



BUILDERS ENGINEERING COLLEGE

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
ISO 9001:2015 Certified Institution & Accredited by NAAC with B++ Grade

Erode Road, Nathakadaiyur, Kangeyam, Tirupur - 638 108, Tamil Nadu.

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Department of Electrical & Electronics Engineering JUNE 2021

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About the Institution

Builders Engineering College (Formerly known as Erode Builder Educational Trust's Group of Institutions) was established by Erode Builder Educational Trust (EBET) in the year 2009 as an integrated campus and presently functioning as a technical campus. It offers six UG Programmes (BE – Civil, CSE, ECE, EEE, Mechanical) and four PG Programmes (ME – CEM, STR, CSE and MBA) with an intake of 114 students. Stepping into the fourteenth year of service, the Management, CEO, Principal and faculty members are committed to elevating the lives of budding rural aspirants through academics and research. The Chief Patrons are the pioneers in the field of infrastructure and construction all over India.

Vision

To be the most preferred knowledge provider.

Mission

Builders Engineering College endeavours to prepare rural students for successful career through academic and applied research.

About the Department

The Department of Electrical and Electronics Engineering was started in the year 2010 and offers BE EEE programme in tune with the syllabi of Anna University. The department aims to develop electrical engineers who are innovative, entrepreneurial, and equipped to become global leaders in research and technology. The department has well qualified faculty members who are specialists in the fields of Power Electronics and Drives, VLSI Design, Applied Electronics and Power Engineering and Management. The faculty team includes a doctorate serving for the betterment of the students. The department has well equipped laboratories. The department provides an environment to students in such a way that they will be able to understand the core concepts including Electrical machines, Circuits and Networks, Power systems, Power Electronics, Electromagnetic theory, Instrumentation, Microprocessors and Microcontrollers and Electron Devices & Circuits.

Vision

To become a front-runner in moulding the students globally competent, knowledgeable electrical engineers also as performers in the roles of innovators, researchers and entrepreneurs.

Mission

To nurture the students with sound technical knowledge to meet the upcoming challenges in electrical domain and to enhance competitiveness of the graduates for higher studies.

Programme Educational Objectives (PEOs)

- Shall flourish in their professional careers, further education, research, or as entrepreneurs
- Must always learn new things and hone existing abilities to create solutions that have a big impact and are cutting-edge in terms of energy use.
- To create and build practical, multidisciplinary solutions that are technically sound, commercially viable and socially acceptable, graduates must have strong communication skills, a professional demeanour and ethical behaviour.

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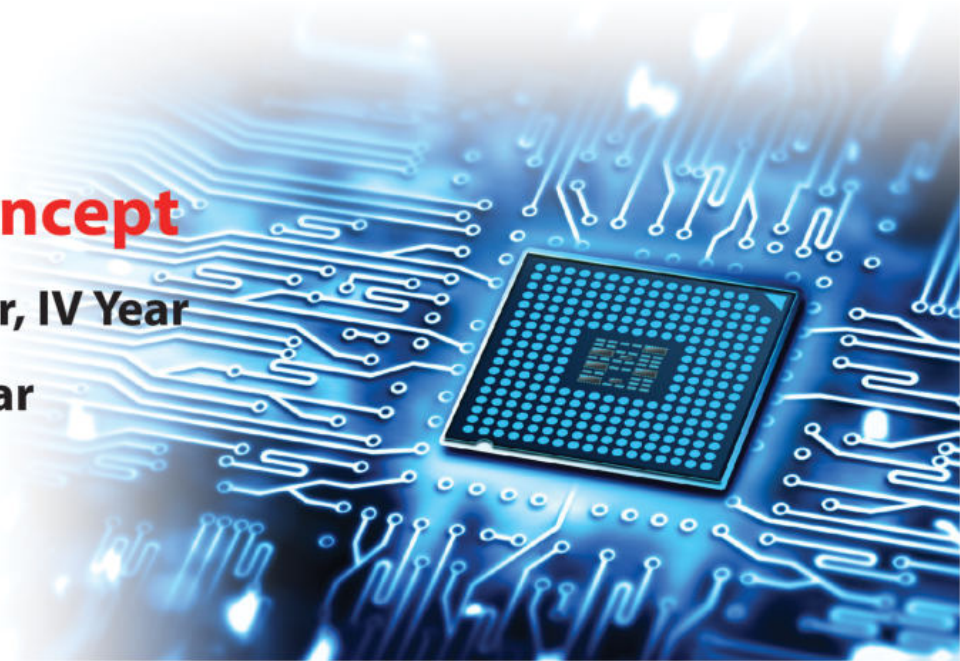
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Advancements in Power Electronics: Pioneering Efficiency in Electrical Systems

