

## Dr. Rampelli Manojkumar

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Years of Experience	Teaching: 3.5 years till June, 2024 Research: 5.5 years
Email Id	manojkumar.r@bvrithyderabad.edu.in, manoj023manoj@gmail.com
CN Id	MR1658
Areas of Specialization	Power and energy systems, energy management, applications of battery energy storage and power electronics, voltage control



### *Educational Qualifications*

Doctoral Degree	Ph.D	Power Engineering, IIT Guwahati, 2023
PG Degree	M.Tech	Power and Energy Systems, NITK Surathkal, 2015
UG Degree	B.E	Electrical & Electronics Engineering, Vasavi College of Engineering, Hyderabad, 2013

### *Contributions to Research Grants/Projects*

- a) **Title of the Project:** Investigation and Exploration of Smart Transformer Based ship Microgrid systems
- Coordinator:** Dr. Chandan Kumar (Indian Institute of Technology Guwahati)
- Collaborators:** Dr. Sanjib Ganguly (Indian Institute of Technology Guwahati)
- Sponsoring Agency:** Technology and Innovation Hub (TIH), Government of India
- Role:** Involved in writing the project proposal.
- b) **Title of the Project:** Design, control and management of distributed generation in microgrid
- Coordinator:** Dr. Chandan Kumar (Indian Institute of Technology Guwahati)
- Collaborators:** Prof. Saad Mekhilef (University of Malaya, Malaysia) and Prof. HB Gooi (Nanyang Technological University, Singapore)
- Sponsoring Agency:** ASEAN-India Science & Technology Development Fund
- Role:** The project deliverables such as developing energy management control methods in residential distribution systems are achieved and written the project reports.
- c) **Title of the Project** Design, Operation and Control of Smart Transformer-based Microgrid System
- Coordinator:** Dr. Chandan Kumar (Indian Institute of Technology Guwahati)
- Sponsoring Agency:** Science and Engineering Research Board (SERB), Department of Science and Technology, India
- Role:** The project deliverables such as developing optimal energy management control methods in smart transformer based distribution systems are achieved and written the project reports.

