

MOJDEH KHORSAND HEDMAN

School of Electrical, Computer and Energy Engineering
PO Box 875706 GWC 206
Arizona State University, Tempe, AZ 85287-5706

mojdeh.khorsand@asu.edu
(480) 965-0787
Engineering Research Center (ERC) 525

Academic Appointment

Arizona State University
Assistant Professor

Aug. 2017-Present

School of Electrical, Computer, and Energy Engineering

Education

Ph.D. in Electrical Engineering (Electric Power and Energy Systems)

Aug. 2012-May 2017

Arizona State University, Tempe, AZ

Dissertation: Analytical Approaches for Identification and Representation of Critical Protection Systems in Transient Stability Studies

M.Sc. in Electrical Engineering (Electric Power Systems)

Sep. 2008-Sep. 2010

Iran University of Science and Technology, Tehran, Iran

Thesis: Determining the Optimal Amount of Reserves Considering Wind Power Generation in Power System Using Stochastic Optimization

B.Sc. in Electrical Engineering (Electric Power Systems)

Sep. 2003-Sep. 2007

Mazandaran University, Mazandaran, Iran

Publications

Journal publications:

- [J8] Y. Wang, V. Vittal, **M. Khorsand**, and C. Singh, "Probabilistic Reliability Evaluation Including Adequacy and Dynamic Security Assessment," *IEEE Transactions on Power Systems*, Accepted for Publication.
- [J7] **M. Abdi-Khorsand** and V. Vittal, "Identification of Critical Protection Functions for Transient Stability Studies," *IEEE Transactions on Power Systems*, vol. 33, no. 3, pp. 2940 - 2948, May 2018.
- [J6] **M. Abdi-Khorsand** and V. Vittal, "Modeling Protection Systems in Time-Domain Simulations: A New Method to Detect Mis-operating Relays for Unstable Power Swings," *IEEE Transactions on Power Systems*, vol. 32, no. 4, pp. 2790-2798, Jul. 2017.
- [J5] X. Li, M. Sahraei-Ardakani, P. Balasubramanian, **M. Abdi-Khorsand**, K. W. Hedman, and R. Podmore, "Real-Time Contingency Analysis with Corrective Transmission Switching," *IEEE Transactions on Power Systems*, vol. 32, no. 4, pp. 2604 - 2617, Jul. 2017.
- [J4] **M. Abdi-Khorsand**, M. Sahraei-Ardakani, and Y. Al-Abdullah, "Corrective Transmission Switching with N-1-1 Contingency Analysis," *IEEE Transactions on Power Systems*, vol. 32, no. 2, pp. 1606-1615, Mar. 2017.
- [J3] M. Sahraei-Ardakani, X. Li, P. Balasubramanian, K. W. Hedman, and **M. Abdi-Khorsand**,

“Real-Time Contingency Analysis With Transmission Switching on Real Power System Data,” *IEEE Transactions on Power Systems*, vol. 31, no. 3, pp. 2501-2502, May 2016.

- [J2] Y. Al-Abdullah, **M. Abdi-Khorsand**, and K. W. Hedman, “The Role of Out-of-Market Corrections in Day-Ahead Scheduling,” *IEEE Transactions on Power Systems*, vol. 30, no. 4, pp. 1937-1946, Jul. 2015.
- [J1] **M. Abdi-Khorsand** and H. Heydari, “Multiobjective Augmented Eps-constraint Optimization for Economic/Environmental Stochastic Unit Commitment in Power Systems with High Penetration of Wind Power,” *International Review of Electrical Engineering*, vol. 5, no. 4, Aug. 2010.

