# MICHAEL STARKE

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# RESEARCH EXPERIENCE

## Senior Research Staff, ORNL/ UT-BATTELLE

2018-2022

- Architect and developer of power electronic system software and integration technology
- Lead for optimization and controls of xFC station modeling and control and resiliency
- Developer of transactive agent-based power electronic systems.
- Developer of multi-chemistry agent system for utility scale systems.
- Lead on team to develop agent-based system to integrate transactive controls to HVAC and water heaters into a smart community.
- Program interface manager for Department of Energy, Energy Storage Program

# Research Staff, ORNL/ UT-BATTELLE

2013-2018

- Developed an energy storage system prototype composed of secondary use batteries for Habitat for Humanity
- Lead on open-source microgrid controller called CSEISMIC. Controller supports
  resource optimization, automatic communication and device integration through
  DDS, and islanding and resynchronization features.
- Lead on prototype construction of a secondary-use energy storage system with new inverter controls and communication interface.

# Research Associate, ORNL/ UT-BATTELLE

2009-2013

- Lead on secondary-use energy storage research and development of testing platform at ORNL for testing ABB/GM energy storage system.
- Lead on industrial demand response project to evaluate the demand response potential of industrial loads across the U.S. Created a new tool that was patented (IGATE).
- Lead on residential tool demand simulator. Released open source in 2017. <a href="https://github.com/starkemr/Residential-Simulation-Tool">https://github.com/starkemr/Residential-Simulation-Tool</a>
- Supported development of publications and standards for the IEEE Wind and Solar Collector Design Working Group

Research Associate, ORAU, Knoxville,

2008 to 2009

Worked as a post-masters and finishing PhD

• Supported work with ALCOA aluminum smelting and grid services

Graduate Research Assistant, University of Tennessee,

2004 to 2008

- Teaching classes
- Laboratory Assistant

#### **EDUCATION**

**PhD** University of Tennessee, Knoxville

December 2009

## **Electrical Engineering**

MS	University of Tennessee, Knoxville Electrical Engineering	August 2006
BS	University of Tennessee, Knoxville Electrical Engineering	May 2004

## HONORS AND AWARDS

IEEE Power and Energy Society Chapter Outstanding Engineer Award					
East Tennessee Power and Energy Chapter					
Best Paper Award (Power Electronics for Distributed Generation Systems)	2022				

## **PATENTS**

• Nasr E. Alkadi, Michael R. Starke, "Industrial geospatial analysis tool for energy evaluation," Patent No. 9378256, UT-Battelle, LLC, June 28, 2016.

#### **PUBLICATIONS**

Metrics from Google Scholar: Citations: 3232, H-index: 25, I-index: 56 (updated on 11/2/2022).

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- M. Starke, S. Campbell, M. Chinthavali and B. Dean, "A 1kV, 480V Power Electronics Hub for DER Integration in Commercial Buildings," 2022 IEEE Energy Conversion Congress and Exposition (ECCE), 2022, pp. 1-7.
- M. Chinthavali, A. Adib, J. O. Pereira Pinto, R. Wojda and M. Starke, "A Medium Voltage Three-Stage Power Converter Topology for Distribution Grid Scale Energy Storage Systems," 2022 IEEE Energy Conversion Congress and Exposition (ECCE), 2022, pp. 1-8.
- M. Starke, R. K. Moorthy, S. Campbell and M. Chinthavali, "Start-up Optimization Considering Integrated Power Electronic Systems," 2022 IEEE Power & Energy Society General Meeting (PESGM), 2022, pp. 1-5.
- M. Chinthavali, R. S. K. Moorthy, **M. Starke** and B. Dean, "Solid State Power Substations (SSPS): A Multi-Hierarchical Architecture from Substation to Grid Edge," 2022 IEEE 13th International Symposium on Power Electronics for Distributed Generation Systems (PEDG), 2022, pp. 1-6.
- Alshowkan, M., Evans, P.G., **Starke, M**. et al. Authentication of smart grid communications using quantum key distribution. Sci Rep 12, 12731 (2022).
- Chen, Y., Abu-Heiba, A., Kassaee, S., Liu, C., Liu, G., Starke, M., Smith, B. T., and Momen, A. M. (March 2, 2022). "Coupled Heat Power Operation of Smart Buildings via Modular Pumped Hydro Storage." ASME. *J. Energy Resour. Technol.* July 2022; 144(7): 070912.
- M. Starke, S. Bal, M. Chinthavali and N. Kim, "A Control Strategy for Improving Resiliency of an DC Fast Charging EV System," 2022 IEEE Transportation Electrification Conference & Expo (ITEC), 2022, pp. 947-952.

- **M. Starke** et al., "A MW scale charging architecture for supporting extreme fast charging of heavy-duty electric vehicles," 2022 IEEE Transportation Electrification Conference & Expo (ITEC), 2022, pp. 485-490.
- J. Hall, M. Starke, J. Munk, H. Zandi, T. Kuruganti and H. Buckberry, "A System of Agents for Supporting Optimization and Control of a Connected Community," in IEEE Journal of Emerging and Selected Topics in Industrial Electronics, vol. 3, no. 1, pp. 57-68, Jan. 2022.
- **M. Starke** et al., "Agent-Based Distributed Energy Resources for Supporting Intelligence at the Grid Edge," in IEEE Journal of Emerging and Selected Topics in Industrial Electronics, vol. 3, no. 1, pp. 69-78, Jan. 2022.

