References

- J. Momoh, Smart Grid: Fundamentals of Design and Analysis. Hoboken, NJ: John Wiley and Sons, 2012.
- [2] S. F. Bush, Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. Hoboken, NJ: Wiley-IEEE, 2014.
- [3] G. M. Masters, *Renewable and Efficient Electric Power Systems*, 2nd ed. Hoboken, NJ: John Wiley and Sons, 2013.
- [4] B. M. Buchholz and Z. Styczynski, Smart Grids–Fundamentals and Technologies in Electricity Networks. Berlin, Germany: Springer, 2014.
- [5] F. P. Sioshansi, Smart Grid: Integrating Renewable, Distributed and Efficient Energy. Waltham, MA: Elsevier, 2012.
- [6] A. Keyhani, *Design of Smart Power Grid Renewable Energy Systems*, 2nd ed. Hoboken, NJ: John Wiley and Sons, 2017.
- [7] K. C. Budka, J. G. Deshpande, and M. Thottan, *Communication Networks for Smart Grids*. London, UK: Springer, 2014.
- [8] H. Farhangi, "The Path of the Smart Grid," *IEEE Power and Energy Society Magazine*, vol. 8, no. 1, pp. 18–28, Jan. 2010.
- [9] A. Ipakchi and F. Albuyeh, "Grid of the Future," *IEEE Power and Energy Society Magazine*, vol. 7, no. 2, pp. 52–62, Mar. 2009.
- [10] S. M. Amin and B. F. Wollenberg, "Toward a Smart Grid: Power Delivery for the 21st Century," *IEEE Power and Energy Society Magazine*, vol. 3, no. 5, pp. 34–41, Sep. 2005.
- [11] H. Farhangi, "A Road Map to Integration: Perspectives on Smart Grid Development," *IEEE Power and Energy Society Magazine*, vol. 12, no. 3, pp. 52–66, May 2014.
- [12] A. R. Bergen and V. Vittal, *Power System Analysis*, 2nd ed. Upper Saddle River, NJ: Prentice Hall, 2000.
- [13] J. D. Glover, T. Overbye, and M. S. Sarma, *Power System Analysis and Design*, 6th ed. Boston, MA: Cengage Learning, 2016.
- [14] J. Momoh, Electric Power Distribution, Automation, Protection, and Control. Boca Raton, FL: CRC Press, 2008.
- [15] A. J. Wood, B. F. Wollenberg, and G. B. Sheblé, *Power Generation, Operation, and Control*, 3rd ed. New York, NY: John Wiley and Sons, 2013.
- [16] U.S. Department of Energy, "What Is the Smart Grid?" www.smartgrid.gov/the_smart_ grid/.
- [17] U.S. Department of Energy, "The Smart Grid: An Introduction," Sep. 2008. www.energy .gov/oe/downloads/smart-grid-introduction-0.
- [18] European Commission, "Smart Grids," Feb. 2020. https://s3platform.jrc.ec.europa.eu/ smart-grids.

- [19] European Commission, "Smart Grids and Meters," Apr. 2021. https://ec.europa.eu/ energy/topics/markets-and-consumers/smart-grids-and-meters/overview_en.
- [20] The Chinese Central Government's Official Web Portal, "State Grid: Complete a Unified Strong Smart Grid in 2020," May 2009. www.gov.cn/jrzg/2009-05/21/content_1321530 .htm.
- [21] IEEE Smart Grid, "What Is the Smart Grid?" 2015. https://smartgrid.ieee.org/about-ieeesmart-grid.
- [22] National Institute of Standards and Technology, "Smart Grid," 2021. https://www.nist .gov/el/smart-grid.
- [23] Electric Power Research Institute, "Smart Grid Resource Center," 2020. https://smartgrid .epri.com/.
- [24] The Institution of Engineering and Technology, "What is a Smart Grid?" 2013. www.theiet.org/media/1251/smart-grids.pdf.
- [25] United States Congress, "H.R. 6 Energy Independence and Security Act of 2007," Jan. 2017.www.congress.gov/bill/110th-congress/house-bill/6.
- [26] U.S. Department of Energy, "Large Power Transformers and the U.S. Electric Grid," Apr. 2014. www.energy.gov/sites/prod/files/2014/04/f15/LPTStudyUpdate-040914.pdf.
- [27] L. Lamarre, "Problems with Power Quality," EPRI Journal, pp. 14-23, Jul. 1991.
- [28] American National Standards Institute, "ANSI C84.1-2016: American National Standard for Electric Power Systems and Equipment–Voltage Ratings (60 Hz)." New York, NY: American National Standards Institute, 2016.
- [29] Y. Zhang, N. Rahbari-Asr, J. Duan, and M.-Y. Chow, "Day-Ahead Smart Grid Cooperative Distributed Energy Scheduling with Renewable and Storage Integration," *IEEE Transactions on Sustainable Energy*, vol. 7, no. 4, pp. 1739–1748, Oct. 2016.
- [30] A. Giani, E. Bitar, M. Garcia, M. McQueen, P. Khargonekar, and K. Poolla, "Smart Grid Data Integrity Attacks," *IEEE Transactions on Smart Grid*, vol. 4, no. 3, pp. 1244–1253, Sep. 2013.
- [31] H. Mohsenian-Rad, "Coordinated Price-Maker Operation of Large Energy Storage Systems in Nodal Energy Markets," *IEEE Transactions on Power Systems*, vol. 31, no. 1, pp. 786–797, Jan. 2016.
- [32] A. Garces, "A Linear Three-Phase Load Flow for Power Distribution Systems," *IEEE Transactions on Power Systems*, vol. 31, no. 1, pp. 827–828, Jan. 2016.
- [33] M. E. Baran and F. F. Wu, "Network Reconfiguration in Distribution Systems for Loss Reduction and Load Balancing," *IEEE Transactions on Power Delivery*, vol. 4, no. 2, pp. 1401–1407, Apr. 1989.
- [34] MathWorks, "Help Center-solve." www.mathworks.com/help/optim/ug/fsolve .html.
- [35] International Energy Agency, "Electricity Statistics," Dec. 2019. www.iea.org/data-andstatistics/data-product/monthly-electricity-statistics.
- [36] California Energy Commission, "2018 Total System Electric Generation in Gigawatt Hours," www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/ 2019-total-system-electric-generation/2018.
- [37] J. Twidell and T. Weir, *Renewable Energy Resources*. New York, NY: E & FN Spon, 2015.
- [38] S. Bhattacharya, Design of Foundations for Offshore Wind Turbines. Hoboken, NJ: Wiley, Apr. 2019.

- [39] Power Technology, "Alta Wind Energy Center (AWEC), California." www.powertechnology.com/projects/alta-wind-energy-center-awec-california/.
- [40] Sun Power Inc., "Solar Star Projects Fact Sheet," https://us.sunpower.com/sites/default/ files/cs-solar-star-projects-fact-sheet_0.pdf.
- [41] J. Driesen and F. Katiraei, "Design for Distributed Energy Resources," *IEEE Power and Energy Magazine*, vol. 6, no. 3, pp. 30–40, May 2008.
- [42] X. Han, K. Heussen, O. Gehrke, H. W. Bindner, and B. Kroposki, "Taxonomy for Evaluation of Distributed Control Strategies for Distributed Energy Resources," *IEEE Transactions on Smart Grid*, vol. 9, no. 5, pp. 5185–5195, Sep. 2018.
- [43] P. Basak, S. Chowdhury, S. Nee, and D. S. Chowdhury, "A Literature Review on Integration of Distributed Energy Resources in the Perspective of Control, Protection and Stability of Microgrid," *Renewable and Sustainable Energy Reviews*, vol. 16, no. 8, pp. 5545–5556, Oct. 2012.
- [44] N. Hatziargyriou, H. Asano, R. Iravani, and C. Marnay, "Microgrids," *IEEE Power and Energy Magazine*, vol. 5, no. 4, pp. 78–94, Jul. 2007.
- [45] F. Katiraei, R. Iravani, N. Hatziargyrious, and S. Amires, "Microgrids: Control and Management," *IEEE Power and Energy Magazine*, vol. 6, no. 3, pp. 74–98, May 2008.
- [46] B. Kroposki, R. Lasseter, T. Ise, S. Morozumi, S. Papathanassiou, and N. Hatziargyriou, "Making Microgrids Work," *IEEE Power and Energy Magazine*, vol. 6, no. 3, pp. 40–53, May 2008.
- [47] N. Hatziargyriou, *Microgrids: Architectures and Control*. Chichester, UK: Wiley-IEEE Press, 2014.
- [48] U. A. Bakshi and A. V. Bakshi, *Generation, Transmission, and Distribution*. Pune, India: Technical Publications, 2009.
- [49] Riverside Public Utilities, "Schedule A: General Service and Schedule D: Domestic Service," www.riversideca.gov/utilities/businesses/rates-electric.asp.
- [50] Y. Liu, B. Qiu, X. Fan, H. Zhu, and B. Han, "Review of Smart Home Energy Management Systems," *Energy Procedia*, vol. 104, pp. 504–508, Dec. 2016.
- [51] S. Althaher, P. Mancarella, and J. Mutale, "Automated Demand Response from Home Energy Management System under Dynamic Pricing and Power and Comfort Constraints," *IEEE Transactions on Smart Grid*, vol. 6, no. 4, pp. 1874–1883, Jul. 2015.
- [52] W. Tushar, N. Wijerathne, W.-T. Li, C. Yuen, H. V. Poor, T. K. Saha, and K. L. Wood, "Internet of Things for Green Building Management: Disruptive Innovations through Low-Cost Sensor Technology and Artificial Intelligence," *IEEE Signal Processing Magazine*, vol. 35, no. 5, pp. 100–110, Sep. 2018.
- [53] M. Yu, S. H. Hong, and J. B. Kim, "Incentive-Based Demand Response Approach for Aggregated Demand Side Participation," in *Proceedings of the IEEE International Conference on Smart Grid Communications*, Sydney, NSW, Australia, Nov. 2016.
- [54] H. Zhong, L. Xie, and Q. Xia, "Coupon Incentive-Based Demand Response: Theory and Case Study," *IEEE Transactions on Power Systems*, vol. 28, no. 2, pp. 1266–1276, May 2013.
- [55] M. R. Sarker, M. A. Ortega-Vazquez, and D. S. Kirschen, "Optimal Coordination and Scheduling of Demand Response via Monetary Incentives," *IEEE Transactions on Smart Grid*, vol. 6, no. 3, pp. 1341–1352, May 2015.
- [56] H. Mohsenian-Rad, V. Wong, J. Jatskevich, R. Schober, and A. Leon-Garcia, "Autonomous Demand-Side Management Based on Game Theoretic Energy Consumption

Scheduling for the Future Smart Grid," *IEEE Transactions on Smart Grid*, vol. 1, no. 3, pp. 320–331, Nov. 2010.

- [57] J. Gorzelany, "Electric Vehicle Battery Basics." https://www.myev.com/research/ev-101/ electric-vehicle-battery-basics.
- [58] Y. Ota, H. Taniguchi, T. Nakajima, K. M. Liyanage, J. Baba, and A. Yokoyama, "Autonomous Distributed V2G (Vehicle-to-Grid) Considering Charging Request and Battery Condition," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies Conference*, Gothenberg, Sweden, Oct. 2009.
- [59] Y. Ota, H. Taniguchi, T. Nakajima, K. M. Liyanage, J. Baba, and A. Yokoyama, "Autonomous Distributed V2G (Vehicle-to-Grid) Satisfying Scheduled Charging," *IEEE Transactions on Smart Grid*, vol. 3, no. 1, pp. 559–564, Mar. 2012.
- [60] K. Tanguy, M. R. Dubois, K. L. Lopez, and C. Gagné, "Optimization Model and Economic Assessment of Collaborative Charging Using Vehicle-to-Building," *Sustainable Cities and Society*, vol. 26, pp. 496–506, Oct. 2016.
- [61] California Energy Commission, "Energy Storage," Aug. 2018. www.energy.ca.gov/sites/ default/files/2019-12/energy_storage_ada.pdf.
- [62] S. Rehmana, L. M. Al-Hadhramia, and M. M. Alam, "Pumped Hydro Energy Storage System: A Technological Review," *Renewable and Sustainable Energy Reviews*, vol. 44, pp. 586–598, Apr. 2015.
- [63] G. Venkataramani, P. Parankusam, V. Ramalingam, and J. Wang, "A Review on Compressed Air Energy Storage – A Pathway for Smart Grid and Polygeneration," *Renewable and Sustainable Energy Reviews*, vol. 62, pp. 895–907, Sep. 2016.
- [64] S. M. Mousavi, F. Faraji, A. Majazi, and K. Al-Haddad, "A Comprehensive Review of Flywheel Energy Storage System Technology," *Renewable and Sustainable Energy Reviews*, vol. 67, pp. 477–490, Jan. 2017.
- [65] A. Arteconi, N. J. Hewitt, and F. Polonara, "Domestic Demand-Side Management (DSM): Role of Heat Pumps and Thermal Energy Storage (TES) Systems," *Applied Thermal Engineering*, vol. 51, no. 1, pp. 155–165, Mar. 2013.
- [66] F. Sehar, S. Rahman, and M. Pipattanasomporn, "Impacts of Ice Storage on Electrical Energy Consumptions in Office Buildings," *Energy and Buildings*, vol. 51, pp. 255–262, Aug. 2012.
- [67] A. R. Sparacino, G. F. Reed, R. J. Kerestes, B. M. Grainger, and Z. T. Smith, "Survey of Battery Energy Storage Systems and Modeling Techniques," in *Proceedings of the IEEE Power and Energy Society General Meeting*, San Diego, CA, Jul. 2012.
- [68] M. Abdel-Monem, O. Hegazy, N. Omar, K. Trad, P. V. den Bossche, and J. V. Mierlo, "Lithium-Ion Batteries: Comprehensive Technical Analysis of Second-Life Batteries for Smart Grid Applications," in *Proceedings of the European Conference on Power Electronics and Applications*, Warsaw, Poland, sep 2017.
- [69] Z. Taylor, H. Akhavan-Hejazi, E. Cortez, L. Alvarez, S. Ula, M. Barth, and H. Mohsenian-Rad, "Customer-side SCADA-Assisted Large Battery Operation Optimization for Distribution Feeder Peak Load Shaving," *IEEE Transactions on Smart Grid*, vol. 10, no. 1, pp. 992–1004, Jan. 2019.
- [70] W. Jing, C. H. Lai, S. H. W. Wong, and M. L. D. Wong, "Supercapacitor Hybrid Energy Storage System in Standalone DC Microgrids: A Review," *IET Renewable Power Generation*, vol. 11, no. 4, pp. 461–469, Mar. 2017.