Conference publications (peer reviewed):

- [C12] M. He and **M. Khorsand**, “A data-driven based strategy to evaluate participation of diverse social classes in smart electric grids,” *North American Power Symposium (NAPS)*, 2019.
- [C11] P. Chatterjee, **M. Khorsand**, and K. W. Hedman, “Enhanced Assessment of Power System Behavior during Multiple Contingencies,” *North American Power Symposium (NAPS)*, 2018.
- [C10] T. Tesfay, M. Jamei, A. Scaglione, **M. Khorsand**, K. Hedman and R. Bazzi, “AVAIL: Assured Volt-Ampere Information Ledger,” *IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm)*, 2018.
- [C9] X. Li, P. Balasubramanian, **M. Abdi-Khorsand**, A. Korad, and K. W. Hedman, “Effect of Topology Control on System Reliability: TVA Test Case,” *CIGRE Grid of the Future Symposium 2014*, pp. 1-8, Oct. 2014.
- [C8] **M. Abdi-Khorsand** and K. W. Hedman, “Day-Ahead Corrective Transmission Topology Control,” *In Proc. of the IEEE PES General Meeting 2014*, Washington, DC, Jul. 2014.
- [C7] Y. Al-Abdullah, **M. Abdi-Khorsand**, and K. W. Hedman, “Analyzing the Impacts of Out-of-Market Corrections,” *In Proc. of the 2013 IREP Symposium-Bulk Power System Dynamics and Control-IX (IREP)*, Rethymnon, Greece, Aug. 2013.
- [C6] S. A. H. Bahreyni, **M. Abdi-Khorsand**, and S. Jadid, “A Stochastic Unit Commitment in Power Systems with High Penetration of Smart Grid Technologies,” *In Proc. of the 2nd Iranian Conference on Smart Electrical Grids (ICSG)*, Iran, May 2012.
- [C5] **M. Abdi-Khorsand** and H. Heydari, “Joint Stochastic Wind-Thermal Generation Scheduling and Emission Reduction Using Multiobjective Augmented Eps-Constraint Algorithm,” *In Proc. of the 6th International Conf. on Technical and Physical Problems of Power Engineering*, Iran, Sep. 2011.
- [C4] **M. Abdi-Khorsand**, A. Zakariazadeh, and S. Jadid, “Stochastic Wind-Thermal Generation Scheduling Considering Emission Reduction: A Multiobjective Mathematical Programming Approach,” *In Proc. of the Asia-Pacific Power and Energy Engineering Conference*, China, Mar. 2011.
- [C3] **M. Abdi-Khorsand** and H. Heydari, “Stochastic Reserve Scheduling for Power System with High Penetration of Wind Power and Interruptible Load Participation Analysis,” *In Proc. of the 1st Iranian Conf. on Renewable Energy and Distributed Generation*, Iran, Mar. 2010.

- [C2] **M. Abdi-Khorsand**, H. Heydari, and A. Zakariazadeh, “Interruptible Load Participation as Operating Reserve in Joint Energy and Spinning Reserve Markets Using Stochastic Security Analysis,” *In Proc. of the 2nd International Conf. on Computer and Automation Engineering*, vol. 5, Singapore, Feb. 2010.
- [C1] **M. Abdi-Khorsand** and S. Jadid, “Augmented Z_{bus} Transmission Network Cost Allocation,” *In Proc. of the 18th Iranian Conference on Electrical Engineering (ICEE)*, Iran, May 2010.

Technical reports:

- [T3] M. He and **M. Khorsand Hedman**, “Enabling and Incentivizing Active Participation of Customers in Smart Grid,” Submitted to Salt River Project.
- [T2] R. Vakili, P. Chatterjee, **M. Khorsand Hedman**, and Vijay Vittal, “Analyzing the Importance of Modeling Distance Relays in Stability Studies and Development of an Iterative Contingency-based Algorithm to Identify Critical Lines for Modeling Distance Relays,” Submitted to Salt River Project.
- [T1] M. Chen, V. Vittal, and **M. Khorsand Hedman**, “An Examination of Transmission System Flexibility Metrics,” Submitted to Salt River Project.

