ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2020 Rank Band: 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.
काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
(An Autonomous Institute under Kakatiya University, Warangal)
(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)
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TECHNICAL MAGAZINE

A.Y. 2024–2025

DEPARTMENT OF

ELECTRICAL & ELECTRONICSENGINEERING

Technical Magazine Committee:

Editor : **Dr. G. Rajendar, Head of the Department, EEE Dept.**

Members : **Sri. T. Praveen Kumar, Asst. Prof., EEE Dept.**
Dr. G. Sunil Kumar, Asst. Prof., EEE Dept.

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Message by HoD

With great pleasure and honour I write this foreword. Indeed, this Technical Magazine has a lot to look forward. I am happy that our department started in the year 1994 with the B.Tech-EEE programme has completed 31 years during 2024-25. During these 31 years EEE department has crossed several milestones and contributed to society in the form of education to engineering students.

Started with B.Tech – EEE in 1994 with an intake of 60 later enhanced to an intake of 120 in the year 2012. PG programme of M.Tech-Power Electronics was started in the year 2013. B.Tech-EEE program has been accredited by NBA three times under Tier-II from 2011-14 and 2016-19. I am glad to inform that now B.Tech-EEE program has been accredited by NBA under Tier-I for three years from 1st July 2019.

Faculty have contributed whole heartedly for the growth of the Department. The Department has also witnessed the strong force of faculty. At present the Department has faculty strength 26 with diversity of specialization, out of which 18 of them have Doctorates, 03 are pursuing PhD and 05 are with M.Tech. There are four research groups in the department – Power Electronics, Power systems, Electrical Machines & Drives, Control Systems and Instrumentation.

The objective of Technical Magazine is to display the research culture in the department and publications made by the department faculty in terms of Journals / Transactions / Conference Papers during the academic year. Also, it provides an opportunity to students to publish technical articles.

I would like to offer a word of thanks to our readers, our contributors, and our editorial board for their support of the technical magazine and its mission: to improve the quality of research contribution and awareness on recent trends & life-long learning among students. This technical magazine will provide a glimpse of faculty and student contributions made during academic year 2024-2025.

Dr. G. Rajendar
HOD, EEE Dept.

Faculty publications - Journals

List of Journals published by the Faculty during A.Y. 2024-25:

S.No.	Name of the Faculty	Title of the Paper	Name of the Journal	Details of Paper
1.	Rakesh Chandra Dongari	Short-Term Load Forecasting in Distribution Substation Using Autoencoder and Radial Basis Function Neural Networks: A Case Study in India	Journal of Computation, MDPI	pp. 1–18, vol. 15, no. 75, March 2025
2.	Pavan Kumar Chillappagari& Madhukar Rao Airineni	Fault Resilient Ability of Reduced Switches Multi Level Inverter for Off Grid Applications	Iranian Journal of Science and Technology, Transactions of Electrical Engineering, Springer	pp. 1669–1684, vol. 48, September 2024
3.	Dr.B.Jagadish Kumar	Zeta Converter-Based Switched Mode Power Supply with Enhanced Power Quality	The International journal of analytical and experimental modal analysis	pp. 398–402, vol. 17, no. 05, May 2025

computation

MDPI

Article

Short-Term Load Forecasting in Distribution Substation Using Autoencoder and Radial Basis Function Neural Networks: A Case Study in India

Venkataramana Veeramsetty [1], Prabhu Kiran Konda [2], Rakesh Chandra Dongari [3] and Surender Reddy Salkuti [4,*]

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Abstract: Electric load forecasting is an essential task for Distribution System Operators in order to achieve proper planning, high integration of small-scale production from renewable energy sources, and to define effective marketing strategies. In this framework, machine learning and data dimensionality reduction techniques can be useful for building more efficient tools for electrical energy load prediction. In this paper, a machine learning model based on a combination of a radial basis function neural network and an autoencoder is used to forecast the electric load on a 33/11 kV substation located in Godishala, Warangal, India. One year of historical data on an electrical substation and weather are considered to assess the effectiveness of the proposed model. The impact of weather, day, and season status on load forecasting is also considered. The input dataset dimensionality is reduced using autoencoder to build a light-weight machine learning model to be deployed on edge devices. The proposed methodology is supported by a comparison with the state of the art based on extensive numerical simulations.

Keywords: radial basis function neural network; autoencoder; electric power load; forecasting; machine learning

Received: 25 January 2025
Revised: 1 March 2025
Accepted: 9 March 2025
Published: 14 March 2025

Citation: Veeramsetty, V.; Konda, P.K.; Dongari, R.C.; Salkuti, S.R. Short-Term Load Forecasting in Distribution Substation Using Autoencoder and Radial Basis Function Neural Networks: A Case Study in India. *Computation* **2025**, *13*, 75. https://doi.org/10.3390/computation13030075

1. Introduction

Utility companies must estimate electrical power consumption in order to reduce operating and maintenance costs, manage demand and supply, increase dependability, properly plan for future investments, and engage in efficient energy trading [1–3]. Based on the forecasting time, electrical load forecasting may be broadly classified into four primary categories: extremely short-term and short-term [4,5], medium-term, and long-term load forecasting [6]. Depending on the time horizon, load forecasting can be used for a variety of purposes, including optimal operations, grid stability, demand-side management (DSM), or long-term strategic planning [7].