- [71] Z. Taylor, H. Akhavan-Hejazi, and H. Mohsenian-Rad, "Optimal Operation of Grid-Tied Energy Storage Systems Considering Detailed Device-Level Battery Models," *IEEE Transactions on Industrial Informatics*, vol. 16, no. 6, pp. 3928–3941, Jun. 2020.
- [72] H. Akhavan-Hejazi, Z. Taylor, and H. Mohsenian-Rad, "Optimal Cell Removal to Enhance Operation of Aged Grid-Tied Battery Storage Systems," *IEEE Transactions* on Sustainable Energy, vol. 12, no. 1, pp. 739–742, Jan. 2021.
- [73] A. Sadeghi-Mobarakeh and H. Mohsenian-Rad, "Performance Accuracy Scores in CAISO and MISO Regulation Markets: A Comparison based on Real Data and Mathematical Analysis," *IEEE Transactions on Power Systems*, vol. 33, no. 3, pp. 3196–3198, May 2018.
- [74] U. A. Bakshi and A. V. Bakshi, *Electronic and Electrical Measuring Instruments and Machines*. Pune, India: Technical Publications, 2009.
- [75] V. Lackovic, "Voltage Transformers," Woodcliff Lake, NJ. www.cedengineering.com/ userfiles/Voltage%20Transformers-R1.pdf.
- [76] Lindsey Real Time Transmission Conductor Monitor, http://lindsey-usa.com, Mar. 2017.
- [77] W. Houschild and E. Lemke, *High Voltage Test and Measuring Techniques*. Springer, 2013.
- [78] W. R. Smith-Vaniz and R. L. Sieron, "Apparatus for Measuring the Potential of a Transmission Line Conductor," U.S. Patent Number 4,714,893.
- [79] T. W. Cease and P. Johnston, "A Magneto-Optic Current Transducer," *IEEE Transactions on Power Delivery*, vol. 5, pp. 548–555, Apr. 1990.
- [80] K. Bohnert, P. Gabus, and H. Brandle, "Fiber-Optic Current and Voltage Sensors for High-Voltage Substations," in *Proceedings of the IEEE International Conference on Optical Fiber Sensors*, Oct. 2003.
- [81] Sentient Energy, "Product Brochures: MM3 Line Monitor," www.sentient-energy.com/ products/mm3-intelligent-sensor.
- [82] R. J. Marks, Introduction to Shannon Sampling and Interpolation Theory. Springer, 1991.
- [83] S. Ramet, "A Low-Distortion Anti-Aliasing/Smoothing Filter for Sampled Data Integrated Circuits," *IEEE Journal of Solid-State Circuits*, vol. 23, no. 5, pp. 1267–1272, May 1988.
- [84] A. Miler and M. Dewe, "The Application of Multi-Rate Digital Signal Processing Techniques to the Measurement of Power System Harmonic Levels," *IEEE Transactions* on Power Delivery, vol. 8, no. 2, pp. 531–539, Feb. 1993.
- [85] J. Castelló, J. M. Espí, and R. García-Gil, "A New Generalized Robust Predictive Current Control for Grid-Connected Inverters Compensates Anti-Aliasing Filters Delay," *IEEE Transactions on Industrial Electronics*, vol. 63, no. 7, pp. 4485–4494, Jul. 2016.
- [86] R. Martins, J. Franca, and F. Maloberti, "An Optimum CMOS Switched-Capacitor Antialiasing Decimating Filter," *IEEE Journal of Solid-State Circuits*, vol. 28, no. 9, pp. 962–970, Sep. 1993.
- [87] A. Shahsavari, M. Farajollahi, E. Stewart, C. Roberts, and H. Mohsenian-Rad, "A Data-Driven Analysis of Lightning-Initiated Contingencies at a Distribution Grid with a PV Farm Using Micro-PMU Data," in *Proceedings of the IEEE North American Power Symposium*, Sep. 2017.
- [88] Center for Environmental Research and Technology, "Sustainable Integrated Grid Initiative." www.cert.ucr.edu/laboratoryservices/sustainable-integrated-grid-initiative.

- [89] H. Mohsenian-Rad and E. Cortez, "Smart Grid for Smart City Activities in the California City of Fiverside," in *Proceedings of the International Conference on Smart Grid for Smart Cities*, Toronto, ON, Oct. 2015.
- [90] Z. Taylor, H. Akhavan-Hejazi, E. Cortez, L. Alvarez, S. Ula, M. Barth, and H. Mohsenian-Rad, "Customer-Side SCADA-Assisted Large Battery Operation Optimization for Distribution Feeder Peak Load Shaving," *IEEE Transactions on Smart Grid*, vol. 10, no. 1, pp. 992–1004, Jan. 2019.
- [91] D. W. Scott, Multivariate Density Estimation: Theory, Practice, and Visualization, Second Edition Histograms: Theory and Practice, 2nd ed. Hoboken, NJ: John Wiley & Sons Inc., 2015.
- [92] A. Shahsavari, M. Farajollahi, E. Stewart, C. Roberts, F. Megala, L. Alvarez, E. Cortez, and H. Mohsenian-Rad, "Autopsy on Active Distribution Networks: A Data-Driven Fault Analysis Using Micro-PMU Data," in *Proceedings of the IEEE North American Power Symposium*, Sep. 2017.
- [93] P. Khaledian, A. Aligholian, and H. Mohsenian-Rad, "Event-Based Analysis of Solar Power Distribution Feeder Using Micro-PMU Measurements," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies Conference (ISGT)*, Washington, DC, Feb. 2021.
- [94] B. Pal and B. Chaudhuri, *Robust Control in Power Systems*. New York, NY: Springer, 2005.
- [95] J. F. Hauer, C. J. Demeure, and L. L. Scharf, "Initial Results in Prony Analysis of Power System Response Signals," *IEEE Transactions on Power Systems*, vol. 5, no. 1, pp. 80– 89, Feb. 1990.
- [96] B. Pierre, R. Elliott, D. Schoenwald, J. Neely, R. Byrne, D. Trudnowski, and J. Colwell, "Supervisory System for a Wide Area Damping Controller Using PDCI Modulation and Real-Time PMU Feedback," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Bostob, MA, Jul. 2016.
- [97] D. Trudnowski, "Properties of the Dominant Inter-Area Modes in the WECC Interconnect," Jan. 2012. www.wecc.org/Reliability/WECCmodesPaper130113Trudnowski.pdf.
- [98] B. J. Pierre, F. Wilches-Bernal, D. A. Schoenwald, R. T. Elliott, J. C. Neely, R. H. Byrne, and D. Trudnowski, "Open-Loop Testing Results for the Pacific DC Intertie Wide Area Damping Controller," in *Proceedings of the IEEE Manchester PowerTech*, Manchester, UK, Jun. 2017.
- [99] E. Jury, Theory and Application of the Z-transform Method. Huntington, NY: Krieger Publishing, 1964.
- [100] A. D. Poularikas, "The Z-Transform," in *The Transforms and Applications Handbook*, A. D. Poularikas, Ed. Boca Raton, FL: CRC Press, 2000.
- [101] J. F. Hauer, C. J. Demeure, and L. L. Scharf, "Initial Results in Prony Analysis of Power System Response Signals," *IEEE Transactions on Power Systems*, vol. 5, pp. 80–89, Feb. 1.
- [102] MathWorks, "Help Center-Isqlin." www.mathworks.com/help/optim/ug/Isqlin.html.
- [103] S. Boyd and L. Vandenberghe, *Convex Optimization*. Cambridge, UK: Cambridge University Press, 2004.
- [104] MathWorks, "Help Center-roots" www.mathworks.com/help/matlab/ref/roots.html.
- [105] J. Ma, P. J. Matuszyk, R. K. Mallan, C. Torres-Verdín, and B. C. Voss, "Joint Processing of Forward and Backward Extended Prony and Weighted Spectral Semblance Methods

for Robust Extraction of Velocity Dispersion Data," in *Proceedings of the SPWLA 51st* Annual Logging Symposium, Perth, Australia, Jun. 2010.

- [106] D. I. Trudnowski, "Order Reduction of Large-Scale Linear Oscillatory Models," *IEEE Transactions Power Systems*, vol. 9, no. 1, pp. 451–458, Feb. 1994.
- [107] J. Xiao, X. Xie, Y. Han, and J. Wu, "Dynamic Tracking of Low-Frequency Oscillations with Improved Prony Method in Wide-Area Measurement System," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Denver, CO, Jun. 2004.
- [108] J. C. H. Peng and N. K. C. Nair, "Adaptive Sampling Scheme for Monitoring Oscillations Using Prony Analysis," *IET Generation, Transmission and Distribution*, vol. 3, no. 12, pp. 1052–1060, Dec. 2009.
- [109] R. Kumaresan and D. W. Tufts, "Estimating the Parameters of Exponentially Damped Sinusoids and Pole-Zero Modeling in Noise," *IEEE Transactions on Acoustic, Speech,* and Signal Processing, vol. 30, no. 6, pp. 833–840, Dec. 1982.
- [110] D. Ruiz-Vega, A. R. Messina, and M. Pavella, "Online Assessment and Control of Transient Oscillations Damping," *IEEE Transactions on Power Systems*, vol. 19, no. 2, pp. 1038–1047, May 2004.
- [111] F. F. Costa, A. L. de Almeida, F. A. Wegelin, and E. G. da Costa, "Recursive Prony's Method for Improving the Monitoring of Electrical Machines," in *Proceedings of the Instrumentation and Measurement Technology Conference*, Ottawa, Canada, May 2005.
- [112] H. Guoqiang, H. Renmu, Y. Huachun, W. Peng, and M. Rui, "Iterative Prony Method Based Power System Low Frequency Oscillation Mode Analysis and PSS Design," in *Proceedings of the IEEE/PES Transmission and Distribution Conference and Exposition: Asia and Pacific*, Dalian, China, Aug. 2005.
- [113] A. Allen, S. Santoso, and E. Muljadi, "Algorithm for Screening Phasor Measurement Unit Data for Power System Events and Categories and Common Characteristics for Events Seen in Phasor Measurement Unit Relative Phase-Angle Differences and Frequency Signals," National Renewable Energy Laboratory, Aug. 2013. www.nrel.gov/ docs/fy13osti/58611.pdf
- [114] MathWorks, "Help Center-fft." www.mathworks.com/help/matlab/ref/fft.html.
- [115] P. J. Huber and E. M. Ronchetti, Robust Statistics. Hoboken, NJ: Wiley, 2009.
- [116] E. Perez and J. Barros, "Voltage Event Detection and Characterization Methods: A Comparative Study," in *Proceedings of the IEEE PES Transmission and Distribution Conference and Exposition: Latin America*, Caracas, Venezuela, Aug. 2006.
- [117] D.-I. Kim, T. Y. Chun, S. H. Yoon, G. Lee, and Y. J. Shin, "Wavelet-Based Event Detection Method Using PMU Data," *IEEE Transactions on Smart Grid*, vol. 8, no. 3, pp. 1154–1162, May 2017.
- [118] A. Shahsavari, M. Farajollahi, E. Stewart, E. Cortez, and H. Mohsenian-Rad, "Situational Awareness in Distribution Grid Using Micro-PMU Data: A Machine Learning Approach," *IEEE Transactions on Smart Grid*, vol. 10, no. 6, pp. 6167–6177, Nov. 2019.
- [119] N. L. Tasfi, W. A. Higashino, K. Grolinger, and M. A. M. Capretz, "Deep Neural Networks with Confidence Sampling for Electrical Anomaly Detection," in *Proceedings* of *IEEE International Conference on Internet of Things*, Exeter, UK, Jun. 2017.
- [120] D. B. Araya, K. Grolinger, H. F. El-Yamany, M. A. Capretz, and G. Bitsuamlak, "An Ensemble Learning Framework for Anomaly Detection in Building Energy Consumption," *Energy and Buildings*, vol. 144, pp. 191–206, Jun. 2017.

- [121] M. Kahl, T. Kriechbaumer, D. Jorde, A. U. Haq, and H. A. Jacobsen, "Appliance Event Detection—A Multivariate, Supervised Classification Approach," in *Proceedings of the ACM International Conference on Future Energy Systems*, Phoenix, AZ, Jun. 2019.
- [122] D. Nguyen, R. Barella, S. A. Wallace, X. Zhao, and X. Liang, "Smart Grid Line Event Classification Using Supervised Learning over PMU Data Streams," in *Proceedings of the International Green and Sustainable Computing Conference*, Las Vegas, NV, Dec. 2015.
- [123] A. Aligholian, M. Farajollahi, and H. Mohsenian-Rad, "Unsupervised Learning for Online Abnormality Detection in Smart Meter Data," in *Proceedings of the IEEE PES General Meeting*, Atlanta, GA, Aug. 2019.
- [124] A. Aligholian, A. Shahsavari, E. Cortez, E. Stewart, and H. Mohsenian-Rad, "Event Detection in Micro-PMU Data: A Generative Adversarial Network Scoring Method," in *Proceedings of the IEEE PES General Meeting*, Montreal, QC, Canada, Aug. 2020.
- [125] J. Luo, T. Hong, and M. Yue, "Real-Time Anomaly Detection for Very Short-Term Load Forecasting," *Journal of Modern Power Systems and Clean Energy*, vol. 6, no. 2, pp. 235–243, Mar. 2018.
- [126] A. Saad and N. Sisworahardjo, "Data Analytics-Based Anomaly Detection in Smart Distribution Network," in *Proceedings of the International Conference on High Voltage Engineering and Power Systems*, Sanur, Indonesia, Oct. 2017.
- [127] A. Shahsavari, M. Farajollahi, E. Stewart, E. Cortez, and H. Mohsenian-Rad, "A Machine Learning Approach to Event Analysis in Distribution Feeders Using Distribution Synchrophasors," in *Proceedings of the IEEE International Conference on Smart Grid Synchronized Measurements and Analytics (SGSMA)*, College Station, TX, May 2019.
- [128] A. von Jouanne and B. Banerjee, "Assessment of Voltage Unbalance," *IEEE Transactions on Power Delivery*, vol. 16, pp. 782–790, Oct. 2001.
- [129] T. A. Short, *Electric Power Distribution Handbook*. Boca Raton, FL: CRC Press, 2004.
- [130] H. Pezeshki and P. J. Wolfs, "Consumer Phase Identification in a Three Phase Unbalanced LV Distribution Network," in *Proceedings of the IEEE Innovative Smart Grid Technologies*, Berlin, Germany, May 2012.
- [131] B. K. Seal and M. F. McGranaghan, "Automatic Identification of Service Phase for Electric Utility Customers," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Detroit, MI, Jul. 2011.
- [132] North American Electric Reliability Corporation, "Standard BAL-003-1—Frequency Response and Frequency Bias Setting Reliability Standard." www.federalregister.gov/ documents/2014/01/23/2014-01218/frequency-response-and-frequency-bias-settingreliability-standard.
- [133] J. Dong, J. Zuo, L. Wang, K. S. Kook, I. Y. Chung, Y. Liu, S. Affare, B. Rogers, and M. Ingram, "Analysis Power System Disturbances Based on Wide-Area Frequency Measurements," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Jul. 2007.
- [134] North American Electric Reliability Corporation, "Balancing and Frequency Control," Princeton, NJ, Jan. 2011.
- [135] D. P. Chassin, Z. Huang, M. K. Donnelly, C. Hassler, E. Ramirez, and C. Ray, "Estimation of WECC System Inertia Using Observed Frequency Transients," *IEEE Transactions on Power Systems*, vol. 20, pp. 1190–1192, 2005.

