DR. BILAL HUSSAIN (Prof of Practice BU, Islamabad/ Ex-Chief Engineer & Dir , PAEC)

PhD Electrical Engg. (Intelligent Heuristic Algorithmic for advanced energy systems)

Date of Birth: 30/11/1964 **Cells:** 0092-321-5601072/ 0092-323-4858096 **Email:** bilal_hussain@yahoo.com

Professional Summary:

Worked on design & development of electrical systems for nuclear power plants using famous software Tools. Developed innovative intelligent algorithms for modelling and simulation of hybrid energy systems for optimal sizing of eco-efficient renewables and storage systems. Applied intelligent systems including Genetic algorithms, Particle swarms, and Pareto techniques for multi-objective optimization in diversified applications. Case studies conducted for optimal energy systems for homes, micro-grids, and remote bases for energy sustainability, economy and climate in accordance with UN SDGs.
Chair Research Committee, PAEC, on AI, Robotics Intelligent Systems, and Algorithms & Data Structures. Lead Member Working Group of IAEA and Key note speaker at various national and international events on Algorithmic application of Intelligent Systems, hybrid energy systems, and green hydrogen as a future fuel. Presently, working as Professor of Practice in BU, EE department, H11, Islamabad. Motivated for Professor of Practice/ Permanent Faculty Position in Electrical/ Computer/ Robotics Intelligent Systems Engineering. Primary areas of research interest detailed at page-3.

Education:

1) **PhD Elect Engg(Intelligent Heuristic Algo for Energy Systems)**;COMSATS Univ.;CGPA=3.4; 2013-19
2) **MSc. Electric. Engineering (Computing for multimedia)**; UET, Taxila, Pakistan; %age: 77.4%; 1999-2001
3) **Post Graduate Training (Computer Soft/ Hardware);** CTC, Islamabad, Pakistan; %age: 71.36%; 1989-90
4) **B.Sc. Elect. (Power) Engg (Power System Stability Studies);** UET, Lahore, Pakistan; 82.37%; 1984-89

Professional Experience:

Employer/ Position: Professor of Practice, Bahria University, Islamabad, Pakistan
Job Function: Teaching and Research in Electrical Engineering Department
Duration: 03-02-2025 To Present
Duties: Teaching, curriculum and faculty developments, and R&D for undergraduate/ postgraduate program in Electrical Engineering under Outcome Based Education (OBE) system. Developed Curriculum and Taught course on Critical Thinking, Reasoning and Logic; and Principles of Management. Keen in teaching courses and conducting research on Application of Algorithmic Intelligent Systems in Robotics.

Employer/ Position: Chief Engineer/ Director, Pakistan Atomic Energy Commission, Islamabad, Pakistan
Job Function: Intelligent Algorithms for Modelling & Simulation based Analysis of Nuclear-Renewable Hybrid Energy Systems
Duration: 01-12-21 To 29-11-2024
Duties: Developed an Innovative Intelligent Algorithm for optimal operation of a Hybrid Energy System including renewables, storage batteries, nuclear power plants and hydrogen fuel for futuristic sustainable energy systems. Presented the algorithm in 2nd Int. Conf. on Climate Change and Role of Nuclear, IAEA, Vienna, Austria, Oct-2023. The algorithm was used to analyse economy for nuclear hydrogen production in Pakistan. The algorithm was selected for Cross-validation of IAEA FRAMES Tool, under development for Innovative/ Diversified/ Sustainable/ Optimal energy systems. Consultant and Team Lead/ Subject Matter Expert for IAEA Working Group (WG) for IAEA Collaborative Project for development and cross validation of FRAMES Tool. Prepared WG Report on Cross Validation of IAEA Tool using self-owned NSGA Algorithm as a benchmark (June-2025), enabling cross validation process of IAEA FRAMES Tool. Participated in another IAEA WG for analysing use of renewables and nuclear for bulk production of hydrogen as a future green fuel in Pakistan. Working experience on IAEA software Tools for hydrogen economy evaluation program (HEEP) and desalination economy evaluation program (DEEP) to analyse economy for hydrogen and drinking water production. Proposed an Energy Lab for analysing role of innovative power plants and advanced energy technologies in Pakistan.

