Sohag Kumar Saha

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CAREER SUMMARY

With over 10 years of professional and research experience in power systems, control and operation of generation and distribution utilities, particularly in high-voltage grid substations, I'm pursuing a Ph.D. in Electrical Engineering at Tennessee Tech University, TN, USA, and currently seeking an opportunity in areas related to power systems, including smart grids, microgrids, grid protection and control, integration of solar PV, and grid-scale battery energy storage systems (BESS) plants with automatic islanding operation. My background combines hands-on technical expertise with a focus on advancing power systems through research in intelligent energy management systems, utilizing controller hardware-in-the-loop (CHIL).

EDUCATION

Ph.D. in Electrical and Computer Engineering (ECE) Aug. 2021–Present (Expected Graduation: TBD)
Tennessee Technological University, Cookeville, TN, USA; CGPA: **4.00**/4.00, Credit Completed: 43/48.
Research Focus: Power Systems Modeling, Energy Management Systems, CHIL Validation, and Sub-station Automation.

M.Sc. in Electrical and Computer Engineering (ECE) Aug. 2021-Dec. 2024
Tennessee Technological University, Cookeville, TN, USA; CGPA : **3.65**/4.00, Credit Completed: 34/34.

B.Sc. in Electrical and Electronic Engineering (EEE) Mar. 2009-Dec. 2013
Pabna University of Science and Technology, Pabna, Bangladesh; CGPA : **3.87**/4.00, Credit Completed: 165/165.

RELEVANT COURSEWORKS

- Electrical Power Transmission and Distribution, Power System Engineering, Switchgear and Protection, Power Plant Engineering, Power and Industrial Electronics, Electrical Measurement and Instrumentation, Control System Engineering.
- Computer Methods of Power System Analysis, Linear System Analysis, Non-linear Automatic Control, Learning and Adaptive Control, Machine Learning, Cyber-physical Security, Signal Analysis, Wireless Power Transfer, Electromagnetic Field Theory.

SKILLS SUMMARY

- **Programming Languages**: MATLAB, Python, C, Structured Text, HTML, CSS
- **Library+Frameworks**: Matplotlib, Pandas, Seaborn, Scikit-learn, TensorFlow, PyTorch, Keras
- **Communication Protocols**: Modbus RTU, Modbus TCP/IP, IEC-61850, Ethernet
- **Software Tools**: Simulink, Typhoon HIL, OpenDSS, PSCAD, LTspice, Proteus, Multisim, OpenPLC, SCADABr
- **Hardware Tools**: Typhoon HIL, Universal HIL Connect, SEL RTAC, EPC Power Inverter Controller, SEL Protection Relays
- **Platforms**: Windows, Kali Linux, Arduino IDE
- **Typesetting**: Microsoft Word, Overleaf Latex, Mendeley Citation Tool
- **Substation Construction**: Physical Layouts; Bus-bar Arrangement; Grounding Design; Lightning Protection; DERs Sizing
- **Switchgear Equipment Testing**: 230kV/132kV/33kV AIS & 400 kV GIS Switchgear; SF6 Circuit Breakers; Power Transformers, Auto-transformers; Instrument Transformers (CT/PT); Surge Arresters; Disconnect Switches; and Protection Relays.
- **Project Management**: Bill of Materials Management; Vendor Specification Preparation and Review; Technical Change Control; Risk Management; Contractor Supervision; Commissioning & Energization Plans; Keep Records and Design Updates.
- **Power System Modeling, Analysis and Optimization**: Distribution network modeling, Power flow, DC-OPF, AC-OPF, State estimation, Power system optimization, Convex Optimization, PSO Optimization, Deep Learning and Reinforcement Learning

PROFESSIONAL EXPERIENCES

Graduate Research Assistant (GRA) — ECE, Tennessee Tech University (TTU) TN, USA
Center for Energy Systems Research (CESR) *Aug. 2021 - Till Date*

- Intelligent Energy Management Systems within Community Microgrid using Real-time Controller Hardware-In-the-Loop.
- Modbus TCP/IP and IEC standard communication integrated BESS Plant for Peak Shaving Operation using Typhoon HIL.
- Grid Impact Analysis of PV Integration using OpenDSS and Time Series Analysis.
- Economic Load Dispatch using Particle Swarm Optimization in MATLAB.

Sub-Divisional Engineer/AE — Ashuganj Power Station Company Ltd. (APSCL) Brahmanbaria, Bangladesh
Sub-station Construction, Operation and Maintenance Division *Aug. 2016 - Aug. 2021*

- Installation, Testing and Commissioning work of switch-gear and Protection Equipment in Grid Sub-station.
- Electrical maintenance, trouble-shooting, and fault analysis of High Voltage (33kV, 132kV & 230 kV) Grid sub-station.
- Ensure Efficient Transmission of Electrical Power with Reliability & conducting internships and technical training sessions

Assistant Engineer (AE) — Bangladesh Rural Electrification Board (BREB) Dhaka, Bangladesh
Power Distribution Network Operation, Control and Maintenance *Aug. 2015 - Aug. 2016*

- Operation and maintenance of distribution system for rural electrification in Bangladesh.
- Construction of 33/11 kV sub-stations, distribution lines, and connections of local users to the distribution grids.
- Provide uninterruptible and reliable electricity to consumers with proper voltage, current, frequency, and power factor.