- [136] S. Sharma, S. H. Huang, and N. Sarma, "System Inertial Frequency Response Estimation and Impact of Renewable Resources," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Jul. 2011.
- [137] Institute of Electrical and Electronics Engineers, "Standard Requirements for Instrument Transformers, C57.13-2016." https://ieeexplore.ieee.org/document/7501435.
- [138] R. Moghe, "Smart Sensors for Utility Assets," doctoral thesis, Georgia Institute of Technology, Atlanta, GA, 2012.
- [139] H. Mohsenian-Rad, E. Stewart, and E. Cortez, "Distribution Synchrophasors: Pairing Big Data with Analytics to Create Actionable Information," *IEEE Power and Energy Society Magazine*, vol. 16, no. 3, pp. 26–34, May 2018.
- [140] A. G. Phadke and J. S. Thorp, Synchronized Phasor Measurements and Their Applications. New York, NY: Springer, 2008.
- [141] Institute of Electrical and Electronics Engineers, "Standard for Synchrophasor Measurements for Power Systems, C37.118.1-2011." https://ieeexplore.ieee.org/document/ 6111222.
- [142] D. L. Mills, "Internet Time Synchronization: The Network Time Protocol," *IEEE Transactions on Communications*, vol. 39, no. 10, pp. 1482–1493, Oct. 1991.
- [143] A. Derviškadić, R. Razzaghi, Q. Walger, and M. Paolone, "The White Rabbit Time Synchronization Protocol for Synchrophasor Networks," *IEEE Transactions on Smart Grid*, vol. 11, no. 1, pp. 726–738, Jan. 2020.
- [144] Schweitzer Engineering Laboratories, "It's About Time: Synchrophasor Measurements Require a Precise, Absolute Time Reference." https://selinc.com/solutions/ synchrophasors/report/115267/.
- [145] A. G. Phadke, "Synchronized Phasor Measurements-a Historical Overview," in Proceedings of the IEEE PES Transmission and Distribution Conference and Exhibition, Oct. 2002.
- [146] S. Nuthalapati, *Power System Grid Operation Using Synchrophasor Technology*. New York, NY: Springer, 2019.
- [147] A. von Meier, E. Stewart, A. McEachern, M. Andersen, and L. Mehrmanesh, "Precision Micro-Synchrophasors for Distribution Systems: A Summary of Applications," *IEEE Transactions on Smart Grid*, vol. 8, no. 6, pp. 2926–2936, Nov. 2017.
- [148] Institute of Electrical and Electronics Engineers, "Guide for Phasor Data Concentrator Requirements for Power System Protection, Control, and Monitoring, C37.244-2013." https://ieeexplore.ieee.org/document/6514039.
- [149] P. Kundur, Power System Stability and Control. New York, NY: McGraw-Hill, 1994.
- [150] B. J. Pierre, F. Wilches-Bernal, D. A. Schoenwald, R. T. Elliott, D. J. Trudnowski, R. H. Byrne, and J. C. Neely, "Design of the Pacific DC Intertie Wide Area Damping Controller," *IEEE Transactions on Power Systems*, vol. 34, no. 5, pp. 3594–3604, Sep. 2019.
- [151] M. Farajollahi, A. Shahsavari, and H. Mohsenian-Rad, "Location Identification of Distribution Network Events Using Synchrophasor Data," in *Proceedings of the IEEE North American Power Symposium*, Morgantown, WV, Sep. 2017.
- [152] A. Shahsavari, M. Farajollahi, E. Stewart, A. Von-Meier, L. Alvarez, E. Cortez, and H. Mohsenian-Rad, "Data-Driven Analysis of Capacitor Bank Operation at a Distribution Feeder Using Micro-PMU Data," in *Proceedings of the IEEE Power and Energy Society Conference on Innovative Smart Grid Technologies*, Apr. 2017.

- [153] M. Farajollahi, A. Shahsavari, and H. Mohsenian-Rad, "Tracking State Estimation in Distribution Networks Using Distribution-Level Synchrophasor Data," in *Proceedings* of the IEEE Power and Energy Society General Meeting, Aug. 2018.
- [154] A. Akrami, M. S. Asif, and H. Mohsenian-Rad, "Sparse Distribution System State Estimation: An Approximate Solution against Low Observability," in *Proceedings of the IEEE Power and Energy Society Conference on Innovative Smart Grid Technologies*, Feb. 2020.
- [155] M. Farajollahi, A. Shahsavari, E. Stewart, and H. Mohsenian-Rad, "Locating the Source of Events in Power Distribution Systems Using Micro-PMU Data," *IEEE Transactions* on Power Systems, vol. 33, no. 6, pp. 6343–6354, Nov. 2018.
- [156] K. S. Kumar, Electric Circuits and Networks. Chennai, India: Pearson, 2009.
- [157] V. K. Gaur and B. R. Bhalja, "Synchrophasor Based Fault Distance Estimation Method for Tapped Transmission Line," in *Proceedings of the IEEE International Conference on Smart Grid Synchronized Measurements and Analytics (SGSMA)*, College Station, TX, May 2019.
- [158] Q. Jiang, X. Li, B. Wang, and H. Wang, "PMU-Based Fault Location Using Voltage Measurements in Large Transmission Networks," *IEEE Transactions on Power Delivery*, vol. 27, no. 3, 1644.
- [159] Q. Jiang, B. Wang, and X. Li, "An Efficient PMU-Based Fault-Location Technique for Multiterminal Transmission Lines," *IEEE Transactions on Power Delivery*, vol. 29, no. 4, pp. 1675–1682, Aug. 2014.
- [160] J. Ren, S. S. Venkata, and E. Sortomme, "An Accurate Synchrophasor Based Fault Location Method for Emerging Distribution Systems," *IEEE Transactions on Power Delivery*, vol. 29, no. 1, pp. 297–298, Feb. 2014.
- [161] K. Mei, S. M. Rovnyak, and C. Ong, "Clustering-Based Dynamic Event Location Using Wide-Area Phasor Measurements," *IEEE Transactions on Power Systems*, vol. 23, no. 2, pp. 673–679, May 2008.
- [162] M. Pignati, L. Zanni, P. Romano, R. Cherkaoui, and M. Paolone, "Fault Detection and Faulted Line Identification in Active Distribution Networks Using Synchrophasors-Based Real-Time State Estimation," *IEEE Transactions on Power Delivery*, vol. 32, no. 1, pp. 381–392, Feb. 2017.
- [163] G. Feng and A. Abur, "Fault Location Using Wide-Area Measurements and Sparse Estimation," *IEEE Transactions on Power Systems*, vol. 31, no. 4, pp. 2938–2945, Jul. 2016.
- [164] W. Li, D. Deka, M. Chertkov, and M. Wang, "Real-Time Faulted Line Localization and PMU Placement in Power Systems Through Convolutional Neural Networks," *IEEE Transactions on Power Systems*, vol. 34, no. 6, pp. 4640–4651, Nov. 2019.
- [165] J. Blanco, J. F. Petit, and G. Ordóñez, "Algorithm for Relative Location of Voltage Sags and Capacitor Switching Transients Based on Voltage Measurement Only," in *Proceedings of the IEEE International Conference on Harmonics and Quality of Power* (ICHQP), Bucharest, Romania, May 2014.
- [166] C. D. Le, M. H. J. Bollen, and I. Y. H. Gu, "Analysis of Power Disturbances from Monitoring Multiple Levels and Locations in a Power System," in *Proceedings of the IEEE International Conference on Harmonics and Quality of Power (ICHQP)*, Bergamo, Italy, Sep. 2010.
- [167] Powerside Inc., "Synchrophasor Micro-PMU." https://powerside.com/products/ monitoring/micropmu/

- [168] J. L. Blackburn and T. J. Domin, Protective Relaying Principles and Applications. Boca Raton, FL: CRC Press, 2007.
- [169] P. M. Anderson, Analysis of Faulted Power Systems. Ames, IA: Iowa State University Press, 1973.
- [170] E. O. Schweitzer and S. E. Zocholl, "Introduction to Symmetrical Components," in Proceedings of the Annual Georgia Tech Protective Relaying Conference, Atlanta, GA, Apr. 2004.
- [171] T. Smith and C. Wester, "Fundamentals of Modern Protective Relaying," 2011. https:// ewh.ieee.org/r3/atlanta/ias/2011-2012_Presentations/IEEE%20Seminar%20-%20 Fundamentals%20of%20Modern%20Protective%20Relaying%20-%20Part1.pdf.
- [172] N. Cristianini and J. Shawe-Taylor, An Introduction to Support Vector Machines and Other Kernel-Based Learning Methods. Cambridge, UK: Cambridge University Press, 2000.
- [173] C. Hsu and C. Lin, "A Comparison of Methods for Multi-Class Support Vector Machines," *IEEE Transactions on Neural Networks*, vol. 13, no. 2, pp. 415–425, Mar. 2002.
- [174] S. Suthaharan, Machine Learning Models and Algorithms for Big Data Classification. New York, NY: Springer, 2016.
- [175] G. Madzarov, D. Gjorgjevikj, and I. Chorbev, "A Multi-Class SVM Classifier Utilizing Binary Decision Tree," *Informatica*, vol. 33, no. 2, pp. 233–241, 2009.
- [176] A. Shahsavari, M. Farajollahi, and H. Mohsenian-Rad, "Individual Load Model Parameter Estimation in Distribution Systems using Load Switching Events," *IEEE Transactions* on Power Systems, vol. 34, no. 6, pp. 4652–4664, Nov. 2019.
- [177] MathWorks "Help Center-quadprog." https://www.mathworks.com/help/optim/ug/ quadprog.html.
- [178] CVX Research, "CVX: Matlab Software for Disciplined Convex Programming." http://cvxr.com/cvx/.
- [179] B. E. Boser, I. M. Guyon, and V. N. Vapnik, "A Training Algorithm for Optimal Margin Classifiers," in *Proceedings of the ACM Annual Workshop on Computational Learning Theory*, Pittsburgh, PA, Jul. 1992.
- [180] Z. Fu, A. Robles-Kelly, and J. Zhou, "Mixing Linear SVMs for Nonlinear Classification," *IEEE Transactions on Neural Networks*, vol. 21, no. 12, pp. 1963–1975, Dec. 2010.
- [181] F. Perez-Cruz, A. Navia-Vazquez, P. L. Alarcon-Diana, and A. Artes-Rodriguez, "Support Vector Classifier with Hyperbolic Tangent Penalty Function," in *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing*, Istanbul, Turkey, Jun. 2000.
- [182] B. V. Dasarathy, *Nearest Neighbor (NN) Norms: NN Pattern Classification Rechniques*. Los Alamitos, CA: IEEE Computer Society Press, 1991.
- [183] L. Breiman, J. H. Friedman, R. A. Olshen, and C. J. Stone, *Classification and Regression Trees*. Monterey, CA: Wadsworth and Brooks, 1984.
- [184] S. Shalev-Shwartz and S. Ben-David, Understanding Machine Learning. Cambridge, UK: Cambridge University Press, 2014.
- [185] N. H. Abbasy and H. M. Ismail, "A Unified Approach for the Optimal PMU Location for Power System State Estimation," *IEEE Transactions on Power Systems*, vol. 24, no. 2, pp. 806–813, May 2009.

