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- EXPERTISE Power Electronics, Power Systems, Control Systems, Renewable Energy, Energy Conversion
- AFFILIATION **National Renewable Energy Laboratory**, Golden, Colorado
Electrical Engineer, March 2013 – Present
- EDUCATION **University of Illinois at Urbana-Champaign**, Urbana, Illinois
Ph.D., Electrical and Computer Engineering, May 2013
M.S., Electrical and Computer Engineering, December 2009
Texas State University, San Marcos, Texas
B.S., Physics, and B.M., Music, May 2008
- JOURNAL PUBLICATIONS [13] B. Kroposki, **B. Johnson**, Y. Zhang, V. Gevorgian, P. Denholm, B. Hodge, B. Hannegan, “Achieving 100% renewable grids: Operating electric power systems with extremely high levels of variable renewable energy,” *IEEE Power and Energy Magazine*, vol. 15, no. 2, pp. 61–73, March 2017.
- [12] M. Sinha, F. Dörfler, **B. Johnson**, S. Dhople, “Uncovering droop control laws embedded within the nonlinear dynamics of Van der Pol oscillators,” *IEEE Transactions on Control of Network Systems*, vol. 4, no. 2, pp. 347–358, June 2017.
- [11] **B. Johnson**, P. Krein, “An Analytical time-domain expression for the net ripple produced by parallel interleaved converters,” *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 64, no. 3, pp. 289–293, March 2017.
- [10] J. Cale, E. Dall’Anese, **B. Johnson**, and P. Young, L. Holton, D. Zimmerle, “A Method for mitigating communication latency errors in remote hardware-in-the-loop experiments,” *IEEE Transactions on Industrial Electronics*, 2016, (Submitted).
- [9] **B. Johnson**, M. Sinha, N. Ainsworth, F. Dorfler, and S. Dhople, “Synthesizing virtual oscillators to control islanded inverters,” *IEEE Transactions on Power Electronics*, vol. 31, no. 8, pp. 6002–6015, Aug. 2016.
- [8] E. Dall’Anese, S. Dhople, **B. Johnson**, G. Giannakis, “Optimal dispatch of residential photovoltaic inverters under forecasting uncertainties,” *IEEE Journal of Photovoltaics*, vol. 5, no. 1, pp. 350–359, Jan. 2015.
- [7] E. Dall’Anese, S. Dhople, **B. Johnson**, G. Giannakis, “Decentralized optimal dispatch of photovoltaic inverters in residential distribution systems,” *IEEE Transactions on Energy Conversion*, vol. 29, no. 4, pp. 957–967, Dec. 2014.
- [6] **B. Johnson**, S. Dhople, A. Hamadeh, and P. Krein, “Synchronization of parallel single-phase inverters using virtual oscillator control,” *IEEE Transactions on Power Electronics*, vol. 29, no. 11, pp. 6124–6138, Nov. 2014.
- [5] S. Dhople, **B. Johnson**, F. Dörfler, and A. Hamadeh, “Synchronization of nonlinear circuits in generalized dynamic electrical networks,” *IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications*, vol. 61, no. 9, pp. 2677–2690, Sept. 2014.
- [4] **B. Johnson**, S. Dhople, A. Hamadeh, and P. Krein, “Synchronization of nonlinear oscillators in an LTI electrical power network,” *IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications*, vol. 61, no. 3, pp. 834–844, Mar. 2014.