Invited Conference Papers:

- [IC1] **M. Abdi-Khorsand** and V. Vittal, “Modeling Protection Systems in Time-Domain Simulations: A New Method to Detect Mis-operating Relays for Unstable Power Swings,” *Georgia Institute of Technology Protective Relaying Conference, Clayton Griffin Student Paper Award*, 2017. (**Best Paper Award**)

Under review papers:

- [U1] Y. Wang, V. Vittal, **M. Khorsand**, and C. Singh, “Impact of High Wind Power Penetration on System Reliability with Essential Reliability Services Assessment,” *IEEE Transactions on Power Systems*.

Working papers:

- [W5] M. Ghaljehei, **M. Khorsand** and K. W. Hedman, “Electric Energy Markets via Stochastic Optimization: Pricing Implications,” *IEEE Transactions on Power Systems*, submitted November 2019.
- [W4] R. Vakili and **M. Khorsand**, “Identification of Critical Distance Relays for Transient Stability Analysis,” *IEEE Transactions on Power Systems*, to be submitted by Dec. 1, 2019.
- [W3] R. Vakili and **M. Khorsand**, “An Advanced Situational Awareness Method using Machine Learning Algorithms,” *IEEE Transactions on Power Systems*, working paper.
- [W2] Z. Soltani and **M. Khorsand**, “Distribution System Topology Processor,” *IET Energy System Integration*, to be submitted by Nov. 30, 2019.
- [W1] M. Ghaljehei and **M. Khorsand**, “Flexible Ramp Requirement for Day-ahead Scheduling,” *IEEE Transactions on Power Systems*, to be submitted by Dec. 1, 2019.

Invited Presentations:

- [IP4] Mojdeh Khorsand Hedman, “Modeling protection systems in time-domain simulations, North American Electric Reliability Corporation”, System Analysis and Modeling Subcommittee, July 2019.

- [IP3] Mojdeh Khorsand Hedman, “Corrective Transmission Switching with $N-1-1$ Contingency Analysis”, Institute for Operations Research and the Management Sciences (INFORMS) conference, October 2019.
- [IP2] Mojdeh Khorsand Hedman, “Integrated resource plan docket support: ASU LightWorks”, Special Open Meeting of the Arizona Corporation Commission, Stakeholder Meeting and Workshop, Resource Planning and Procurement in 2019, 2020 and 2021; In the Matter of Possible Modification to the Rules on Resource Planning and Procurement, September 2019.
- [IP1] Mojdeh Khorsand Hedman, “Developing Tools to Support Urban and Regional Energy Planning”, One-Day Urban and Regional Energy Transitions Workshop, April 2019.

Teaching Experience

- **Power System Analysis, Arizona State University** (Spring 2018)
- **Power Systems Operations and Planning, Arizona State University** (Fall 2017, Fall 2018, Fall 2019)
- **Electrical Machinery, Azad University, Iran** (Fall 2011, Spring 2012)
- **Circuits I, Azad University, Iran** (Fall 2011, Spring 2012, Spring 2012)
- **Smart Meters and Devices in Smart Grids, Azad University, Iran** (Fall 2011, Spring 2012)

Research Grants

Sponsored projects:

Project Title: [Grant 1] **Sensor Enabled Modeling of Future Distribution Systems with Distributed Energy Resources**
Agency: The US Department of Energy, Advanced Research Projects Agency-Energy
Grant Amount: \$3,100,000 (3 Years)
PI: Vijay Vittal (Arizona State University)
Share: 18% (\$558,000)
Co-PIs: Mojdeh Khorsand Hedman, Raja Ayyanar, Anamitra Pal, Yang Weng (Arizona State University)
Project Period: September 2019-September 2022

Project Title: [Grant 2] **Newly Implemented and Proposed Market Products and Reformulations: Pricing Implications, Analysis, and Enhancements**
Agency: Power Systems Engineering Research Center (PSERC)
Grant Amount: \$220,000 (2 Years)
PI: Mojdeh Khorsand (Arizona State University)
Share: 36% (\$80,000)
Co-PIs: Kory Hedman (Arizona State University) and Lang Tong (Cornell University)
Project Period: July 1, 2018 - August 31, 2020