- [186] S. Chakrabarti and E. Kyriakides, "Optimal Placement of Phasor Measurement Units for Power System Observability," *IEEE Transactions on Power Systems*, vol. 23, no. 3, pp. 1433–1440, Aug. 2008.
- [187] N. M. Manousakis, G. N. Korres, and P. S. Georgilakis, "Taxonomy of PMU Placement Methodologies," *IEEE Transactions on Power Systems*, vol. 27, no. 2, pp. 1070–1077, May 2012.
- [188] B. Xu and A. Abur, "Observability Analysis and Measurement Placement for Systems with PMUs," in *Proceedings of the IEEE PES Power Systems Conference and Exposition*, Oct. 2004.
- [189] B. Gou, "Generalized Integer Linear Programming Formulation for Optimal PMU Placement," *IEEE Transactions on Power Systems*, vol. 23, no. 3, pp. 1099–1104, Aug. 2008.
- [190] Y. Xiao, J. C. Maun, H. B. Mahmoud, T. Detroz, and S. Do, "Harmonic Impedance Measurement Using Voltage and Current Increments from Disturbing Loads," in *Proceedings* of the IEEE International Conference on Harmonics and Quality of Power, Oct. 2000.
- [191] M. Farajollahi, A. Shahsavari, and H. Mohsenian-Rad, "Topology Identification in Distribution Systems Using Line Current Sensors: An MILP Approach," *IEEE Transactions* on Smart Grid, vol. 11, no. 2, pp. 1159–1170, Mar. 2020.
- [192] Z. Tian, W. Wu, and B. Zhang, "A Mixed Integer Quadratic Programming Model for Topology Identification in Distribution Network," *IEEE Transactions on Smart Grid*, vol. 31, no. 1, pp. 823–824, Jan. 2016.
- [193] S. Affijulla and P. Tripathy, "Development of Phasor Estimation Algorithm for P-Class PMU Suitable in Protection Applications," *IEEE Transactions on Smart Grid*, vol. 9, no. 2, pp. 1250–1260, Mar. 2018.
- [194] S. Ajulla and P. Tripathy, "Development of Dictionary-Based Phasor Estimator Suitable for P-Class Phasor Measurement Unit," *IEEE Transactions on Instrumentation and Measurement*, vol. 67, no. 11, pp. 2603–2615, Nov. 2018.
- [195] A. J. Roscoe, I. F. Abdulhadi, and G. M. Burt, "Filters for M Class Phasor Measurement Units," in *Proceedings of the IEEE International Workshop on Applied Measurements* for Power Systems, Aachen, Germany, Sep. 2012.
- [196] A. J. Roscoe, I. F. Abdulhadi, and G. M. Burt, "Filter Design Masks for C37.118.1a-Compliant Frequency-Tracking and Fixed-Filter M-Class Phasor Measurement Units," *IEEE Transactions on Instrumentation and Measurement*, vol. 64, no. 8, pp. 2096–2107, Aug. 2015.
- [197] M. Kamal, M. Farajollahi, and H. Mohsenian-Rad, "Analysis of Cyber Attacks Against Micro-PMUs: The Case of Event Source Location Identification," in *Proceedings of the IEEE Power and Energy Society Conference on Innovative Smart Grid Technologies*, Feb. 2020.
- [198] MathWorks, "Help Center-smoothdata." www.mathworks.com/help/matlab/ref/ smoothdata.html.
- [199] C. Mullins, "Adjusting Waveform Capture Sampling Rates," White Paper, Power Monitors Inc., Jan. 2016.
- [200] D. Carnovale, "Power Quality Monitoring: Waveform Analysis," https://ewh.ieee.org/r3/ nashville/events/2008/2008.05.06.pdf, May2008.
- [201] J. H. R. Enslin and P. J. M. Heskes, "Harmonic Interaction between a Large Number of Distributed Power Inverters and the Distribution Network," *IEEE Transactions on Power Electronics*, vol. 19, no. 6, pp. 1586–1593, Nov. 2004.

- [202] European Standards, "Standard EN 50160: Voltage Characteristics in Public Distribution Systems," http://copperalliance.org.uk/uploads/2018/03/542-standard-en-50160voltage-characteristics-in.pdf.
- [203] C. Payne, "Understanding Crest Factor," White Paper, Power Monitors Inc., Mar. 2016.
- [204] R. Arghandeh, A. Onen, J. Jung, D. Cheng, R. P. Broadwater, and V. Centeno, "Phasor-Based Assessment for Harmonic Sources in Distribution Networks," *Electric Power Systems Research*, vol. 116, pp. 94–105, Jul. 2014.
- [205] Institute of Electrical and Electronics Engineers, "519-2014–IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems," 2014. https:// ieeexplore.ieee.org/document/6826459
- [206] International Electrotechnical Commission, "Electromagnetic Compatibility (EMC)– Part 2-2: Environment–Compatibility Levels for Low-Frequency Conducted Disturbances and Signalling in Public Low-Voltage Power Supply Systems," 2002. https:// webstore.iec.ch/publication/63116.
- [207] International Electrotechnical Commission, "Electromagnetic Measurement Techniques–General Guide on Harmonics and Interharmonics Measurements and Instrumentation, for Power Supply Systems and Equipment Connected Thereto," 2002. https://webstore.iec.ch/publication/4226.
- [208] C. Mullins, "Measuring PLC AMR Signals with the Revolution," White Paper, Power Monitors Inc., May 2013.
- [209] C. Andrus, "Voltage Notching in IEEE Std 519-2014," White Paper, Power Monitors Inc., Jan. 2015.
- [210] C. Andrus, "Power Factor Correction Capacitors and Resonances," White Paper, Power Monitors Inc., Nov. 2014.
- [211] C. Mullins, "Transient Capture versus Waveform Capture," White Paper, Power Monitors Inc., Jul. 2015.
- [212] B. Li, R. Torquato, W. Freitas, D. D. Sabin, C. Li, M. J. Mousavi, W. Xu, G. MacLeod, T. E. Grebe, J. Yong, T. Laughner, A. Murphy, and T. A. Cooke, "Electric Signatures of Power Equipment Failures," IEEE PES Working Group on Power Quality Data Analytics, 2018.
- [213] B. Li, "Abnormality Detection Methods for Utility Equipment Condition Monitoring," master's thesis, University of Alberta, Edmonton, Alberta, Canada, 2016.
- [214] S. Kulkarni, S. Santoso, and T. A. Short, "Incipient Fault Location Algorithm for Underground Cables," *IEEE Transactions on Smart Grid*, vol. 5, no. 3, pp. 1165–1174, May 2014.
- [215] T. E. Grebe, "Effective Collection and Management of Power Quality Data for Analysis and Detection of Incipient Distribution System Components Faults and Identification of Their Locations," CEATI Report Number T124700-5159, Sep. 2013.
- [216] L. A. Kojovic and C. W. Williams, "Sub-cycle Detection of Incipient Cable Splice Faults to Prevent Cable Damage," in *Proceedings of the IEEE Power Engineering Society Summer Meeting*, Jul. 2000.
- [217] S. Kulkarni, A. J. Allen, S. Chopra, S. Santoso, and T. A. Short, "Waveform Characteristics of Underground Cable Failures," in *Proceedings of the IEEE Power Engineering Society General Meeting*, Jul. 2010.
- [218] U.S. Department of Energy and Electric Power Research Institute, "DOE/EPRI National Database Repository of Power System Events," https://pqmon.epri.com/see_all.html.

- [219] H. Blume, "PG&E Reaches \$13.5-Billion Settlement with Victims of Devastating California Wildfires," *Los Angeles Times*, Dec. 2019.
- [220] L. A. Irwin, "Real Experience Using Power Quality Data to Improve Power Distribution Reliability," in *Proceedings of the IEEE International Conference on Harmonics and Quality of Power*, Sep. 2010.
- [221] S. Santoso and D. D. Sabin, "Power Quality Data Analytics: Tracking, Interpreting, and Predicting Performance," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Jul. 2012.
- [222] B. Kasztenny, I. Voloh, A. Depew, and J. Wolete, "Re-Strike and Breaker Failure Conditions for Circuit Breakers Connecting Capacitor Banks," in *Proceedings of the IEEE Annual Conference for Protective Relay Engineers*, Apr. 2008.
- [223] C. L. Benner, B. D. Russell, and A. Sundaram, "Feeder Interruptions Caused by Recurring Faults on Distribution Feeders: Faults You Don't Know," in *Proceedings of* the IEEE Annual Conference for Protective Relay Engineers, Apr. 2008.
- [224] C. L. Benner and B. D. Russell, "Distribution Incipient Faults and Abnormal Events: Case Studies from Recorded Field Data," in *Proceedings of the IEEE Annual Conference* for Protective Relay Engineers, Apr. 2004.
- [225] Electric Power Research Institute, "DPQ Event: Back-to-Back Capacitor Switching," Report Number 1017221, Palo Alto, CA, 2003. www.epri.com/research/products/ 00000000001017221.
- [226] Electric Power Research Institute, "DPQ Event: Arcing Switch Contacts during Capacitor Energization," EPRI Technical Report Number 1017218, Palo Alto, CA, 2003. www .epri.com/research/products/0000000001017225.
- [227] M. A. Eltawil and Z. Zhao, "Grid-Connected Photovoltaic Power Systems: Technical and Potential Problems—A Review," *Renewable and Sustainable Energy Reviews*, vol. 14, no. 1, pp. 112–129, Jan. 2010.
- [228] C. Hochgraf and R. H. Lasseter, "Statcom Controls for Operation with Unbalanced Voltages," *IEEE Transactions on Power Delivery*, vol. 13, no. 2, pp. 538–544, Apr. 1998.
- [229] M. Hagiwara, K. Wada, H. Fujita, and H. Akagi, "Dynamic Behavior of a 21-Level BTB-Based Power Flow Controller under Single Line-to-Ground Fault Conditions," *IEEE Transactions on Industry Applications*, vol. 43, no. 5, pp. 1379–1387, Sep. 2007.
- [230] A. Hoke, A. Nelson, S. Chakraborty, J. Chebahtah, T. Wang, and M. McCarty, "Inverter Ground Fault Overvoltage Testing," National Renewable Energy Laboratory, Technical Report NREL/TP-5D00-64173, Aug. 2015.
- [231] M. Ropp, A. Hoke, S. Chakraborty, D. Schutz, C. Mouw, A. Nelson, M. McCarty, T. Wang, and A. Sorenson, "Ground Fault Overvoltage with Inverter-Interfaced Distributed Energy Resources," *IEEE Transactions on Power Delivery*, vol. 32, no. 2, pp. 890–899, Apr. 2017.
- [232] Joint NERC and WECC Staff Report, "900 mw Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report, Southern California Event: October 9, 2017," Feb. 2018. www.nerc.com/pa/rrm/ea/October%209%202017%20Canyon%202%20Fire %20Disturbance%20Report/900%20MW%20Solar%20Photovoltaic%20Resource %20Interruption%20Disturbance%20Repo
- [233] North American Electric Reliability Corporation, "1,200 mw Fault Induced Solar Photovoltaic Resource Interruption Disturbance Report," 2017. www.nerc.com/pa/ rrm/ea/1200_MW_Fault_Induced_Solar_Photovoltaic_Resource_/1200_MW_Fault_ Induced_Solar_Photovoltaic_Resource_Interruption_Final.pdf.

- [234] North American Electric Reliability Corporation, "Reliability Guideline: BPS-Connected Inverter-Based Resource Performance," Sep. 2018. www.nerc.com/comm/ PC_Reliability_Guidelines_DL/Inverter-Based_Resource_Performance_Guideline.pdf.
- [235] V. B. Nunez, S. Kulkarni, S. Santoso, and M. F. Joaquim, "Feature Analysis and Classification Methodology for Overhead Distribution Fault Events," in *Proceedings of the IEEE Power Engineering Society General Meeting*, Jul. 2010.
- [236] D. Sabin, G. MacLeod, and M. Wojdan, "Distribution Fault Location and Grid Analytics at Hydro Ottawa," in *Proceedings of the IEEE International Conference on Harmonics* and Quality of Power, May 2018.
- [237] IEEE, "IEEE Recommended Practice for Monitoring Electric Power Quality," IEEE Standard 1159–2009.
- [238] T. Keppler, N. Watson, and J. Arrillaga, "Computation of the Short-Term Flicker Severity Index," *IEEE Transactions on Power Delivery*, vol. 15, no. 4, pp. 1110–1115, Oct. 2000.
- [239] S. Rahman, M. Moghaddami, A. I. Sarwat, T. Olowu, and M. Jafaritalarposhti, "Flicker Estimation Associated with PV Integrated Distribution Network," in *Proceedings of the IEEE Southeastcon*, Apr. 2018.
- [240] J. Mora-Flòrez, J. Melóndez, and G. Carrillo-Caicedo, "Comparison of Impedance Based Fault Location Methods for Power Distribution Systems," *Electric Power Systems Research*, vol. 78, no. 4, pp. 657–666, Apr. 2008.
- [241] S. S. Kulkarni, "Fault Location and Characterization in AC and DC Power Systems," PhD thesis, University of Texas at Austin, Dec. 2012.
- [242] J. Goodfellow, "Investigating Tree-Caused Faults," Distribution World, Nov. 2005.
- [243] S. Kulkarni, D. Lee, A. J. Allen, S. Santoso, and T. A. Short, "Waveform Characterization of Animal Contact, Tree Contact, and Lightning Induced Faults," in *Proceedings of the IEEE Power Engineering Society General Meeting*, Jul. 2010.
- [244] Y. Cai and M. Y. Chow, "Small World Stratification for Distribution Fault Diagnosis," in *Proceedings of the IEEE PES Power Systems Conference and Exposition*, Mar. 2011.
- [245] A. Carta, N. Locci, and C. Muscas, "A PMU for the Measurement of Synchronized Harmonic Phasors in Three-Piece Distribution Networks," *IEEE Transactions on Instrumentation and Measurement*, vol. 58, no. 10, pp. 3723–3730, Oct. 2009.
- [246] B. Zeng, Z. Teng, Y. Cai, S. Guo, and B. Qing, "Harmonic Phasor Analysis Based on Improved FFT Algorithm," *IEEE Transactions on Smart Grid*, vol. 2, no. 1, pp. 51–59, Mar. 2011.
- [247] M. Chakir, I. Kamwa, and H. L. Huy, "Extended C37.118.1 PMU Algorithms for Joint Tracking of Fundamental and Harmonic Phasors in Stressed Power Systems and Microgrids," *IEEE Transactions on Power Delivery*, vol. 29, no. 3, pp. 1465–1480, Jun. 2014.
- [248] S. K. Jain, P. Jain, and S. N. Singh, "A Fast Harmonic Phasor Measurement Method for Smart Grid Applications," *IEEE Transactions on Smart Grid*, vol. 8, no. 1, pp. 493–502, Jan. 2017.
- [249] L. Chen, W. Zhao, F. Wang, and S. Huang, "Harmonic Phasor Estimator for P Class Phasor Measurement Units," *IEEE Transactions on Instrumentation and Measurement*, vol. 58, no. 10, pp. 1–10, May 2019.
- [250] M. Elad, Sparse and Redundant Representations: From Theory to Applications in Signal and Image Processing. New York, NY: Springer, 2010.