- [3] **B. Johnson**, S. Dhople, J. Cale, A. Hamadeh, and P. Krein, “Oscillator-based inverter control for islanded three-phase microgrids,” *IEEE Journal of Photovoltaics*, vol. 4, no. 1, pp. 387–395, Jan. 2014.
- [2] P. Shenoy, K. Kim, **B. Johnson**, and P. Krein, “Differential power processing for increased energy production and reliability of photovoltaic systems,” *IEEE Transactions on Power Electronics*, vol. 28, no. 6, pp. 2968–2979, June 2013.
- [1] **B. Johnson**, A. Davoudi, P. Chapman, and P. Sauer, “A unified dynamic characterization framework for microgrid systems,” *Electric Power Components and Systems*, vol. 40, no. 1, pp. 93–111, Nov. 2011.
- CONFERENCE PUBLICATIONS [17] M. Sinha, **B. Johnson**, M. Rodriguez, J. Poon, and S. Dhople, “Decentralized interleaving of paralleled dc-dc buck converters,” in *Proc. 2017 Workshop on Modeling and Control of Power Electronics*, 2017, To Appear.
- [16] **B. Johnson**, M. Rodriguez, M. Sinha, and S. Dhople, “Comparison of virtual oscillator and droop control in islanded microgrids,” in *Proc. 2017 Workshop on Modeling and Control of Power Electronics*, 2017, To Appear.
- [15] V. Purba, S. Jafarpour, **B. Johnson**, F. Bullo, and S. Dhople, “Reduced-order structure-preserving model for parallel-connected three-phase grid-tied inverters,” in *Proc. 2017 Workshop on Modeling and Control of Power Electronics*, 2017, To Appear.
- [14] Y. Lin, **B. Johnson**, V. Purba, V. Gevorgian, and S. Dhople, “Stability assessment of a system comprising a single machine and inverter with scalable ratings,” in *Proc. 2017 North American Power Symposium*, 2017, To Appear.
- [13] **B. Johnson**, S. Salapaka, B. Lundstrom, M. Salapaka, “Optimal structures for voltage controllers in inverters,” in *Proc. 2016 International Symposium on Mathematical Theory of Networks and Systems*, 2016.
- [12] M. Sinha, F. Dörfler, **B. Johnson**, and S. Dhople, “Synchronization of Lienard-type oscillators in uniform electrical networks,” in *Proc. 2016 American Control Conference*, 2016, pp. 4311–4316.
- [11] M. Sinha, **B. Johnson**, N. Ainsworth, F. Dörfler, and S. Dhople, “Nonlinear supersets to droop control,” in *Proc. 2015 Workshop on Control and Modeling for Power Electronics*, 2015, pp. 1–6.
- [10] M. Sinha, F. Dörfler, **B. Johnson**, and S. Dhople, “Virtual oscillator control subsumes droop control,” in *Proc. 2015 American Control Conference*, 2015, pp. 2353–2358.
- [9] S. Salapaka, **B. Johnson**, B. Lundstrom, S. Kim, S. Collyer, and M. Salapaka, “Viability and analysis of implementing only voltage-power droop for parallel inverter systems,” in *Proc. Control and Decision Conference*, 2014, pp. 3246–3251.
- [8] F. Dörfler, S. Dhople, **B. Johnson**, and A. Hamadeh, “Synchronization of nonlinear circuits in dynamic electrical networks,” in *Proc. IEEE European Control Conference*, 2014, pp. 552–557.
- [7] S. Dhople, **B. Johnson**, F. Dörfler, and A. Hamadeh, “Virtual oscillator control for voltage source inverters,” in *Proc. Allerton Conference on Communication, Control, and Computing*, 2013, pp. 1359–1363.
- [6] **B. Johnson**, A. Lentine, P. Krein, and Z. Zheng, “A single-stage three-phase ac module for high-voltage photovoltaics” in *Proc. IEEE Applied Power Electronics Conference*, 2012, pp. 885–891.

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- [4] A. Bazzi, K. Kim, **B. Johnson**, P. Krein, and A. Dominguez-Garcia, “Fault impacts on solar power unit reliability,” in *Proc. IEEE Applied Power Electronics Convention*, 2011, pp. 1223–1231.
- [3] **B. Johnson**, P. Krein, and P. Chapman, “Photovoltaic ac module composed of a very large number of interleaved inverters,” in *Proc. IEEE Applied Power Electronics Convention*, 2011, pp. 976–981.
- [2] K. Kroeger, S. Choi, A. Bazzi, **B. Johnson**, and P. Krein, “A digital implementation of continuous-time ripple correlation control for photovoltaic applications,” in *Proc. IEEE Power and Energy Conference at Illinois*, 2010, pp. 7–11.
- [1] **B. Johnson**, A. Davoudi, P. Chapman, and P. Sauer, “Microgrid dynamics characterization using the automated state model generation algorithm,” in *Proc. IEEE International Symposium on Circuits and Systems*, 2010, pp. 2758–2761.