One of the more difficult problems in a deregulated power system is anticipating short-term active power load. Load consumption patterns are more commonly adjusted as a result of weather, cultural events, and people's social routines, according to [8]. The active power load in low-voltage distribution systems is very unpredictable, particularly in India, because the majority of customers are residential and commercial customers who are

Iranian Journal of Science and Technology, Transactions of Electrical Engineering
https://doi.org/10.1007/s40998-024-00749-3

RESEARCH PAPER

Fault Resilient Ability of Reduced Switches Multi Level Inverter for Off Grid Applications

Pavan Kumar Chillappagari[1] · Karthick Nagaraj[1] · Madhukar Rao Airineni[2]

Received: 4 July 2023 / Accepted: 23 August 2024

Abstract
In this article, reduced switch-based fault resilience capable multi-level inverter (MLI) with phase disposition pulse width modulation (PD-PWM) strategy is implemented. For reliable power conditioning and monitoring of PV based systems multi-level inverter (MLI) received a lot of attention. The switching device quantity mainly influences of volume and reliability in a MLIs. It is a crucial challenge in on and off-grid applications. Because of the high failure rate of power devices, the reliability of MLI utilized in PV and grid-connected systems is very poor or susceptible. To reduce the switching losses and enhance the MLIs reliability with fault resiliency, the reduced switch component topology is proposed in this work. Instead of a single switch, the suggested configuration is employed with multiple switch fault resiliency, then the reliability of the inverter is enhanced. Further, the PD-PWM switching strategy is employed for the MLI operation. The proposed scheme offers an excellent performance with significant result of THD, switching losses, and efficacy. The implemented inverter topology with PD-PWM strategy is simulated in MATLAB/Simulink along with fault tolerance operation under normal and faulty operation. Also, the real-time operation of proposed topology with experimental setup is validated using field programmable gate array (FPGA) controller.

Keywords MLI · Field programmable gate array · Switching losses · Phase disposition pulse width modulation · Fault resilient ability · Reliability

1 Introduction

Power electronic converters, on the basis of their excellent performance, and efficacy are extensively utilized in an array of applications such as grid interfacing non-conventional energy sources, variable speed drives, FACTS devices, electric vehicle, and so on (Rahimpour et al. 2023). Multilevel inverters (MLIs) extremely handle the voltage restriction associated with typical two-level inverters (Vijeh et al. 2019). Moreover, traditional two-level inverters have a large harmonic content, higher switching losses, and a lower fundamental value. An MLI has significant benefits over its predecessor, including a higher number of output voltage levels, it enhances power quality, reduces the dv/dt stress on the switches, the elimination of filters, and strong electromagnetic compatibility (Poorfakhraei et al. 2021). With increasing the number of switches, the higher voltage levels are generated in MLI and it can improve the quality of output. As a result of that, the reliability of the system deteriorated and chances of failure switches increases (Vemuganti et al. 2021). Consequence, the inverter will may not provide power to load and may have a chance to failure of source. In order to avoid this problem, the MLI are design with reduced switch count (Omer et al. 2020).

Many of the research scholars in the literature, a variety of topologies with lesser devices such as power semiconductor switches, diodes and capacitors have been presented. The conventional MLI configurations are neural point-based diode clamped inverter in Wang et al. (2020), flying capacitor-based MLI in Kampitsis et al. (2022), and cascaded connection-based H-bridge inverters in Maheswari et al. (2021) discussed. The higher number of switches are required if the inverter is operating for higher

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Published online: 12 September 2024

ZETA CONVERTER-BASED SWITCHED MODE POWER SUPPLY WITH ENHANCED POWER QUALITY

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***Abstract*— This project presents an innovative zeta converter-based switched mode power supply for enhanced power quality. Integrating source inductance, a diode bridge rectifier, a Zeta converter, non-linear load, PWM generator, PI controller, and hysteresis current controller, the system reduces current ripples and harmonics, improves power factor, and stabilizes voltage. Experimental results verified in Matlab 2024a show significant improvements in power factor, total harmonic distortion (THD), and voltage regulation.**
Keywords—Zeta Converter, Hysteresis Current Controller, Power Factor Correction Total Hormonic Distortion.

I. INTRODUCTION

Switched Mode Power Supplies (SMPS) have revolutionized power electronics by offering significant advantages over traditional linear power supplies. This introduction provides a comprehensive overview of SMPS, delving into their principles, operations, applications, and benefits. Power supply units convert electrical energy for electronic devices, historically dominated by linear power supplies, which are inefficient, bulky, and limited in voltage conversion. In contrast, SMPS achieve higher efficiency by switching a semiconductor device on and off rapidly, minimizing energy loss. The process involves rectifying AC input to DC, chopping it into high-frequency pulses using a MOSFET or transistor, transforming these pulses to the desired voltage, and then rectifying and filtering the output to ensure a stable DC output. SMPS's high-frequency operation allows for smaller, lighter components, making them ideal for compact applications in consumer electronics, telecommunications, and automotive sectors. Their dynamic voltage adjustment under varying loads enhances efficiency, especially in battery-powered devices. Additionally, SMPS offer improved voltage regulation, faster transient response, and better power factor correction, making them versatile for numerous applications. The superior efficiency, compact size, and performance of SMPS have made them integral to modern electronic devices, underscoring their prominence in today's technology-driven landscape.