## Papers Published

### International Journal Publications

1. Hossain, J., Saeed, N., **Manojkumar, R.**, Marzband, M., Sedraoui, K., & Al-Turki, Y. (2024), "Optimal Peak-Shaving Control Strategy Utilizing an Efficient PV-BES System for Dynamic Demand Response in Smart Malaysian Commercial Buildings," in *Sustainable Cities and Society*, 101, 105107, doi: 10.1016/j.scs.2023.105107. **(SCIE, Impact factor: 11.7)**.
2. **R. Manojkumar**, C. Kumar, S. Ganguly and J. P. S. Catalão, "Net Load Forecast Error Compensation for Peak Shaving in a Grid-Connected PV Storage System," in *IEEE Transactions on Power Systems*, vol. 39, no. 2, pp. 4372-4381, March 2024, doi: 10.1109/TPWRS.2023.3317309. **(SCIE, Impact factor: 6.6)**.
3. J. Hossain, A. F. A Kadir, H. Shareef, **R. Manojkumar**, N. Saeed, A. N. Nur Hanafi, " A Grid Connected Optimal Hybrid PV-BES System Sizing for Malaysian Commercial Buildings", in **Sustainability** 2023; 15(13):10564. **(Impact Factor: 3.889)**
4. D. Das, **R. Manojkumar**, C. Kumar and S. Ganguly, "Power Loss Minimization in Smart Transformer Enabled Low Voltage Islanded Meshed Hybrid Microgrid," in *IEEE Access*, vol. 10, pp. 123259-123270, 2022 **(Impact Factor: 3.476)**.
5. **R. Manojkumar**, C. Kumar, S. Ganguly, H. B. Gooi and S. Mekhilef, and J. P. S. Catalão "Rule-based Peak Shaving Using Master-Slave Level Optimization in a Diesel Generator Supplied Microgrid", **IEEE Transactions on Power Systems**, doi:10.1109/TPWRS.2022.3187069 **(Impact factor: 7.326)**.
6. **R. Manojkumar**, C. Kumar, S. Ganguly, "Optimal Demand Response in a Residential PV Storage System Using Energy Pricing Limits," **IEEE Transactions on Industrial Informatics**, vol. 18, no. 4, pp. 2497-2507, April 2022 **(Impact factor: 11.648)**.
7. **R. Manojkumar**, C. Kumar, S. Ganguly and J. P. S. Catalão, "Optimal Peak Shaving Control Using Dynamic Demand and Feed-In Limits for Grid-Connected PV Sources With Batteries," in **IEEE Systems Journal**, vol. 15, no. 4, pp. 5560-5570, Dec. 2021 **(Impact factor: 4.802)**.
8. **R. Manojkumar**, Kumar, C., Ganguly, S., Gooi, H.B. and Mekhilef, S. (2020), Voltage control using smart transformer via dynamic optimal setpoints and limit tolerance in a residential distribution network with PV sources. **IET Generation Transmission and Distribution**, 2020, 14, (22), p. 5143-5151 **(Impact factor: 2.995)**.
9. C. Kumar, **R. Manojkumar**, S. Ganguly and M. Liserre, "Impact of Optimal Control of Distributed Generation Converters in Smart Transformer Based Meshed Hybrid Distribution Network," in **IEEE Access**, vol. 9, pp. 140268-140280, 2021 **(Impact factor: 3.476)**.
10. **R. Manojkumar**, Jayaprakash. B, PV Nagaraju, "An Overview of Power System State Estimation from Static State Estimation to Dynamic State Estimation", **International Journal of Pure and Applied Mathematics**, 2017, Vol. 114, 8, pp. 123-129.
11. **R Manojkumar**, PV Nagaraju, "A working methodology of applying Unscented Kalman Filter Technique for Power System dynamic State Estimation," **International Journal of Pure and Applied Mathematics**, 2017, Vol. 114, 8, pp. 255-263.
12. **R. Manojkumar** and D. Jena, "Advantage of extended kalman filter over discrete kalman filter in dynamic state estimation of power system network" **International Journal of Control Theory and Applications**, 2016, Vol. 9, 10, pp. 4795-4800.

### **International Conference Publications:**

1. Hossain, J., Marzband, M., Saeed, N., Kalam, A., Hossain, M.A., **Manojkumar, R.** (2024). Optimal Sizing Capacities of Solar Photovoltaic and Battery Energy Storage Systems for Grid-Connected Commercial Buildings in Malaysia. In: Zhao, J., Kadam, S., Yu, Z., Li, X. (eds) IGEC Transactions, Volume 1: Energy Conversion and Management. IAGE 2023. Springer Proceedings in Energy. Springer, Cham.
2. J. Hossain, H. Shareef, M. A. Hossain, **R. Manojkumar**, Q. Abdullah and A. H. H. Al-Masoodi, "Optimizing Battery Energy Storage and Solar Photovoltaic Systems for Commercial Buildings in Malaysia: A Case Study," *2023 IEEE International Conference on Energy Technologies for Future Grids (ETFG)*, Wollongong, Australia, 2023, pp. 1-6, doi: 10.1109/ETFG55873.2023.10408468.
3. J. Hossain, M. Marzband, A. Kalam, M. Alamgir Hossain, **R. Manojkumar** and N. Saeed, "Optimizing PV and Battery Energy Storage Systems for Peak Demand Reduction and Cost Savings in Malaysian Commercial Buildings," *2023 IEEE IAS Global Conference on Emerging Technologies (GlobConET)*, London, United Kingdom, 2023, pp. 1-6, doi: 10.1109/GlobConET56651.2023.10149980.
4. C. Kumar, **R. Manojkumar**, S. Ganguly, "Optimal Placement of Smart Transformer Low Voltage Converter in Meshed Hybrid Distribution Network" *12th IEEE 2021 - Energy Conversion Congress & Exposition - Asia (ECCE Asia 2021)*, 2021, pp. 1795-1800.
5. D. Das, **R. Manojkumar**, C. Kumar, S. Ganguly, "Optimal Power Management for Islanded Operation of ST-based Meshed Hybrid LV Microgrid" *12th IEEE 2021 - Energy Conversion Congress & Exposition - Asia (ECCE Asia 2021)*, 2021, pp. 183-188.
6. C. Kumar, **R. Manojkumar**, S. Ganguly and M. Liserre, "Power Loss Minimization in Smart Transformer Based Meshed Hybrid Distribution Network," *IECON 2020 The 46th Annual Conference of the IEEE Industrial Electronics Society*, 2020, pp. 1670-1675.