TEACHING
EXPERIENCE

[**Fall 2016, Fall 2017**], ECEN 5008: *Power Systems Analysis and Control*, Role: Instructor, University of Colorado Boulder, Department: Electrical, Computer, and Energy Engineering.

GRANTS

- [**PI**], “Wide-Bandgap Modular Architectures for Medium Voltage Energy Conversion in Utility-Scale Wind and Solar,” National Renewable Energy Laboratory: Lab Directed R&D, Oct. 2017–Sept. 2019, Team Members: NREL (lead), University of Colorado Boulder, Amount: \$400,000.
- [**PI**], “Stabilizing the Power System in 2035 and Beyond: Evolving from Grid-Following to Grid-Forming Distributed Inverter Controllers,” Department of Energy –Solar Energy Technologies Office, Oct. 2015–Sept. 2018, Agreement # 30364, Amount: \$3,849,999.
- [**PI**], “Optimal Inverter Dispatch: Facilitating High PV Penetration with Optimization and Grid Informatics,” National Renewable Energy Laboratory: Lab Directed R&D, Oct. 2014–Sept. 2016, Amount: \$385,774.
- [**Key Personnel**], “A Robust Distributed Framework for Flexible Power Grids,” Department of Energy – ARPA-E, Spring 2016–Spring 2018, Team Members: University of Minnesota (lead), NREL, University of Tennessee, DynaPower LLC, Amount: \$2,950,000.
- [**Key Personnel**], “Community Control of Distributed Resources for Wide Area Reserve Provision,” Department of Energy – Grid Modernization Laboratory Consortium, Spring 2016–Spring 2018, Collaborators: Lawrence Berkeley National Lab (lead), Sandia, Riverside Public Utility, Smarter Grid Solutions, Amount: \$3,250,000 (\$500,000 NREL share).

PATENTS

- P. Krein, **B. Johnson**, S. Dhople, and A. Hamadeh, “Virtual oscillator control of power electronic inverters,” U.S. Patent # (9,484,745), 2016.
- B. Johnson**, P. Krein, A. Lentine, “Microinverters for employment in connection with photovoltaic modules,” Sandia National Laboratories, U.S. Patent # (9,143,053), 2015.
- B. Johnson**, P. Krein, and P. Chapman, “Inverter array with localized inverter control,” SolarBridge Technologies, U.S. Patent # (8,842,454), 2014.

- HONORS AND AWARDS
- NREL Outstanding Mentor Award (2015, 2016, 2017)
 - NREL Chairman’s Award for Exceptional Performance (2013)
 - National Science Foundation Graduate Research Fellowship (2010-2013)
 - University of Illinois Graduate College Fellowship (2008-2010)
 - Support for Under-Represented Groups in Engineering Fellowship (2008-2010)
 - Outstanding Presentation Award – Applied Power Electronics Conference (2011)
 - Outstanding Graduating Physics Major (2008)
 - Houston Louis Stokes Alliance for Minority Participation Scholarship (2006-2008)

- SERVICE
- Editorial Experience:
- Associate Editor for *IEEE Transactions on Energy Conversion* (2016–present)
 - Guest Editor for *IEEE Transactions on Energy Conversion* Special Issue: Advanced Distributed Control of Energy Conversion Devices and Systems (2015)
- Conference Service:
- Technical Program Committee: *IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)* (2015)
 - Session Chair: *IEEE Power and Energy Conference at Illinois* (2011, 2012)
 - Volunteer Coordinator: *IEEE Energy Conversion Conference and Exposition* (2013)

- PROFESSIONAL EXPERIENCE
- National Renewable Energy Laboratory, Golden, CO**
- Electrical Engineer* **March 2013 – Present**
- Wrote proposals and secured research funding from various funding agencies.
 - Acted as Principal Investigator on multiple projects where responsibilities included acting as technical lead, coordinating activities of staff, reporting to funding agencies, and ensuring that project deliverables were completed on schedule.
 - Developed techniques for modeling, control, and analysis of distributed power systems, microgrids, and power electronics.
- Sandia National Laboratories – Intern** **Summer 2011**
- SolarBridge Technologies – Intern** **Summer 2010**
- Avenson Audio – Intern** **2006 – 2008**