

A Comprehensive Survey on Electrical Distribution Systems

Namburi Nireekshana¹; Sadiya Shiraz²; Reddy Dharani Divyashree³;
Karishma Naaz⁴; Siliveri Soumya⁵

¹Assistant Professor, Department of Electrical and Electronics Engineering, Methodist College of Engineering and Technology (Autonomous), Hyderabad, India

^{2,3,4,5}BE, IV Year, Department of Electrical and Electronics Engineering, Methodist College of Engineering and Technology (Autonomous), Hyderabad, India

Publication Date: 2025/12/05

Abstract: The electrical distribution system (EDS) plays a vital role in the power sector, serving as the final stage in the delivery of electrical energy from the transmission network to end users. It ensures the efficient, reliable, and safe supply of electricity to residential, commercial, and industrial consumers. Over the years, distribution systems have evolved significantly in terms of design, operation, and technology to meet the growing energy demand and improve service quality. This paper surveys existing research, technical developments, and innovations in electrical distribution systems (EDS). It provides a detailed overview of traditional systems mainly radial, ring, and interconnected networks and highlights their characteristics, advantages, and limitations. The study also emphasizes the importance of load management, voltage regulation, and protection schemes that ensure system reliability and minimize power losses. With the integration of renewable energy sources such as solar and wind, as well as the implementation of automation and smart grid technologies, modern distribution systems have become more intelligent and adaptive. The paper explores the role of technologies like Supervisory Control and Data Acquisition (SCADA), smart meters, and Internet of Things (IoT) devices in enhancing monitoring, control, and fault detection. Additionally, challenges such as aging infrastructure, power quality issues, and cybersecurity threats are discussed, along with emerging solutions like energy storage and artificial intelligence-based predictive maintenance. Overall, this survey aims to provide an in-depth understanding of both conventional and modern electrical distribution systems, their operational challenges, and future development trends, contributing to improved system performance and sustainable power distribution in the evolving energy landscape. The findings from this survey consolidate recent advancements and highlight future research opportunities in smart and sustainable distribution systems.

Keywords: Electrical Distribution System (EDS), Smart Grid, Distributed Generation, Load Management, Voltage Regulation, SCADA, IoT, Power Quality, Renewable Energy Integration, Cybersecurity, Predictive Maintenance, Energy Storage.

How to Cite: Namburi Nireekshana; Sadiya Shiraz; Reddy Dharani Divyashree; Karishma Naaz; Siliveri Soumya (2025) A Comprehensive Survey on Electrical Distribution Systems. *International Journal of Innovative Science and Research Technology*, 10(11), 2555-2562. <https://doi.org/10.38124/ijisrt/25nov1110>

I. INTRODUCTION

The electrical distribution system (EDS) forms one of the most critical segments of the overall power system infrastructure, bridging the gap between high-voltage transmission networks and the end users of electricity. Its primary function is to deliver electric power from substations to consumers safely, reliably, and efficiently. In the early stages of electrical power development, distribution systems were designed simply to transmit energy to consumers through radial connections, with minimal focus on efficiency or automation. However, the steady rise in population, rapid industrialization, and the growing dependence on electricity

have led to a massive increase in energy consumption. This growth has demanded more reliable and technically advanced distribution systems that can handle fluctuating loads, maintain voltage stability, and ensure minimal losses. Today's electrical distribution systems are no longer just passive networks; they are evolving into intelligent, automated infrastructures integrated with modern technologies that enable real-time monitoring, control, and optimization of electrical energy flow. Thus, understanding the architecture, components, and operation of distribution systems has become essential for electrical engineers, researchers, and power planners in ensuring sustainable and efficient power delivery[1].

The structure of a distribution system consists of various interconnected elements that work together to ensure the effective flow of electrical energy from substations to consumers. These include feeders, distributors, service mains, transformers, circuit breakers, fuses, switches, and other protective devices. The design and layout of these components depend on several factors such as consumer load density, geographical location, voltage level, and type of service required. For instance, urban areas with high load demand usually employ underground distribution systems for better aesthetics and reliability, while rural areas use overhead lines for cost-effectiveness. In addition to physical components, distribution systems also involve operational mechanisms such as voltage regulation, load management, power factor correction, and fault protection to maintain system performance and reliability. Engineers must also consider power quality aspects such as harmonics, voltage dips, and interruptions that can significantly affect industrial processes and sensitive electronic equipment. The design philosophy has thus shifted from simple energy delivery to comprehensive system planning that prioritizes efficiency, safety, and sustainability[2].