Project Title: [Grant 3] **Enabling and Incentivizing Active Participation of Customers in a Smart Grid**
Agency: Salt River Project (SRP)
Grant Amount: \$57,200
PI: Mojdeh Khorsand Hedman (Arizona State University)
Share: 100% (\$57,200)

Co-PIs: N/A
Project Period: August 2018-August 2019

Project Title: **[Grant 4] Development of a Co-simulation Platform for ASPEN and PSLF to Represent Protective Relaying Functions in Transient Stability Simulations**
Agency: Salt River Project (SRP)
Grant Amount: \$62,700
PI: Mojdeh Khorsand Hedman (Arizona State University)
Share: 50% (\$31,350)
Co-PIs: Vijay Vittal (Arizona State University)
Project Period: August 2018-August 2019

Project Title: **[Grant 5] An Examination of Transmission System Flexibility Metrics**
Agency: Salt River Project (SRP)
Grant Amount: \$62,700 (\$31,350)
PI: Vijay Vittal (Arizona State University)
Share: 50%
Co-PIs: Mojdeh Khorsand Hedman (Arizona State University)
Project Period: August 2018-August 2019

Project Title: **[Grant 6] Arizona Corporation Commission: Energy Modeling Tool Development**
Agency: Arizona Corporation Commission, TRIF
Grant Amount: \$95,000
PI: Gary Dirks (Arizona State University)
Share: 100% (\$95,000)
Co-PIs: Mojdeh Khorsand Hedman (Arizona State University)
Project Period: March 2019-December 2020

Pending research proposals:

Project Title: **[Proposal 1] SCC-IRG Track 2: Powering Communities in the Era of Energy Democracy: Incentivizing Efficient Adoption of Smart Electric Grid Technologies across Social Classes**
Agency: National Science Foundation
Grant Amount: \$1,487,893
PI: Mojdeh Khorsand Hedman (Arizona State University)
Share: 35% (\$520,763)
Co-PIs: Adolfo Escobedo, Ross Maciejewski, Clark Miller, Lauren Keeler (Arizona State University)
Project Period: 2020-2023

Project Title: **[Proposal 2] CAREER: Design of Socially-Aware Smart Grid Solutions: Risk Assessment and Operational Enhancements**
Agency: National Science Foundation
Grant Amount: \$500,000

PI: Mojdeh Khorsand Hedman (Arizona State University)
Share: 100% (\$500,000)
Co-PIs: NA
Project Period: 2020-2025

Project Title: **[Proposal 3] Causal Learning for Uncertainty Quantification of Participation of Distributed Energy Resources in Electric Grid Services**
Agency: The US Department of Energy, Office of Science
Grant Amount: \$300,000 (2 Years)
PI: Huan Liu (Arizona State University)
Share: 40% (\$120,000)
Co-PIs: Mojdeh Khorsand Hedman, Selcuk Candan (Arizona State University)
Project Period: 2020-2022

Project Title: **[Proposal 4] Who are controlling the DERs? Increasing DER hosting capacity through targeted modeling, sensing, and control**
Agency: Power Systems Engineering Research Center (PSERC)
Grant Amount: \$220,000 (2 Years)
PI: Line Roald (University of Wisconsin–Madison)
Share: 32% (\$70,000)
Co-PIs: Mojdeh Khorsand Hedman (Arizona State University), Daniel Molzahn (Georgia Institute of Technology)
Project Period: 2020-2022

Project Title: **[Proposal 5] Design of Socially-aware Retail Electricity Market to Enhance Adoption and Participation of Grid-Edge Technologies**
Agency: Power Systems Engineering Research Center (PSERC)
Grant Amount: \$220,000 (2 Years)
PI: Visvakumar Aravinthan (Wichita State University)
Share: 32% (\$70,000)
Co-PIs: Mojdeh Khorsand Hedman (Arizona State University), Chanan Singh (Texas A&M University), Ehsan Salari, C. Brendan Clark (Wichita State University)
Project Period: 2020-2022

