Mohammed Alharbi, PhD

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Professional Summary

A professor with a profound dedication to research and teaching, specializing in the field of power electronics and renewable energy integration. My research interests lie in the application of power electronic converters for grid integration of renewable energy systems, with a particular emphasis on modular multi-level converter (MMC) technologies for high-power applications. Passionate about innovating solutions that facilitate the seamless integration of renewable energy systems into existing infrastructure, with a commitment to sustainability and efficiency.

Professional Experience

Chairman of Electrical Engineering Department, [King Saud University], [Riyadh], [Saudi Arabia]

February [2023] - Present

- Provide visionary leadership and oversee day-to-day operations of the Electrical Engineering Department.
- Develop and revise curriculum offerings to align with industry trends and technological advancements.
- Facilitate research endeavors by fostering interdisciplinary collaborations and securing funding opportunities.
- Support student success through mentorship, academic advising, and professional development initiatives.
- Develop partnerships with industry stakeholders and community organizations to enhance experiential learning and technology transfer.
- Ensure compliance with accreditation standards and regulatory requirements, driving continuous improvement in teaching, research, and service activities.

Head of Technical Committee for Lighting and Accessories, [Saudi Standards Metrology and Quality Organization], [Riyadh], [Saudi Arabia]

January [2022] - Present

- Lead and coordinate the activities of the Technical Committee, supervising the review and investigation of national and international standards.
- Conduct thorough analysis and evaluation of proposed standards, ensuring alignment with regulatory requirements and industry best practices.
- Provide recommendations based on comprehensive assessments of studied standards, advising on their adoption or exclusion to enhance product quality, safety, and compliance.

Council Secretary of Master of Science Program in Renewable Energy, [King Saud University], [Riyadh], [Saudi Arabia]

Novembre [2021] - May [2023]

- Facilitate and coordinate regular meetings of the program council, ensuring efficient communication and collaboration among faculty members.
- Prepare meeting agendas, gather relevant materials, and distribute pre-meeting documentation to participants in a timely manner.
- Provide administrative support, including accurate record of meeting minutes, tracking action items, and following up on decisions and assignments.

Assistant Professor, [King Saud University], [Riyadh], [Saudi Arabia]

January [2021] - Present

- Instruct graduate-level courses including "Power Semiconductor Converters."
- Serve as a mentor and advisor to graduate students.

- Teach undergraduate-level courses such as "Electric Circuit Analysis" and "Fundamentals of Power Systems."
- Participate in academic advising and counseling activities.
- Contribute to the academic community through research publications.

Research Assistant, [North Carolina State University], [Raleigh], [USA] **January [2015] - July [2020]**

- Design and construct a small-scale prototype of a Modular Multilevel Converter (MMC).
- Conducted research and development of MMC systems using real-time simulation tools such as the RTDS.
- Designed control platforms for MMC systems for High Voltage Direct Current (HVDC) applications.
- Performed Control Hardware-In-The-Loop (CHIL) validations using FPGA boards for MMC systems.
- Conducted experiments on MMC-based multi-terminal HVDC systems using RTDS and GTFPGA units.
- Implemented and validated Pulse-Width Modulation (PWM) techniques for MMC systems using microcontroller platforms.

Teaching Assistant, [King Saud University], [Riyadh], [Saudi Arabia] **September [2010] - May [2011]**

- Assist in the delivery of lectures, tutorials, and laboratory sessions for undergraduate and postgraduate courses in electrical engineering department.
- Provide mentorship and support to students, offering guidance on course materials, assignments, and projects.

Education

Doctor of Philosophy in Electrical Engineering **January [2015] - July [2020]**

- North Carolina State University, Raleigh, USA

Master of Science in Electrical Engineering **August [2012] - December [2020]**

- Missouri University of Science and Technology, Rolla, USA

English Language Program **January [2011] - August [2012]**

- University of Wisconsin, Madison, USA

Bachelor of Science in Electrical Engineering **August [2005] - July [2010]**

- King Saud University, Riyadh, Saudi Arabia

Research Projects

Design and Control of Various Technologies for Electric Vehicles Charging Systems **December [2022] - April [2024]**

- Funding Source: Institutional Funding Program for Research and Innovation, Directed Research Articles' Program, King Saud University.

Control and Performance Analysis for MMC Submodules Scale-up Methodology for HVDC and Multi-Terminal DC Applications **January [2015] - April [2020]**

- Conducted in the Future Renewable Electric Energy Delivery and Management System (FREEDM System)

Investigation of Emergency Diesel Generator (EDG) Excitation System Diode CR4 Failure **April [2017] - August [2017]**

- Funding Source: Duke Energy Corporation, Charlotte, North Carolina, USA

Minimization of Generator Operation Costs and Transmission Lines Losses Based on Lagrangian Formulation **August [2015] - December [2015]**

- Conducted in the North Carolina State University

Modeling of Multi-terminal VSC-Based HVDC Systems **January [2013] - December [2014]**

- Conducted in the Missouri University of Science and Technology

Technical Skills

- Real-time Control Hardware-in-the-Loop Verification of Power Converters.
- Testing, Validation, and Installation of Power Electronic Devices.
- Developing Control Algorithms for MMC Systems Based on FPGA Boards.
- Power Level and Controller Parameter Designs for AC/DC Converters.