- [251] H. Liao, "Power System Harmonic State Estimation and Observability Analysis via Sparsity Maximization," *IEEE Transactions on Power Systems*, vol. 22, no. 1, pp. 15– 23, Feb. 2007.
- [252] L. Chen, M. Farajollahi, M. Ghamkhari, W. Zhao, S. Huang, and H. Mohsenian-Rad, "Switch Status Identification in Distribution Networks Using Harmonic Synchrophasor Measurements," *IEEE Transactions on Smart Grid*, vol. 12, no. 3, pp. 2413–2424, May 2021.
- [253] C. L. Benner and B. D. Russell, "Practical High-Impedance Fault Detection on Distribution Feeders," *IEEE Transactions on Industry Applications*, vol. 33, no. 3, pp. 635–640, May 1997.
- [254] M. Farajollahi, A. Shahsavari, and H. Mohsenian-Rad, "Location Identification of High Impedance Faults Using Synchronized Harmonic Phasors," in *Proceedings of the IEEE Power and Energy Society Conference on Innovative Smart Grid Technologies*, Apr. 2017.
- [255] A. F. Bastos, S. Santoso, W. Freitas, and W. Xu, "Synchrowaveform Measurement Units and Applications," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Aug. 2019.
- [256] M. Izadi and H. Mohsenian-Rad, "Event Location Identification in Distribution Networks Using Waveform Measurement Units," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies Conference*, The Hague, Netherlands, Oct. 2020.
- [257] G. Ziegler, Numerical Differential Protection: Principles and Applications. Erlangen, Germany: Publicis Publishing, 2012.
- [258] M. Izadi and H. Mohsenian-Rad, "Synchronous Waveform Measurements to Locate Transient Events and Incipient Faults in Power Distribution Networks," *IEEE Transactions on Smart Grid*, May 2021.
- [259] Power Monitors Inc., "Revolution Power Quality Recorder," https://powermonitors.com/ product/revolution-power-quality-recorder/.
- [260] S. Misak, J. Fulnecek, T. Vantuch, and L. Prokop, "Towards the Character and Challenges of Partial Discharge Pattern Data Measured on Medium Voltage Overhead Lines," in *Proceedings of the IEEE International Scientific Conference on Electric Power Engineering*, Kouty nad Desnou, Czech Republic, May 2019.
- [261] S. Misak, J. Fulnecek, T. Vantuch, T. Burianek, and T. Jezowicz, "A Complex Classification Approach of Partial Discharges from Covered Conductors in Real Environment," *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 24, no. 2, pp. 1097– 1104, Apr. 2017.
- [262] L. A. Barclay, *Propagation of Radio Waves*. London: Institution of Engineering and Technology, 2003.
- [263] H. A. Illias, M. A. Tunio, A. H. A. Baker, H. Mokhlis, and G. Chen, "Partial Dicharge Phenomena within an Artificial Void in Cable Insulation Geometry: Experimental Validation and Simulation," *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 23, no. 1, pp. 451–459, Feb. 2016.
- [264] F. Alvarez, J. Ortega, F. Garnacho, and M. A. Sanchez-Uran, "A Clustering Technique for Partial Discharge and Noise Sources Identification in Power Cables by Means of Waveform Parameters," *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 23, no. 1, pp. 469–481, Feb. 2016.
- [265] C. Andrus, "Understanding Variable Frequency Drives," White Paper, Power Monitors Inc., Sep. 2015.

- [266] T. Hong, D. Deswal, and F. De-Leon, "An Online Data-Driven Technique for the Detection of Transformer Winding Deformations," *IEEE Transactions on Power Delivery*, vol. 33, pp. 600–609, Apr. 2018.
- [267] M. Izadi and H. Mohsenian-Rad, "A Synchronized Lissajous-Based Method to Achieve Situational Awareness Using Synchronized Waveform Measurements," in *Proceedings* of the IEEE Power and Energy Society General Meeting, Aug. 2021.
- [268] Pecan Street Project, www.pecanstreet.org/dataport/Austin,TX.
- [269] Electric Reliability Council of Texas, "Wind Power Production," www.ercot.com/ gridinfo/generation/.
- [270] S. Svensson, "Power Measurement Techniques for Non-sinusoidal Conditions," PhD thesis, Chalmers University of Technology, Göteborg, Sweden, 1999.
- [271] S. Grijalva and M. U. Tariq, "Prosumer-Based Smart Grid Architecture Enables a Flat, Sustainable Electricity Industry," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies*, Anaheim, CA, Jan. 2011.
- [272] I. Lampropoulos, G. M. A. Vanalme, and W. L. Kling, "A Methodology for Modeling the Behavior of Electricity Prosumers within the Smart Grid," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies—Europe*, Gothenberg, Sweden, Oct. 2010.
- [273] M. Albachrony, D. Ha, Q. Tran, A. Brun, and M. Petit, "Coordinated Prosumer Transaction Based on Load Shifting and Optimization," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies—Europe*, Bucharest, Romania, Sep. 2019.
- [274] Southern California Edison, "Net Energy Metering," www.sce.com/residential/ generating-your-own-power/net-energy-metering.
- [275] California Public Utilities Commission, "CPUC Approves Feed-in Tariffs to Support Development of Onsite Renewable Generation." https://docs.cpuc.ca.gov/PUBLISHED/ NEWS_RELEASE/78824.htm
- [276] E. Hinds, C. Matsuishi, and B. Schoradt, "Feed-In Tariffs Emerge as Key Driver for Solar Development," *Solar Power International Show Preview Guide*, 2012.
- [277] K. S. K. Weranga, S. Kumarawadu, and D. P. Chandima, *Smart Metering Design and Applications*. New York, NY: Springer, 2014.
- [278] T&D World, "Smart Meter Deployment Projected to Reach 107 Million as of Year-End 2020." www.tdworld.com/grid-innovations/smart-grid/article/21120206/ smart-meter-deployment-projected-to-reach-107-million-as-of-yearend-2020.
- [279] M. Albadi and E. El-Saadany, "A Summary of Demand Response in Electricity Markets," *Electric Power Systems Research*, vol. 78, no. 11, pp. 1989–1996, Nov. 2008.
- [280] A monthly bill issued by Riverside Public Utilities in 2017.
- [281] H. Mohsenian-Rad and A. Leon-Garcia, "Optimal Residential Load Control with Price Prediction in Real-Time Electricity Pricing Environments," *IEEE Transactions on Smart Grid*, vol. 1, no. 2, pp. 120–133, Sep. 2010.
- [282] X. Chen, T. Wei, and S. Hu, "Uncertainty-Aware Household Appliance Scheduling Considering Dynamic Electricity Pricing in Smart Home," *IEEE Transactions on Smart Grid*, vol. 4, no. 2, pp. 932–941, Jun. 2013.
- [283] Z. Xu, R. Diao, S. Lu, J. Lian, and Y. Zhang, "Modeling of Electric Water Heaters for Demand Response: A Baseline PDE Model," *IEEE Transactions on Smart Grid*, vol. 5, no. 5, pp. 2203–2210, Sep. 2014.

- [284] A. Gholian, H. Mohsenian-Rad, Y. Hua, and J. Qin, "Optimal Industrial Load Control in Smart Grid: A Case Study for Oil Refineries," in *Proceedings of the IEEE PES General Meeting*, Vancouver, Canada, Jul. 2013.
- [285] M. H. Shoreh, P. Siano, M. Shafie-khah, V. Loia, and J. P. S. Catalão, "A Survey of Industrial Applications of Demand Response," *Electric Power Systems Research*, vol. 141, pp. 31–49, Dec. 2016.
- [286] Z. Liu, I. Liu, S. Low, and A. Wierman, "Pricing Data Center Demand Response," in Proceedings of the ACM Sigmetrics, Austin, TX, Jun. 2014.
- [287] G. Marks, E. Wilcox, D. Olsen, and S. Goli, "Opportunities for Demand Response in California Agricultural Irrigation: A Scoping Study," *Technical Report, Lawrence Berkeley National Laboratory*, 2013. www.osti.gov/servlets/purl/1172125.
- [288] S. Meyn, P. Barooah, A. Busic, and J. Ehren, "Ancillary Service to the Grid from Deferrable Loads: The Case for Intelligent Pool Pumps in Florida," in *Proceedings of the Conference on Decision and Control*, Florence, Italy, Dec. 2013.
- [289] A. Gholian, H. Mohsenian-Rad, and Y. Hua, "Optimal Industrial Load Control in Smart Grid," *IEEE Transactions on Smart Grid*, vol. 7, no. 5, pp. 2305–2316, Sep. 2016.
- [290] N. Lessem, A. Faruqui, S. Sergici, and D. Mountain, "The Impact of Time-of-Use Rates in Ontario," *Public Utilities Fortnightly*, pp. 56–87, Feb. 2017.
- [291] EnerNOC Inc., "The Demand Response Baseline," White Paper, 2009. https://www .naesb.org/pdf4/dsmee_group3_100809w3.pdf.
- [292] XENERGY Inc., "Protocol Development for Demand Response Calculation Draft Findings and Recommendations," Aug. 2002. www.calmac.org/publications/2002-08-02_XENERGY_REPORT.pdf.
- [293] J. Oyedokun, S. Bu, Z. Han, and X. Liu, "Customer Baseline Load Estimation for Incentive-Based Demand Response Using Long Short-Term Memory Recurrent Neural Network," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies Europe*, Bucharest, Romania, Sep. 2019.
- [294] T. K. Wijaya, M. Vasirani, and K. Aberer, "When Bias Matters: An Economic Assessment of Demand Response Baselines for Residential Customers," *IEEE Transactions on Smart Grid*, vol. 5, no. 4, pp. 1755–1763, Jul. 2014.
- [295] Y. Weng and R. Rajagopal, "Probabilistic Baseline Estimation via Gaussian Process," in Proceedings of the IEEE Power and Energy Society General Meeting, Denver, CO, Jul. 2015.
- [296] Y. Zhang, W. Chen, R. Xu, and J. Black, "A Cluster-Based Method for Calculating Baselines for Residential Loads," *IEEE Transactions on Smart Grid*, vol. 7, no. 5, pp. 2368–2377, Sep. 2016.
- [297] A. Albert and R. Rajagopal, "Smart Meter Driven Segmentation: What Your Consumption Says About You," *IEEE Transactions on Power Systems*, vol. 28, no. 4, pp. 4019– 4030, Nov. 2013.
- [298] J. Kwac, J. Flora, and R. Rajagopal, "Household Energy Consumption Segmentation Using Hourly Data," *IEEE Transactions on Smart Grid*, vol. 5, no. 1, pp. 420–430, Jan. 2014.
- [299] M. Chaouch, "Clustering-Based Improvement of Nonparametric Functional Time Series Forecasting: Application to Intra-Day Household-Level Load Curves," *IEEE Transactions on Smart Grid*, vol. 5, no. 1, pp. 411–419, Jan. 2014.

- [300] T. Teeraratkul, D. O'Neill, and S. Lall, "Shape-Based Approach to Household Electric Load Curve Clustering and Prediction," *IEEE Transactions on Smart Grid*, vol. 9, no. 5, pp. 5196–5206, Sep. 2018.
- [301] C. Dinesh, S. Makonin, and I. V. Bajić, "Residential Power Forecasting Using Load Identification and Graph Spectral Clustering," *IEEE Transactions on Circuits and Systems II*, vol. 66, no. 11, pp. 1900–1904, Nov. 2019.
- [302] K. Hopf, M. Sodenkamp, I. Kozlovkiy, and T. Staake, "Feature Extraction and Filtering for Household Classification Based on Smart Electricity Meter Data," *Computer Science Research and Development*, vol. 31, no. 3, pp. 141–148, Aug. 2016.
- [303] D. McClendon, "American Electric Power—Meter Remote Connect/Disconnect," 2011. https://smartgrid.epri.com/UseCases/Meter%20Remote%20Connect%20Disconnect_ ph2add.pdf.
- [304] B. Mullenmaster, "American Electric Power—Outage Notification," 2011. https:// smartgrid.epri.com/UseCases/Outage%20Notification_ph2add.pdf.
- [305] Y. Jiang, C.-C. Liu, M. Diedesch, E. Lee, and A. K. Srivastava, "Outage Management of Distribution Systems Incorporating Information from Smart Meters," *IEEE Transactions* on Power Systems, vol. 31, no. 5, pp. 4144–4154, Sep. 2016.
- [306] PR Newswire, "World Loses \$89.3 Billion to Electricity Theft Annually, \$58.7 Billion in Emerging Markets," Dec. 2014. www.prnewswire.com/news-releases/world-loses-893billion-to-electricity-theft-annually-587-billion-in-emerging-markets-300006515.html.
- [307] J. Nagi, K. S. Yap, S. K. Tiong, S. K. Ahmed, and M. Mohamad, "Nontechnical Loss Detection for Metered Customers in Power Utility Using Support Vector Machines," *IEEE Transactions on Power Delivery*, vol. 25, no. 2, pp. 1162–1171, Apr. 2010.
- [308] S. Sahoo, D. N. Nikovski, T. Muso, and K. Tsuru, "Electricity Theft Detection Using Smart Meter Data," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies*, Washington, DC, Feb. 2015.
- [309] Y. Wang, Q. Chen, T. Hong, and C. Kang, "Review of Smart Meter Data Analytics: Applications, Methodologies, and Challenges," *IEEE Transactions on Smart Grid*, vol. 10, no. 3, pp. 3125–3148, May 2019.
- [310] M. E. H. Dyson, S. D. Borgeson, M. D. Tabone, and D. S. Callaway, "Using Smart Meter Data to Estimate Demand Response Potential with Application to Solar Energy Integration," *Energy Policy*, vol. 73, pp. 607–619, Oct. 2014.
- [311] A. Albert and R. Rajagopal, "Finding the Right Consumers for Thermal Demand-Response: An Experimental Evaluation," *IEEE Transactions on Smart Grid*, vol. 9, no. 2, pp. 564–572, Mar. 2018.
- [312] K. Dehghanpour, Z. Wang, J. Wang, Y. Yuan, and F. Bu, "A Survey on State Estimation Techniques and Challenges in Smart Distribution Systems," *IEEE Transactions on Smart Grid*, vol. 10, no. 2, pp. 2312–2322, Mar. 2019.
- [313] A. Alimardani, F. Therrien, D. Atanackovic, J. Jatskevich, and E. Vaahedi, "Distribution System State Estimation Based on Nonsynchronized Smart Meters," *IEEE Transactions* on Smart Grid, vol. 6, no. 6, pp. 2919–2928, Nov. 2015.
- [314] X. Feng, F. Yang, and W. Peterson, "A Practical Multi-Phase Distribution State Estimation Solution Incorporating Smart Meter and Sensor Data," in *Proceedings of the IEEE Power and Energy Society General Meeting*, San Diego, CA, Jul. 2012.
- [315] J. Peppanen, M. J. Reno, M. Thakkar, S. Grijalva, and R. G. Harley, "Leveraging AMI Data for Distribution System Model Calibration and Situational Awareness," *IEEE Transactions on Smart Grid*, vol. 6, no. 4, pp. 2050–2059, Jul. 2015.

