

HISHAM ALHARBI

Assistant Professor
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Education

Ph.D. in Electrical & Computer Engineering, (University of Waterloo, Canada)

- Graduation date: August 2020 (92.5%)

M.A.Sc. in Electrical & Computer Engineering, (University of Waterloo, Canada)

- Graduation date: May 2015 (85.2%)

B.Sc. in Electrical Engineering, (Umm Al Qura University, Saudi Arabia)

- Graduation date: September 2008 (GPA: 3.74/4 with honors)

Professional Affiliations & Collaborations

- **Actively contributed to various academic and professional committees:**
 - **Head of Department**, Electrical Engineering Department, Taif University
 - **Chair**, Strategic Planning Unit, College of Engineering, Taif University
 - **Chair**, Department Research Committee, Elect. Eng. Dep., Taif University
 - **Consultant**, External Advisory Board, Elect. Eng. Dep., (Umm Al Qura University)
 - **Member**, Program Accreditation Committee, Elect. Eng. Dep., Taif University
 - **Member**, Curriculum and Study Plans Committee, Elect. Eng. Dep., Taif University
- **Member of the IEEE Power & Energy Society.**
- **Member of the Saudi Council of Engineers.**
- **Highly Qualified Personnel of the NSERC Energy Storage Technology Network (NESTNet).**
 - NESTNet is a Canadian network of 15 universities and 26 industry and government partners focused on the future of energy storage.
 - Project 4.3: Provision of ancillary services by energy storage systems.
 - Website: <https://www.torontomu.ca/nestnet/>

▪ **Technical Reviewer for:**

- IEEE Transactions on Sustainable Energy, IEEE Transactions on Power Systems, IEEE Transactions on Smart Grid, IEEE Transactions on Industrial Informatics, IEEE-IAS Industrial Automation and Control Committee, IEEE ACCESS, IEEE Power and Energy Technology Systems Journal.
- MDPI Energies, MDPI Electronics, MDPI Sustainability.
- Energy Sources, Part A: Recovery, Utilization, and Environmental Effects.
- International Journal of Sustainable Energy.

Teaching Experience

▪ **Assistant Professor at Taif University, (2020-present).**

- **Undergraduate Courses:**

Electrical Power Systems (1), Electrical Power Systems (2), Electrical Installations, Basics of Electric Circuits, Electromagnetic, Special Topics in Computer Engineering: Mathematical Optimization Models and Applications

- **Master Program in Renewable and Sustainable Energy:**

Economics of Renewable Energy, Energy Storage

▪ **Teaching Assistant at University of Waterloo, (2017-2018).**

ECE 140 Linear Circuits.

▪ **Teaching Assistant at Taif University, (2009–2010).**

Computer Programming (1) -Introduction to MATLAB-, Power System (1), Electric Circuits, Electronics (1), Logic Design.

Research Interests

Research Focus: Advancing secure, resilient energy systems through innovative approaches in power system operations, optimization, and strategic planning.

Technical Expertise and Contributions:

- **Advanced Energy Storage:** Expertise in advanced storage solutions, including batteries and pumped hydro storage, to enhance grid stability and resilience.
- **Resilient Microgrids for Remote Communities:** Designed microgrid systems for isolated areas, prioritizing critical loads during disruptions and ensuring reliable energy access in challenging conditions.

- **Stochastic Modeling, AI-Driven Analytics, & Game-Theoretic Frameworks:** Developed stochastic models and applied AI and game theory to mitigate risks to energy supply chains, develop robust strategic energy solutions, and optimize grid operations for secure, adaptive energy systems.

Publications and Research Activities

Journal Papers:

- **H. Alharbi**, “Day-Ahead Scheduling of Cool Thermal Energy Storage for PV-Supported Hot-Climate Systems”, *International Journal of Engineering Research & Technology (IJERT)*, Vol. 15, No. 5, 2026.
- Z. Boumous, S. Boumous, S. Latréche, B. Babes, M. K. Metwaly, **H. Alharbi** et al. “Design of Robust MPC-Based Master–Slave Control With Disturbance Observer for Islanded Microgrids”, *IEEE Access*, Vol. 14, 2026.
- A. Seghior, Y. Bendjeddou, I. M. Mostefaoui, A. Chouder, **H. Alharbi** et al. “Fault detection and diagnosis in photovoltaic systems using artificial intelligence and time-frequency analysis”, *Scientific Reports*, Vol. 16, No. 10056, 2026.
- L. Zaghba, A. Borni, M. K. Benbitour, A. Fezzani, **H. Alharbi** et al. “Design and implementation of a predictive current control strategy for enhanced performance of DC-DC boost converters applications”, *Results in Engineering*, Vol. 28, Article No. 106960, 2025.
- D. E. Sifou, A. Kheldoun, A. Chaib, H. Belmadani, **H. Alharbi** et al. “Optimum sizing of hybrid sustainable and renewable energy systems using a modified harris hawks optimizer”, *Results in Engineering*, Vol. 27, Article No. 106812, 2025.
- L. A. Mouloud, A. Kheldoun, S. Oussidhoum, **H. Alharbi** et al. “Seasonal quantile forecasting of solar photovoltaic power using Q-CNN-GRU”, *Scientific Reports*, Vol. 15, No. 1, 2025.
- S. S. Alharbi, S. S. Alharbi, A. Bubshait, **H. Alharbi**, A. Alateeq, “Effects of Wide Bandgap Devices on the Inverter Performance and Efficiency for Residential PV Applications”, *Electronics*, Vol. 14, No. 6, 2025.
- K Fettah, A Salhi, T Guia, A S Saidi, A Betka, M Tegar, **H Alharbi**, SSM Ghoneim, T F Agajie, R NR Ghaly, “Optimal Integration of Photovoltaic Sources and Capacitor Banks Considering Irradiance, Temperature, and Load Changes in Electric Distribution System”, *Scientific Reports*, Vol. 15, No. 2670, 2025.

- S T Chauhdary, **H Alharbi**, A S Bin Humayd, T Alharbi, "Dual-Indexed Ensemble Kalman Filtering-Based Anti-Islanding Detection Methods for AC Microgrids," *IEEE Access*, Vol. 12, pp. 183312-183325, 2024.
- A Balabel, M. S Alrehaili, A. O. Alharbi, M Mohammed, **H Alharbi**, "Potential of Solar Hydrogen Production by Water Electrolysis in the NEOM Green City of Saudi Arabia", *World Journal of Advanced Engineering Technology and Sciences*, Vol. 8, No. 01, 2023.
- A Oubelaid, **H Alharbi**, ASB Humayd, N Taib, T Rekioua, SSM Ghoneim, "Fuzzy-Energy-Management-Based Intelligent Direct Torque Control for a Battery—Supercapacitor Electric Vehicle", *Sustainability*, Vol. 14, No. 14, 2022.
- M Tostado-Véliz, T Alharbi, **H Alharbi**, S Kamel, F Jurado, "On Optimal Settings for a Family of Runge–Kutta-Based Power-Flow Solvers Suitable for Large-Scale Ill-Conditioned Cases", *Mathematics*, Vol. 10, No. 8, 2022.
- P Khampariya, S Panda, **H Alharbi**, AY Abdelaziz, SSM Ghoneim, "Coordinated Design of Type-2 Fuzzy Lead–Lag-Structured SSSCs and PSSs for Power System Stability Improvement", *Sustainability* Vol. 14, No. 11, 2022.
- A AlKassem, A Draou, A Alamri, **H Alharbi**, "Design Analysis of an Optimal Microgrid System for the Integration of Renewable Energy Sources at a University Campus", *Sustainability*, Vol. 14, No. 7, 2022.
- B Larouci, ANEI Ayad, **H Alharbi** et al. "Investigation on New Metaheuristic Algorithms for Solving Dynamic Combined Economic Environmental Dispatch Problems", *Sustainability*, Vol. 14, No. 9, 2022.
- **H. Alharbi** and K. Bhattacharya, "Participation of Pumped Hydro Storage in Energy and Performance-Based Regulation Markets," *IEEE Transactions on Power Systems*, Vol. 35, No. 6, 2020, pp. 4307-4323.
- **H. Alharbi** and K. Bhattacharya, "Stochastic Optimal Planning of Battery Energy Storage Systems for Isolated Microgrids," *IEEE Transactions on Sustainable Energy*, Vol. 9, No. 1, Jan. 2018, pp. 211-227.

Conference Papers:

- **H. Alharbi**, "Optimal Scheduling of Micro Pumped Hydro Storage for Advancing Sustainable Development in Remote Communities," The International conference: Universities and Sustainable Development Goals 2030, Jan. 2024.