Technological advancement has brought a major transformation in electrical distribution systems. The integration of automation, communication, and control technologies has resulted in the development of what is now called the “smart distribution system.” Smart grids, equipped with advanced sensors, intelligent electronic devices (IEDs), and automated control units, enable utilities to detect faults, reroute power, and restore service within seconds. Systems such as Supervisory Control and Data Acquisition (SCADA), Geographic Information Systems (GIS), and Advanced Metering Infrastructure (AMI) allow real-time monitoring and

data analytics for better decision-making. These technologies not only improve reliability and efficiency but also support the integration of distributed energy resources (DERs) such as solar panels, wind turbines, and battery storage units. The shift toward renewable energy has made distribution networks more dynamic and complex, requiring flexible control strategies and bidirectional power flow capabilities. As a result, modern electrical distribution systems are no longer static; they continuously adapt to changing load patterns, generation variability, and consumer demands[3], [4].

In addition to technology, several challenges affect the performance and reliability of electrical distribution systems. One major issue is the aging infrastructure in many regions, where outdated equipment leads to frequent failures and high maintenance costs. Power losses—both technical and non-technical—also continue to be a concern, particularly in developing countries where transmission and distribution losses can exceed 20%. Voltage instability, unbalanced loads, and inadequate protection schemes can cause disruptions and equipment damage. Moreover, the integration of renewable energy introduces variability and intermittency in power supply, which can complicate grid management. Another emerging challenge is cybersecurity, as the increasing digitization of grids exposes them to potential cyberattacks. Addressing these challenges requires a combination of robust design, advanced control systems, skilled workforce, and government policies promoting modernization and investment in infrastructure. Educational institutions, research organizations, and power utilities are therefore focusing on training engineers and developing innovative technologies to enhance the reliability, efficiency, and resilience of distribution networks[5], [6].

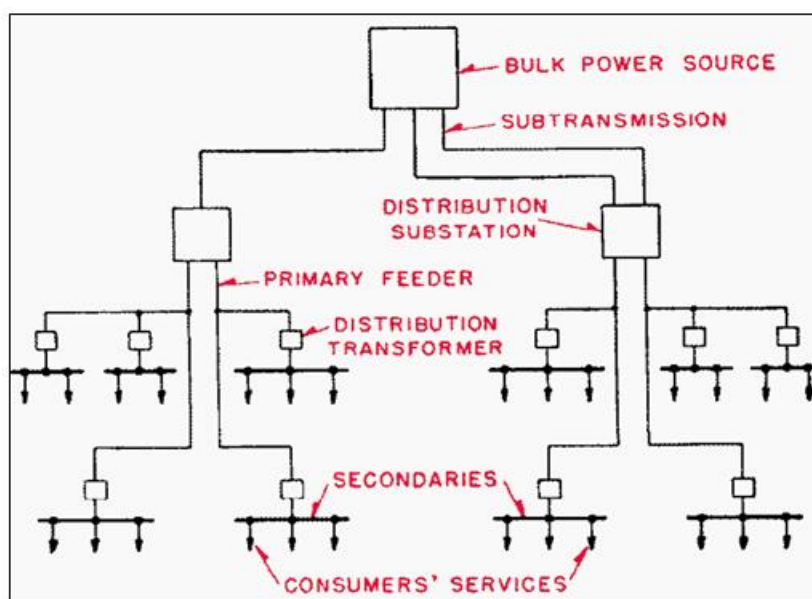


Fig 1 Distribution Systems

The study of electrical distribution systems is not only vital for understanding how electricity reaches end consumers but also for addressing the emerging challenges of sustainability, energy efficiency, and smart infrastructure. With the global emphasis on reducing carbon emissions and transitioning toward renewable energy, distribution networks play a crucial role in connecting decentralized energy sources to the main grid and managing energy flow effectively. They are the foundation of future power systems, enabling concepts like microgrids, demand response, and electric vehicle charging networks. This paper aims to provide a comprehensive survey of electrical distribution systems,

covering their fundamental structure, types, and operational aspects. It also highlights the latest technological trends, challenges, and advancements shaping the modernization of distribution networks. By understanding both traditional and modern systems, readers can gain insights into how power distribution is evolving to meet the demands of an increasingly digital and sustainable world. The paper thus serves as a bridge between classical distribution engineering and the emerging smart grid era, offering a holistic view of the electrical distribution system as a cornerstone of modern power delivery[7], [8].