Employer: Pakistan Atomic Energy Commission, Islamabad, Pakistan
Position: Deputy Chief Engineer/ Manager
Job Function: Optimal Design for Renewable-Diesel-Storage based Hybrid Energy Systems
Duration: 01-12-2013 To 30-11-2021
Duties: PhD Studies on Title "Demand Side Energy Management in Smart Grid".
Course Work Subjects: Renewable Energy Sources; Smart Grid Operations; Power System Operation and Control; Advanced AI Techniques (NNs, Genetic Algorithm, Particle Swarms, and Pareto optimization); DC and Flexible AC Transmission; Power Electronics; Power Quality; Power System Protection (CGPA= 3.4/4). Studied State of Art in Energy Technologies, Energy Systems Modelling Technique & Advanced AI Algorithms for Designing Optimal Energy Systems.
Developed Heuristic Algorithms for Modelling and Simulation based Analysis of Energy System including Renewables, Storage System, Distributed Generation, and Utility. Applied Multi-objective Optimization Techniques for demand response, energy system sizing and optimal operations for Energy Economy and Emission. Made 5 International publications during PhD.

Employer: Pakistan Atomic Energy Commission, Islamabad, Pakistan
Position: Principal Engineer
Job Function: Detailed Design and Execution of Electrical Systems for C-2 Nuclear Power Plant (NPP)
Duration: 01-12-2002 To 30-11-2013
Duties: Design and development of electrical systems for nuclear power plants (NPP). Design Participation in electrical systems design for C-2 NPP in SNERDI, Shanghai, China. Short Circuit Analysis & Protective device Coordination for Design/ Sizing of Electrical Systems. Resolutions of Tech. issues with Regulator from Fuel Loading till Grid connection. Participation in design of Electrical and Control Systems for power plants in Hitec Technology Ltd, Beijing, China. Participation in Installation/ Commissioning activities of C-2 NPP at Chashma, Pakistan.

Employer: Pakistan Atomic Energy Commission, Islamabad, Pakistan
Position: Senior Engineer
Job Function: Detailed Design & Execution of Electrical Systems for C-1 Nuclear Power Plant (NPP)
Duration: 01-12-94 To 30-11-2002
Duties: Detailed Design and Analysis of C-1 NPP, Pakistan. Training under TOT for Safety class Electrical Systems of C-1 NPP in SNERDI, China. Tech. Specs for Electrical Equipment, Qualification Requirement, and Testing of Safety Class Electrical Equipment. Resolutions of Technical Issues with Regulator for Licensing from Fuel loading till Grid Connection. Tech. Coordination with IAEA Missions for Implementing IAEA Recommendations for Plant Safety. Load Flow and Stability Studies for Power Grid Integration of C-1 NPP. Participation in Installation/ Commissioning, and Grid Connection of C-1 NPP.

Employer: Pakistan Atomic Energy Commission, Islamabad, Pakistan
Position: Junior Engineer
Job Function: Basic Design of Electrical Systems for C-1 Nuclear Power Plant
Duration: 01-10-90 To 30-11-1994
Duties: Worked as a part of team responsible for Preparation of Technical Contract for C-1 NPP with China; Review of Safety Analysis Reports; Detailed Studies and Application of Codes and Standards; and Review of Basic Design. Carried out Power System Expansion planning studies for NPPs in Pakistan using IAEA WASP Tool.

Professional Foreign and Local Trainings:

- Workshop on “Research Excellence through Smart PLS and SPSS” conducted by department of leadership and management, Bahria university, Islamabad (8 weeks, 2017)
- Design participation for “Implementation of electrical systems and logic design” on integrated automation systems” for NPPs in Hitech Control Systems Ltd (HITE), Shanghai China (3 Weeks, 2007).
- Detailed design participation in design of “6kV safety class electrical systems” for 300MWe C-2 NPP in Shanghai Nuclear Engg. Research & Design Institute (SNERDI), Shanghai, China (3 Months 2006).