PROJECT EXPERIENCES

- HILLTOP-based grid-connected community microgrid with utility-scale BESS and PV plants with automatic islanding.
- Optimal Electric Vehicle Hosting Capacity in Distribution Network and Validation in Typhoon Hardware-in-the-Loop (HIL).
- Multivariate Optimal Hybrid Deep Learning Model for Forecasting of Solar Irradiance with Meteorological Constraints.
- Installation, testing, and commissioning of 3-phase, 300 MVA, 232 kV/132 kV auto transformer at Ashuganj Grid.
- Installation, testing, and commissioning of 132 kV and 230 kV SF-6 circuit breakers in Ashuganj Grid with all protections.
- Installation, testing, and commissioning of 3 nos. 25 MVAR, 132 kV shunt reactors in Ashuganj grid substation.
- Installation, testing, and commissioning of 10/14 MVA, 33/11 kV distribution substation under BREB, Bangladesh.

POSTER PRESENTATIONS

- **Sohag Kumar Saha**, Ali Arzani and Satish M. Mahajan, "HILLTOP-Based BESS Plant for Peak-Shaving Application." *Tennessee Renewable Energy & Economic Development Council (TREEDC) conference,* Leslie Town Center, Cookeville, TN, USA, 14 Nov 2024.
- **Sohag Kumar Saha** and Douglas A. Talbert, "Automatic Detection of Dust Deposition in Solar Photovoltaic Panels using CNN and LSTM Algorithms." *Research and Creative Inquiry Day-2023,* Tennessee Tech University, Cookeville, TN, USA, 19 April 2023.

PUBLICATIONS

- Hany A. Abdelsalam, Ali Arzani, Satish M. Mahajan, and **Sohag Kumar Saha**, "Real-Time Implementation of Consensus Tracking Control for Battery Energy Management and SoC Balancing." *Accepted in the IEEE 10th Texas Power and Energy Conference (TPEC)*, College Station, Texas, Feb. 2026, pp. 1–6.
- Prashant Kumar, Ali Arzani, **Sohag Kumar Saha**, and Satish M. Mahajan, "An Enhanced Linear Active Disturbance Rejection Controller-Based Dual Active Bridge Converters for EV Charging." *in Proceedings in the IEEE Energy Conversion Conference and Expo (ECCE)*, Philadelphia, Pennsylvania, USA, October 2025, pp. 1–6.
- **Sohag Kumar Saha**, Ali Arzani, Reynaldo Salcedo, and Satish M. Mahajan, "Modbus TCP/IP Based BESS Plant Controller Operations for a Peak Shaving Application." *in Proceedings IEEE 9th Texas Power and Energy Conference (TPEC)*, College Station, Texas, USA, February 2025, pp. 1–6.
- **Sohag Kumar Saha** and Satish M. Mahajan, "Multivariate Optimal Hybrid Deep Learning Model for Forecasting of Day-Ahead Solar Irradiance with Meteorological Constraints." *in Proceedings IEEE 56th North American Power Symposiums (NAPS),* El Paso, Texas, USA, 2024, pp. 1-6.
- Shampa Banik, **Sohag Kumar Saha**, Trapa Banik and S M Mostaq Hossain, "Anomaly Detection Techniques in Smart Grid Systems: A Review." *in Proceedings IEEE World AI IoT Congress (AIIoT),* Seattle, USA, May 2023, pp. 1-7.
- Shampa Banik, Trapa Banik, S M Mostaq Hossain, **Sohag Kumar Saha**, "Implementing Man-In-The-Middle Attack to Investigate Cyber-Security Vulnerabilities in Smart-Grid Test-Bed." *in Proceedings IEEE World AI IoT Congress (AIIoT),* Seattle, USA, May 2023, pp. 1-7.
- S M Mostaq Hossain, **Sohag Kumar Saha**, Shampa Banik and Trapa Banik, "A New Era of Mobility: Exploring Digital Twin Applications in Autonomous Vehicular Systems." *in Proceedings IEEE World AI IoT Congress (AIIoT),* Seattle, USA, May 2023, pp. 1-7.
- Md. Shahidul Islam, Md. Selim Hossain and **Sohag Kumar Saha**, "Efficient Rectenna Design for Harvesting Microwave Power from SSPS System." *in Proceedings IEEE - 2nd International Conference on Electrical & Electronic Engineering (ICEEE),* Rajshahi, Bangladesh, December 2017, pp. 1-4.
- **Sohag Kumar Saha** and Md. Selim Hossain, "Novel Approach of Antenna Array with Beam Steering Technology for Microwave Power Transmission from Space Solar Power Satellite (SSPS) System." *in Proceedings 2nd International Conference on Electrical, Computer & Telecommunication Engineering (ICECTE),* Rajshahi, Bangladesh, December 2016, pp. 1-4.
- **Sohag Kumar Saha**, Md. Amirul Islam and Md. Masudur Rahman, "Design and Simulation of 8-Shape Slotted Microstrip Patch Antenna." *World Applied Sciences Journal (WASJ)*, ISSN: 1818-4952, Volume: 31, Issue: 6, Page: 1065-1071, 2014.