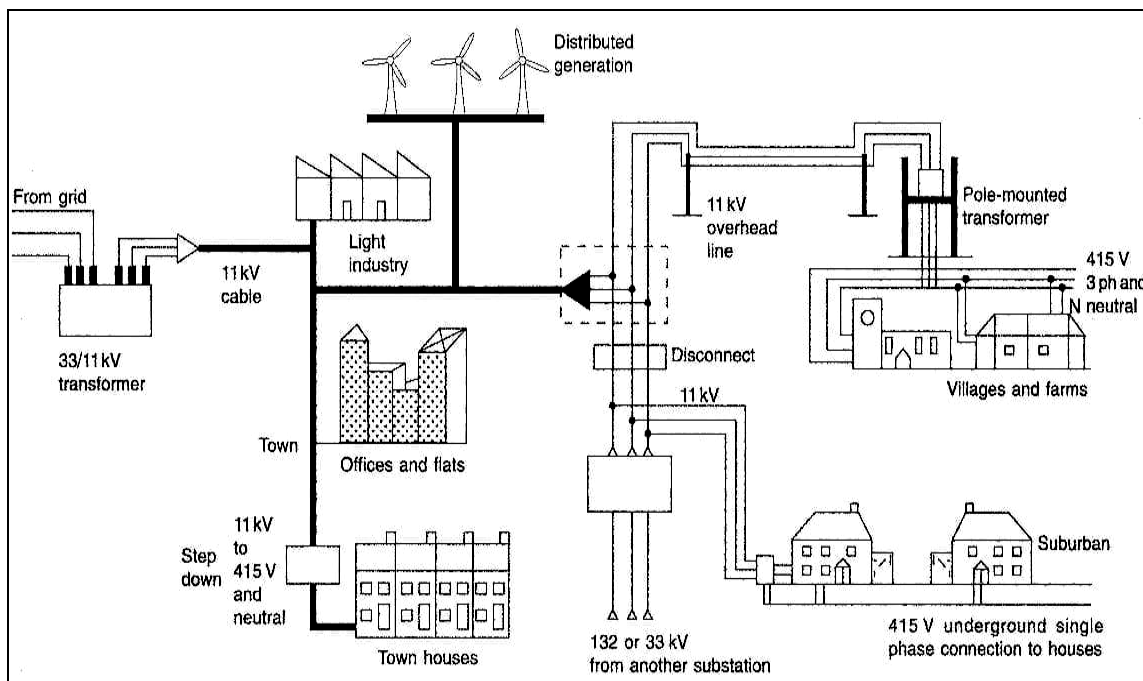


Fig 2 Electrical Distribution System

Despite extensive research on distribution network automation and renewable integration, a consolidated review focusing on the evolution, current technologies, and emerging challenges of EDS is limited. This paper aims to bridge that gap by surveying existing literature and identifying key research directions for future smart and sustainable distribution networks[9], [10].

II. OVERVIEW

The electrical distribution system (EDS) is one of the most critical components of the entire power system, serving as the final link in the chain that connects electricity generation and transmission to end users. It ensures that

electric power is delivered efficiently, reliably, and safely to consumers in homes, industries, and commercial establishments. While transmission systems carry bulk power over long distances at very high voltages, distribution systems step down this voltage through substations and transformers before supplying it to users at medium and low voltage levels. Thus, the distribution system bridges the gap between the high-voltage transmission network and the low-voltage consumer network, making it indispensable for the smooth functioning of modern societies. Without an effective distribution infrastructure, even the most advanced generation technologies would fail to serve their purpose, as electricity must reach the end consumer in a usable and stable form.[11], [12]