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- Qingxin Shi, Fangxing Li, Mohammed Olama, Jin Dong, Yaosuo Xue, Michael Starke, Wei Feng, Chris Winstead, Teja Kuruganti, Post-extreme-event restoration using linear topological constraints and DER scheduling to enhance distribution system resilience, International Journal of Electrical Power & Energy Systems, Volume 131, 2021.
- **M. Starke** et al., "A Remote Development Process and Platform for Power Electronic Systems," 2021 IEEE Energy Conversion Congress and Exposition (ECCE), 2021, pp. 3182-3189.
- M. Starke, B. Xiao and M. Chinthavali, "A Low Voltage DC Power Electronic Hub to Support Buildings," 2021 IEEE Fourth International Conference on DC Microgrids (ICDCM), 2021, pp. 1-8.
- M. Starke et al., "Control and Management of Multiple Converters in a Residential Smart Grid," 2021 IEEE Applied Power Electronics Conference and Exposition (APEC), 2021, pp. 668-674.
- M. Starke et al., "Secondary Use-Plug-and-Play Energy Storage System Composed of Multiple Energy Storage Technologies," 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), 2021, pp. 1-5.
- B. Dean, M. Starke, M. Smith, M. Chinthavli and L. Tolbert, "A Communication Testbed for Testing Power Electronic Agent Systems," 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), 2021, pp. 1-5.
- J. Hall, M. Starke, J. Munk, H. Zandi, S. Chinthavali, V. Tansakul, T. Kuruganti, H. Buckberry, "A Real-time Agent Based Optimization and Control Approach for Residential Building Heating Ventilation and Air Conditioning Systems," 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), 2021, pp. 01-05.
- S. Chinthavali, S. Lee, M. Starke, J. Chae, V. Tansakul, J. Munk. H. Zandi, T. Kuruganti., "Data Analysis Approach for Large Data Volumes in a Connected Community," 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), 2021, pp. 1-5.
- R. S. Krishna Moorthy, G. Liu, M. Chinthavali, J. Choi, A. Aswad and **M. Starke**, "Architecture of a Residential Solid State Power Substation (SSPS) Node," 2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), 2021, pp. 1-5.
- Qingxin Shi, Fangxing Li, Mohammed Olama, Jin Dong, Yaosuo Xue, Michael Starke, Chris Winstead, Teja Kuruganti, Network reconfiguration and distributed energy resource scheduling for improved distribution system resilience, International Journal of Electrical Power & Energy Systems, Volume 124, 2021.

- Xiao Kou; Fangxing Li; Jin Dong; Mohammed Olama; **Michael Starke**; Yang Chen; Helia Zandi., "A Comprehensive Scheduling Framework using SP-ADMM for Residential Demand Response with Weather and Consumer Uncertainties," in IEEE Transactions on Power Systems, December 2020.
- P. Bhowmik, **M. Starke**, B. Dean and M. Chinthavali, "Vulnerability Detection Methodology for a Digital Signal Processor Micro-Controller at Edge Level Distributed Energy Resource Controller," 2020 IEEE CyberPELS (CyberPELS), 2020, pp. 1-5.
- M. Starke et al., "A Plug-and-Play Design Suite of Converters for the Electric Grid," 2020 IEEE Energy Conversion Congress and Exposition (ECCE), 2020, pp. 2314-2321.

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- M. Chinthavali, M. Starke, R. Moorthy, An Intelligent Energy Router for Managing Behind the Meter Resources Assets, IEEE Innovative Smart Grid Technologies, 2020.
- M. Starke, J. Munk, H. Zandi, T. Kuruganti, H. Buckberry, J. Hall, J. Leverette, "Real-Time MPC for Residential Building Water Heater Systems to Support the Electric Grid" IEEE Innovative Smart Grid Technologies, 2020.
- M. Starke, M. Chinthavali, S. Zheng, S. Campbell, R. Zeng, M. Smith, T. Kuruganti, Agent-Based Framework for Supporting Behind the Meter Transactive Power Electronic Systems, IEEE Innovative Smart Grid Technologies, 2020.

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  Conference on Smart Grid and Smart Cities, June 2019.
- M. Starke, M. Chinthavali, B. Taube, D. Spiers, B. Schultz, "Secondary Use Energy Storage System Design Considerations, TechConnect 2019.
- M. Starke, J. Munk, H. Zandi, T. Kuruganti, H. Buckberry, J. Hall, J. Leverette, "Agent-Based System for Transactive Control of Smart Residential Neighborhoods," IEEE Power and Energy General Meeting, 2019.
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- M. Smith, **M. Starke**, A. Herron, D. King, L. Tolbert, Autonomous Battery Identification and Health Parameterization, Power Industry Division Symposium, June 2018.

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- O. Ceylan, A. Dimitrovski, **M. Starke**, K. Tomsovic, "Optimal Reactive Power Allocation for Photovoltaic Inverters to Limit Transformer Tap Changes", 2016 IEEE PES General Meeting, Boston MA, July 17-21
- G. Gurrala, A. Dimitrovski, S. Pannala, S. Simunovic, **M. Starke**, "Parareal in Time for Fast Power System Dynamic Simulations", IEEE Transactions on Power Systems, Vol. 31, No. 3, 2016, pp. 1820-1830.
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