

## Zhifang Wang, PhD

Assistant Professor

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### Education

- Ph.D., Cornell University, Electrical and Computer Engineering, Ithaca, NY, USA, Aug 2005.  
Dissertation: **Bluetooth Enabled Wireless Network and Its application in Electric Power Systems**,  
Advisor: Dr. Robert J. Thomas, IEEE life Fellow
- M.S., Tsinghua University, Electrical Power Engineering, Beijing, China, Aug 1998  
Dissertation: **Secondary Voltage Control**, Advisor: Dr. Qiang Lu, IEEE Fellow
- B.S., Tsinghua University, Department of Electrical Power Engineering, Beijing, China 1995  
Dissertation: **Dynamic Long-term Voltage Stability**, Advisor: Dr. Yuanzhang Sun, IEEE Senior Member

### Appointments

- *Assistant Professor*, ECE, Virginia Commonwealth University, 2012- Present
- *Associate Specialist*, ECE, University of California, Davis, CA, 2010- 2012
- Postdoc, Information Trust Institute, University of Illinois at Urbana-Champaign, 2008-2010
- Postdoc, Electrical and Computer Engineering, Cornell University, 2005-2008

### Research Interests

Power System Modeling and Optimization  
Integration of Renewable Generation  
Grid Vulnerability Analysis  
Voltage Stability and Controls  
Smart Grid Communication Architecture

### Teaching Experiences

EGRE 471 Power System Analysis (spring 2013, fall 2013, fall 2014, spring 2016, spring 2017)  
EGRE 671 Advanced Power System Analysis (Power System Operation and Controls) – Graduate level  
(spring 2013, fall 2013, fall 2014, spring 2016)  
EGRE 573 Sustainable and Efficient Power Systems (spring 2015, fall 2016)  
EGRE 336 Intro Communication Systems (spring 2014, spring 2015)  
EGRE 444 Communication Systems (fall 2015)  
EGRE 402 Capstone Senior Design Projects (fall 2012, spring & fall 2013, spring & fall 2014, spring &  
fall 2015, spring 2016)  
EGRE 692 Independent Study: Power Electronics (fall 2015)  
EGRE 697 Directed Research (offered each semester since spring 2013 for my graduate students)

### Honors and Awards

HICSS'48 Best Paper Award (2015)  
IEEE Donald G. Fink Award (2013)  
IEEE Senior Member (2012)  
Cornell Graduate Fellowship (1998)  
Chinese Society for Electrical Engineering Scholarship First Prize (1995)

**Funded Research Projects** (my share total since joining VCU: **\$489.5k**)

1. PI, *Random Topology Power Grid Modeling and an Automated Simulation Platform*, DoE-CERTS, through subcontract with Lawrence Berkley National Lab, June 2014 - Dec 2017, \$248,000. (my share \$248k)
2. Co-PI, *Optimizing the Grid Integration of Distributed Solar Energy through Smart Grid Technology, Power Controls, & Public Policy Initiatives.*, VCU PERQ Award, Aug 2015- Dec 2016, \$29,201. (my share \$11.5k)
3. PI, Synthetic Data for Power Grid R&D, DoE ARPA-E, June 2016-June 2018, \$1,028,325. (my share \$230k)

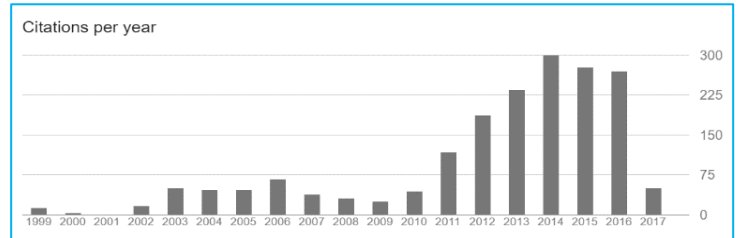
**Publications** (Supervised student coauthor is indicated with an asterisk `\*`)

**Summary:**

Type	Counts		Recently Submitted
	Published since 2012 (including published + accepted)	Total Published	
Journal Paper	1	12	2
Conference Paper	15	35	3
Book Chapters	1	3	-
Total	17	50	5