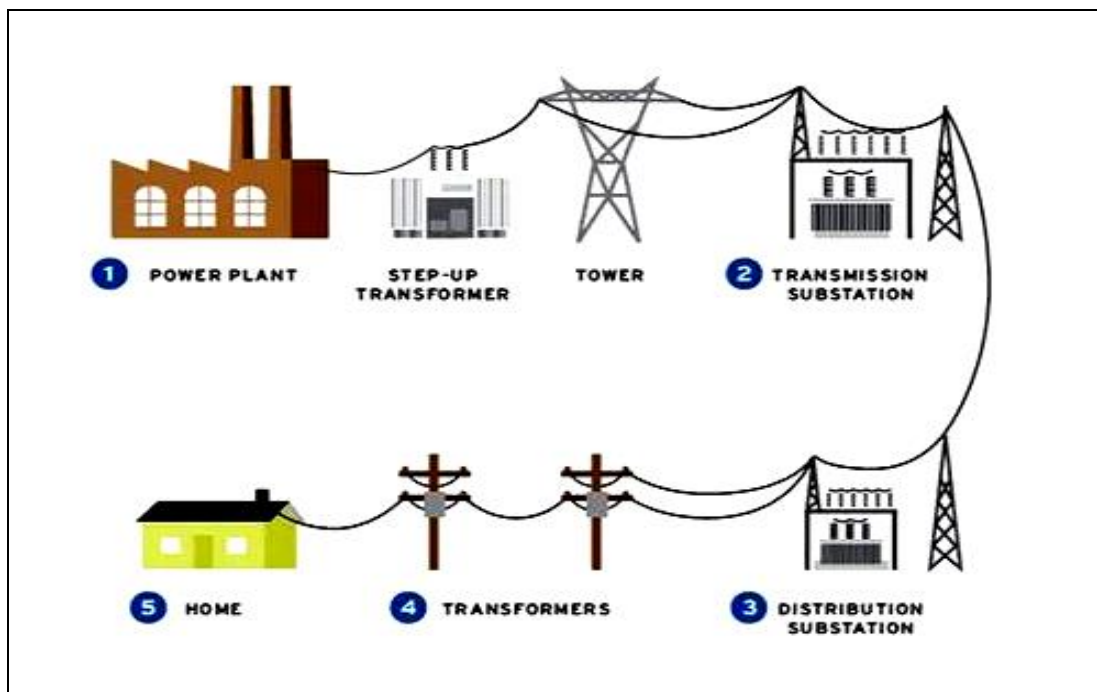


Fig 3. Structure of Power Systems

The design and operation of an electrical distribution system depend on various factors, such as geographical area, population density, load type, and voltage requirements. Typically, the system consists of several key components: feeders, distributors, service mains, transformers, circuit breakers, isolators, and protective devices. Feeders carry large amounts of power from substations to distribution points, while distributors supply electricity to different consumers along their routes. Service mains are the final connections that deliver power directly to users. The performance of a distribution system is measured in terms of parameters such as voltage regulation, power factor, load management, and energy losses. Maintaining optimal voltage levels and minimizing technical losses are crucial for efficiency and reliability. As electricity demand continues to grow, system planning must consider not only technical efficiency but also environmental sustainability and future scalability[13], [14].

In recent decades, the evolution of electrical distribution systems has been significantly influenced by technological advancements and the global shift toward smarter, greener, and more resilient energy infrastructure. Traditional distribution networks, which were primarily radial and manually controlled, are now being replaced or upgraded with smart distribution systems that incorporate automation, real-time monitoring, and intelligent control. Technologies such as Supervisory Control and Data Acquisition (SCADA), Geographic Information Systems (GIS), and Advanced Metering Infrastructure (AMI) have transformed how utilities monitor and manage their networks. Smart grids enable two-way communication between utilities and consumers, allowing for better load balancing, faster fault detection, and improved energy efficiency. The integration of Internet of Things (IoT) devices, sensors, and artificial intelligence has further enhanced decision-making in grid management, paving the way for predictive maintenance and automated fault restoration[15], [16].

Table 1: Comparison Between Traditional and Smart Electrical Distribution Systems

Feature	Traditional EDS	Smart EDS
Power Flow	Unidirectional (from substation to consumers)	Bidirectional (with distributed generation and renewables)
Control Type	Manual / Semi-automatic	Fully automated with intelligent control
Monitoring	Limited or periodic	Real-time via SCADA, AMI, and IoT devices
Fault Detection	Manual inspection and delayed response	Automated fault detection and self-healing capability
Voltage Regulation	Fixed equipment-based	Adaptive, sensor-based control

Data Communication	Minimal / one-way	Two-way communication between utility and consumer
Integration with Renewables	Difficult	Seamless integration with distributed energy resources (DERs)
System Reliability	Moderate	High, with predictive maintenance
Decision Support	Human-based	Data-driven using AI and analytics

Table 1 summarizes the major differences between traditional and smart EDS configurations discussed in recent studies. Another major transformation in modern distribution systems is the increasing integration of renewable energy sources and distributed generation. Solar photovoltaic systems, small-scale wind turbines, and microgrids are being connected directly to the distribution network, creating a bidirectional flow of power. This has made the grid more dynamic but also more complex, as utilities must manage fluctuating generation patterns and ensure power quality. The adoption of energy storage systems, such as lithium-ion batteries, helps stabilize supply during peak demand or low generation periods. These innovations not only improve reliability but also contribute to sustainability by reducing greenhouse gas emissions and supporting the transition to clean energy[17], [18].

The electrical distribution system has evolved from a simple network of lines and transformers into an intelligent and adaptive infrastructure capable of meeting the growing demands of a digital and energy-conscious world. It plays a pivotal role in ensuring energy security, promoting economic growth, and achieving environmental goals. Understanding its components, operation, and technological advancements is essential for building the next generation of efficient and sustainable power systems[19], [20].