Software Skills

Electrical Engineering Tools:

- MATLAB/Simulink
- PLECS
- PSCAD
- RSCAD
- Xilinx Vivado
- Code Composer

Programming:

- MATLAB
- C
- VHDL
- FPGA and DSP Coding

Honors and Awards

- MSc. Scholarship Award, King Saud University, 2011.
- MSc. Graduate with Honors, Missouri University of Science and Technology, 2014.
- PhD. Scholarship Award, King Saud University, 2015.

Professional Activities

- Selected topic lecture provided to the Saudi Council Engineers, 2022.
- Reviewer of IEEE Transactions on Power Electronics.
- Reviewer of IEEE Access.
- Reviewer of 2017 IEEE Power & Energy Society General Meeting (PESGM).
- Reviewer of 2017 IEEE Energy Conversion & Expo (ECCE2017).
- Reviewer of 2018 IEEE Applied Power Electronics Conference (APEC2018).
- Presenter in the 2019 RTDS Applications and Technology Conference in Denever, CO.
- Organizer and presenter of a MATLAB workshop at Missouri University of Science and Technology in 2014.

Selected Publications (Updated: July 2024)

- **Patent:**
    1. S. Bhattacharya, **M. Alharbi**, "MMC submodules scale-up methodology for MV and HV power conversion system applications," USA (US11824461B2), June 24, 2021, Granted in Nov. **2023.**
- **Journal Papers:**
    1. Nourhan A. Maged, Hany M. Hasanien, **Mohammed Alharbi**, *"Electric eel foraging algorithm-based optimal control for low voltage ride through capability improvement of Grid-Connected photovoltaic power plants,"* Ain Shams Engineering Journal, Volume 15, Issue 7, **2024**, 102855.
    2. Ellithy, H.H.; Hasanien, H.M.; **Alharbi, M.**; Sobhy, M.A.; Taha, A.M.; Attia, M.A. *"Marine Predator Algorithm-Based Optimal PI Controllers for LVRT Capability Enhancement of Grid-Connected PV Systems."* Biomimetics **2024**, 9, 66.
    3. Akram M. Abdurraqeeb, Abdullrahman A. Al-Shamma'a, Abdulaziz Alkuhayli, **Mohammed Alharbi**, Hassan M.Hussein Farh, Faisal Alsaif, Hammed Olabisi Omotoso, Khaled E. Addoweesh, Affaq Qamar, "*Stabilization of constant power loads and dynamic current sharing in DC microgrid using robust control technique*," Electric Power Systems Research, Volume 230, **2024**.
    4. **Alharbi, M.,** "*Control Approach of Grid-Connected PV Inverter under Unbalanced Grid Conditions.*" Processes **2024**, 12, 212.

5. Aly S. Mekhamer, Hany M. Hasanien, **Mohammed Alharbi**, Marcos Tostado-Véliz, Francisco Jurado, Dina A. Zaky, *"Coati optimization algorithm-based optimal frequency control of power systems including storage devices and electric vehicles,"* Journal of Energy Storage, Volume 93, **2024**, 112367.
6. K. Arulvendhan, S. Kandadai Nagaratnam, R. Narayanamoorthi, **M. Alharbi** and S. Hussen, *"Hybrid Compensation Based Efficient Wireless Charging System Design With Solar Photovoltaic Interface Toward Sustainable Transportation,"* in IEEE Access, vol. 12, pp. 87152-87166, **2024**.
7. Omotoso, H.O.; Al-Shamma'a, A.A.; **Alharbi, M.**; Farh, H.M.H.; Alkuhayli, A.; Abdurraqeeb, A.M.; Alsaif, F.; Bawah, U.; Addoweesh, K.E., *"Machine Learning Supervisory Control of Grid-Forming Inverters in Islanded Mode."* Sustainability **2023**, 15, 8018.
8. Ibrahim, Nagwa F., Sid Ahmed El Mehdi Ardjoun, **Mohammed Alharbi**, Abdulaziz Alkuhayli, Mohamed Abuagreb, Usama Khaled, and Mohamed Metwally Mahmoud, "*Multiport Converter Utility Interface with a High-Frequency Link for Interfacing Clean Energy Sources (PV\Wind\Fuel Cell) and Battery to the Power System: Application of the HHA Algorithm*" Sustainability **2023**, 15, 13716.
9. Soomro, J.B.; Kumar, D.; Chachar, F.A.; Isik, S.; **Alharbi, M.,** *"An Enhanced AC Fault Ride through Scheme for Offshore Wind-Based MMC-HVDC System."* Sustainability **2023**, 15, 8922.
10. **M. Alharbi**, S. Isik and S. Bhattacharya, "*An Equivalent Hybrid Model for a Large-Scale Modular Multilevel Converter and Control Simulations*," in IEEE Access, vol. 10, pp. 53504-53512, **2022.**
11. Isik, S.; Burugula, V.; **Alharbi, M.**; Azidehak, A.; Bhattacharya, S. *"Implementation of a Modular Distributed Fault-Tolerant Controller for MMC Applications*." Energies **2022**, 15, 8427.
12. **Alharbi, M.**; Isik, S.; Bhattacharya, S., *"Submodule Fault-Tolerant Strategy for Modular Multilevel Converter with Scalable Control Structure*." Sustainability **2022**, 14, 16445.

More research is available in google scholar:
(https://scholar.google.com/citations?hl=en&tzom=-180&user=6XsMJdUAAAAJ)