**Google Scholar Citation Record:**

<u>Citation indices</u>	All	Since 2012
<u>Citations</u>	1845	1335
<u>h-index</u>	15	12
<u>i10-index</u>	19	16



**Book Chapters**

- [BC1] Z. Wang, A. Scaglione, R. J. Thomas, contributed book chapter, “**Power Grid Network Analysis for Smart Grid Applications**”, chapter 7 in *Smart Grids: Clouds, Communications, Open Source, and Automation*, edited by David Bakken, CRC Press, 2014.
- [BC2] Z. Wang, A. Scaglione, R. J. Thomas, contributed book chapter, “**Electrical Centrality Measures for Power Grids**”, chapter 12 in *Control and Optimization Theory for Electric Smart Grids*, edited by M. Ilic, and A. Chakraborty, Springer, 2012.
- [BC3] A. Scaglione, Z. Wang, \*M. Alizadeh, contributed book chapter, “**New Models for Networked Control in Smart Grid**”, chapter 2 in *Smart Grid Communications and Networking*, edited by E. Hossain, Z. Han, and H. V. Poor, Cambridge University Press, 2011.

**Journal Articles:**

- [J14] A. Birchfield, E. Schweitzer, \*M. H. Athari, et al., and Z. Wang, “**Validation Metrics to Assess the Realism of Synthetic Power Grids**”, IEEE trans. on Power Systems, submitted Mar 2017, passed the first round of review. (IF: 3.342, top journal in the area of power system research)

- [J13] \*M. H. Athari and Z. Wang, “**Impacts of Wind Power Uncertainty on Grid Vulnerability to Cascading Overload Failures**”, IEEE trans. on Sustainable Energy, submitted Jan 2017, passed the first round of review. (IF: 3.727, top journal in the area of renewable generation research)
- [J12] \*S. H. Elyas, Z. Wang, “**Improved Synthetic Power Grid Modeling with Correlated Bus Type Assignments**”, IEEE Trans on Power Systems. (accepted Dec 2016, available in IEEE explorer). (IF: 3.342, top journal in the area of power system research)
- [J11] 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 the special issue "Smart Grid: The Electric Energy System of the Future," Proceedings of the IEEE, 99(6):998-1027, 2011. (IF: 5.629, citation 653)  
IEEE Xplore Top 100 Downloaded Articles for five months from June to October 2011, selected by the IEEE Communication Society as one of the best readings in PLC. Receive the 2013 IEEE Donald G. Fink Prize Paper Award
- [J10] \*M. Alizadeh, \*X. Li, Z. Wang, A. Scaglione, R. Melton, “**Demand Side Management in the Smart Grid: Information Processing for the Power Switch**”, IEEE Signal Processing Magazine: Special Issue on Smart Grid, 2011. (IF: 6.671, citation 67)
- [J9] Z. Wang, R. J. Thomas, and A. Scaglione, “**Generating Statistically Correct Random Topologies for Testing Smart Grid Communication and Control Networks**”, *IEEE Transactions on Smart Grid*, volume 1(1):28-39, 2010. (IF: 3.190, citation 155, top journal in the area of smart grid research)
- [J8] Z. Wang, R. J. Thomas, and Z. J. Haas, “**Performance comparison of Bluetooth scatternet formation protocols for multi-hop networks**”, *Wireless Networks*, volume 15(2), p.209–226, 2009. (IF: 1.590, citation 21)
- [J7] \*X. Yao, Y. Sun, Z. Wang, “**Studies on the Optimal Allocation of Reactive Power Sources**”, *Automation of Electric Power Systems*, vol. 23(3), 1999. (IF: 3.939, citation 18)
- [J6] Y. Sun, Z. Wang, \*X. Yao, “**Study on Secondary Voltage control of Power System**”, *Automation of Electric Power Systems*, vol. 23(9), p.9-14, 1999. (IF: 3.939, citation 66)
- [J5] Y. Sun, Z. Wang, “**OLTC Simulation Model and its Impact on the Stability of Voltage and Reactive Power**”, *Automation of Electric Power Systems*, vol. 22 (5), p.10-13, 1998. (IF: 3.939, citation 6)
- [J4] Z. Wang, Y. Sun, G. Zhang, Y. Huang, “**Simulation Analysis of Nonlinear Optimal Excitation Controllers Improving the Stability of the Central-China Power System**”, *Power System Technology*, vol. 22(3), p.11-13, 1998. (IF: 3.449, citation 5)
- [J3] Y. Sun, Z. Wang, “**Dynamic Load Restoration Modeling and Its Impact on Voltage Stability**”, *Automation of Electric Power Systems*, vol. 21(1), p. 29-32, 1997. (IF: 3.939, citation 4)
- [J2] Y. Sun, Z. Wang, Q. Lu, “**The Effects of Static Var Compensator On the Voltage Stability**”, *Proceedings of the Chinese Society for Electrical Engineering*, volume 17(6), p.373-376, 1997. (IF: 4.239, citation 88)
- [J1] Y. Sun, Z. Yang, Z. Wang, Q. Lu, “**Voltage Stability Improvement Using ASVG Nonlinear Control**”, *Automation of Electric Power Systems*, volume 20(6), p.21-26, 1996. (IF: 3.939, citation 21)