III. OBJECTIVES

The primary objective of studying electrical distribution systems (EDS) is to understand the principles, components, and technologies involved in the efficient and reliable delivery of electrical energy to consumers. A major focus of recent research has been the integration of distributed generation and renewable resources to enhance sustainability. A well-planned distribution system ensures that electricity generated at power plants reaches end users at suitable voltage levels with minimal losses and interruptions. One of the main goals is to analyze the structure and configuration of various distribution systems: such as radial, ring, and interconnected networks—to evaluate their efficiency, reliability, and suitability for different applications. Understanding how these configurations affect fault management, voltage regulation, and load distribution is essential for improving system performance. Another important objective is to examine the key operational aspects of distribution systems, including voltage control, power factor correction, and load balancing, which are vital for maintaining consistent power quality and stability. With the advancement of technology, a major focus is also placed on exploring how automation, monitoring, and smart grid

technologies enhance the operation and management of distribution networks. Tools such as Supervisory Control and Data Acquisition (SCADA), Advanced Metering Infrastructure (AMI), and Internet of Things (IoT)-based devices allow real-time monitoring and faster fault response, leading to greater system efficiency. In addition, the study aims to understand the integration of renewable energy sources and distributed generation units into existing distribution networks to promote sustainability and reduce dependency on conventional power sources. Overall, the objective of this study is to develop a comprehensive understanding of how traditional and modern distribution systems operate, the challenges they face, and the emerging innovations that can make them more intelligent, efficient, and resilient in meeting future energy demands[21], [22].

IV. TYPES OF ELECTRICAL DISTRIBUTION SYSTEMS

Electrical Distribution Systems (EDS) can be categorized in several ways, depending on the type of current used, the configuration of the network, and the voltage level of distribution. Broadly, these systems are divided into Alternating Current (AC) and Direct Current (DC) distribution networks. Although DC systems were widely used in the early stages of electrification, AC systems became dominant due to their ability to easily transform voltage levels using transformers, enabling efficient long-distance transmission. Within AC systems, there are two main categories: single-phase and three-phase. Single-phase distribution is typically employed for residential and light commercial loads where power demand is relatively low, while three-phase systems are used for industrial and large commercial consumers where high power and balanced loads are required[23], [24].

Based on the network configuration, electrical distribution systems are generally classified as radial, ring main, and interconnected systems. The radial system is the simplest and most economical, consisting of feeders radiating from a single substation to various load points. However, it suffers from poor reliability since a fault in the feeder can interrupt power to all connected consumers. The ring main system, in contrast, provides an alternative path for current flow, thereby improving reliability and maintaining supply even if one section of the network fails. The interconnected system further enhances reliability and flexibility by linking multiple substations and feeders, allowing for better load sharing, reduced losses, and improved voltage regulation[25].

Table 2: Comparison of Radial, Ring Main, and Interconnected Distribution Systems

Type of EDS	Key Features	Advantages	Limitations	Typical Applications
Radial System	Single path from substation to load	Simple design, low cost	Poor reliability; single fault affects all consumers	Rural or small networks
Ring Main System	Closed loop with alternate path	Improved reliability, continuous supply	Moderate cost, complex protection	Urban and commercial areas
Interconnected System	Multiple substations interconnected	High reliability, flexible operation	Expensive, complex control	Industrial zones, critical loads

Table 2 presents a comparative summary of the major distribution system configurations discussed in literature, . Another important classification is based on voltage level: primary distribution (typically 11 kV to 33 kV) and secondary distribution (400 V to 230 V). Primary systems deliver electricity from substations to distribution transformers, while secondary systems supply power directly to consumers. In recent years, smart distribution systems have emerged as an advanced category, incorporating automation, remote monitoring, distributed energy resources, and real-time fault detection. These smart networks enable bidirectional power flow, integration of renewable energy sources, and enhanced grid resilience. Hence, the understanding of different EDS types is fundamental for developing reliable, efficient, and sustainable power distribution networks suited to modern energy demands[26]-[27].

V. ADVANTAGES OF ELECTRICAL DISTRIBUTION SYSTEMS

Electrical Distribution Systems (EDS) provide numerous advantages that make them an essential part of modern power networks. They are the final and most crucial link in the electrical supply chain, ensuring that electricity generated at power plants reaches consumers efficiently, reliably, and safely. One of the primary advantages of an effective distribution system is its ability to deliver electricity with minimal technical losses. Proper voltage regulation, adequate conductor sizing, and strategically placed substations help minimize power losses and ensure that consumers receive stable voltage. Devices such as automatic voltage regulators, on-load tap-changing transformers, and capacitor banks maintain power quality, reduce fluctuations, and enhance the overall stability of the network[28].