ACADEMIC HONORS AND AWARDS

- The Ongoing Ph.D. research work is funded by the U.S. Appalachian Regional Commission (ARC) under Grant MU-21579-23.
- National Science Foundation (NSF) grant from conference authority for participating in the Texas Power and Energy Conference (TPEC) 2025, College Station, Texas, to present both research article and poster.
- Travel Grant from the Center for Energy Systems Research (CESR), Tennessee Tech University, for participating in the North American Power Symposiums 2024, El Paso, Texas, conference to present a research article.
- Another Travel Grant from the Center for Energy Systems Research (CESR), Tennessee Tech University, for participating in the Appalachian Energy Summit 2023 conference in Boone, North Carolina, to present a research poster.
- Bangladesh-Sweden Trust Fund Scholarship 2022 as a travel grant for covering Bangladesh to USA flight to conduct Ph.D.
- Undergraduate Merit Scholarship in all academic terms and Graduate Assistantship Award in ongoing Ph.D. program.
- BASIS Outsourcing Award as Best Freelancer of the Year-2014 in Web Development Category (District-wise award in BD).

TECHNICAL MEMBERSHIP

- **Senior Member, IEEE;** Region: R3 -Southeastern USA, Section: Central Tennessee, USA.
- **Senior Member**, IEEE Power and Energy Society (IEEE-PES), IEEE Power Electronics Society (IEEE-PELS), and IEEE Industry Applications Society (IEEE-IAS).
- **Member**, International Council on Large Electric Systems (CIGRE), Type: Individual Member-III.
- **Member**, Bangladesh Water and Power Engineers Association (BWPEA).

VOLUNTARY PEER REVIEWER

- **Journals:** IEEE Transactions on Transportation Electrification; IEEE Transactions on Power Electronics; IEEE Access; DE Gruyter: International Journal of Emerging Electric Power Systems; Springer: Peer-to-Peer Networking and Applications; International Journal of Renewable Energy Resources (IJRER); Indonesian Journal of Electrical Engineering and Computer Sciences (IJEECS).
- **Conferences:** IEEE PES General Meeting; IEEE PES International Meeting (2026, Hong Kong SAR, China); IEEE Applied Power Electronics Conference and Exposition (APEC) 2026, IEEE ECCE 2025 (PA, USA); IEEE ECCE Europe 2025 (Birmingham, UK); IEEE ITEC 2025 (CA, USA); IEEE TPEC 2025 (College Station, TX, USA); IEEE PES Innovative Smart Grid Technologies 2024; IEEE PES/IAS PowerAfrica Conference; IEEE SmartGridComm; IEEE COBEP-SPEC; International Conference on Artificial Intelligence, Computer, Data Sciences and Applications; International Conference on Electrical, Computer and Energy Technologies; International Conference on Smart and Sustainable Developments in Electrical Engineering; International Conference on Electrical, Computer, Communications and Mechatronics Engineering.

SELECTED WORKSHOPS AND TECHNICAL TRAINING ATTENDED

- Participated in the industrial Visit on Nashville Electric Service (NES) Control Room and Substation & watched the Demonstration of SEL Microgrid, Venue: NES, Nashville, TN, USA; Mar 30, 2022
- Attended a Seminar on "Upgradation and renovation of Smart grids and Urban grids of Bangladesh", (13 July 2018 to 02 August 2018), Venue: Power-China Zhongnan Engineering Corporation Ltd., Hunan, China
- Completed HIL Fundamental and HIL Specialist-2 Training Program by Typhoon HIL Academy
- Grid-Forming Inverters to Control Microgrids by Federal University of Santa Maria and HIL Academy
- Distributed Secondary Control using Typhoon HIL to Control Microgrids by UIUC & HIL Academy
- Completed Training on Managing DERs with RTAC Grid Connect by Schweitzer Engineering Laboratories
- Completed Lab Safety Training to conduct lab courses for undergrad students at Tennessee Tech
- Completed the official training course as an Instructor on iLearn to teach undergrad students
- Completed online course on Introduction to Python & Introduction to Data Science in Python by Datacamp
- Attended a 5-day workshop on the use and implementation of MATLAB software in scientific research
- Participated a 7-day training course on ISO 9001:2015 (Quality Management Systems), ISO 14001:2015 (Environmental Management Systems), ISO: 45001:2018 (Occupational Health & Safety Management Systems)
- Attended a 5-day training on Power System reliability of grid system
- Attended a 7-day training on Operation & Maintenance of Power Distribution Transformer
- Attended a 3-day training on System Protection, metering, and control of 230kV and 132kV grid systems.