- Participation in design of "Electrical Protections and Controls Systems" for 300MWe C-1 NPP in SNERDI, China (8 Months, 1995).
- Training on "Power System Stability & Control", at WAPDA House, Lahore, conducted by experts from Ontario Hydro, Canada for Power grid (3 Weeks, 1994).
- Postgraduate Training in Computer Software & Hardware, CTC, Islamabad (One year, 1989-90).

Salient Technical Activities:

- Proposed Research Labs**:** (1) Green Hydrogen Technologies (2) Energy Systems Analysis
- Lead Member for IAEA FRAMES, Energy System Optimization Framework, Cross Validation.
- Authored technical research papers published in International Journals (03 Nos).
- Authored Research Papers for Conferences and International Technical Meetings (13 Events)
- Review of Journals: IEEE Access; Energies; Appl. Energy; Information; Total Envir.(> 25paper)
- Supervised 4 final year projects in MSc Electrical Engineering in PIEAS (2012-2016).
- Taught PhD/MS/BS courses in UET Taxila; Comsats Univ., Islamabad; Bahria Univ., Islamabad.
- Professor of Practice in Bahria University, Islamabad, Pakistan (Feb 2025-Present)

IT / Computing Skills:

Development of Heuristic Algorithms; Genetic algorithms; Particle Swarm Optimization; Paretro for multi-objective optimization, Neural Network; Smart PLS; SPSS, Regression & Correlation Analysis, etc. Programming Languages including C/ C++, Matlab, etc.

Areas of Research Interest:

Intelligent Systems in Robotics; Optimization Techniques in Robotics; Mathematical Modeling and Simulation; Algorithms for Energy Economy/ Energy Management; Advanced Energy Technologies; Advanced Heuristic/Quantum-inspired Optimization Techniques; Development of Meta-heuristics Algorithms for Energy System Optimization including Nuclear/ Thermal power plants, Renewables, and Storage Technologies; Nuclear-Renewables for Hydrogen Production and Water Desalination; Smart-grid/ Micro-grid/ Remote Bases/ Moving Platforms Analysis; Development of frameworks based on heuristic/ Quantum Techniques and AI to analyze optimal multi-sectoral integrated energy systems for Energy Economy, Climate, & Sustainability; Frameworks for Climate, Land, Energy, Water (CLEW) nexus analysis**.**

Academic Courses Offered in Electrical Engineering / Energy Technologies/ Robotics:

Available to teach courses on Algorithms & Data-structures; Intelligent Systems in Robotics; Optimization Techniques in Robotics; Computational Intelligence; Advanced Energy Technologies; Renewable Energy Systems; Modeling & Simulation for Integrated Energy Systems; Power Systems Analysis; Power Quality; Smart Grids; Critical Thinking/Reasoning and Logic; Principles of Management.

Publications:

1. **Bilal Hussain,** Qadeer Ul Hasan, Nadeem Javaid, Mohsen Guizani, Ahmad Almogren, and Atif Alamri, "An Innovative Heuristic Algorithm for IoT-Enabled Smart Homes for Developing Countries", IEEE Access Journal 6, 15550-15575 (IF=3.557), 2018.
2. **Bilal Hussain,** Nadeem Javaid, Qadeer Ul Hasan, Sakeena Javaid, Asif Khan, and Shahzad A. Malik, "An Inventive Method for Eco-Efficient Operation of Home Energy Management Systems", Energies Journal 11, no. 11, 3091 (2018) (IF=2.676), 2018.
3. **Bilal Hussain,** Asif Khan, Nadeem Javaid, Qadeer Ul Hasan, Shahzad A. Malik, Omar Ahmad, Amir Hanif Dar and Ahmad Kazmi, "A Weighted-sum PSO Algorithm for HEMS: A New Approach for Design and Diversified Performance Analysis", Electronics Journal, 8(2), p.180 (IF=2.110), 2019.
4. **Bilal, Hussain,** Nadeem Javaid, Qadeer Ul Hasan and Asma Rafique, "An Inventive Method for Eco-efficient Operation of Home Energy Management System", International Conference on Cyber Security and Computer Science (ICONCS), Karabuk University (KBU), Turkey, 2018.

