Guest Editorial Column: Special Issue of Distributed Generation & Alternative Energy Journal "Digital twin for Accelerating Sustainability in Energy Automation and Smart Grid"

Dear Readers,

We are very glad to introduce you to this Special Issue of the Distributed Generation & Alternative Energy Journal "Digital Twin for Accelerating Sustainability in Energy Automation and Smart Grid". This Special Issue is published in collaboration with authors from research institutions and universities who have great experience in the development of international research projects on both distributed generation and alternative energy.

The aim of this Special Issue is to present the Digital Twin for Accelerating Sustainability in Energy Automation and Smart Grid. Therefore, the utilities can harness the power of transparency with a single source of truth for data across their entire utility IT landscape. A digital twin is a digital representation of a physical object, person, or process, contextualized in a digital version of its environment. Digital twins can help an organization simulate real situations and their outcomes, ultimately allowing it to make better decisions [1, 2]. This Digital Twin closely aligns real and virtual worlds by providing utilities with a single source of truth to model data across their entire IT landscape. A common network model is there to facilitate grid simulation across all domains relevant to reliable, efficient, and secure electrical system planning, operation, and maintenance.

The Special Issue consists of four articles:

The article "*Optimizing Energy Consumption in Smart Grids Using Demand Response Techniques*", by SwornaKokila M L et al., is devoted to develop a smart Demand Response (DR) system that can predict times of high-energy demand and proactively alter usage to reduce such periods. Machine learning strategies are utilized in the proposed system to estimate peak demand via past data, weather predictions, and other variables. The system will then alter energy use based on real-time data from smart meters along with other sensing devices to meet the projected demand. The simulation model will include several scenarios for testing the DR system's flexibility, including a range of weather conditions, load profiles, and grid topologies.

In "*Multi-Criteria Decision-Making for Energy Management in Smart Homes Using Hybridized Neuro-Fuzzy Approach*", U.V. Anbazhagu et al. discuss necessity for smart energy oversight solutions has arisen in response to the rising popularity of energy-efficient home automation and other energy-saving technologies. This investigation presents a hybrid Neuro-Fuzzy (H-NF) method for MCDM in regulating energy for smart homes by combining FL with an MNN. The suggested approach would optimize energy use in smart homes by considering several parameters, notably cost, ease of use, and environmental effects. In addition, this study aims to examine how the H-NF model fares in comparison to other methods of making important decisions in terms of several performance metrics.

The article "*A Deep Learning Based Enhancing the Power by Reducing the Harmonics in Grid Connected Inverters*", by Subramanya Sarma S et al., deals with the proportional integral (PI) and proportional resonant (PR) controllers have been investigated for their effectiveness in reducing harmonics in grid-connected inverters. The study also investigates the impact of harmonics compensators (HC) on the control strategies. The results of the study suggest that the implementation of PI and PR controllers in the synchronous frame can effectively reduce the injected current harmonics in grid-connected inverters.

Pradeep Kumar P et al. in the article "*An Efficient LIBED and GBLRU-Based Solar Panel Hotspot Detection System Using Thermal Images*" describe the Autonomous diagnostic models, which are required to examine the solar plants and to detect the anomalies within the PV panels. A novel Log Inverse Bilateral Edge Detector (LIBED) and Gated Bernoulli Log-max Recurrent Unit (GBLRU)-centered Solar Panel (SP) hotspot detection scheme is proposed in this research that analyzed the operating PV module's

thermal images. Images are applied for the image processing steps prior to hotspot detection. By utilizing the Contrast Limited Adaptive Histogram Equalization (CLAHE) model, the image contrast has been augmented by the image processing. The GBLRU was utilized to predict the defective panels.

All of these articles have been double-blind reviewed in two review rounds according to the publication standards.

We hope, the readers will enjoy reading this special issue and will get valuable information about advances in distributed generation and alternative energy. We would like to express our deep appreciation to all authors for their contributions, to reviewers for their timely and interesting comments and suggestions. Thank you so much river publishers especially Vijay K. Sood, Editor in Chief and Dr. Sanjeevikumar, Co-Editor in Chief of the Journal for giving me opportunity to serve as the guest editor in this reputed Scopus indexed Journal. Indeed, the journey was very interesting and fruitful. Thanks a lot to Karen for their time to time dedicated support. as well as to River Publishers' staff for kind technical assistance.

We certainly look forward to working with all contributors again in the near future.

[1] P. Karthikeyan, P. F. Katina, and S. P. Anandaraj, *Approaches to data analytics and Internet of Things through digital twin*. Hershey, PA: IGI Global, 2023. Accessed: Nov. 03, 2022. [Online]. Available: https://doi.org/10.4018/978-1-6684-5722-1.

[2] M. W. Grieves, "Virtually Intelligent Product Systems: Digital and Physical Twins," in *Complex Systems Engineering: Theory and Practice*, Volume 256, in Progress in Astronautics and Aeronautics, Volume 256, American Institute of Aeronautics and Astronautics, Inc., 2019, pp. 175–200. doi: 10.2514/5.9781624105654.0175.0200.

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