Another significant advantage is reliability and continuity of power supply. Traditional radial systems, though simple, have limited reliability because a single fault can interrupt power for all users downstream. However, modern configurations such as ring main and interconnected systems provide alternative paths for current flow, allowing electricity to be rerouted in case of faults or maintenance. This ensures uninterrupted supply and increases consumer satisfaction. The integration of automation and protection systems, such as Supervisory Control and Data Acquisition (SCADA), remote sensors, and automatic circuit reclosers, has further improved the fault detection and isolation process.

Automation and SCADA have improved reliability indices by up to 25% according to field data. As a result, outages are shorter, and system restoration is faster, leading to improved operational efficiency[29].

Electrical distribution systems also offer the advantage of flexibility and expandability. As population and industrial demands grow, new feeders, substations, or transformers can be added to the network without major structural changes. The modular nature of modern EDS designs allows utilities to easily adapt to future expansion and evolving energy needs. Furthermore, the adoption of smart grid technologies has revolutionized the way power is managed and distributed. Through real-time monitoring, automation, and data analytics, utilities can predict faults, balance loads, and optimize power flow, ensuring efficient energy utilization and reduced operational costs. The use of IoT and AI-based monitoring further enhances energy efficiency.

Another major advantage is the integration of renewable energy sources and distributed generation. Modern distribution systems are designed to accommodate decentralized power generation from solar panels, wind turbines, and microgrids. This reduces dependence on centralized power plants, lowers transmission losses, and supports sustainability goals by reducing greenhouse gas emissions. Energy storage systems, such as battery banks, can also be connected to the network to store excess energy and provide backup during peak demand or supply interruptions. Integration of renewable energy sources into distribution networks has reduced greenhouse gas emissions and improved grid resilience.

EDS plays an important role in economic growth and social development. A reliable distribution network supports industrial productivity, business operations, healthcare, and education, thereby improving overall quality of life. It also encourages investments in new technologies and promotes a greener, smarter future. In summary, the advantages of electrical distribution systems extend far beyond electricity delivery—they ensure efficiency, reliability, adaptability, and sustainability. A well-planned and technologically advanced distribution network forms the foundation of a strong and resilient power infrastructure capable of meeting the growing demands of modern society. Emerging research is focused on digital twins, edge computing, and AI-driven optimization in distribution networks. The use of blockchain for peer-to-peer

energy trading and cyber-resilient control systems is gaining momentum. Such innovations will transform EDS into fully autonomous, data-driven infrastructures supporting decentralized energy ecosystems.

VI. CONCLUSION

The electrical distribution system forms the most essential link between the generation of power and its utilization by consumers, ensuring that electricity is delivered efficiently, safely, and reliably to every user. As urbanization and electrification expand, resilient and adaptive EDS will be key to energy transition. This comprehensive survey highlights how modern electrical distribution systems have evolved from simple radial networks to highly advanced, automated, and intelligent systems that can handle complex demands of modern society. Through continuous innovation, distribution systems have become more resilient, incorporating technologies such as Supervisory Control and Data Acquisition (SCADA), distribution automation, and smart meters, which have transformed traditional networks into smart grids. These advancements enable real-time monitoring, load balancing, voltage regulation, and fault detection, significantly improving performance and reducing energy losses. Moreover, the integration of renewable energy sources such as solar and wind has made distribution systems more sustainable, supporting the transition towards cleaner energy solutions. As electricity demand continues to grow with urbanization, electric mobility, and digitalization, the need for a robust, flexible, and intelligent distribution infrastructure becomes more critical than ever. Continued investment and innovation in automation, AI, and renewable integration will ensure reliability and sustainability in the future power landscape. An efficient distribution system not only improves power quality but also contributes to economic growth, industrial productivity, and environmental sustainability. Future advancements are expected to focus on decentralization, energy storage, and advanced grid management technologies to achieve maximum reliability and minimal losses. In conclusion, the electrical distribution system stands as a vital component of the power sector, and its modernization is key to meeting the energy challenges of the 21st century. Continuous research, policy support, and investment in smart and sustainable distribution technologies will ensure a more reliable and greener energy future for generations to come.