5. **Bilal, Hussain, and Qadeer Ul Hasan.** "Demand Side Management for Smart Homes in Pakistan", IEEE International Conference on Emerging Technologies (ICET), Islamabad, 2016.
6. **Bilal Hussain,** "Algorithm for Demand side management in Smart grid", International Summit on Energy Systems, PIEAS University, Islamabad, 8-10 October 2018.
7. **Bilal Hussain,** "Nuclear-Renewable hybrid energy systems for co-generation for hydrogen: Economy for peaker operation", IAEA 2nd International Conference on Climate Change and Role of Nuclear Power", Austria, Vienna, 9-13 October 2023.
8. **Bilal Hussain,** "Role of Nuclear-Renewable hybrid energy systems for Economy and Environment through co-generation for hydrogen", A Technical Presentation on Nuclear Co-generation, PAEC HQtrs, Islamabad, 10 December 2023.
9. **Bilal Hussain,** "Hydrogen Production through Nuclear Power in Pakistan", Symposium on Nuclear Hydrogen, Pakistan Academy of Engineering, Karachi, 02 March 2024.
10. **Bilal Hussain,** " Modeling Nuclear-Renewable-Hybrid Energy System: Feasibility for H2 Production Using Existing Nuclear Power Plants in Pakistan", IAEA Consultancy Meeting on FRAMES Collaborative Project Kick-off, Vienna, Austria (Virtual), 19-21 March 2024.
11. **Umair Yaqub, Bilal Hussain,** "Economy for Hydrogen Production: A case study for Pakistan", Third Consultants' meeting INPRO Hydrogen Study, 2-6 September 2024.
12. **Shoaib S. Afridi, Bilal Hussain,** "Optimal Scenario for nuclear hydrogen production in Pakistan", IAEA Technical Meeting of Analysis Support for Enhanced Nuclear Energy Sustainability Pilot Study, Sustainable Deployment Scenarios for Small Modular Reactors, Armenia, 23-27 September 2024.
13. **M. Nasir Khan, Bilal Hussain, Rao Saif A. Khan, Iqra Rafique,** "Investigating Nuclear Co-generation Opportunities for hydrogen and potable water in Pakistan", IAEA Technical Meeting on Recent developments in Co-gen. Processes in Member States, Vienna, Austria, Nov. 2024.
14. **Bilal Hussain,** "FRAMES Validation for the Case of a Nuclear-Renewable-Hybrid Energy System with Co-generation for H2 through Peaker Operation for Economy (Tradeoff analysis using a peer reviewed NSGA heuristic algorithm)", IAEA Technical Meeting on Validation & Utilization of INPRO's FRAMES Model (On-line), Vienna, Austria, 18 December 2024.
15. **Bilal Hussain, et al** "A Working Group Report on Cross Validation of FRAMES Model and Tool through a Validated NSGA Algorithm, Under FRAMES Collaborative Project", IAEA, Vienna, Austria, 17 June 2025.
16. **Bilal Hussain,** "Cross-Validation of the FRAMES Model and Tool Using a Peer-Reviewed, NSGA-II Algorithm: Case Study for a Nuclear-PV-SB-LTE based Micro-grid for Electricity & H2 in Pakistan", IAEA 2nd Technical Meeting on INPRO FRAMES Collaborative Project, Vienna Austria, 28-31 Oct. 2025

References

1. Prof. Dr. Nadeem Javaid (PhD Supervisor), Deptt. of EE/ Computer Sciences, COMSATS University, Islamabad, Pakistan/ Prof. International School of AI, National Yunlin University, Taiwan; Cell: (+92) 300-5792728; Email: nadeemjavaidqau@gmail.com

2. Prof. Dr. Qadeer-Ul-Hasen (PhD Supervisor); HoD Electrical Engineering Department, COMSATS University, Islamabad/ Dean Engineering, GIKI, Pakistan; Cell:(+92)311-5233352; Email: qadeer.hasan@comsats.edu.pk

3. Gu Shen Jie; Chief Engineer. SNERDI, Shanghai, China; Ph: (+86)18601729777; Email: gusj@snerdi.com.cn

4. M. Nasir Khan; Principal Engr., PAEC, Pakistan; Cell: (+92)321-5399569; Email:nasirtaxila97@gmail.com