### **National Conference Publications:**

1. Inala, K. P., & **Manojkumar, R.** (2023, April). Artificial Intelligence and Internet of Things Applications in Smart Grid Security: A Survey. In XVIII International Conference on Data Science and Intelligent Analysis of Information (pp. 299-307). Cham: Springer Nature Switzerland.
2. Arunima Dutta, **R. Manojkumar**, Chandan Kumar, "Power Management of a Smart Transformer based Ship Microgrid", in 11<sup>th</sup> National Power Electronics Conference (NPEC), Guwahati, IIT Guwahati, India, 14-16 Dec. 2023, pp. 1-6, doi: 10.1109/NPEC57805.2023.10385022.
3. **R. Manojkumar**, V. M. Hrishikesan, C. Kumar and S. Ganguly, "Voltage Control Using Smart Transformer for Increasing Photovoltaic Penetration in a Distribution Grid," *2019 20th International Conference on Intelligent System Application to Power Systems (ISAP)*, pp. 1-7.
4. **R. Manojkumar** and D. Jena, "Advantage of Unscented Kalman Filter over Extended Kalman Filter in dynamic state estimation of power system network," *Michael Faraday IET International Summit 2015*, 2015, pp. 278-283.

### **Description of the Overall Research Projects**

#### **1. Rule-based Peak Shaving Using Battery Energy Storage**

In this project, an optimal rule-based peak shaving control strategy with dynamic demand and feed-in limits is proposed. The rules are formulated such that the peak utility grid demand and feed-in powers are limited to the corresponding demand and feed-in limits of the day, respectively, while ensuring the flexible day-to-day management of battery. The optimal inputs required for the proposed rule-based control strategy are determined using the genetic

algorithm. Further, the impact of proposed peak shaving algorithm on an isolated diesel generator supplied residential distribution system is discussed.

## **2. Rule-based Demand Response Using Battery Energy Storage**

In this project, a rule-based demand response (DR) control is proposed. The rules are formulated such that energy buying price and selling prices are limited to their corresponding price limits of the day with the flexible day-to-day management of battery energy storage system. For obtaining optimal results with rule-based control, required control inputs are determined using genetic algorithm. Further, the impact of uncertainties on the proposed DR control is discussed.

## **3. Rule-based Voltage Control Using Smart Power Converter**

In this project, a voltage control method using smart transformer (ST) via dynamic optimal set points and limit tolerance is proposed. The proposed method provides an improved voltage profile in the distribution network, which is tested on a CIGRE low voltage residential distribution network.

## **4. Optimal Control of Meshed Hybrid Power Systems Using Smart Power Converters**

In this project, a method for optimal operation of smart transformer based meshed hybrid distribution network is proposed. The power management scheme and method of determining power flow solution are proposed. To know the impact of proposed method, energy loss, operating energy costs, voltage profile and sizing of ST converters are considered and compared with existing literature. Further, the relocation of ST LV converter for improved performance of the system has been done.