REFERENCES

- [1]. N. Nireekshana, R. Ramachandran, and G. V. Narayana, "A New Soft Computing Fuzzy Logic Frequency Regulation Scheme for Two Area Hybrid Power Systems," *Int. J. Electr. Electron. Res.*, vol. 11, no. 3, pp. 705–710, 2023.
- [2]. N. Nireekshana, A. Archana, and K. Pullareddy, "A Classical H6 Topology for Modern PV Inverter Design," in *Power Energy and Secure Smart Technologies*, CRC Press, 2025, pp. 1–7. Accessed: Nov. 12, 2025. [Online]. Available: <https://www.taylorfrancis.com/chapters/edit/10.1201/9781003661917-1/classical-h6-topology-modern-pv-inverter-design-namburi-nireekshana-archana-pullareddy-kanth-rajini>
- [3]. C. P. Prasad and N. Nireekshan, "A Higher Voltage Multilevel Inverter with Reduced Switches for Industrial Drive," *Int. J. Sci. Eng. Technol. Res. IJSETR*, vol. 5, no. 1, 2016, Accessed: Nov. 12, 2025. [Online]. Available: https://methodist.edu.in/web/uploads/naac/2019-11-19%2012_24_22pm%2092.pdf
- [4]. N. Namburi Nireekshana and K. R. Kumar, "A Modern Distribution Power Flow Controller With A PID-Fuzzy Approach: Improves The Power Quality", Accessed: Nov. 12, 2025. [Online]. Available: https://www.academia.edu/download/112956747/ijeer_120124.pdf
- [5]. N. Nireekshana, N. Ravi, and K. R. Kumar, "A Modern Distribution Power Flow Controller With A PID-Fuzzy Approach: Improves The Power Quality," *Int. J. Electr. Electron. Res.*, vol. 12, no. 1, pp. 167–171, 2024.
- [6]. N. Nireekshana, R. Ramachandran, and G. Narayana, "A Novel Swarm Approach for Regulating Load Frequency in Two-Area Energy Systems," *Int J Electr Electron Res*, vol. 11, pp. 371–377, 2023.
- [7]. N. Nireekshana, R. Ramachandran, and G. V. Narayana, "A Peer Survey on Load Frequency Control in Isolated Power System with Novel Topologies," *Int J Eng Adv Technol IJEAT*, vol. 11, no. 1, pp. 82–88, 2021.
- [8]. N. Nireekshana, "A POD Modulation Technique Based Transformer less HERIC Topology for PV Grid Tied-Inverter," in *E3S Web of Conferences*, EDP Sciences, 2025, p. 01001. Accessed: Nov. 12, 2025. [Online]. Available: https://www.e3s-conferences.org/articles/e3sconf/abs/2025/16/e3sconf_icregcsd2025_01001/e3sconf_icregcsd2025_01001.html
- [9]. N. Nireekshana, R. Ramachandran, and G. V. Narayana, "An innovative fuzzy logic frequency regulation strategy for two-area power systems," *Int. J. Power Electron. Drive Syst. IJPEDS*, vol. 15, no. 1, pp. 603–610, 2024.
- [10]. N. Nireekshana, R. Ramachandran, and G. V. Narayana, "An innovative fuzzy logic frequency regulation strategy for two-area power systems," *Int. J. Power Electron. Drive Syst. IJPEDS*, vol. 15, no. 1, pp. 603–610, Mar. 2024, doi: 10.11591/ijpeds.v15.i1.pp603-610.
- [11]. N. Nireekshana, T. H. Nerlekar, P. N. Kumar, and M. M. Bajaber, "An Innovative Solar Based Robotic Floor Cleaner," *Int. J. Innov. Sci. Res. Technol. IJISRT*, vol. 8, no. 4, pp. 1880–1885, 2023.
- [12]. N. NIREEKSHANA, R. Ramachandran, and G. V. Narayana, "An intelligent technique for load frequency control in hybrid power system," 2023, Accessed: Nov. 12, 2025. [Online]. Available: <https://www.academia.edu/download/107660997/latest.pdf>