- [316] S. J. Pappu, N. Bhatt, R. Pasumarthy, and A. Rajeswaran, "Identifying Topology of Low Voltage Distribution Networks Based on Smart Meter Data," *IEEE Transactions* on Smart Grid, vol. 9, no. 5, pp. 5113–5122, Sep. 2018.
- [317] B. Shah, A. Bose, and A. Srivastava, "Load Modeling and Voltage Optimization Using Smart Meter Infrastructure," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies Conference*, Washington, DC, Feb. 2013.
- [318] U.S. Department of Energy, "Advanced Metering Infrastructure and Customer Systems: Results from the Smart Grid Investment Grant Program," Sep. 2016.
- [319] W. Luan and W. Li, "Smart Metering and Infrastructure," in *Smart Grids: Clouds, Communications, Open Source, and Automation*, D. Bakken, Ed. Boca Raton, FL: CRC Press, 2014, pp. 399–420.
- [320] S. Bavarian, L. Lampe, C. Siew, S. Lancashire, and K. Adeleye, "Leveraging the Smart Metering Infrastructure in Distribution Automation," in *Proceedings of the IEEE International Conference on Smart Grid Communications*, Tainan, Taiwan, Nov. 2012.
- [321] Itron Inc, "Meter Data Management: A Key to the Utility of the Future," Dec. 2012, www.smart-energy.com/regional-news/north-america/meter-data-management-a-key-tothe-utility-of-the-future/
- [322] M. Zeifman and K. Roth, "Nonintrusive Appliance Load Monitoring: Review and Outlook," *IEEE Transactions on Consumer Electronics*, vol. 57, no. 1, pp. 76–84, Feb. 2011.
- [323] G. W. Hart, "Nonintrusive Appliance Load Monitoring," *Proceedings of the IEEE*, vol. 80, no. 12, pp. 1870–1891, Dec. 1992.
- [324] D. He, W. Lin, N. Liu, R. G. Harley, and T. G. Habetler, "Incorporating Non-Intrusive Load Monitoring Into Building Level Demand Response," *IEEE Transactions on Smart Grid*, vol. 4, no. 4, 1870.
- [325] J. Liang, S. K. K. Ng, G. Kendall, and J. W. M. Cheng, "Load Signature Study–Part II: Disaggregation Framework, Simulation, and Applications," *IEEE Transactions on Power Delivery*, vol. 25, no. 2, pp. 561–569, Apr. 2010.
- [326] T. Spanyol, "Smart Meter Data: A Behavioural Marketer's Dream?" *Journal of Direct, Data and Digital Marketing Practice*, vol. 14, pp. 66–69, Aug. 2012.
- [327] A. Armel, A. Gupta, G. Shrimali, and A. Albert, "Is Disaggregation the Holy Grail of Energy Efficiency? The Case of Electricity," *Energy Policy*, vol. 52, pp. 213–234, Jan. 2013.
- [328] A. Zoha, A. Gluhak, M. A. Imran, and S. Rajasegarar, "Non-Intrusive Load Monitoring Approaches for Disaggregated Energy Sensing: A Survey," *Sensors*, vol. 12, pp. 16838– 16866, Dec. 2012.
- [329] J. Liang, S. K. K. Ng, G. Kendall, and J. W. M. Cheng, "Load Signature Study–Part I: Basic Concept, Structure, and Methodology," *IEEE Transactions on Power Delivery*, vol. 25, no. 2, pp. 551–560, Apr. 2010.
- [330] G. C. Koutitas and L. Tassiulas, "Low Cost Disaggregation of Smart Meter Sensor Data," *IEEE Sensors Journal*, vol. 16, no. 6, pp. 1665–1673, Mar. 2016.
- [331] D. Chen and D. Irwin, "SunDance: Black-box Behind-the-Meter Solar Disaggregation," in *Proceedings of the ACM International Conference on Future Energy Systems*, Shatin, Hong Kong, May 2017.
- [332] E. Vrettos, E. C. Kara, E. M. Stewart, and C. Roberts, "Estimating PV Power from Aggregate Power Measurements Within the Distribution Grid," *Journal of Renewable* and Sustainable Energy, vol. 11, no. 2, Apr. 2019.

- [333] M. Tabone, S. Kiliccote, and E. C. Kara, "Disaggregating Solar Generation Behind Individual Meters in Real Time," in *Proceedings of the ACM Conference on Systems* for Built Environments, Shenzhen, China, Nov. 2018.
- [334] M. Ghonima, B. Urquhart, C. Chow, J. Shields, A. Cazorla, and J. Kleissl, "A Method for Cloud Detection and Opacity Classification Based on Ground Based Sky Imagery," *Atmospheric Measurement Techniques*, vol. 5, no. 11, 2881.
- [335] C. M. Cheung, W. Zhong, C. Xiong, A. Srivastava, R. Kannan, and V. K. Prasanna, "Behind-the-Meter Solar Generation Disaggregation Using Consumer Mixture Models," in *Proceedings of the IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids*, Aalborg, Denmark, Oct. 2018.
- [336] F. Kabir, N. Yu, W. Yao, R. Yang, and Y. Zhang, "Estimation of Behind-the-Meter Solar Generation by Integrating Physical with Statistical Models," in *Proceedings of the IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids*, Beijing, China, Oct. 2019.
- [337] J. Z. Kolter and M. J. Johnson, "REDD: A Public Data Set for Energy Disaggregation Research," in *Proceedings of the ACM SustKDD Workshop on Data Mining Applications* in Sustainability, San Diego, CA, Aug. 2011.
- [338] X. M. Milla, "Building Energy Management Systems Technology for HVAC, Lighting, and Outlets with Smart Sensor Networks," master's thesis, Department of Electrical Engineering, California State University, Long Beach, CA, 2018.
- [339] C. K. Metallidou, K. E. Psannis, and E. A. Egyptiadou, "Energy Efficiency in Smart Buildings: IoT Approaches," *IEEE Access*, vol. 8, pp. 63679–63699, Mar. 2020.
- [340] D. H. Tran, M. H. Nazari, A. Sadeghi-Mobarakeh, and H. Mohsenian-Rad, "Smart Building Design: A Framework for Optimal Placement of Smart Sensors and Actuators," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies*, Washington, DC, Jan. 2019.
- [341] D. Kosterev, A. Meklin, J. Undrill, B. Lesieutre, W. Price, D. Chassin, R. Bravo, and S. Yang, "Load Modeling in Power System Studies: WECC Progress Update," in *Proceedings of the IEEE Power and Energy Society General Meeting*, Pittsburgh, PA, Jul. 2008.
- [342] H. Renmu, M. Jin, and D. J. Hill, "Composite Load Modeling via Measurement Approach," *IEEE Transactions on Power Systems*, vol. 21, no. 2, pp. 663–672, May 2006.
- [343] A. Shahsavari, M. Farajollahi, and H. Mohsenian-Rad, "Individual Load Model Parameter Estimation in Distribution Systems Using Load Switching Events," *IEEE Transactions on Power Systems*, vol. 34, no. 6, pp. 4652–4664, Nov. 2019.
- [344] X. Zhang, S. Grijalva, and M. J. Reno, "A Time-Variant Load Model Based on Smart Meter Data Mining," in *Proceedings of the IEEE PES General Meeting*, National Harbor, MD, Jul. 2014.
- [345] L. Zhu, X. Li, H. Ouyang, Y. Wang, W. Liu, and K. Shao, "Research on Component-Based Approach Load Modeling Based on Energy Management System and Load Control Strength," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies*, *Asia*, Tianjin, China, May 2012.
- [346] A. Gaikwad, P. Markham, and P. Pourbeik, "Implementation of the WECC Composite Load Model for Utilities Using the Component-Based Modeling Approach," in *Proceedings of the IEEE PES Transmission and Distribution Conference and Exposition*, Dallas, TX, May 2016.

- [347] A. Arif, Z. Wang, J. Wang, B. Mather, H. Bashualdo, and D. Zhao, "Load Modeling A Review," *IEEE Transactions on Smart Grid*, vol. 9, no. 6, pp. 5986–5999, Nov. 2018.
- [348] A. Bokhari, A. Alkan, R. Dogan, M. Diaz-Aguiló, F. de León, D. Czarkowski, Z. Zabar, L. Birenbaum, A. Noel, and R. E. Uosef, "Experimental Determination of the ZIP Coefficients for Modern Residential, Commercial, and Industrial Loads," *IEEE Transactions* on Power Delivery, vol. 29, no. 3, pp. 1372–1381, Jun. 2014.
- [349] IEEE Task Force on Load Representation for Dynamic Performance, "Load Representation for Dynamic Performance Analysis," *IEEE Transactions on Power Systems*, vol. 8, no. 2, pp. 472–482, May 1993.
- [350] V. Vignesh, S. Chakrabarti, and S. C. Srivastava, "Power System Load Modelling under Large and Small Disturbances Using Phasor Management Units Data," *IET Generation, Transmission & Distribution*, vol. 9, no. 12, pp. 1316–1323, Apr. 2015.
- [351] IEEE Task Force on Load Representation for Dynamic Performance, "Standard Load Models for Power Flow and Dynamic Performance Simulation," *IEEE Transactions on Power Systems*, vol. 10, no. 3, pp. 1302–1313, Aug. 1995.
- [352] D. J. Hill, "Nonlinear Dynamic Load Models with Recovery for Voltage Stability Studies," *IEEE Transactions on Power Systems*, vol. 8, no. 1, pp. 166–176, Feb. 1993.
- [353] J. Milanović, K. Yamashita, S. M. Villanueva, S. Djokic, and L. Korunović J. V. Milanović, K. Yamashita, S. M. Villanueva, S. Å_i. Djokic, and L. M. Korunović, "International Industry Practice on Power System Load Modeling," *IEEE Transactions on Power Systems*, vol. 28, no. 3, pp. 3038–3046, Aug. 2013.
- [354] Electric Power Research Institute, "Measurement-Based Load Modeling," Report Number 1014402, Palo Alto, CA, 2006.
- [355] G. W. Chang, C.I. Chen, Y. J. Liu, "A Neural-Network-Based Method of Modeling Electric Arc Furnace Load for Power Engineering Study," *IEEE Transactions on Power Systems*, vol. 25, no. 1, pp. 138–146, Feb. 2010.
- [356] A. Abur and A. G. Exposito, Power System State Estimation: Theory and Implementation. New York, NY: Marcel Dekker, 2004.
- [357] Mathworks, "Help Center–lsqnonlin," www.mathworks.com/help/optim/ug/lsqnonlin .html.
- [358] F. F. Wu, "Power System State Estimation: A Survey," *International Journal of Electrical Power and Energy Systems*, vol. 12, no. 2, pp. 80–87, Apr. 1990.
- [359] M. Ahmad, Power System State Estimation, Boston, MA: Artech House, 2013.
- [360] A. Monticelli, State Estimation in Electric Power Systems: A Generalized Approach. Boston, MA: Kluwer Academic Publishers, 1999.
- [361] M. L. Crow, Computational Methods for Electric Power Systems, 3rd ed. Boca Raton, FL: CRC Press, 2016.
- [362] B. Stott, J. Jardim, and O. Alsac, "DC Power Flow Revisited," *IEEE Transactions on Power Systems*, vol. 24, no. 3, pp. 1290–1300, Aug. 2009.
- [363] J. Lavaei and S. H. Low, "Zero Duality Gap in Optimal Power Flow Problem," *IEEE Transactions on Power Systems*, vol. 27, no. 1, pp. 92–107, Feb. 2012.
- [364] R. A. Jabr, "Radial Distribution Load Flow Using Conic Programming," *IEEE Transac*tions on Power Systems, vol. 21, no. 3, pp. 1458–1459, Aug. 2006.
- [365] D. Molzahn, J. Holzer, B. Lesieutre, and C. DeMarco, "Implementation of a Large-Scale Optimal Power Flow Solver Based on Semidefinite Programming," *IEEE Transactions* on *Power Systems*, vol. 28, no. 4, pp. 3987–3998, Nov. 2013.