### Conference Papers

- [C38] \*M. H. Athari, Z. Wang, “**Sequential Optimal Placement of Distributed Photovoltaics using Downstream Power Index**”, 2017 North American Power Symposium (NAPS), Sep 17-19, 2017. (Submitted)
- [C37] \*S. H. Elyas, \*H. Alwan, \*H. Sadeghian, Z. Wang, “**Optimized Household Demand Management with Local Distributed Solar Generation**”, 2017 North American Power Symposium (NAPS), Sep 17-19, 2017. (Submitted)

- [C36] \*F. Liu, Z. Wang, “**A Novel Adaptive Genetic Algorithm for Wind Farm Layout Optimization**”, 2017 North American Power Symposium (NAPS), Sep 17-19, 2017. (Submitted)
- [C35] \* S. H. Elyas, Z. Wang, R. J. Thomas, “**On the Statistical Settings of Generation Capacities and Dispatch in a Synthetic Grid Modeling**”, 10th Bulk Power Systems Dynamics and Control Symposium (IREP’2017), Espinho, Portugal, Aug 27-Sep 1 2017. (Accepted, to appear)
- [C34] \*M. H. Athari, Z. Wang, “**Statistical Study on Transformer Parameters for the Validation of Synthetic Grid Modeling**”, 10th Bulk Power Systems Dynamics and Control Symposium (IREP’2017), , Espinho, Portugal, Aug 27-Sep 1 2017. (Accepted, to appear)
- [C33] \*M. H. Athari, Z. Wang, “**Studying Cascading Overload Failures under High Penetration of Wind Generation**”, 2017 IEEE PES General Meeting, Chicago, IL USA, July 16-20, 2017. (Accepted, to appear)
- [C32] \*M. H. Athari, Z. Wang, Seyyed H. Elyas, “**Time-Series Analysis of Photovoltaic Distributed Generation Impacts on a Local Distributed Network**”, PowerTech 2017, Manchester, UK, June 18-22, 2017. (Accepted, to appear)
- [C31] \*H. Sadeghian, \*M. H. Athari, Z. Wang “**Optimized Solar Photovoltaic Generation in a Real Local Distribution Network**”, IEEE PES 2017 Innovative Smart Grid Technologies (ISGT2017) Conference, Arlington, VA USA, Apr 23-26, 2017.
- [C30] Z. Wang, \*Seyyed H. Elyas, “**On the Scaling Property of Power Grids**”, HICSS’50, Big Island, HI, Jan 4-7, 2017.
- [C29] \*Seyyed H. Elyas, Z. Wang, “**Statistical Analysis of Transmission Line Capacities for the Random Topology Power Grid Modeling**”, IEEE PES 2016 Innovative Smart Grid Technologies (ISGT2016) Conference, Minneapolis, MN USA, Sep 6-9, 2016.
- [C28] \*M. H. Athari, Z. Wang, “**Modeling the Uncertainties in Renewable Generation and Smart Grid Loads for the Study of the Grid Vulnerability**”, IEEE PES 2016 Innovative Smart Grid Technologies (ISGT2016) Conference, Minneapolis, MN USA, Sep 6-9, 2016.
- [C27] Z. Wang, \*S. H. Elyas, R. J. Thomas, “**Generating Synthetic Power System Data with Accurate Electric Topology and Parameters**”, the 51st International Universities Power Engineering Conference (UPEC 2016), Coimbra, Portugal, Sep 6-9, 2016.
- [C26] \*S. H. Elyas, Z. Wang, “**A Multi-objective Optimization Algorithm for Bus Type Assignments in Random Topology Power Grid Model**”, HICSS’49, Kauai, HI, Jan 2016.
- [C25] Z. Wang, \*S. H. Elyas, R. J. Thomas, “**A Novel Measure to Characterize the Bus Type Assignments of Realistic Power Grids**”, PowerTech 2015, Eindhoven, Netherlands, June 2015.
- [C24] Z. Wang, R. J. Thomas, “**On Bus Type Assignments in Random Topology Power Grid Models**”, HICSS’48, Kauai, HI, Jan 2015. (HICSS’48 Best Paper Award).
- [C23] Z. Wang, “**Managing Microgrid Demands with Adaptive Hybrid Load Forecasting**”, NSF-UMN Workshop on Electric Power Curriculum, Minneapolis MN, Oct 2014.
- [C22] Z. Wang, “**A Fast and Adaptive Load Forecasting Model for Microgrid Demands**”, Darnell Energy Summit, Richmond, VA, Sep 2014.
- [C21] \*F. Liu, Z. Wang, “**Electric Load Forecasting Using Parallel RBF Neural Network**”, invited paper to the special session “**Information Processing in the Smart Grid**”, 1st IEEE Global Conference on Signal and Information Processing, Austin, Texas, December 2013, p.531-534.
- [C20] Z. Wang, A. Scaglione, “**The impact of volatile generation/load profile in Smart Grid on the grid vulnerability to cascading overload failures**”, special session “**Smart Grid Communication and Networks**”, Asilomar Conference, Pacific Grove, CA, Dec 2012.