II. OBJECTIVES

This project aims to implement a zeta converter-based switched mode power supply to enhance power quality. It will investigate the operational principles of Zeta converters in SMPS, analyze the impact of power quality issues on SMPS performance, and identify improvements using Zeta converter technology. Additionally, the project will evaluate the cost-effectiveness and feasibility of integrating Zeta converters into existing SMPS designs for enhanced power quality..

A. Advantages

Zeta converters facilitate superior power factor correction, leading to improved energy efficiency and reduced harmonic distortion in input currents. Their soft-switching operation minimizes electromagnetic interference (EMI), ensuring compliance with regulatory standards and enhancing the reliability of sensitive electronic equipment. Additionally, with a compact design and wide input voltage range, Zeta converter-based SMPS systems are versatile and suitable for various applications, including renewable energy systems, telecommunications, and industrial automation.

B. Existing System

The quality of electricity supplied to computer components hinges on the converter's performance, which must maintain consistent voltage despite variations. Zeta technology excels in power conversion, performing both buck and boost conversions while enhancing power quality through power factor correction and reducing harmonic distortion. This is crucial as the rectifier's nonlinear properties during AC to DC conversion can introduce issues. Zeta converters regulate output using duty cycle control and are favored for their voltage adjustment capabilities. They improve power factor in applications like LED lights and electric vehicles, and when used with DC motors, they effectively maintain supply-side power factor. Capacitors and inductors play key roles in enhancing power quality, though voltage fluctuations can complicate stability as motor speed varies. SMPS convert AC to DC power, essential for computer function, with specific voltage and current needs for different components. Zeta converters excel at low power levels without flicker, ensuring high-quality power is delivered.

The Zeta Converter has been integrated into existing systems to enhance switched mode power supply performance. In today's digital landscape, ensuring high-quality power is vital to protect electronics from supply fluctuations. Stable power is particularly important for personal computers, as they are sensitive to voltage changes. Researchers have developed a simulation model using Zeta converters for SMPS, showing significant reductions in harmonic distortion. Typically, SMPS operate in two stages, converting AC to DC and using duty cycle regulation to

Faculty publications – Conference Papers

List of Conference Papers published by the Faculty during A.Y. 2024-25:

S.No.	Name of the Faculty	Title of the Paper	Name of the Conference	Conference Date
1.	Santhosh Madasthu and Srinivas Kottakonda	Statistical Machine Learning-Based Electricity Demand Forecasting	Smart Grid Security and Protection	pp. pp 207–221, 03 May 2025

Statistical Machine Learning-Based Electricity Demand Forecasting

Santhosh Madasthu and Srinivas Kottakonda

Abstract As technology advances, so does the demand for electric power, steadily increasing over time. To ensure uninterrupted access to electricity round the clock, it's imperative for generation facilities to synchronize with consumers' evolving demands. Demand forecasting emerges as the key solution to avert any potential energy crises. In our latest endeavor, we've harnessed the power of artificial neural networks for precise electric demand forecasting. By leveraging data from an electric substation in Telangana, India, we've meticulously compared the performance of various neural network architectures. Through rigorous evaluation using metrics like MSE, RMSE, and MAPE, we've demonstrated the efficacy of our proposed support vector machine (SVM) approach. Our results unequivocally highlight that our SVM model stands out, delivering highly accurate forecasts for electric load demand.

Keywords Load forecasting · Support vector machine (SVM) · Neural networks

1 Introduction

The global need for electricity is rapidly increasing. To ensure a sufficient power supply for generation and distribution, it is vital to understand and analyze consumer demands. Load forecasting is critical for balancing power supply and demand. Forecasting the electricity demand is necessary for the electric grid for:

- Planning the utilities based on future consumption of load demand.
- Determining the resources such as fuel which is sufficient to operate the plants.
- Understanding future demand to help the maintenance of power systems.

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A. Q. H. Badar et al. (eds.), *Smart Grid Security and Protection*, Lecture Notes in Electrical Engineering 1307, https://doi.org/10.1007/978-981-96-0824-9_18

Student's Publications

List of the Students' Journals and Conference Papers published during A.Y. 2024-25:

S.No.	Name of the Student(s)	Title of the Paper	Name of the Journal/Conference	Details of Paper
1	Dhanush G, M.Tech Student	Zeta Converter-Based Switched Mode Power Supply with Enhanced Power Quality	The International journal of analytical and experimental modal analysis	pp. 398–402, vol. 17, no. 05, May 2025

ZETA CONVERTER-BASED SWITCHED MODE POWER SUPPLY WITH ENHANCED POWER QUALITY

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