## **5. Power Systems State Estimation Using Kalman Filter Techniques**

In this project Kalman filtering is used for the estimation of both static states i.e. voltage and its angle at all buses and dynamic states i.e. rotor angle w.r.t. synchronously rotating frame in rad and relative angular speed in rad/sec of all the generators present in the system. The algorithms are tested on an IEEE-14 bus, 5-generator test system.

### ***Research Interests:***

- Operation and planning of power systems
- Energy management using energy storage and power electronics converters
- Power systems state estimation
- Meshed and hybrid power systems
- Optimal power flow
- Data analysis and artificial Intelligence for power systems

### ***Technical Skills:***

- Programming/Data analysis tools: MATLAB, Basics of Python
- Simulation: MATLAB/Simulink, PSCAD
- Optimization solvers: Meta-heuristics (Genetic Algorithm, Particle Swarm Optimization)
- Drawing: MS Visio, Inkscape
- Documentation: LaTeX, MS Word

### ***Online Course Certifications:***

- Introduction to Data Analytics by Simplilearn
- Introduction to Artificial Intelligence by Simplilearn
- Python for Beginners by Simplilearn

- Business Analytics with Excel by Simplilearn
- Machine Learning by Simplilearn

### ***Achievements***

- Received gold medal in the NPTEL course titled "Operation and Planning of Power Distribution Systems".
- Received silver medal in the NPTEL Course "MATLAB Programming for Numerical Computation".
- Received the best paper award in 2nd International Conference on Data Science and Artificial Intelligence (ICDSA) 2023 for the paper titled "Artificial Intelligence and Internet of Things Applications in Smart Grid Security: A survey".
- Obtained a percentile of 98.66 in GATE EE-2016, a test conducted to know the comprehensive understanding of various undergraduate subjects in engineering and science.
- Secured second rank in 3-minute Thesis competition conducted by IEEE student chapter, Indian Institute of Technology Guwahati.
- Received Scholarship from Ministry of Education, Government of India during masters and doctoral studies.

### ***Editorials/Reviewer Activities***

- Early Career Board member of International Journal of Ambient Energy
- Guest Editor of PLOS ONE journal
- Reviewer for IEEE Transactions on Industrial Informatics
- Reviewer for IEEE Systems Journal
- Reviewer for IEEE Access Journal
- Reviewer for Applied Energy
- Reviewer for International Journal of Electrical Power and Energy Systems
- Reviewer for Energy Reports
- Reviewer for Journal of Energy Storage
- Reviewer for Journal of Building Engineering
- Reviewer for Results in Engineering
- Reviewer for Energy and Buildings
- Reviewer for Data Science and Management

### ***Speaker Engagements:***

1. Invited speaker of Sustainability Research eConference 2024 (SustainResearch-eCon 2024) held on April 15-16, 2024.
2. Resource person for a guest lecture on "Rule-based approach for Peak Shaving with Energy Storage", Organized by Dept. of EEE in Association with Madanapalle Institute of Technology & Science IEEE & ISTE Chapter, Andhra Pradesh, held on 02.11.2023.
3. Resource person for the talk on "Optimal Rule-based Energy Management and Voltage Control Using Battery Energy Storage and Smart Power Converters" conducted by VEDIC – Research Enabling Program [V-REP], Faculty Research Colloquium, SVES on 09.06.2023.
4. Speaker of IEEE Smart grid webinar titled "Smart Power Converters for Steady State Voltage Support" held on Mar, 2023.
5. Resource person for a session of two-week short-term training programme on "Fundamentals of MATLAB" conducted under student chapter of The Institution of Engineers (India).

***Co-curricular Activities:***

- **Teaching assistant** for the online course “Operation and Planning of Power Distribution Systems” conducted by NPTEL, Government of India.
- **Author** at Kindle direct publishing where handwritten notes of several subjects are available.
- **You tuber** at channel “life learning studio” where lecture videos of few important points of topics in Electrical & Electronics Engineering are presented.

***Professional Memberships:***

- Member of IEEE (No: 9293182)