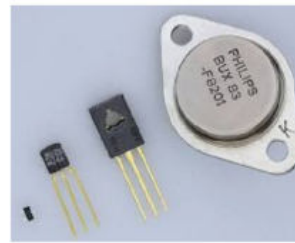
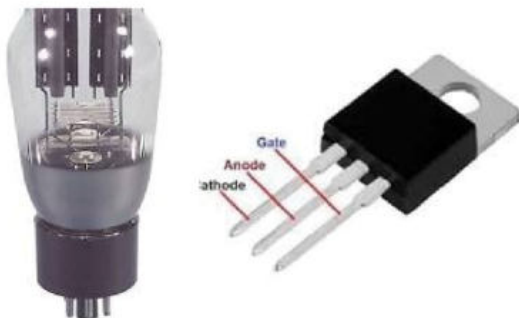
by Dr. S. Saravanan, Professor & HoD

Introduction:

Power electronics, the technology behind the conversion and control of electrical power, plays a pivotal role in modern electrical systems across industries. From renewable energy integration to electric vehicles and smart grids, advancements in power electronics have revolutionized the efficiency, reliability, and sustainability of electrical infrastructure. This article explores the latest innovations in power electronics and their transformative impact on enhancing energy conversion, management, and utilization in diverse applications.

Evolution of Power Electronics:

Power electronics has evolved rapidly over the decades, driven by the demand for more efficient, compact, and cost-effective electrical systems. Early developments focused on basic rectification and voltage conversion circuits, enabling the widespread adoption of AC/DC and DC/DC converters in various applications. With the advent of semiconductor devices such as diodes, thyristors, and later, insulated gate bipolar transistors (IGBTs) and silicon carbide (SiC) MOSFETs, power electronics entered a new era of high-power, high-frequency operation, paving the way for advanced power conversion topologies and control techniques.



Efficient Energy Conversion:

Efficiency is a critical metric in power electronics, particularly in applications where energy loss translates to increased operating costs and reduced system reliability. Recent advancements have focused on improving the efficiency of power converters through the use of wide-bandgap (WBG) semiconductors, advanced modulation schemes, and intelligent control algorithms. Silicon carbide (SiC) and gallium nitride (GaN) devices offer lower switching losses and higher operating temperatures compared to traditional silicon-based devices, enabling higher efficiency and power density in converters.



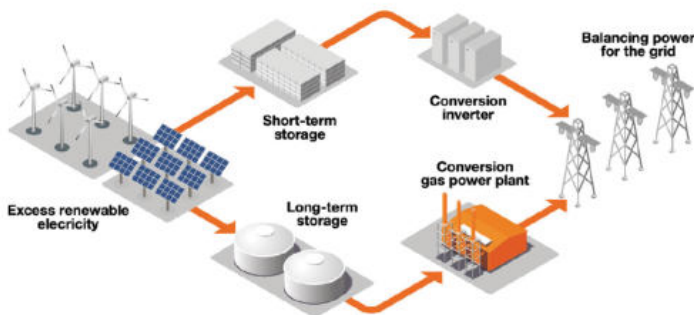
Furthermore, advanced modulation techniques such as pulse-width modulation (PWM), resonant switching, and multi-level topologies minimize switching losses and harmonic distortion, further enhancing converter efficiency. Moreover, digital control algorithms and adaptive optimization algorithms enable real-time monitoring and optimization of converter performance, ensuring optimal efficiency under varying operating conditions.