Selected declined research proposals:

Project Title: **[Proposal 1] Power4Professionals**
Agency: The US Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE)
Grant Amount: \$6,000,000 (4 Years)
PI: Mojdeh Khorsand Hedman
Share: 40%
Co-PIs: Stephen Phillips, Yang Weng, Oliver Kosut, Robin Podmore

Project Title: **[Proposal 2] Advanced Situational Awareness: Identification and Classification of Localized and Widespread Events to Prevent Cascading Outages**

Agency: National Science Foundation
Grant Amount: \$465,776 (3 Years)
PI: Mojdeh Khorsand Hedman
Share: 67%
Co-PIs: Kory Hedman

Project Title: **[Proposal 3] SCC: Powering Communities: Incentivizing Efficient Participation in a Smart Electric Grid across Social Classes**

Agency: National Science Foundation
Grant Amount: \$1,641,062 (3 Years)
PI: Mojdeh Khorsand Hedman
Share: 34%
Co-PIs: Adolfo Escobedo, Amber Wutich

Project Title: **[Proposal 4] CPS: TTP Option: Medium: The Assured Volt-Ampere Information Ledger (AVAIL): A Blockchain Technology for Sharing Sensitive Data in Power**

Agency: **Systems**
Grant Amount: National Science Foundation
PI: \$1,000,000 (3 Years)
Share: Anna Scaglione
Co-PIs: 25%
Mojdeh Khorsand Hedman, Kory Hedman, Rida Bazzi

Project Title: **[Proposal 5] Cybersecure Data Analytics Platform for Enhanced Coordination of Interdependent Electric Energy and Natural Gas Systems**

Agency: The US Department of Energy (DOE)
Grant Amount: \$2,499,999 (3 Years)
PI: Junshan Zhang
Share: 20%
Co-PIs: Mojdeh Khorsand Hedman, Yang Weng, Vijay Vittal

Professional Activities and Services

Referee:

- Reviewer for IEEE Transactions on Power Systems
- Reviewer for IET Generation, Transmission & Distribution
- Reviewer for IEEE Transactions on Smart Grid
- Reviewer for IEEE Systems Journal
- Reviewer for Journal of Renewable and Sustainable Energy

Member:

- IEEE
- INFORMS
- IEEE Power and Energy Society (PES)
- IEEE PES Women in Power
- IEEE PES ASU Student Branch Chapter, Faculty Advisor

Conference and Meeting Organization:

- Chair of organizing committee for the North American Power Symposium (NAPS) 2020 to be

held at ASU

- Session chair: Machine Learning Applications, Emerging Topics Track, NAPS 2019
- Organizing IEEE PES Phoenix Chapter and ASU joint luncheon: 2018 and 2019

ASU Committee:

- New Faculty Advisory Council, committee member, Arizona State University: 2017-2019
- Financial and infrastructure committee, School of Electrical, Computer, and Energy Engineering, Arizona State University

Other Services:

- Volunteer at Arizona Science Lab (a non-profit affinity group of the IEEE Phoenix Section; ASL educates 4-9th grade students on STEM and targets Title 1 schools)

Awards and Honors

- Clayton Griffin Paper Award, Georgia Institute of Technology Protective Relaying Conference, May 2017.
- IEEE PES Phoenix Chapter Graduate Power Engineering Scholarship, March 2016.
- IEEE Phoenix Section Student Scholarship, January 2016.
- University Graduate Fellowship, Arizona State University, 2012.

Advising Students

Ph.D. Students Current:

- Yingying Wang, expected Spring 2020
- Mohammad Ghaljehei, expected Spring 2022
- Zahra Soltani, expected Spring 2022
- Ramin Vakili, expected Spring 2022
- Mingyue He, expected Spring 2023

MS Students Current:

- Byeongdo Jeon, MS student, expected Summer 2020

MS Students Graduated:

- Mingyue He, Fall 2019