- [C19] Z. Wang, \*X. Li, V. Muthukumar A. Scaglione, S. Peisert, C. McParland “**Networked Loads in the Distribution Grid**”, Invited Paper to the special session “Information processing for smart grid” 2012 APSIPA Conference, Hollywood, CA, Dec 2012.
- [C18] Z. Wang, A. Scaglione, “**Comparison of Grid Vulnerability Measures to Cascading Overload Failures**”, Invited Paper to the special session “Information processing for smart grid” 2012 APSIPA Conference, Hollywood, CA, Dec 2012.
- [C17] C. Chen, S. Kishore, Z. Wang, \*M. Alizadeh, A. Scaglione, “**A Cournot Game Analysis on Market Effects of Queuing Energy Request as Demand Response**”, 2012 IEEE Power & Energy Society General Meeting, San Diego, CA, July 2012.
- [C16] \*M. Alizadeh, Z. Wang, A. Scaglione, C. Chen, S. Kishore, “**On the Market Effects of Queuing Energy Requests as an Alternative to Storing Electricity**”, 2012 IEEE Power & Energy Society General Meeting, San Diego, CA, July 2012.
- [C15] \*X. Li, Z. Wang, A. Scaglione, “**Decentralized Data Processing and Management in Smart Grid via Gossiping**”, invited paper to IEEE 7<sup>th</sup> Sensor Array and Multichannel Signal Processing Workshop, Hoboken, NJ, 2012.
- [C14] Z. Wang, A. Scaglione, R. J. Thomas, “**A Markov-Transition Model for Cascading Failures in Power Grids**”, HICSS’45, Jan 4-7, 2012, Maui, Hawaii.
- [C13] \*M. Alizadeh, Z. Wang, A. Scaglione, “**Demand Side Management Trends in the Power Grid**”, IEEE 4<sup>th</sup> International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP 2011), Dec 13-16, 2011, San Juan, Puerto Rico.
- [C12] S. Galli, A. Scaglione, and Z. Wang, “**Power Line Communications and the Smart Grid**”, 1<sup>st</sup> IEEE International Conference on Smart Grid Communications (SmartGridComm), Gaithersburg, Maryland, Oct 4-6 2010.
- [C11] Z. Wang, A. Scaglione and R.J. Thomas, “**Compressing Electrical Power Grids**”, 1st IEEE International Conference on Smart Grid Communications (SmartGridComm), Gaithersburg, Maryland, October 4-6, 2010.
- [C10] Z. Wang, A. Scaglione and R.J. Thomas, “**Electrical Centrality Measures for Electric Power Grid Vulnerability Analysis**”, invited article for the 49th IEEE Conference on Decision and Control, Atlanta, Georgia, December 15-17, 2010.
- [C9] \*M. Alizadeh, A. Scaglione, and Z. Wang, “**On the impact of Smart Grid metering infrastructure on load forecasting**”, invited article for the 48th Annual Allerton Conference on Communication, Control, and Computing, p. 1628-1636, Monticello, Illinois, Sep29 – Oct 1, 2010.
- [C8] Z. Wang, A. Scaglione and R. J. Thomas, “**The Node Degree Distribution in Power Grid and Its Topology Robustness under Random and Selective Node Removals**”, the 1<sup>st</sup> IEEE International Workshop on Smart Grid Communications, Cape Town, South Africa, May 2010.
- [C7] Z. Wang, A. Scaglione and R. J. Thomas, “**On Modeling Random Topology Power Grids for Testing Decentralized Network Control Strategies**”, the 1<sup>st</sup> IFAC Workshop on Distributed Estimation and Control in Networked System, NecSys’09, September 24-26, 2009
- [C6] Z. Wang, A. Scaglione and R. J. Thomas, “**Generating Random Topology Power Grids**”, the 41<sup>st</sup> Annual Hawaii International Conference on System Sciences, HICSS-41, January, 2008
- [C5] \*S. Kirti, Z. Wang, A. Scaglione, and R. Thomas, “**On the Communication Architecture for Wide-Area Real-Time Monitoring in Power Networks**”, the 40<sup>th</sup> Annual Hawaii International Conference on System Sciences, HICSS-40, Big Islands, Jan 2007
- [C4] C. Jaeseok, R. Thomas, Z. Wang, A. El-Keib, R. Billinton, “**A study on probabilistic optimal reliability**

