The High Cost of Peak System Load in a Windy World*. Skytop, PA: Proceedings of the 28th Eastern Conference of the Rutgers CRRI.
- Mount, T. D., Cardell, J., Anderson, C. L., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D. (2009). *Evaluating the Net Benefits of Investing in New Wind and Transmission Capacity on a Network*. Waikoloa, Hawaii: Proceedings of the IEEE HICCS-42.
- Thomas, R. J., Murillo-Sánchez, C. E., Zimmerman, R. D. (2008). *An Advanced Security Constrained OPF That Produces Correct Market-Based Pricing* (pp. 6). Pittsburgh, PA, US: Power and Energy Society General Meeting - Conversion and Delivery of Electrical Energy in the 21st Century, 2008 IEEE.
- Mount, T. D., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D. (2008). *The Economic Value of Improving the Reliability of Supply on a Bulk Power Transmission Network*. Monterey, CA, US: Advanced Workshop in Regulation & Competition, 21st Annual Western Conference.
- Mount, T. D., Cardell, J., Anderson, C. L., Lamadrid, A., Maneevitjit, S., Thomas, R. J., Zimmerman, R. D. (2008). *The Economic Implications of Adding Wind Capacity to a Bulk Power Transmission Network*. Skytop, PA, US: Advanced Workshop in Regulation & Competition, 27th Annual Eastern Conference.
- Adilov, N., Light, T., Schuler, R. E., Schulze, W. D., Toomey, D., Zimmerman, R. D. (2005). Differences in Capacity Requirements, Line Flows and System Operability under Alternative Deregulated Market Structures: Simulations Derived from Experimental Trials. *IEEE PES General Meeting* (pp. 635-641).
- Adilov, N., Light, T., Schuler, R. E., Schulze, W. D., Toomey, D., Zimmerman, R. D. (2005). Market Structure and the Predictability of Electricity System Line Flows: An Experimental Analysis. *Proceedings of the 38th Hawaii International Conference on System Sciences*.

- Adilov, N., Light, T., Schuler, R. E., Schulze, W. D., Toomey, D., Zimmerman, R. D. (2004). Self-Regulating Electricity Markets?. *Advanced Workshop in Regulation and Competition, Rutgers Center for Research in Regulated Industries, 17th Annual Western Conference.*
- Kian, A., Thomas, R. J., Zimmerman, R. D., Lesieutre, B., Mount, T. D. (2004). Identifying the Potential for Market Power in Electric Power Systems in Real-Time. *Proceedings of the 37th Hawaii International Conference on System Sciences.*
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- Murillo-Sánchez, C., Zimmerman, R. D., Thomas, R. J. (2001). Kirchhoff vs. Competitive Electricity Markets: A Few Examples. *IEEE Power Engineering Society Winter Meeting 2001* (vol. 3, pp. 1256-1261).
- Mount, T. D., Schulze, W. D., Thomas, R. J., Zimmerman, R. D. (2001). Testing the Performance of Uniform Price and Discriminative Auctions. *Rutger's Center for Research in Regulated Industries 14th Annual Western Conference: Advanced Workshop in Regulation and Competition, Competitive Change in Network Industries.*
- Murillo-Sánchez, C., Ede, S., Mount, T. D., Thomas, R. J., Zimmerman, R. D. (2001). An Engineering Approach to Monitoring Market Power in Restructured Markets for Electricity. *Proceedings of 24th IAEE International Conference.*
- Ede, S., Zimmerman, R. D., Mount, T. D., Thomas, R. J., Schulze, W. D. (2000). An Economic Analysis of the Self Commitment of Thermal Units. *Proceedings of the 33rd Hawaii International Conference on System Sciences, Jan 4-7, 2000, Maui, Hawaii* (pp. 1245-1254).
- Ede, S., Mount, T. D., Murillo-Sánchez, C., Thomas, R. J., Zimmerman, R. D. (2000). Experimental Tests of Deregulated Markets for Electric Power: Market Power and Self-Commitment. *Report to the United States Department of Energy.*
- Zimmerman, R. D., Bernard, J., Thomas, R. J., Schulze, W. D. (1999). Energy Auctions and Market Power: An Experimental Examination. *Proceedings of the 32nd Annual Hawaii International Conference on System Sciences, Jan 7-10, 1999, Maui, Hawaii.*
- Bernard, J., Ethier, R., Mount, T. D., Schulze, W. D., Zimmerman, R. D., Gan, D., Murillo-Sánchez, C., Thomas, R. J., Schuler, R. E. (1998). Experimental Results for Single Period Auctions. *Proceedings of the 31st Annual Hawaii International Conference on System Sciences, Jan. 6-9, 1998. Kona, Hawaii.*



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Ethier, R., Zimmerman, R. D., Mount, T. D., Schulze, W. D., Thomas, R. J. (1997). Auction Design for Competitive Electricity Markets. *Proceedings of the 30th Annual Hawaii International Conference on System Sciences, Jan. 7-10, 1997, Maui, Hawaii*.

Sakk, E., Thomas, R. J., Zimmerman, R. D. (1997). Power System Bidding Tournaments for a Deregulated Environment. *Proceedings of the 30th Hawaii International Conference on System Sciences, Jan 7-10, 1997, Maui, Hawaii* (vol. 5, pp. 681-686).

## Research Report

Coffrin, Carleton, et. al., *The Power Grid Library for Benchmarking AC Optimal Power Flow Algorithms*, Report for the IEEE PES PGLib-OPF Task Force, 2019. [Online]. Available: <https://arxiv.org/abs/1908.02788>.

Bistline, J., Shawhan, D., Blanford, G., de la Chesnaye, F., Mao, B., Santen, N., Zimmerman, R., Krupnick A. (2017), *Systems Analysis in Electric Power Sector Modeling: Evaluating Model Complexity for Long-Range Planning*. Technical Report 3002011365.

Mount, T. D., Anderson, C. L., Zimmerman, R. D., Cardell., J. B. (2012). Coupling Wind Generation with Controllable Load and Storage: A Time-Series Application of the SuperOPF: Final Project Report. *PSERC Project M-22, PSERC Publication* (pp. 12-18). Power Systems Engineering Research Center.

Zimmerman, R. D. (2009). *CERTS R&M Project 1A Development and Testing of New Tools Summary of Activities for 2009*. Ithaca, NY, US: CERTS Report.

Schulze, W. D., Thomas, R. J., Mount, T. D., Schuler, R. E., Zimmerman, R. D., Tylavsky, D., Shawhan, D. L., Mitarotonda, D., Tabor, J. (2009). *Facilitating Environmental Initiatives While Maintaining Efficient Markets and Electric System Reliability* (ed., vol. 2009). Tempe, AZ: PSERC.

Murillo-Sánchez, C. E., Zimmerman, R. D., Thomas, R. J. (2009). *Secure Horizon Planning with Intertemporal Constraints*. Ithaca, NY, US: CERTS Report.

Murillo-Sánchez, C. E., Zimmerman, R. D., Thomas, R. J. (2009). *Secure Unit Commitment*. Ithaca, NY, US: CERTS Report.

Lamadrid, A., Maneevitjit, S., Mount, T. D., Murillo-Sánchez, C., Thomas, R. J., Zimmerman, R. D. (2008). *A SuperOPF Framework*. Ithaca, NY: CERTS Report.

Zimmerman, R. D. (2008). *SuperOPF Research Roadmap*. Ithaca, NY: CERTS Report.

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