Atmanandmaya

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Pursuing Doctor of Philosophy (PhD) in the Department of Energy Research (formerly Interdisciplinary Centre for Energy Research (ICER)), Indian Institute of Science, Bangalore, INDIA, under the guidance of Prof L. Umanand and Dr. Subba Reddy B.

Area of Research Work

My current research is centered on developing a decentralized hybrid source thermal desalination system that efficiently utilizes latent heat. This system is integrated with a Photovoltaic (PV) system through a DC-DC converter and a Battery Management System (BMS).

My Current research encompasses both fundamental and applied sciences. 1) on the fundamental science where I study the thermal, mechanical, electromagnetic, and electrothermal energy conversion process for designing and developing the hybrid source thermal desalination system through multi-physics and bond modelling. 2) on applied science where I investigate and evaluate performance, and efficiency of the system including techno-economic analysis. Assess social and environmental constraints to ensure the system's viability for real-world application and implementation.

Experience in designing and experimentally evaluating multilevel inverter and dc-dc converter.

Area of Research Interest

Areas of research interest are power electronics for renewable energy conversion (specifically dc-dc converter and MPPT), Bond graph modelling of physical systems, application of thermoelectric modules for energy harvesting and hybrid PVT systems, thermal desalination with interfacial heat localization, Decarbonisation

Educational Qualifications

Qualification	Board/University	Year	Percentage
PhD (Energy Research)	Indian Institute of Science, Bangalore, INDIA	2019-till date	8.5/10
M.Tech (Renewable Energy and Systems)	National Institute of Technology, Kurukshetra, INDIA	2016-18	8.33/10
B.Tech (Electrical Engineering)	National Institute of Technology, Durgapur, INDIA	2011-15	7.65/10
Class 12	Central Board of Secondary Education	2010	76.00%
Class 10	Central Board of Secondary Education	2008	90.40%

Highlights of PhD. Research — Indian Institute of Science (IISc), Bengaluru, INDIA

August 2019 - Present

Design and Development of **Hybrid Source Thermal Desalination System** with Latent Heat Recovery using **Peltier Module** as Heat Pump

- Innovative system design to significantly enhances the efficiency of heat transfer process and do the energy harvesting by latent heat recovery.
- Characterization of Peltier Module with the terminal output and material point of view.
- Theoretical and Experimental evaluation of coefficients of performance of Peltier Module
- Theoretical and Experimental evaluation of GOR and efficiency for the developed desalination unit with and without latent heat recovery.
- Developed a coupled electrical and thermal model of Peltier Module to integrate with the thermal model of desalination unit for heat pump.
- Developed a module parameter estimation method for the Peltier module for non-intrusive surface measurement in the developed desalination unit.
- Integration of developed desalination system through dc-dc converter with the Photovoltaic system

Design and Development of **Active Heating and Cooling Chamber** using **Peltier Brick** integrated with Photovoltaic system for army outpost

- Developed a dynamic model of Peltier module using small signal approach for heating and cooling application
- Developed a modular thermoelectric system for the Peltier brick
- A bidirectional dc-dc converter for the Peltier brick to setup the microgrid system for the Chamber is under development

Highlights of M. Tech Research — National Institute of Technology, Kurukshetra, INDIA

August 2016 – July 2018

Project work on "Analysis of Production of Steam for electricity generation using Calcium Carbide" under the supervision of Prof A. Swarup

Research Work

- Design and performance evaluation of hybrid cascaded inverter of 9 level using single carrier PWM scheme for renewable energy conversion
- Developed a general multilevel inverter facility system for experimental evaluation of multilevel inverter topology.

Highlights of B. Tech Project Work — National Institute of Technology, Durgapur, INDIA

August 2011 – June 2015

- "Modelling and Simulation of Faults of 3-phase Induction Machine" under the supervision of Prof S. K. Dutta

Highlights of Internship — National Thermal Power Plant (NTPC), Barh, INDIA

May 2014 – July 2014

- Learn about Switch yard, Ash handling plant and Boiler Protection and interlock system as an Executive Tranee.
- Learn and visualized the synchronous generator and High-Pressure Turbine section, as unit were under erection.

Research Publications

Preprint

1. **Atmanandmaya**, L Umanand, Subba Reddy B "*Development of a Coupled Thermal-Electrical Circuit Model for Peltier device in heat pump application for desalination systems*" Applied Energy Symposium, MIT 2024
2. **Atmanandmaya**, L Umanand, Subba Reddy B, Wei He" *Analysis and Application of Peltier Module for Surface Temperature Measurement in Hybrid Source Thermal Desalination System by Module Parameter Estimation*" Applied energy Symposium, MIT 2024
3. **Atmanandmaya**, L Umanand, Subba Reddy B "*Sustainable Solution to Mitigate Carbon Emission for the Cumulative Electrical and Thermal Energy Demand in Silk Reeling Process in Southern India*" Energy Proceedings ISSN 2004-2965 2022, Vol. 27,2022
4. **Atmanandmaya**, L Umanand, Subba Reddy B "*Development of Hybrid Source Thermal Desalination System using Thermoelectric Module as a Powerful Heat Pump*" ISSN 2004-2965 Energy Proceedings, Vol. 22, 2021