**criterion determination in composite power system expansion planning**”, IEEE Power Engineering Society General Meeting, p.1277 – 1284, volume (2), June 12-16, 2005.

- [C3] Z. Wang, Z. Haas, and R. J. Thomas, “**BlueNet II – A Detailed Realization of the Algorithm and Performance Analysis**”, HICSS-36, Big Island, Hawaii, January 2003.
- [C2] Z. Wang, R. J. Thomas, Z. Haas, “**Bluenet - a New Scatternet Formation Scheme**”, 35<sup>th</sup> Hawaii International Conference on System Science, HICSS-35, Big Island, Hawaii, January 2002.
- [C1] Y. Sun, C. Sun, Z. Wang, Q. Lu, “**Voltage Security Enhancement Using ASVG Nonlinear Control**”, the International Conference on Energy Management and Power Delivery, IEEE EMPD-1995, p. 337-341, Piscataway, NJ, 1995.

### **Invited Talks and Presentations**

- 2017 VCU, Department of Statistics, “Statistical Modeling of Power Grid Uncertainties and Vulnerability”.
- 2017 DoE ARPA-e Review, “Statistical Modeling of Transformer Parameters”.
- 2016 DoE ARPA-e Review, “Scaling Properties of Power Grids and Verification Measures of Synthetic Grid Modeling”.
- 2016 University of Illinois at Urbana-Champaign, ECE Seminar, “Synthetic Grid Modeling with Random Small-world Topology and Electrical Parameters”
- 2015 Dominion Workshop, “VCU EPES Lab: Research Projects and Collaboration Opportunities”.
- 2014, 2015, 2016, DoE CERTS Review, “Synthetic Grid Modeling and Simulation Platform”.
- 2014 NSG-UMN workshop, “Managing Micro-grid Demands”.
- 2012 Santa Fe Institute workshop: Power Grids as Complex Networks, “Cascading Overload Failures in Power Grid”
- 2011 SAMSI Workshop: Scientific Problems for the Smart Grid Workshop, “Power Grid Vulnerability to Cascading failures”.
- 2011 TCIPG Industry Workshop, “Metrics of power grid vulnerability to cascading failures”
- 2010 SAMSI seminar on the applications of network theory to smart grid, “Decentralized Monitoring and Control Architecture for Smart Grids”
- 2010 TCIPG Seminar, “Electrical Centrality Measures for Electrical Power Grid Vulnerability Analysis”
- 2008 TCIP Industry Workshop, “Random Topology Power Grids”