- [366] S. Low, "Convex Relaxation of Optimal Power Flow–Part I: Formulations and Equivalence," *IEEE Transactions on Control of Network Systems*, vol. 1, no. 1, pp. 15–27, Mar. 2014.
- [367] S. Low, "Convex Relaxation of Optimal Power Flow–Part II: Exactness," *IEEE Transac*tions on Control of Network Systems, vol. 1, no. 2, pp. 177–189, Jun. 2014.
- [368] Hao Zhu and Georgios B. Giannakis, "Power System Nonlinear State Estimation Using Distributed Semidefinite Programming," *IEEE Journal of Selected Topics in Signal Processing*, vol. 8, no. 6, pp. 1039–1050, Dec. 2014.
- [369] Y. Weng, Q. Li, R. Negi, and M. Ilić, "Distributed Algorithm for SDP State Estimation," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies Conference*, Washington, DC, Feb. 2013.
- [370] R. Yang and Y. Zhang, "Three-Phase AC Optimal Power Flow Based Distribution Locational Marginal Price," in *Proceedings of the IEEE North American Power Symposium*, Charlotte, NC, Oct. 2015.
- [371] Y. Yao, X. Liu, D. Zhao, and Z. Li, "Distribution System State Estimation: A Semidefinite Programming Approach," *IEEE Transactions on Smart Grid*, vol. 10, no. 4, pp. 4369–4378, Jul. 2019.
- [372] J. Zhang, G. Welch, G. Bishop, and Z. Huang, "A Two-Stage Kalman Filter Approach for Robust and Real-Time Power System State Estimation," *IEEE Transactions on Sustainable Energy*, vol. 5, no. 2, pp. 629–636, Apr. 2014.
- [373] G. Valverde and V. Terzija, "Unscented Kalman Filter for Power System Dynamic State Estimation," *IET Generation, Transmission & Distribution*, vol. 5, no. 1, pp. 29–37, Jan. 2011.
- [374] Newtons4th Ltd, "3 Phase 2 Wattmeter Power Measurements Explained—Application Note 14," Mar. 2012, www.newtons4th.com/wp-content/uploads/2010/03/APP014-3-Phase-2-Wattmeter-Explained.pdf.
- [375] V. Arya, D. Seetharam, S. Kalyanaraman, K. Dontas, C. Pavlovski, S. Hoy, and J. R. Kalagnanam, "Phase Identification in Smart Grids," in *Proceedings of IEEE International Conference on Smart Grid Communications*, Oct. 2011.
- [376] CVX Research, "Mixed-Integer Support in CVX 2.0." http://cvxr.com/news/2012/08/ midcp/.
- [377] International Business Machines, "IBM CPLEX Optimizer: High-Performance Mathematical Programming Solver for Linear Programming, Mixed-Integer Programming and Quadratic Programming." www.ibm.com/analytics/cplex-optimizer.
- [378] K. Zipp, "Three Become One: The Rise of Three-Phase Solar String Inverters," Sep. 2014, www.solarpowerworldonline.com/2014/09/three-become-one-rise-three-phase-solar-string-inverters/.
- [379] Jiaqi Chen and Ye Guo and Wenchuan Wu, "Optimal Dispatch Scheme for DSO and Prosumers by Implementing Three-Phase Distribution Locational Marginal Prices," *IET Generation, Transmission & Distribution*, vol. 14, pp. 2138–2146, Jun. 2020.
- [380] R. Yang and Y. Zhang, "Three-Phase AC Optimal Power flow Based Distribution Locational Marginal Price," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies Conference (ISGT)*, Washington, DC, Apr. 2017.
- [381] M. N. Faqiry and L. Wang and H. Wu, "HEMS-Enabled Transactive Flexibility in Three-Phase Unbalanced Distribution Systems," *Journal of Modern Power Systems and Clean Energy*, vol. 7, no. 6, pp. 1434–1449, Jul. 2019.

- [382] M. E. Baran and A. W. Kelley, "State Estimation for Real-Time Monitoring of Distribution Systems," *IEEE Transactions on Power Systems*, vol. 9, no. 3, pp. 1601–1609, Aug. 1994.
- [383] Y. Yao, X. Liu, D. Zhao, and Z. Li, "Distribution System State Estimation: A Semidefinite Programming Approach," *IEEE Transactions on Smart Grid*, vol. 10, no. 4, pp. 4369–4378, Jul. 2019.
- [384] Y. Deng, and Y. He, and B. Zhang, "A Branch-estimation-Based State Estimation Method for Radial Distribution Systems," *IEEE Transactions on Power Systems*, vol. 17, no. 4, pp. 1057–1062, Oct. 2002.
- [385] G. Wang, G. B. Giannakis, J. Chen, and J. Sun, "Distribution System State Estimation: An Overview of Recent Developments," *Frontiers of Information Technology & Electronic Engineering*, vol. 20, no. 1, pp. 4–17, 2019.
- [386] L. S. Czarnecki and P. M. Haley, "Unbalanced Power in Four-Wire Systems and Its Reactive Compensation," *IEEE Transactions on Power Systems*, vol. 30, no. 1, pp. 53– 63, Feb. 2015.
- [387] AIEE Committee, "Apparent Power in Three-Phase Systems," *Transactions of AIEE*, vol. 39, pp. 1450–1455, 1920.
- [388] F. Buchholz, "The Apparent Three-Phase Power in the Event of an Uneven Load on the Three Branches," *Light Power*, pp. 9–11, Jan. 1922.
- [389] American National Standards Institute, "ANSI C12.20-2015: American National Standard for Electricity Meters—0.1, 0.2, and 0.5 Accuracy Classes," Feb. 2017.
- [390] T. Mooney and D. Martin, "Increasing Metering Accuracy by Optimizing the Analog to Digital Converter Characteristics," in *Proceedings of the IEEE Power Systems Conference: Advanced Metering, Protection, Control, Communication, and Distributed Resources*, Clemson, SC, Mar. 2006.
- [391] S. Bell, "A Beginner's Guide to Uncertainty of Measurement," *IEEE Transactions on Smart Grid*, vol. 11, no. 2, pp. 1–33, Aug. 1999.
- [392] SATEC Power Solutions Ltd, "Accuracy Class: A Small "S" That Makes a Big Difference," Jul. 2018, www.satec-global.com/sites/default/files/Application-note_Accuracy-Class_July2018.pdf
- [393] Electric Power Research Institute, "Accuracy of Digital Electricity Meters," Report Number 1020908, Palo Alto, CA, 2010.
- [394] P. WÄŹgierek and M. Konarski, "The Temperature Effect on Measurement Accuracy of the Smart Electricity Meter," *Electrical Review*, vol. 92, no. 8, pp. 148–150, 2016.
- [395] EnerNOC Inc., "The Demand Response Baseline," 2011. https://library.cee1.org/sites/ default/files/library/10774/CEE_EvalDRBaseline_2011.pdf.
- [396] S. Bhela, V. Kekatos, and S. Veeramachaneni, "Enhancing Observability in Distribution Grids Using Smart Meter Data," *IEEE Transactions on Smart Grid*, vol. 9, no. 6, pp. 5953–5961, Nov. 2018.
- [397] S. Bhela, V. Kekatos, L. Zhang, and S. Veeramachaneni, "Enhancing Observability in Power Distribution Grids," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Mar. 2017.
- [398] K. J. Caird, "Meter Phase Identification," U.S. Patent Number 0164473. https://patents .google.com/patent/US20100164473A1/en.
- [399] D. B. Arnold, M. Negrete-Pincetic, M. D. Sankur, D. M. Auslander, and D. S. Callaway, "Model-Free Optimal Control of VAR Resources in Distribution Systems: An Extremum

Seeking Approach," *IEEE Transactions on Power Systems*, vol. 31, no. 5, pp. 3583–3593, Sep. 2016.

- [400] M. L. Shelton, P. F. Winkelman, W. A. Mittelstadt, and W. J. Bellerby, "Bonneville Power Administration 1400-MW Braking Resistor," *IEEE Transactions on Power Apparatus* and Systems, vol. 94, no. 2, pp. 602–611, Mar. 1975.
- [401] J. F. Hauer, D. J. Trudnowski, and J. G. DeSteese, "A Perspective on WAMS Analysis Tools for Tracking of Oscillatory Dynamics," in *Proceedings of the IEEE Power Engineering Society General Meeting*, Tampa, FL, Jun. 2007.
- [402] International Council on Large Electric Systems, "Impact of Interactions among Power System Controls," CIGRE Technical Brochure, May 2000.
- [403] J. F. Hauer, W. A. Mittelstadt, K. E. Martin, J. Burns, H. Lee, J. Pierre, and D. J. Trudnowski, "Use of the WECC WAMS in Wide-Area Probing Tests for Validation of System Performance and Modeling," *IEEE Transactions on Power Systems*, vol. 24, no. 1, pp. 250–257, Feb. 2009.
- [404] L. Ljung, *System Identification Theory for the User*. Upper Saddle River, NJ: Prentice Hall, 1999.
- [405] L. Lampe, A. Tonello, and D. Shaver, "Power Line Communications for Automation Networks and Smart Grid," *IEEE Communications Magazine*, vol. 49, no. 12, pp. 26–27, Dec. 2011.
- [406] M. Yigit, V. C. Gungor, G. Tuna, M. Rangoussi, and E. Fadel, "Power Line Communication Technologies for Smart Grid Applications: A Review of Advances and Challenges," *Computer Networks*, vol. 70, no. 9, pp. 366–383, Sep. 2014.
- [407] R. Rao, S. Akella, and G. Guley, "Power Power Line Carrier (PLC) Signal Analysis of Smart Meters for Outlier Detection," in *Proceedings of the IEEE International Conference on in Smart Grid Communications*, Oct. 2011.
- [408] A. Sendin, I. Peña, and P. Angueira, "Strategies for Power Line Communications Smart Metering Network Deployment," *Energies*, vol. 7, pp. 2377–2420, 2014.
- [409] L. T. Berger, A. Schwager, and J. J. Escudero-Garzás, "Power Line Communications for Smart Grid Applications," *Journal of Electrical and Computer Engineering*, pp. 1–16, Mar. 2013.
- [410] S. Galli, A. Scaglione, and Z. Wang, "For the Grid and through the Grid: The Role of Power Line Communications in the Smart Grid," in *Proceedings of the IEEE*, vol. 99, no. 6, pp. 998–1027, Jun. 2011.
- [411] L. G. S. Costa, A. C. M. Queiroz, B. Adebisi, V. L. R. Costa, and M. V. Ribeiro, "Coupling for Power Line Communication: A Survey," *Journal of Communication and Information System*, vol. 32, no. 1, pp. 8–22, 2017.
- [412] H. Ferreira, L. Lampe, J. Newbury, and T. Swart, "Industrial and International Standards on PLC Base Networking Technologies," in *Power Line Communications: Theory and Applications for Narrowband and Broadband Communications over Power Lines*, S. Galli, M. Koch, H. Latchman, S. Lee, and V. Oksman, Eds. New York: Wiley, 2010, pp. 377–426.
- [413] D. Fink and R. J. Jeung, "Feasible Connectivity Solutions of PLC for Rural and Remote Areas," *Proceedings of the IEEE International Symposium on Power Line Communications and Its Applications*, Apr. 2008.
- [414] W. Liu, M. Sigle, and K. Dostert, "Channel Characterization and System Verification for Narrowband Power Line Communication in Smart Grid Applications," *IEEE Communications Magazine*, vol. 49, no. 12, pp. 28–35, Dec. 2011.

- [415] Y. Huo, G. Prasad, L. Atanackovic, L. Lampe, and V. C. M. Leung, "Cable Diagnostics with Power Line Modems for Smart Grid Monitoring," *IEEE Access*, vol. 7, pp. 60206– 60220, 2019.
- [416] L. Forstel and L. Lampe, "Grid Diagnostics: Monitoring Cable Aging Using Power Line Transmission," in *Proceedings of the IEEE International Symposium on Power Line Communications and its Applications*, Apr. 2017.
- [417] F. Yang, W. Ding, and J. Song, "Non-intrusive Power Line Quality Monitoring Based on Power Line Communications," in *Proceedings of the IEEE International Symposium on Power Line Communications and Its Applications*, Mar. 2013.
- [418] T. Erseghe, S. Tomasin, S. Member, and A. Vigato, "Topology Estimation for Smart Micro Grids via Powerline Communications," *IEEE Transactions on Signal Processing*, vol. 61, no. 13, pp. 3368–3377, Jul. 2013.
- [419] M. O. Ahmed and L. Lampe, "Power Line Communications for Low-Voltage Power Grid Tomography," *IEEE Transactions on Communications*, vol. 61, no. 12, pp. 5163–5175, Dec. 2013.
- [420] L. Lampe and M. O. Ahmed, "Power Grid Topology Inference Using Power Line Communications," in *Proceedings of the IEEE International Conference on Smart Grid Communications*, Oct. 2013.
- [421] Y. Huo, G. Prasad, L. Atanackovic, L. Lampe, and V. C. Leung, "Grid Surveillance and Diagnostics using Power Line Communications," in *Proceedings of the IEEE International Symposium on Power Line Communications and its Applications*, Apr. 2018.
- [422] R. Rao, S. Akella, and G. Guley, "Power Line Carrier (PLC) Signal Analysis of Smart Meters for Outlier Detection," in *Proceedings of the IEEE International Conference on Smart Grid Communications*, Oct. 2011.
- [423] H. J. Byun and S. G. Shon, "Cable and Phase Identification Based on Power Line Communication," *International Journal of Control and Automation*, vol. 8, no. 9, pp. 63–74, 2015.
- [424] J. J. Woo, H. J. Byun, and S. G. Shon, "Cable Identification as a New Application of Power Line Communication Technology," *Advanced Science and Technology Letters*, vol. 95, pp. 17–21, 2015.
- [425] F. Passerini and A. Tonello, "Smart Grid Monitoring Using Power Line Modems: Anomaly Detection and Localization," *IEEE Transactions on Smart Grid*, vol. 10, no. 6, pp. 6178–6186, Nov. 2019.
- [426] F. Passerini and A. Tonello, "Power Line Network Topology Identification Using Admittance Measurements and Total Least Squares Estimation," in *Proceedings of the IEEE International Conference on Communications*, Paris, France, May 2017.
- [427] A. M. Lehmann, K. Raab, F. Gruber, E. Fischery, R. Muller, and J. B. Huber, "A Diagnostic Method for Power Line Networks by Channel Estimation of PLC Devices," *Proceedings of the IEEE International Conference on Smart Grid Communications*, Nov. 2016.
- [428] M. Wang, A. J. Vandermaar, and K. D. Srivastava, "Review of Condition Assessment of Power Transformers in Service," *IEEE Electrical Insulation Magazine*, vol. 18, pp. 12–25, Nov. 2002.
- [429] A. Jahromi, R. Piercy, S. Cress, J. Service, and W. Fan, "An Approach to Power Transformer Asset Management Using Health Index," *IEEE Electrical Insulation Magazine*, vol. 25, no. 2, pp. 20–34, Mar. 2009.