- O. Alrumayh, S. Wong, **H. Alharbi** and K. Bhattacharya, “Incentives for Demand Response and Flexibility Services Procured from Energy Storage Systems,” IEEE Power and Energy Society General Meeting, Aug. 2020.
- **H. Alharbi** and K. Bhattacharya, “Energy Storage and Ancillary Services Markets in North America,” 2019 CIGRE Canada Conference, Montreal, Canada, Sep. 2019.
- **H. Alharbi** and K. Bhattacharya, “A Goal Programming Approach to Sizing and Timing of Third Party Investments in Storage System for Microgrids”, IEEE Canada Electrical Power and Energy Conference (EPEC) 2018, Toronto, Canada, October 2018.
- **H. Alharbi**, K. Bhattacharya, “Optimal Sizing of Battery Energy Storage Systems for Microgrids,” in Proc. IEEE Electr. Power Energy Conf., Calgary, AB, Canada, Nov. 2014, pp. 275–280.

Book Chapters:

- **H. Alharbi** and K. Bhattacharya, “An Optimal Investment Model for Battery Energy Storage Systems in Isolated Microgrids”. in V. Bertsch, W. Fichtner, V. Heuveline, T. Leibfried (Edited): *Advances in Energy System Optimization*, pp. 105-121, Springer Publishing, 2017.

Posters:

- T. Alotaibi, A. Almalki, A. Alotaibi, W. Alotaibi, **H. Alharbi**, “Designing pumped hydro storage system for innovative backup power in Taif hospitals leveraging existing strategic water reservoirs”, *Career Day 2024*, Taif University, 2024.
- **H. Alharbi**, N. Padmanabhan, K. Bhattacharya, M. Ahmed, “Planning and operation of energy storage systems and demand response in electricity markets”, *NSERC Energy Storage Technology (NEST) Annual Meeting 2017*, Toronto, ON, Canada, Jun. 2017.
- **H. Alharbi**, N. Padmanabhan, K. Bhattacharya, M. Ahmed, “Planning and operation of energy storage systems and demand response in electricity markets”, *WISE Energy Day 2017*, Waterloo, ON, Canada, Mar. 2017.

Seminars and Presentations:

- “Power Sector Reform in Saudi Arabia,” Seminar, Department of Electrical Engineering, 2024.

- “Provision of ancillary services by energy storage systems,” NSERC Energy Storage Technology (NEST) Virtual Annual Meeting 2020, Jun. 2020.
- “Flywheel energy storage technology for frequency regulation provisions,” NSERC Energy Storage Technology (NEST) Annual Meeting 2019, Toronto, Canada, Jun. 2019.
- “Operating practices for inclusion of energy storage in energy and ancillary service markets of USA and Canada,” NSERC Energy Storage Technology (NEST) Winter School 2019, Montreal, QC, Canada, May 2019.
- “Stochastic optimal planning of battery energy storage systems for isolated microgrids,” NSERC Energy Storage Technology (NEST) Winter School 2018, Shawinigan, QC, Canada, Feb. 2018.
- “Development of operation and planning models for bulk power systems and microgrids considering energy storage systems,” NSERC Energy Storage Technology (NEST) Winter School 2017, Waterloo, ON, Canada, Feb. 2017.

Ph.D. Thesis:

- **Title:** “Electricity Market Participation and Investment Planning Frameworks for Energy Storage Systems,” University of Waterloo, August 2020.
- **Overview:** The thesis focuses on developing market participation and investment planning models for energy storage systems (ESS) considering different ownership structures. Stochastic frameworks, considering demand and intermittent renewable generation, are proposed to determine the optimal investment decisions of ESS from the grid operators’ and third-party investors’ perspectives. The developed optimization models solve the computationally challenging problems using different approaches: stochastic two-stage decomposition-based approach, goal programming approach, and bi-level equilibrium model. Extensive studies and analysis are carried out to demonstrate the effectiveness of the proposed approaches.

Master Thesis:

- **Title:** “Optimal Planning and Scheduling of Battery Energy Storage Systems for Isolated Microgrids,” University of Waterloo, May 2015.

Awards and Scholarships

Excellence Award

- Saudi Arabian Cultural Bureau in Canada (2020)

Highly Qualified Personnel International Mobility Grant

- The Natural Sciences and Engineering Research Council of Canada (NSERC) (2020)

Faculty of Engineering Award

- Electrical & Computer Engineering Dep., University of Waterloo (2017)

Graduate Research Studentship

- The Natural Sciences and Engineering Research Council of Canada (2016-2020)

Graduate Studies Scholarship

- Taif University, Taif, Saudi Arabia