Renewable Energy Integration:

The proliferation of renewable energy sources,

such as solar and wind power, presents both opportunities and challenges for power electronics. Renewable energy systems often exhibit variable output characteristics, requiring sophisticated power electronics solutions for efficient integration into the grid. Power converters such as grid-tied inverters and DC-DC converters play a crucial role in interfacing renewable energy sources with the grid, ensuring maximum power extraction and grid stability.

Advanced control algorithms, including maximum power point tracking (MPPT) and grid synchronization techniques, enable renewable energy systems to operate at peak efficiency while maintaining grid compatibility. Moreover, bi-directional power flow capabilities in grid-tied converters facilitate energy exchange between renewable energy sources and the grid, enabling distributed generation and energy storage integration.



Electric Vehicles and Energy Storage:

The electrification of transportation is driving demand for high-performance power electronics solutions in electric vehicles (EVs) and energy storage systems. Power converters in EVs, such as onboard chargers, DC-DC converters, and motor drives, require high efficiency, compact size, and reliable operation to maximize vehicle range and performance.

Advancements in power electronics technology, including SiC and GaN devices, enable faster charging, higher power density, and extended battery life in EVs. Furthermore, bidirectional power flow capabilities in EV chargers and vehicle-to-grid (V2G) systems enable EVs to serve as grid-connected energy storage devices,

supporting grid stability and renewable energy integration.



Conclusion:

Advancements in power electronics are driving innovation and efficiency across a wide range of electrical systems, from renewable energy integration to electric vehicles and beyond. By leveraging the latest semiconductor technologies, advanced control algorithms, and system integration techniques, power electronics engineers continue to push the boundaries of efficiency, reliability, and sustainability in electrical systems. As the demand for clean energy and electrified transportation continues to grow, power electronics will play an increasingly critical role in shaping the future of energy conversion and management.

Smart Grid Technologies: Enabling Seamless Integration of Renewable Energy

by *M. Hariharan, IV Year*

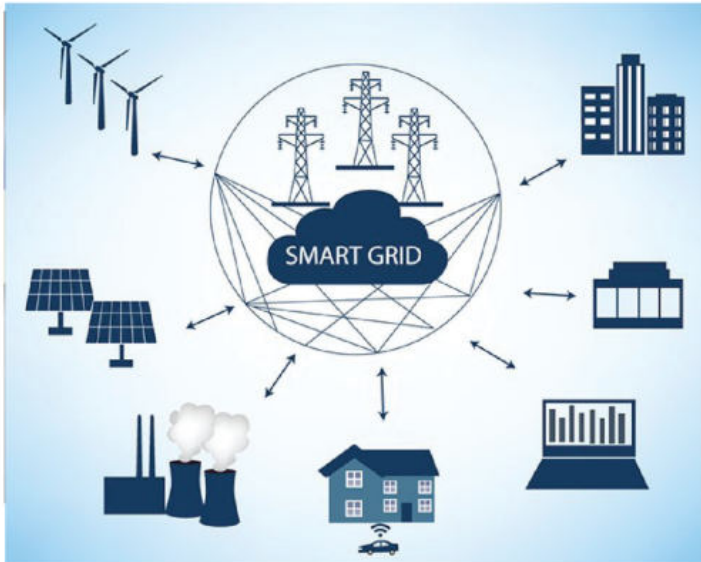
Introduction:

As the world transitions towards a sustainable energy future, the integration of renewable energy sources into the power grid is becoming increasingly vital. Smart grid technologies represent a paradigm shift in how we manage, distribute, and consume electricity, offering innovative solutions to accommodate the growing share of renewable energy generation. This article

dives into the role of smart grid technologies in facilitating the seamless integration of renewable energy, driving efficiency, reliability, and sustainability in the power sector.