Conference

1. **Atmanandmaya**, L Umanand, Subba Reddy B "*Derivation and Analysis of Dynamic Model of Peltier Module using Small Signal Approach for Heat Pump Application*", 2023 IEEE IAS Global Conference on Renewable Energy and Hydrogen Technologies (GlobConHT) Year: 2023 | Conference Paper | Publisher: IEEE
2. Shubham, **Atmanandmaya**, Subba Reddy B, L Umanand, "*Integration of Photovoltaic Panels with DC Grid using high gain dc-dc converter*" 2020 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT) Year: 2020 | Conference Paper | Publisher: IEEE
3. W. He, G.A. Raiker, **Atmanandmaya**, B. Subba Reddy, L. Umanand, J. Wang, "*Preliminary Analysis of Photovoltaic-Powered Electrodialysis for In-Home Water Desalination in Rural India*", Proc. B-HTC 2020 - 1st IEEE Bangalore Humanit. Technol. Conf. (2020)
4. Reddy Nithin G, **Atmanandmaya**, Febin Francis, M-Ramez Halloum, B. Subba Reddy, L Umanand, "*Power Quality and Energy Audit Analysis – A Case Study*" 2024 IEEE International Conferences on Electronics, Computing, and Communication Technologies (CONNECT) Year:2024 I Conference Paper I Publisher: IEEE
5. **Atmanandmaya**, Jayaram Nakka "*Single Phase Symmetrical Nine Level Cascaded Multilevel Inverter by Single Carrier PWM Scheme*", 2018 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), DOI: 10.1109/SCEECS.2018.8546884, Publisher: IEEE
6. **Atmanandmaya**, Jayaram Nakka "*Single Carrier PWM Scheme for Single Phase Nine Level Symmetrical Inverter for Renewable Energy Interfacing*", 2018 International Conference on Emerging Trends and Innovations in Engineering and Technological Research (ICETIETR), DOI: 10.1109/ICETIETR.2018.8529002, Publisher: IEEE

Book Chapter

1. Subham, Subba Reddy B, L Umanand, **Atmanandmaya** *"Heating and Cooling of Thermoelectric Module Using Modified Johnson Converter*" Innovations in Electrical and Electronic Engineering, Proceedings of ICEEE 2022, Volume 2

Notable Achievements/Responsibility

1. **Power Quality Analysis and Energy Audit Report** 2024 for Indian Institute of Science during October 23- January 24 and submitted to the Director of IISc, which provides significant inputs to the maintenance engineers of CCMD to upgrade and maintain IISc substations and take corrective measures for the load distribution on various phases at the departments.
2. Detailed Analysis of **100KW Solar Power Photovoltaic System** dedicated to skill development center from the **1MW solar power plant** installed inside IISc, Challakere Campus. Report making is under development.
3. Conducted and supported the online Training program on "**Solar Energy Systems**" held during 4th -8th Jan 2021 for the Skill Development at IISc Challakere, INDIA
4. Invited talk on "**Renewable Energy – Application for Societal needs**" held on 9th September 2021 organized by HAL skill development center IISc Challakere, INDIA
5. Created the team "**SwaJal-Urja**" and participated in 14th cohort of the **I-NCUBATE Program** offered by Centre for Innovation and Entrepreneurship during March-April 2021 at IIT Madras, INDIA
6. Teaching Assistant for the course "**Design of Photovoltaics**" offered by Prof L Umanand during July-October 2023 and during July-October 2024
7. Teaching Assistance for the course "**Advances in UHV Transmission and Distribution**" offered by Dr. Subba Reddy B during September-November 2020 and July-September 2021
8. Teaching Assistance for the course "**Recent Advances in Transmission Insulators**" offered by Dr. Subba Reddy B during Jan-Feb 2021
9. "**Performance Evaluation of Solar Battery Fence Energizer**" for Sub inspector of Rural Police Station Kushalnagar
10. Active reviewer for the **Applied Energy Journal**.

Major Courses finished in Academia

PhD (IISc, Bangalore INDIA)

1. Design of Power Converters
2. Design and Control of Power Converters and Drives
3. Control System Design
4. Switched Mode Power Converter
5. Power Electronics
6. Advance Power Electronics
7. Advance Instrumentations Electronics
8. Digital Controller for Power Electronics
9. Electronic Systems Packaging
10. Thermal Management for Electronics
11. Solar Thermal Engineering
12. Design of Photovoltaic Systems
13. Renewable Energy Techniques

Masters (NIT, Kurukshetra INDIA)

1. Renewable Energy sources
2. Power & Planning of Power Systems
3. Optimization Techniques
4. Energy Conversion Systems
5. Solar Energy Systems
6. Wind Power and Energy Systems
7. Solar Refrigeration & Air-Conditioning
8. Economics & Financing of Renewable Energy Systems
9. Energy Auditing & Management

Software Skill

1. Simulation tools: LTspice, Octave, MATLAB Simscape and Simulink
2. CAD: SolidWorks, Space Claim, OpenSCAD, Blender
3. CAE: Ansys Workbench (specifically Thermoelectric), Icepak
4. CAM: 3D printing
5. PCB Design: KiCAD (similar to Altium), DipTrace
6. Microcontroller platforms: Atmega, TI-DSP
7. Modelling tool: 20Sim for Bond Graph Modelling
8. Photovoltaics Simulation: PVsyst
9. Emulator: dSPACE, OPAL-RT4512

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References

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