- [430] C. Sun, P. R. Ohodnicki, and E. M. Stewart, "Chemical Sensing Strategies for Real-Time Monitoring of Transformer Oil: A Review," *IEEE Sensors Journal*, vol. 17, no. 18, pp. 5786–5806, Aug. 2017.
- [431] N. Moodley and C. T. Gaunt, "Low Energy Degradation Triangle for Power Transformer Health Assessment," *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 24, no. 1, pp. 639–646, Feb. 2017.
- [432] General Electric, "Multilin DGCC Capacitor Bank Controller," 2019. www .gegridsolutions.com/multilin/catalog/dgcc.htm.
- [433] Allen-Bradley, "Bulletin 1413 Capacitor Bank Controller," 2019. https://rexel-cdn.com/ products/1413-cap-me.pdf?i=8DB02F34-16CA-42C3-8131-30BB08CD0A68.
- [434] Tollgrade Communications, "Capacitor Bank Monitoring: Application Guide," 2014. www.enghousenetworks.com/tollgrade/smart-grid-resources/application-guides/.
- [435] J. Liu, "Dynamic Line Rating in Power Systems," Master's Thesis, Department of Electrical and Computer Engineering, University of California at Riverside, Riverside, CA, Mar. 2017.
- [436] CIGRE Study Committee B2, "Technical Brochure 324: Sag-Tension Calculation Methods for Overhead Lines," Jun. 2007.
- [437] D. Douglass, W. Chisholm, and G. Davidson, "Real-Time Overhead Transmission-Line Monitoring for Dynamic Rating," *IEEE Transactions on Power Delivery*, vol. 31, pp. 921–927, Jun. 2016.
- [438] F. P. G. Márquez, A. M. Tobias, J. M. P. Pérez, and M. Papaelias, "Condition Monitoring of Wind Turbines: Techniques and Methods," *Renewable Energy*, vol. 46, pp. 169–178, 2012.
- [439] ONYX InSight Inc., "CASE STUDY 1: Main Bearing Fault Detection and Grease Flushing," https://onyxinsight.com/monitoring-software/.
- [440] S. Mekhilef, R. Saidur, and M. Kamalisarvestani, "Effect of Dust, Humidity and Air Velocity on Efficiency of Photovoltaic Cells," *Renewable and Sustainable Energy Reviews*, vol. 16, no. 5, pp. 2920–2925, Jun. 2012.
- [441] K. Tsamaase, T. Ramasesane, I. Zibani, E. Matlotse, and K. Motshidisi, "Automated Dust Detection and Cleaning System of PV Module," *IOSR Journal of Electrical and Electronics Engineering*, vol. 12, no. 6, pp. 93–98, Nov. 2017.
- [442] B. Guo, W. Javed, B. W. Figgis, and T. Mirza, "Effect of Dust and Weather Conditions on Photovoltaic Performance in Doha, Qatar," in *Proceedings of the IEEE Workshop on Smart Grid and Renewable Energy*, Mar. 2015.
- [443] Z. Taylor, H. Akhavan-Hejazi, and H. Mohsenian-Rad, "Optimal Operation of Grid-Tied Energy Storage Systems Considering Detailed Device-Level Battery Models," *IEEE Transactions on Industrial Informatics*, pp. 1–12, Aug. 2019.
- [444] U.S. Department of Energy, "An Assessment of Energy Technologies and Research Opportunities—Chapter 5: Increasing Efficiency of Building Systems and Technogies," Sep. 2015. www.energy.gov/sites/default/files/2017/03/f34/qtr-2015-chapter5.pdf.
- [445] Z. Xu, X. Guan, Q.-S. Jia, J. Wu, D. Wang, and S. Chen, "Performance Analysis and Comparison on Energy Storage Devices for Smart Building Energy Management," *IEEE Transactions on Smart Grid*, vol. 3, no. 4, pp. 2136–2147, Dec. 2012.
- [446] C. Chen, J. Wang, Y. Heo, and S. Kishore, "MPC-Based Appliance Scheduling for Residential Building Energy Management Controller," *IEEE Transactions on Smart Grid*, vol. 4, no. 3, pp. 1401–1410, Sep. 2013.

- [447] L. A. Hurtado, P. H. Nguyen, and W. L. Kling, "Agent-Based Control for Building Energy Management in the Smart Grid Framework," in *Proceedings of the IEEE PES Innovative Smart Grid Technologies*, Istanbul, Turkey, Oct. 2014.
- [448] C. Dilouie, "All about occupancy and vacancy sensors," Aug. 2017. https:// lightingcontrolsassociation.org/2017/08/21/all-about-occupancy-and-vacancy-sensors/.
- [449] E. Samani, P. Khaledian, A. Aligholian, E. Papalexakis, S. Cun, M. H. Nazari, and H. Mohsenian-Rad, "Anomaly Detection in IoT-Based PIR Occupancy Sensors to Improve Building Energy Efficiency," in *Proceedings of the IEEE Innovative Smart Grid Technologies*, Washington, DC, Feb. 2020.
- [450] CSULB Research Foundation, "Internet of Things and Ubiquitous Sensing in University Building Energy Management: Design Optimization and Technology Demonstration." https://ceqanet.opr.ca.gov/2017038493.
- [451] SensMax Inc., "Real-Time Wireless Bidirectional People Counter," https://sensmax.eu/ devices/.
- [452] B. Howard, S. Acha, N. Shah, and J. Polak, "Implicit Sensing of Building Occupancy Count with Information and Communication Technology Data Sets," *Building and Environment*, vol. 157, pp. 297–308, Jun. 2019.
- [453] Enlighted Inc., "Smart Sensors." www.enlightedinc.com/system-and-solutions/iotsystem/smart-sensors/.
- [454] Leviton Inc., "Daylighting Control Products." www.leviton.com/en/products/ commercial/lighting-controls/daylighting-controls.
- [455] A. Akrami, P. Khaledian, H. Akhavan-Hejazi, A. Aligholian, E. Samani, and H. Mohsenian-Rad, "Impact on EMS on Academic Building Operation Report: CEC Project Report—EPIC-16-033," 2019.
- [456] E. Veldman and R. A. Verzijlbergh, "Distribution Grid Impacts of Smart Electric Vehicle Charging from Different Perspectives," *IEEE Transactions on Smart Grid*, vol. 6, no. 1, pp. 333–342, Jan. 2015.
- [457] S. Semsar, T. Soong, and P. W. Lehn, "On-Board Single-Phase Integrated Electric Vehicle Charger with V2G Functionality," *IEEE Transactions on Power Electronics*, vol. 35, no. 11, pp. 12072–12084, Nov. 2020.
- [458] F. S. Tidjani, A. Hamadi, A. Chandra, B. Saghir, B. Mounir, and M. Garoum, "Energy Management of Micro Grid Based Electrical Vehicle to the Building (V2B)," in *Proceedings of the IEEE International Renewable and Sustainable Energy Conference*, Agadir, Morocco, Nov. 2019.
- [459] F. Xie, M. Huang, W. Zhang, and J. Li, "Research on Electric Vehicle Charging Station Load Forecasting," in *Proceedings of the IEEE International Conference on Advanced Power System Automation and Protection*, Beijing, China, Oct. 2011.
- [460] M. Majidpour, C. Qiu, P. Chu, R. Gadh, and H. R. Pota, "Modified Pattern Sequence-Based Forecasting for Electric Vehicle Charging Stations," in *Proceedings of the IEEE International Conference on Smart Grid Communications*, Venice, Italy, Nov. 2014.
- [461] Pacific Gas and Electric, "Time of Use Pricing," www.portlandgeneral.com/residential/ power-choices/time-of-use/time-of-use-pricing,2020.
- [462] A. Primadianto and C.-N. Lu, "A Review on Distribution System State Estimation," *IEEE Transactions on Power Systems*, vol. 32, no. 5, pp. 3875–3883, Sep. 2017.
- [463] R. Hoffman, "Practical State Estimation for Electric," in *Proceedings of the IEEE PES Power Systems Conference and Exposition*, Atlanta, GA, Nov. 2006.
- [464] California Independent System Operator. www.caiso.com.

- [465] California Independent System Operator, "California ISO Open Access Same-Time Information System." http://oasis.caiso.com/.
- [466] H. Mohsenian-Rad, "Optimal Bidding, Scheduling, and Deployment of Battery Systems in California Day-Ahead Energy Market," *IEEE Transactions on Power Systems*, vol. 31, no. 1, pp. 442–453, Jan. 2016.
- [467] H. S. Jang, K. Y. Bae, H.-S. Park, and D. K. Sung, "Solar Power Prediction Based on Satellite Images and Support Vector Machine," *IEEE Transactions on Sustainable Energy*, vol. 7, no. 3, pp. 1255–1263, 2016 2016.
- [468] Google Maps. https://www.google.com/maps/@66.1495066,-150.2543188,2643m/ data=!3m1!1e3.
- [469] NASA Earth Observatory, "Camp Fire Rages in California." https://earthobservatory .nasa.gov/images/144225/camp-fire-rages-in-california.
- [470] C.Wai-Chow, B. Urquhart, M. Lave, A. Dominguez, J. Kleissl, J. Shields, and B. Washom, "Intra-Hour Forecasting with a Total Sky Imager at the UC San Diego Solar Energy Testbed," *Solar Energy*, vol. 85, no. 11, pp. 2881–2893, Nov. 2011.
- [471] A. Molaei, H. D. Taghirad, and J. Dargahi, "Extracting of Sagging Profile of Overhead Power Transmission Line Via Image Processing," in *Proceedings of the IEEE Canadian Conference on Electrical & Computer Engineering*, Quebec City, QC, May 2018.
- [472] J. Xie, A. Stefanov, and C.-C. Liu, "Physical and Cyber Security in a Smart Grid Environment," *Wiley Interdisciplinary Reviews: Energy and Environment*, vol. 5, no. 5, pp. 519–542, Mar. 2016.
- [473] P. Dong and Q. Chen, *LiDAR Remote Sensing and Applications*. Boca Raton, FL: CRC Press, 2018.
- [474] M. Frank, Z. Pan, B. Raber, and C. Lenart, "Vegetation Management of Utility Corridors Using High-Resolution Hyperspectral Imaging and LiDAR," in *Proceedings of the IEEE Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing*, Reykjavik, Iceland, Jun. 2010.
- [475] L. Matikainen, M. Lehtomäki, E. Ahokas, J. Hyyppä, M. Karjalainen, A. Jaakkola, A. Kukko, and T. Heinonen, "Remote Sensing Methods for Power Line Corridor Surveys," *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 119, pp. 10–31, Sep. 2016.
- [476] R. Ishino and F. Tsutsumi, "Detection System of Damaged Cables Using Video Obtained from an Aerial Inspection of Transmission Lines," in *Proceedings of the IEEE PES General Meeting*, Denver, CO, Jun. 2004.
- [477] R. McLaughlin, "Extracting Transmission Lines From Airborne LIDAR Data," IEEE Geoscience and Remote Sensing Letters, vol. 3, no. 2, pp. 222–226, Apr. 2006.
- [478] H. Ha, S. Han, and J. Lee, "Fault Detection on Transmission Lines Using a Microphone Array and an Infrared Thermal Imaging Camera," *IEEE Transactions on Instrumentation* and Measurement, vol. 61, no. 1, pp. 267–275, Jan. 2012.
- [479] B. Jiang, A. P. Sample, R. M. Wistort, and A. V. Mamishev, "Autonomous Robotic Monitoring of Underground Cable Systems," in *Proceedings of the IEEE International Conference on Advanced Robotics*, Seattle, WA, Jul. 2005.
- [480] W. Hongguang, J. Yong, L. Aihua, F. Lijin, and L. Lie, "Research of Power Transmission Line Maintenance Robots in SIACAS," in *Proceedings of the IEEE International Conference on Applied Robotics for the Power Industry*, Montreal, QC, Oct. 2010.

- [481] J. Rocha and J. Sequeira, "The Development of a Robotic System for Maintenance and Inspection of Power Lines," in *Proceedings of the International Symposium on Robotics*, Paris, France, Mar. 2004.
- [482] O. Menendez, F. A. A. Cheein, M. Perez, and S. Kouro, "Robotics in Power Systems: Enabling a More Reliable and Safe Grid," *IEEE Industrial Electronics Magazine*, vol. 11, no. 2, pp. 22–34, Jun. 2017.
- [483] B. Jiang and A. Mamishev, "Robotic Monitoring of Power Systems," *IEEE Transactions on Power Delivery*, vol. 19, no. 3, pp. 912–918, Jul. 2004.
- [484] J. Katrasnik, F. Pernus, and B. Likar, "A Survey of Mobile Robots for Distribution Power Line Inspection," *IEEE Transactions on Power Delivery*, vol. 25, no. 1, pp. 485–493, Jan. 2010.
- [485] K. L. Cummins, E. P. Krider, and M. D. Malone, "The USNational Lightning Detection NetworkTM and Applications of Cloud-to-Ground Lightning Data by Electric Power Utilities," *IEEE Transactions on Electromagnetic Compatibility*, vol. 40, no. 4, pp. 465– 480, Nov. 1998.
- [486] C. Wang and S. Wang, "The Automatic Routing System of Urban Mid-Voltage Distribution Network Based on Spatial GIS," *Proceedings of the International Conference on Power System Technology*, Nov. 2004.
- [487] T. Hong, P. Pinson, S. Fan, H. Zareipour, A. Troccoli, and R. J. Hyndman, "Probabilistic Energy Forecasting: Global Energy Forecasting Competition 2014 and Beyond," *International Journal of Forecasting*, vol. 32, no. 3, pp. 914–938, Jul. 2016.
- [488] J. Aparicio, J. Rosca, M. Mediger, A. Essl, K. Arzig, and C. Develder, "Exploiting Road Traffic Data for Very Short Term Load Forecasting in Smart Grids," in *Proceedings of the IEEE PES Conference on Innovative Smart Grid Technologies*, Washington, DC, Feb. 2014.
- [489] A. Nejat and H. Mohsenian-Rad, "Electric Load Forecasting: A Multi-Agent Systems Approach," in *Proceedings of the IEEE International Conference on Intelligent Transportation Systems*, Anchorage, AK, Sep. 2012.
- [490] Q. Guo, S. Xin, H. Sun, Z. Li, and B. Zhang, "Rapid-Charging Navigation of Electric Vehicles Based on Real-Time Power Systems and Traffic Data," *IEEE Transactions on Smart Grid*, vol. 5, no. 4, pp. 1969–1979, Jul. 2014.
- [491] M. Aiello and G. A. Pagani, "The Smart Grid's Data Generating Potentials," in Proceedings of the Federated Conference on Computer Science and Information Systems, Warsaw, Poland, Sep. 2014.
- [492] Y. Huang, M. Warnier, F. Brazier, and D. Miorandi, "Social Networking for Smart Grid Users," in *Proceedings of the IEEE International Conference on Networking, Sensing* and Control, Taipei, Taiwan, Apr. 2015.
- [493] Alternative Energy Institute, West Texas A & M University, www.windenergy.org/.
- [494] H. Akhavan-Hejazi, H. Mohsenian-Rad, and A. Nejat, "Developing a Test Data Set for Electric Vehicle Applications in Smart Grid Research," *Proceedings of the IEEE Vehicular Technology Conference*, Sep. 2014.