### **Completed Graduate Advisees:**

- PhD Degree:
  - Seyyed Hamid Elyas, “Synthetic Power Grid Modeling based on Statistical Analysis”  
Date Graduated: May 2017
- Master Degree:
  - Shiyang Song, research project “Power Quality Analysis of Microgrid”.  
Date Graduated: Aug 2015, Employment: **Dominion Virginia Power**  
Passed national power engineer exams and became a **Certified Power Engineer** in 2016

### **Student Advising:**

Current Research Students under my supervision in the EPES lab:

- PhD students: 3
  - Hayder Alwan (Fall 2014 ---)
  - Mir Hadi Athari (Fall 2015---)
  - Hamidreza Sadeghian (Fall 2016---)
- MS students: 3
  - Nathaniel Moore (Fall 2014 ---)
  - Wesley Barrier (Fall 2015 ---)
  - Tianshu Yang (Fall 2016 ---)
- Undergrad students: 1
  - James Robinson (Fall 2016---)
- DERI High School students: 2
  - Charles Yang (Fall 2016 --- Spring 2017)
  - Makenzi Moore (Fall 2016 --- Spring 2017)
- Capstone Senior Design Projects Advised:
  - 2012-2013, **Power Analysis Toolkit for VCU Micro-Grid**
    - Sai Priya Veerapaneni
    - Michael Roberts
    - Udit Chavda
    - Gongbo Song
  - 2013-2014, **Multi-Functional Intelligent UPS for High Power Electronic Devices**
    - Jasdeep Kandola
    - Rameez Khimani
    - MacPherson Stevens
    - Raleigh Waters
  - 2014-2015, **Photocell Optimization through Thermoelectric Generation**
    - Brian Nguyen,
    - Dante Johnson,
    - General Roberts
  - 2015-2016, **Power Quality Study of Third Floor Clean Room and Harmonic Isolation via Power Inverter Isolation**
    - Aubrey Buckner
    - Gabriel Knight
    - Bart Thornton

**Major University, School, and Departmental Commitments:**

**VCU SOE:**

NWCIT Committee (2015),  
Grade Appeal Committee (2016).

**VCU ECE:**

Graduate Committee (2015-present),

Faculty Search Committee (2014, 2016, 2017),  
ECE Strategic Plan Committee (2016-present).

**Coordinator of ECE graduate seminars** (2015-present):

Invited distinguished scholars and experts from outside to give seminar talks for ECE graduate students and faculties, enhanced interdisciplinary collaborations and promoted active engagement of graduate students.

**Service to Profession:**

- **NSF Panelist:** EPCN (2015), Eager-DCL (2015).
- **Industry proposal Review:** VEDP proposal review (2014).
- **Invited Textbook Review:** A first Course in Electrical and Computer Engineering (2017).
- **Technical Program Committee:**
  - IEEE SmartGridComm (2013, 2015),
  - International conference on Intelligent Green Building and Smart Grid (2014).
- **Conference Session Chair:**
  - 2012 Asilomar Conference, “*Smart Grid Communication and Networks*”
  - 2013 IEEE SmartGridComm, “*Pricing Demand Response*”
  - 2013 CMOS Symposium on Emerging Technologies Research, “*Green Energy*”
- **Journal Reviewer:** IEEE Transactions on Power Systems, IET Renewable Power Generation, IEEE Transactions on Smart Grid, IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Informatics, Journal of Network and Computer Applications, IEEE Journal on Selected Areas in Communications: Smart Grid Communications Series.
- **Conference Reviewer:** IEEE PES GM, IEEE SmartGridComm, HICSS, CDC.
- **Academic Membership:**
  - IEEE Senior Member, IEEE Power and Energy Society member.