- [13]. N. Nireekshana, "Control of a Bidirectional Converter to Interface Electrochemical double layer capacitors with Renewable Energy Sources", Accessed: Nov. 12, 2025. [Online]. Available: https://methodist.edu.in/web/uploads/naac/2019-11-19%2012_45_38pm%20151.pdf
- [14]. N. Nireekshana, "Design and Implementation of Single PHASERV Topology Five Level Inverter.," *Grenze Int. J. Eng. Technol. GIJET*, vol. 4, no. 3, 2018, Accessed: Nov. 12, 2025. [Online]. Available: https://methodist.edu.in/web/uploads/naac/2019-11-19%2012_58_19pm%20202.pdf
- [15]. Y. Mastanamma, B. Laxman, J. R. Babu, N. Nireekshan, and E. Saidulu, "Electric Cargo Tricycle-A New Mobility," in *E3S Web of Conferences*, EDP Sciences, 2025, p. 03015. Accessed: Nov. 12, 2025. [Online]. Available: https://www.e3s-conferences.org/articles/e3sconf/abs/2025/16/e3sconf_icregcsd2025_03015/e3sconf_icregcsd2025_03015.html
- [16]. N. Nireekshana, S. Unissa, B. R. Jaleja, C. Mukta Tejaswi, P. Mangathayaru Mahitha, and P. Vaishnavi, "FACTS: Present and Future," *Int. J. Innov. Sci. Res. Technol. IJISRT*, pp. 2350–2358, Oct. 2024, doi: 10.38124/ijisrt/IJISRT24SEP1424.
- [17]. N. Nireekshana, R. R. Chandran, and G. V. Narayana, "Frequency Regulation in Two Area System with PSO Driven PID Technique," *J Power Electron Power Syst*, vol. 12, no. 2, pp. 8–20, 2022.
- [18]. R. Jatoth and N. Nireekshana, "Improvement of Power Quality in Grid Connected Non Coventional Energy Sources at Distribution Loads," *Grenze Int J Eng Technol GIJET*, vol. 4, no. 3, 2018, Accessed: Nov. 12, 2025. [Online]. Available: https://methodist.edu.in/web/uploads/naac/2019-11-19%2012_58_06pm%20201.pdf
- [19]. B. Jula and N. Nireekshan, "Improving the Voltage Profile at Load End using DVR.," *Grenze Int. J. Eng. Technol. GIJET*, vol. 4, no. 3, 2018, Accessed: Nov. 12, 2025. [Online]. Available: <https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=23955287&AN=134178998&h=YQk2OkwoPFcVuqJX%2B1rKA0MbU%2B3%2FNRIInXZhf6Wu1MJR4MoiWNdCgc7k4H5aV7e79V%2BdpemgvHWYJbJToV64CuQ%3D%3D&crl=c>
- [20]. N. Nireekshana, R. Ramachandran, and G. V. Narayana, "Novel Intelligence ANFIS Technique for Two-Area Hybrid Power System's Load Frequency Regulation," in *E3S Web of Conferences*, EDP Sciences, 2024, p. 02005. Accessed: Nov. 12, 2025. [Online]. Available: https://www.e3s-conferences.org/articles/e3sconf/abs/2024/02/e3sconf_icregcsd2023_02005/e3sconf_icregcsd2023_02005.html
- [21]. N. Nireekshana, G. M. Krishna, A. George Muller, K. Sai Manideep, and M. Abdul Mukheem, "Power Quality Improving using FCL and DVR," *Int. J. Innov. Sci. Res. Technol. IJISRT*, pp. 624–632, May 2024, doi: 10.38124/ijisrt/IJISRT24MAY025.
- [22]. N. Nireekshana, "Reactive Power Compensation in High Power Applications by Bidirectional cascaded H-Bridge Based Statcom", Accessed: Nov. 12, 2025. [Online]. Available: https://methodist.edu.in/web/uploads/naac/2019-11-19%2012_45_47pm%20152.pdf
- [23]. N. NIREEKSHANA, A. SHIVA, A. FURKHAN, M. SRIDHAR, A. OMPRAKASH, and K. K. SHIVA, "SIX PULSE TYPE SEGMENTED THYRISTOR CONTROLLED REACTOR WITH FIXED CAPACITOR FOR REACTIVE POWER COMPENSATION," *Int. J.*, pp. 3153–3159, 2024.
- [24]. N. Nireekshana, M. A. Goud, R. B. Shankar, and G. N. S. Chandra, "Solar Powered Multipurpose Agriculture Robot," *Int. J. Innov. Sci. Res. Technol.*, vol. 8, no. 5, p. 299, 2023.
- [25]. N. Nireekshana, K. P. Reddy, A. Archana, and P. R. Kanth, "Solar-Assisted Smart Driving System for Sustainable Transportation," *Int. J. Innov. Sci. Res. Technol.*, vol. 10, no. 8, pp. 168–173, 2025.
- [26]. Namburi Nireekshana, Onteru Divya, Mohammed Abdul Saquib Adil, Rathod Rahul, and Mohammed Shoaib Mohiuddin, "An Innovative SSSC Device for Power Quality Enhancement," Feb. 2024, doi: 10.5281/ZENODO.10670526.
- [27]. Namburi Nireekshana, K. Pulla Reddy, Reyya Bose Babu, Bonda Sunder, G. Sumanth Kumar, and P. Vivekananda Raj, "Static Var Compensator for Reactive Power Control," Feb. 2024, doi: 10.5281/ZENODO.10638477.
- [28]. Namburi Nireekshana, A. Archana, Setla Manvitha, Mohammed Saad Ahmed, Nisar Ahmed Khan, and Akellu George Muller, "Unique Facts Device for Power Quality Mitigation," Feb. 2024, doi: 10.5281/ZENODO.10652911.
- [29]. Namburi Nireekshana, Manmarry Vaibhav Murali, Makka Harinath, Ch. Vishal, and Ankam Sandeep Kumar, "Power Quality Improvement by Thyristor Controlled Series Capacitor," Feb. 2024, doi: 10.5281/ZENODO.10669448.