Understanding Smart Grids:

A smart grid is an advanced electrical grid that leverages digital communication, sensing, and control technologies to optimize the generation, distribution, and consumption of electricity. Unlike traditional grids, which operate in a one-way flow of electricity from centralized power plants to consumers, smart grids enable bidirectional energy flow, real-time monitoring, and dynamic optimization of grid operations. By integrating renewable energy resources, energy storage systems, and demand-side management, smart grids enhance grid flexibility, resilience, and efficiency.

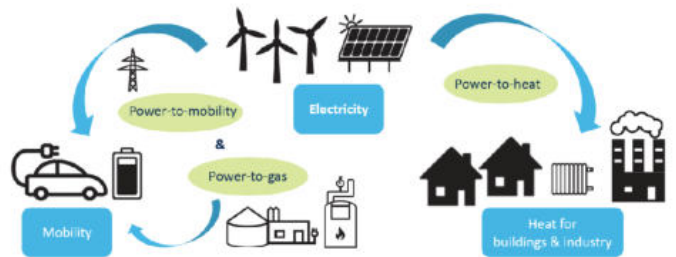


Renewable Energy Integration:

Renewable energy sources, such as solar, wind, and hydroelectric power, exhibit variable and intermittent output characteristics, posing challenges to grid stability and reliability. Smart grid technologies offer innovative solutions to overcome these challenges and maximize the integration of renewable energy into the grid. Advanced forecasting algorithms enable accurate prediction of renewable energy generation, allowing grid operators to anticipate fluctuations and optimize grid operations accordingly.

Furthermore, smart grid technologies facilitate the seamless integration of distributed energy resources (DERs), including rooftop solar panels, wind turbines, and energy storage systems. Through advanced monitoring and control capabilities, smart grids enable efficient coordination of DERs, optimizing their contribution to grid stability and reliability. Additionally, demand response programs incentivize consumers to adjust their electricity usage in response to grid conditions, reducing peak demand and enhancing grid flexibility.

Sector coupling – an integrated energy system based on renewable electricity



Grid Modernization and Automation:

The modernization of aging infrastructure and the deployment of intelligent automation technologies are central to the evolution of smart grids. Advanced sensors, communication networks, and data analytics enable real-time monitoring and control of grid assets, enhancing situational awareness and facilitating rapid response to grid disturbances. Automated control algorithms optimize grid operations, enabling self-healing capabilities and reducing the impact of outages on consumers.

Moreover, grid modernization efforts encompass the deployment of advanced metering infrastructure (AMI), which enables two-way communication between utilities and consumers. Smart meters provide consumers with real-time visibility into their electricity usage and enable dynamic pricing schemes, encouraging energy conservation and load shifting. By empowering consumers to actively participate in grid management, smart grids promote energy efficiency and sustainability at the grassroots level.

Collaboration and Policy Support:

The widespread adoption of smart grid technologies requires collaboration among utilities, regulators, technology providers, and consumers. Policy support, financial incentives, and regulatory frameworks play a crucial role in fostering investment in smart grid infrastructure and incentivizing renewable energy integration. Governments worldwide are implementing initiatives to accelerate the deployment of smart grids and promote the transition to a low-carbon energy system.

Conclusion:

Smart grid technologies are revolutionizing the way we generate, distribute, and consume electricity, enabling the seamless integration of renewable energy into the power grid. By leveraging digital communication, sensing, and control capabilities, smart grids enhance grid flexibility, reliability, and sustainability. As the global demand for clean energy continues to rise, smart grids will play a pivotal role in shaping a resilient and sustainable energy future.

Wireless Power Transfer: Revolutionizing Electrical Engineering

by K. Divya, II Year

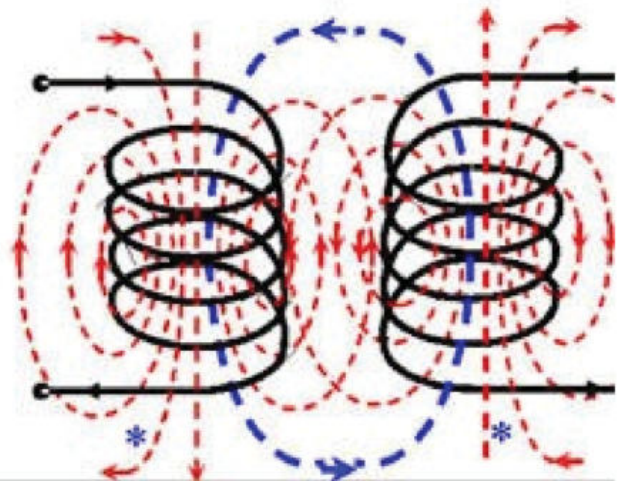
Introduction:

In the realm of electrical engineering, the advent of wireless power transfer (WPT) stands as a groundbreaking innovation poised to redefine how we transmit and utilize electrical energy. From powering electronic devices without cords to enabling electric vehicle charging without physical contact, WPT represents a transformative leap towards a more efficient, convenient, and sustainable future. This article explores the principles, applications, and potential impact of wireless power transfer, highlighting its emergence as a game-changer in electrical engineering.

Understanding Wireless Power Transfer:

Wireless power transfer, also known as inductive power transfer or resonant coupling, enables the transmission of electrical energy from a power source to a receiver without the need for direct electrical connections. The technology operates on the principle of electromagnetic induction, where alternating magnetic fields generated by a transmitter coil induce a voltage in a nearby receiver coil, thus enabling power transfer. WPT systems can be classified into near-field and far-field technologies, each offering unique advantages and applications.

Near-field WPT systems, such as inductive charging pads and coils, are suitable for short-range power transfer applications, typically ranging from a few millimeters to a few centimeters. These systems are commonly used for wireless charging of smartphones, wearable devices, and medical implants, offering convenience and eliminating the need for physical connectors. Far-field WPT systems, on the other hand, utilize electromagnetic waves to transfer power over longer distances, making them ideal for applications such as wireless power transmission to remote sensors, IoT devices, and electric vehicles.



Applications of Wireless Power Transfer:

The versatility of wireless power transfer has led to its adoption across a wide range of applications, revolutionizing various industries and consumer

technologies. In the consumer electronics sector, wireless charging has become increasingly prevalent, with smartphones, tablets, and wearable devices incorporating Qi-standard wireless charging technology. By eliminating the need for multiple chargers and cables, wireless charging offers enhanced convenience and portability for users.

In the automotive industry, wireless power transfer holds the promise of transforming electric vehicle charging infrastructure. Wireless charging pads embedded in parking lots and roadways enable automatic charging of electric vehicles while parked or in motion, eliminating the need for manual connection to charging stations. This not only streamlines the charging process but also reduces the deployment costs and enhances the user experience, thereby accelerating the adoption of electric vehicles.

Moreover, wireless power transfer finds applications in healthcare, aerospace, industrial automation, and IoT devices, where the elimination of cables and connectors offers significant benefits in terms of reliability, safety, and maintenance. Wireless power transfer technology is also being explored for powering remote sensors, implantable medical devices, and unmanned aerial vehicles (UAVs), opening up new possibilities for remote monitoring, surveillance, and healthcare delivery.



Challenges and Future Prospects:

Despite its numerous advantages, wireless power transfer technology still faces challenges related to efficiency, range, and standardization. Improving the efficiency of power transfer, minimizing electromagnetic interference, and optimizing coil designs are areas of ongoing research and development. Additionally, ensuring interoperability and compatibility among different wireless charging standards is essential for widespread adoption and market acceptance.

Looking ahead, the future of wireless power transfer holds tremendous promise, with advancements in materials science, electronics, and telecommunications driving innovation in the field. Emerging technologies such as resonant beam charging, microwave power transmission, and long-range wireless power transfer are poised to expand the capabilities and applications of WPT, enabling new paradigms in energy distribution, transportation, and connectivity.



Conclusion:

Wireless power transfer represents a paradigm shift in electrical engineering, offering a compelling alternative to traditional wired power transmission systems. From consumer electronics to electric vehicles and beyond, the versatility and convenience of WPT are driving its widespread adoption across diverse industries and applications.